



# **PINAL COUNTY** Community Wildfire Protection Plan

June 2018

Apache Junction  
Dudleyville  
Golder Ranch  
Kearny  
Mammoth  
Oracle  
Queen Valley

San Manuel  
Superior  
Top of the World  
Ak-Chin Indian Community  
Avra Valley  
Casa Grande  
Coolidge

Eloy  
Florence  
Gila River Indian Community  
Maricopa  
Queen Creek  
Tohono O'odham Nation



**PINAL COUNTY**  
WIDE OPEN OPPORTUNITY

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# **Pinal County Community Wildfire Protection Plan**

**June 2018**

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## ACRONYMS AND ABBREVIATIONS

ADFFM	Arizona Department of Forestry and Fire Management
APS	Arizona Public Service
ASLD	Arizona State Land Department
BAER	burned area emergency response
BLM	Bureau of Land Management
CARs	communities-at-risk
CNF	Coronado National Forest
CWPP	community wildfire protection plan
EMA	Ecosystem Management Area
FMU	Fire Management Unit
FMZ	fire management zones
FRCC	fire regime condition class
GIS	geographic information system
GPS	Global Positioning System
HFRA	Healthy Forests Restoration Act
IGA	intergovernmental agreement
ISO	Insurance Services Office
NFDRS	National Fire Danger Rating System
NFPA	National Fire Protection Association
NIFC	National Interagency Fire Center
PCOEM	Pinal County Office of Emergency Management
PPE	personal protective equipment
SR	State Route
SRP	Salt River Project
TES	threatened, endangered, and sensitive species
TNF	Tonto National Forest
USDA	US Department of Agriculture
USDI	US Department of the Interior
USFS	US Forest Service
VCC	vegetation condition class
WFLC	Wildland Fire Leadership Council
WUI	wildland-urban interface

## I. INTRODUCTION

The existing Pinal County Community Wildfire Protection Plan (CWPP) for at-risk communities in Pinal County was developed in 2009 in response to the Healthy Forests Restoration Act (HFRA) of 2003 and due to the proximity of these communities to landscape-scale fires. The 2009 Pinal County CWPP is compliant with HFRA and was designed to support the efforts of local land managers (both public and private) to identify and mitigate hazards to private property, community infrastructure, and ecosystem health from wildfire in the wildland-urban interface (WUI). The 2009 Pinal County CWPP established goals and objectives to reduce wildland fire threat to at-risk communities. Since the approval of the 2009 Pinal County CWPP, residents, government agencies, and fire departments and districts have worked collaboratively to achieve the goals established in that CWPP. However, the WUI continues to grow; new residents continue to arrive; the drought persists; and concepts, tools, and public attitudes related to wildland fire risk assessment and to wildland fuels and ecosystem management are evolving—all resulting in changing views from “protection from wildfire” to “preparation for wildfire.” Therefore, Pinal County has determined that the 2009 Pinal County CWPP should be reviewed and, where necessary, revised to provide a higher level of community protection from, and preparation for, unwanted wildland fire. Pinal County believes that the protection of life and property from wildland fire must involve a comprehensive approach, from a single home site to the entire community that abuts wildlands to the surrounding region. Pinal County believes in a community-focused approach to creating fire-adapted communities (<https://fireadapted.org/>), which is a new path forward and a new way of thinking about wildland fire that reduces dependency on suppression. Such fire-adapted communities are composed of informed and prepared citizens collaboratively planning, preparing, and taking action to safely coexist with wildland fire. Additionally, Pinal County supports a regional approach to preventing and preparing for unwanted wildfire in at-risk communities. Pinal County has agreed to reestablish the Pinal County CWPP planning team and to identify and expand, where necessary, community wildfire protection and preparation on a regional level (refer to Figure 1.1).

### A. Background

Pinal County fully supports the tenets 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 explores four broad challenges:

1. Managing vegetation and fuels
2. Protecting homes, communities, and other values at risk
3. Managing human-caused ignitions
4. Effectively and efficiently responding to wildfire



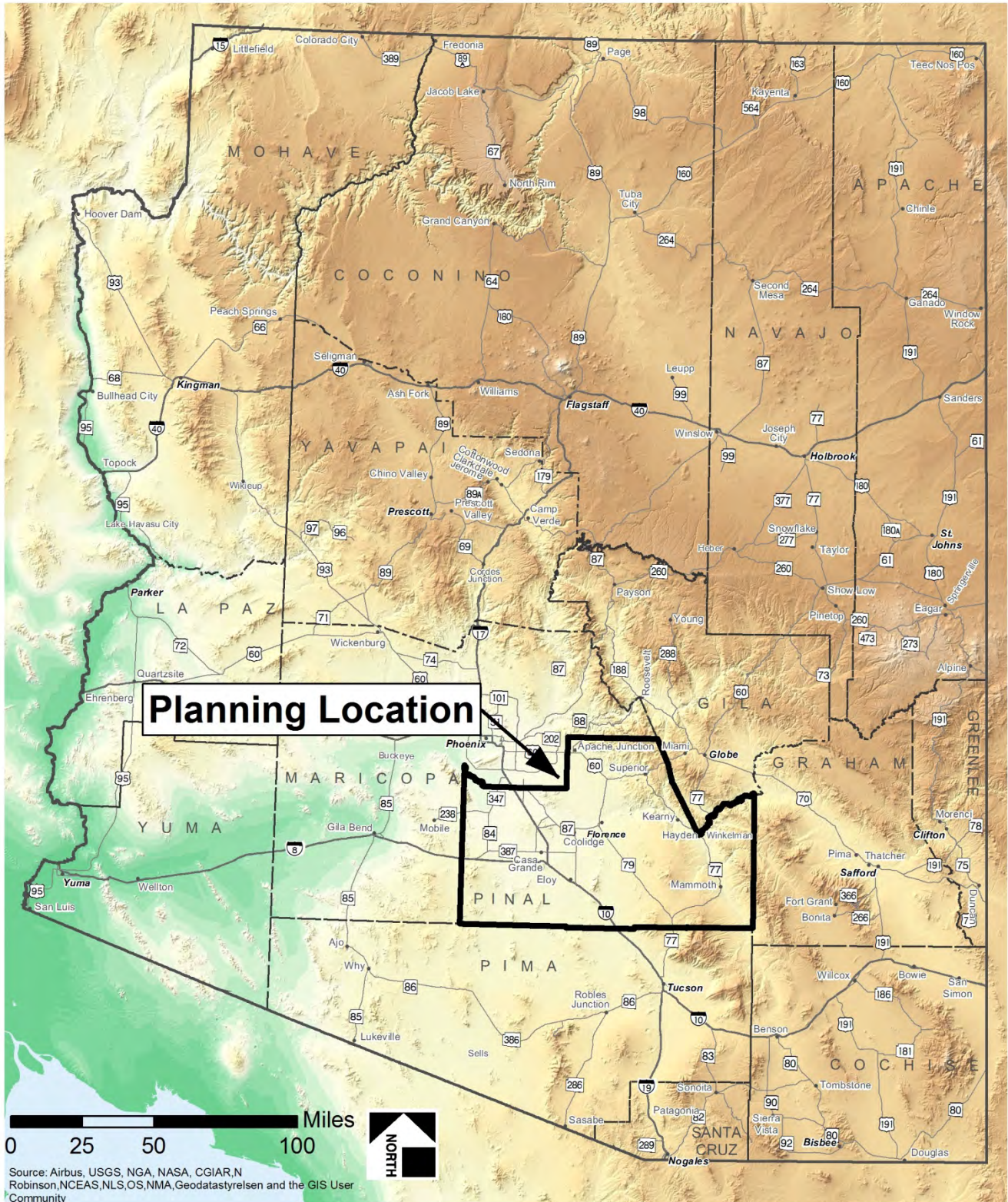


Figure 1.1. Location of 2018 Pinal County CWPP Analysis Area



In particular, Pinal County supports 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 Pinal County residents with the most up-to-date information on community wildland fire preparation, the Pinal County Office of Emergency Management (PCOEM) is updating and, where appropriate, revising the 2009 Pinal County CWPP to have an inclusive regional approach to enhance fire-adapted communities.

The 2009 Pinal County CWPP was developed as a collaborative effort between representatives of local governments, fire departments and districts, Arizona Department of Forestry and Fire Management (ADFFM), Bureau of Land Management (BLM) Gila District, Coronado National Forest (CNF), and Tonto National Forest (TNF), who collectively formed the Core Planning Team (Core Team).

Pinal County has reinitiated the collaborative planning process for this update and revision by soliciting participation by the Core Team members from the original 2009 collaborative process. Recognizing that relationships between municipalities and fire districts within Pinal County as well as partnerships with state and federal land managers where public safety responsibilities may overlap requires a collaborative effort to succeed. In response, the 2018 Core Team is composed of representatives from the PCOEM, Pinal County Public Works, Pinal County Public Health, Pinal County Geographic Information Systems, CNF, TNF, BLM, ADFFM, local fire departments, cities/towns, communities, and interested parties. The Core Team was re-formed to guide and provide direction for updates to this 2018 Pinal County CWPP (refer to Photograph 1.1). The 2018 Core Team has followed essentially the same planning process as used during development of the 2009 Pinal County CWPP (refer to Figure 1.2) to develop a HFRA-compliant CWPP for the at-risk communities of Pinal County.



**Photograph 1.1. 2018 Pinal County CWPP Core Team Kick-Off Meeting**

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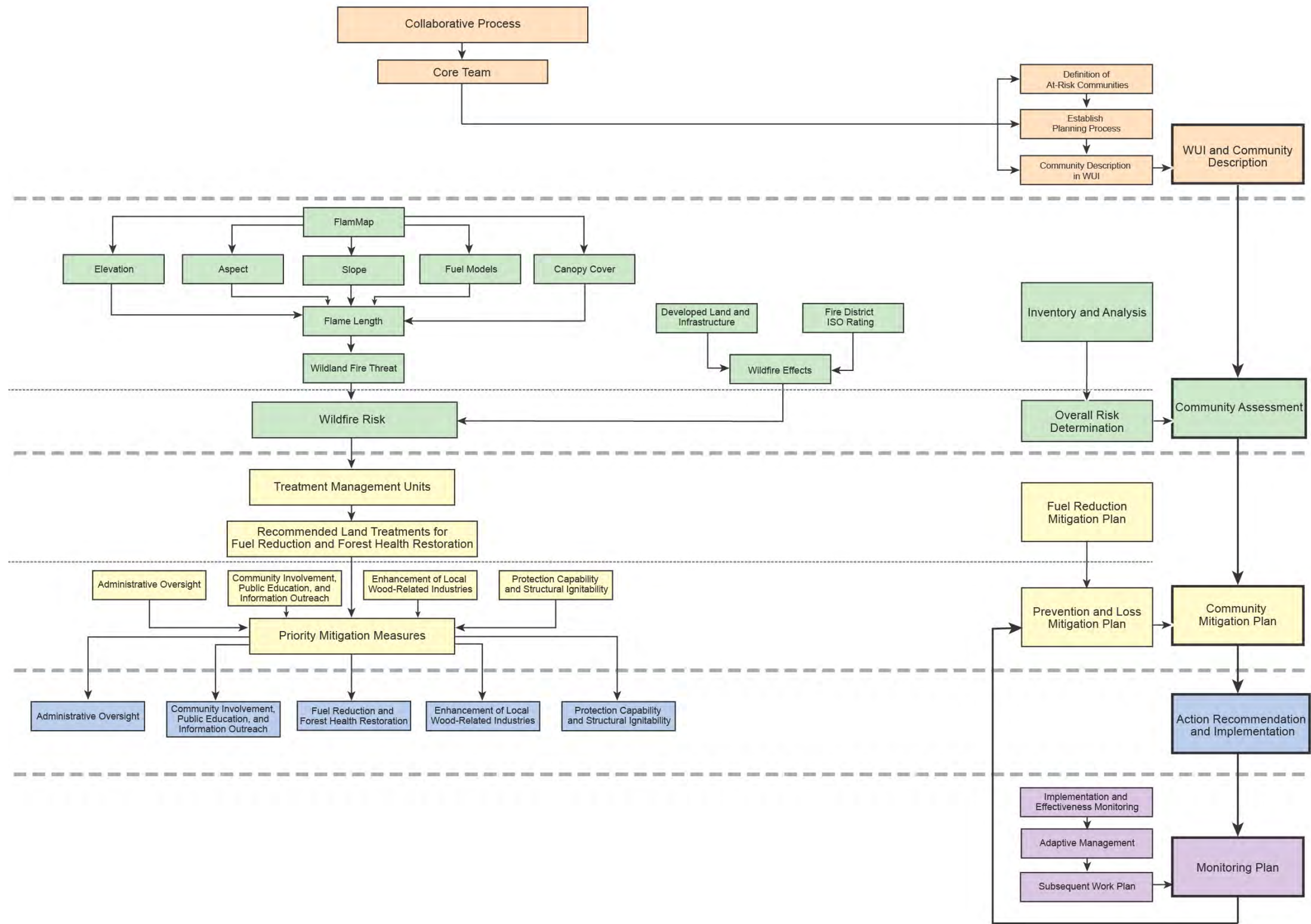


Figure 1.2. Pinal County CWPP Planning Process

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During analyses for the revision of the Pinal County CWPP, the Core Team recognized that in addition to guidance documents used during development of the 2009 CWPP, advancements in wildland fire risk assessments, responses, and public education have occurred. The following documents information sources that have been reviewed or referenced as part of the 2018 Pinal County CWPP revision process:

- “Urban Wildland Interface Communities within the Vicinity of Federal Lands That Are at High Risk from Wildfire” (US Department of Agriculture [USDA] and US Department of the Interior [USDI] 2001a, 2001b)
- *Field Guidance: Identifying and Prioritizing Communities at Risk* (National Association of State Foresters 2003)
- *Arizona Wildland Urban Interface Assessment* (Arizona Department of Forestry and Fire Management [ADFFM] 2004)
- *Identifying Arizona’s Wildland/Urban Interface Communities at Risk: A Guide for State and Federal Land Managers* (ADFFM 2007)
- *Arizona Identified Communities-At-Risk* (ADFFM 2009)
- *Statewide Strategy for Restoring Arizona’s Forests* (Governor’s Forest Health Councils 2007)
- *Arizona Forest Resource Assessment* (ADFFM 2010a)
- *Arizona Forest Resource Strategy* (ADFFM 2010b)
- *Forest Health Landscape-Scale Restoration Recommendations* (Western Governors’ Association 2010)
- *A National Cohesive Wildland Fire Management Strategy-Phase II National Report* (Wildland Fire Leadership Council [WFLC] 2012)
- *Landscape Conservation and Restoration Strategic Action Plan* (US Forest Service [USFS] 2011)
- *Approved Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management and Decision Record* (BLM 2004a)
- *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)
- *Coronado National Forest Plan* (USFS 1986)
- *Tonto National Forest Plan* (USFS 1985)
- *Arizona BLM Gila District Fire Management Plan* (BLM 2013)
- *Wildland Urban Interface Wildfire Mitigation Desk Reference Guide* (PMS 051; National Wildfire Coordinating Group 2017)
- *National Fire Protection Association (NFPA) Firewise Communities* (NFPA 2018a)

## B. WUI and Delineation Process

In January and August 2001, the USDI and USDA published the “Urban Wildland Interface Communities within the Vicinity of Federal Lands That Are at High Risk from Wildfire” in the *Federal Register* (USDA and USDI 2001a, 2001b), which included two communities within Pinal County: Oracle and Santa Cruz. In December 2008, six communities were included in the *Arizona Identified Communities-At-Risk* (ADFFM 2009) and were given a WUI risk rating for catastrophic wildland fire.

The Core Team has reviewed and concurs with the listing of at-risk communities within the 2009 *Arizona Identified Communities-At-Risk* list (ADFFM 2009), as maintained by the ADFFM. The Core Team and collaborators recommend maintaining the original four nontribal and two tribal communities based on the results of the 2009 Pinal County CWPP wildland fire analysis, and further recommend including the Pinal County communities identified in the *Arizona Identified Communities-At-Risk* list (refer to Table 1.1) as part of the 2018 update process, along with their associated WUI risk ratings.

**Table 1.1 Pinal County CWPP Recommended At-Risk Communities**

Community	Fire Department/District	2007 CARs WUI Risk <sup>a</sup>	2009 CWPP WUI Risk <sup>b</sup>	2009 CARs WUI Risk <sup>c</sup>	2018 CWPP WUI Risk <sup>d</sup>
Apache Junction	Apache Junction Fire District	-	Low	-	Low
Arizona City	Arizona City Fire District	-	Low	-	Moderate
Avra Valley	Avra Valley Fire District	-	Low	-	Moderate
Casa Grande	Casa Grande Fire Department	-	Low	-	Low
Chuichu	Tohono O’odham Nation Fire Department	-	Moderate	-	Moderate
Coolidge	Coolidge Fire Department	-	Low	-	Low
Dudleyville	Dudleyville Fire District	Moderate	Moderate	Low	Moderate
Eloy	Eloy Fire District	-	Low	-	Moderate
Florence	Florence Fire Department	-	Moderate	-	Moderate
Galiuro Mountains	None	-	Low	-	Moderate
Kearny	Kearny Fire Department	High	High	Moderate	Moderate
Mammoth	Mammoth Fire District	-	Low	-	Moderate
Maricopa	Maricopa Fire Department	-	Low	-	Moderate
Maricopa Colony	Ak-Chin Indian Community Fire Department	Low	Low		Low
Oracle	Oracle Fire District	High	High	High	Moderate
Oracle Junction/Saddlebrook	Golder Ranch Fire District	-	Moderate	-	Moderate
Picacho	None	-	Low	-	Moderate
Queen Creek	Queen Creek Fire Department	-	Low	-	Low
Queen Valley	Queen Valley Fire District	-	High	-	Moderate
San Manuel	San Manuel Fire District	-	Low	-	Moderate
Santa Cruz	Gila River Indian Community Fire Department	Moderate	Moderate	Moderate	Moderate

Community	Fire Department/District	2007 CARs WUI Risk <sup>a</sup>	2009 CWPP WUI Risk <sup>b</sup>	2009 CARs WUI Risk <sup>c</sup>	2018 CWPP WUI Risk <sup>d</sup>
St. John	Gila River Indian Community Fire Department	-	-	Moderate	-
Stanfield	Stanfield Fire District	-	Low	-	Moderate
Superior	Superior Fire Department	-	High	-	Moderate
Thunderbird Farms	Thunderbird Fire District	-	Low	-	-
Top of the World	None	High	High	Moderate	Moderate

Note: CARs = communities-at-risk; CWPP = Community Wildfire Protection Plan; WUI = wildland-urban interface

Differences in CWPP Risk Rating and CAR Rating may be attributed to WUI delineation differences and/or risk determination

<sup>a</sup> 2007 Communities at Risk list, ADFFM

<sup>b</sup> 2009 Pinal County CWPP

<sup>c</sup> 2009 Communities at Risk list, ADFFM

<sup>d</sup> Differences in CWPP WUI Risk Rating and CAR WUI Rating may be attributed to WUI delineation differences and/ or risk analysis processes

The Core Team has determined the need to reanalyze the wildland fire risk to the Pinal County communities using current data and methodologies. Evaluating risk with current techniques is consistent with recent state and federal agencies' approaches to analyzing wildland fire risk across Arizona.

The at-risk communities within Pinal County are adjacent to state and federal lands, including public lands administered by the Arizona State Land Department (ASLD), BLM, TNF, and CNF. These communities are consistent with the ADFFM definition of an *intermix* or *interface community* provided below:

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 within the intermixed 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. (ADFFM 2007:1)

In addition to a community's 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, governmental sites, prehistoric and historic sites, and wildlife habitats. This Pinal County CWPP will be revised where

necessary to enhance the protection of community values and to minimize the potential loss of property, while ensuring that public and firefighter safety during a catastrophic wildfire remains the overriding priority recommendation of this Pinal County CWPP.

During the revised Pinal County CWPP planning process, the Core Team identified the community WUIs in accordance with the National Wildfire Coordinating Group's *Glossary of Wildland Fire Terminology* (NWCG 2012), which defines the WUI as the "line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels." The definition(s) of an interface community as defined within HFRA Sec.101.1 have also been reviewed as part of the 2018 Pinal County CWPPP revision and include the following:

1. a group of homes and other structures with basic infrastructure and services (such as utilities and collectively maintained transportations routes) within or adjacent to Federal land
2. in which conditions are conducive to large-scale wildland fire disturbance event
3. for which a significant threat to human life or property exists as a result of a wildland fire disturbance event

The Core Team also identified structures in accordance with the ADDFM definition of a *structure*:

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 wildlife watering devices. (ADFFM 2007:1)

The Pinal County CWPP process of delineating WUI boundaries for at-risk communities involved collaboration among local, state, and federal government representatives, as well as interested individuals within the communities. The Core Team reviewed the 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, Section101.1.16.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 Pinal County CWPP analysis area have not significantly changed since 2009; however some areas with increased development were added into the WUI boundary. The Core Team believes that the Pinal County CWPP community WUI boundaries are the minimum areas needed to provide protection for each community and its surrounding community values. The WUI identified in this 2018 Pinal County CWPP includes a total of 2,002,277 acres composed of a mix of private, county, state, tribal trust, and federal lands; the updated WUI is slightly larger than the 2009 WUI (by approximately 16,200 acres) due to increases in developed areas where development has increased, the inclusion of the Gila River riparian corridor between Kearny and Florence, as well as modifications to the 2009 WUI boundary to be more consistent with land ownership boundaries. The WUI lands surrounding the communities are, or could be, subject to extraordinary weather events or conditions conducive to large-scale wildland fire that could threaten human life and properties.

General elements used in creating the WUI boundaries for the 2018 Pinal County CWPP at-risk communities include the following:

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

### **C. Desired Future Condition and Wildfire Mitigation in the WUI**

The desired future conditions of lands identified in this 2018 Pinal County CWPP update have not significantly changed since 2009:

- Maintenance of, or return to, wildland fire resiliency status and the maintenance of, or return to, the vegetation component of the historical plant potential community across Pinal County.
- Consistency with desired future conditions of public lands related to wildfire protection, watershed, rangeland restoration and protection of community values and restoration of native vegetation to historical wildfire return intervals.
- Public education and land treatment projects in the Pinal County CWPP area, coupled with current efforts of local governments, fire departments and districts, TNF, CNF, and BLM, will create a better-informed constituency capable of protecting at-risk communities through restoration and vegetative fuels mitigation efforts within the WUI.

The desired future conditions of federal lands include improved public and firefighter safety from wildland fire, wildland fire used as a management tool to achieve resource objectives, hazardous wildland fuels managed within and adjacent to the WUI, adaptive wildland fire response and suppression provided, and public lands returned to fire-resilient ecosystems through reintroduction of fire into fire-adapted ecosystems where practicable. Once these conditions are 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. Fire management 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 BLM, CNF, and TNF adhere to federal policy when managing all unplanned wildfire ignitions on public lands within the WUI. Federal policy for reducing wildfires on BLM and USFS public lands is planned and administered locally through the BLM’s Lower Sonoran, Safford, and Tucson Field Offices and the CNF’s Santa Catalina and TNF’s Globe and Mesa Districts. Under the proposed action described in the *Approved Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management and Decision Record* (BLM 2004a), BLM-administered public lands are assigned one of two land use allocations for fire management: Allocation 1 includes areas suitable for wildland fire use for resource-management

benefit, and Allocation 2 includes areas not suitable for wildland fire use for resource benefit. With the exception of a small amount of desert shrub vegetation associations within the WUI, most of the WUI is classified as Allocation 2 lands.

The desired future condition of private lands in the community WUIs is either to be in conformance with the National Firewise Communities program<sup>1</sup> (Firewise) and the Fire Adapted Communities program<sup>2</sup> or to meet home-ignition-zone landscaping or fire-safe landscaping recommended by the Pinal County CWPP fire departments and districts in compliance with local ordinances to establish fire-adapted communities. The Fire Adapted Communities program is a national effort to prepare fire-prone communities for the effects of wildland fire. Firewise is a national program that helps communities and individual homeowners 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. The Core Team encourages homeowner associations to use their conditions, covenants, and restrictions (CC&Rs) to become a Firewise community or adopt fire-safe standards in consultation with their local fire department. Fire departments and districts and local governments in Pinal County 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). Pinal County recognizes the importance of a community and regional approach to wildfire preparedness and supports creating fire-adapted communities.

The Core Team is aware that wildland fuel accumulations primarily associated with the invasion of woody species, native and nonnative grasses, and decades of fire suppression, together with community growth in the WUI, have produced areas at risk for catastrophic wildfire. Additionally, areas of dense invasive species, such as tamarisk within river corridors with the associated migratory introduction of the tamarisk beetle, can lead to an increase in the amount of standing dead biomass within riparian habitats, which will greatly increase wildland fire risk over time and will need to be monitored. At this time there are no known tamarisk beetle monitoring plans in place. The Core Team aspires to achieve restored, self-sustaining, biologically diverse habitats of mixed open space and developed areas that contribute to a high quality of life within Pinal County. The Core Team recognizes that protection from catastrophic wildland fire requires collaboration and implementation through all levels of government and through an informed and motivated public. Ecosystem restoration and maintenance of fire-resilient ecosystems through reintroduction of fire into fire-adapted ecosystems, community protection, and public and firefighter safety were evaluated during the CWPP revision process.

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<sup>1</sup> Refer to <https://www.nfpa.org/Public-Education/By-topic/Wildfire/Firewise-USA>

<sup>2</sup> Refer to <https://fireadapted.org/>



Financial commitments required to reduce the risk of catastrophic wildfire can be extensive for local, county, state, and federal governments; for fire districts; and for the small rural communities surrounded by public lands (Ingalsbee 2010, 2014). Since the creation of the 2009 Pinal County CWPP, Pinal County, local municipalities and BLM, CNF, and TNF have implemented wildland fuel mitigation projects within or near the Pinal County community WUIs. Fire departments and districts have improved wildland fire suppression response and have continued with active public education and outreach programs concerning wildland fire threat and home-ignition-zone recommendations. Pinal County fire departments and districts have standing mutual-aid agreements to enhance initial and sustained wildland response. Pinal County fire departments and districts maintain wildland fire response teams supported by various engines and support equipment and various other specialized response vehicles. Wildland fire response teams are composed of personnel with various levels of wildland firefighting training, including red-carded firefighters. Specially-trained wildland fire response teams have not only provided suppression response to brush fires but also community awareness programs and structural-fire risk assessments. Additionally, the fire departments and districts have taken proactive measures to encourage willing property owners to reduce fire risk on private property (HFRA, Section 103.d.2.B). The Core Team are proposing additional wildland fuel treatments and wildland fire suppression enhancements; they have been proactive in pursuing funding for wildland fire public outreach programs and fire-suppression training and equipment, and will continue these activities in order to meet the goals and objectives of this 2018 Pinal County CWPP.

#### **D. Goals for the 2018 Pinal County CWPP**

The goals established in the 2009 Pinal County CWPP consisted of the following eight primary goals:

1. Improve fire prevention and suppression, emphasizing firefighter and public safety
2. Reduce hazardous fuels, emphasizing public and private property protection
3. Restore forest, rangeland, and riparian health
4. Promote community involvement and provide for community protection
5. Recommend measures to reduce structural ignitability in the WUI
6. Encourage economic development in the communities from vegetative treatments
7. Promote development of wildfire emergency evacuation and communication plans
8. Integrate use of the CWPP with surrounding community and agency fire management plans

The 2009 Pinal County CWPP 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 this 2018 Pinal County CWPP to reduce the risks to life and property from catastrophic wildland fire by:

- Encouraging high-risk communities to become fire-adapted communities
- Reducing potential economic loss to communities from unwanted wildland fire

- Working with elected officials to develop opportunities for enhance funding through national, state, and local sources for implementing the action recommendations of this Pinal County CWPP

Action recommendations for at-risk areas within the Pinal County WUI boundaries have been reviewed and updated where needed as part of this planning process. Treatments for wildland vegetative fuels and additional wildland fire mitigation measures are recommended to be implemented in specific time frames and with associated monitoring to determine and document measurable outcomes. Successful implementation of this Pinal County CWPP will require collaboration between fire departments and districts, governments, resource-management agencies, and private landowners in developing processes and systems that allow for implementation of recommended actions of this Pinal County CWPP in order to comply with applicable local, state, and federal environmental regulations. The Core Team encourages all agencies, groups, and individuals involved to develop additional formal agreements as necessary to work toward this Pinal County CWPP'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 2009 Pinal County CWPP; to determine current wildfire risk assessment using up-to-date information and techniques; to be supportive of and complementary to current local, state, and federal land management direction; and to represent all Pinal County communities and their interests, with all parties being involved in and supportive of the implementation of this 2018 Pinal County CWPP.

## II. PINAL COUNTY CWPP COMMUNITY ASSESSMENT AND ANALYSIS

During the review and revision of the 2009 Pinal County CWPP (hereafter, this Pinal County CWPP), the Core Team determined that the community wildfire risk analysis would involve assessment of the following:

- *Wildland Fire Threat*—the probability and/or intensity of an area burning
- *Wildfire Effects*—the community values at risk from wildfire
- *Wildfire Risk*—the potential for catastrophic wildland fire occurring adjacent to or within areas of high community values within the WUI

This risk analysis was developed to closely tie to the **Arizona Wildfire Risk Assessment Portal**<sup>3</sup> (**AZWRAP**). This Pinal County CWPP incorporates the current fire regime condition class (FRCC), wildfire fuel hazards, risk of ignition, local preparedness and protection capabilities, and at-risk community values. As part of the revision process, the ADFFM's *Identifying Arizona's Wildland/Urban Interface Communities at Risk: A Guide for State and Federal Land Managers* (ADFFM 2007) was referenced to confirm that the Pinal County CWPP update was compatible with and complementary to statewide CWPP planning efforts. This Pinal County CWPP includes 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 were evaluated to determine areas of highest wildfire risk.

### A. Analysis Area

The 2009 Pinal County CWPP Core Team identified specific WUI boundaries based on proximity to population centers and with respect to known values at risk. The WUI boundary in the 2009 Pinal County CWPP covered 1,986,077 acres (57.7 percent of the total Pinal County area), with 21 sub-WUI areas (refer to Figure 2.1). The sub-WUIs are communities within the overall WUI boundary that have been targeted for more in-depth discussion due to their underlying factors considered during the cumulative risk analysis: housing/structure density, vegetation associations, and ignition history.

The Pinal County CWPP analysis area is the revised WUI, which includes communities within Pinal County that total approximately 2,002,277 at-risk acres. The 2018 WUI is slightly larger than the 1,986,077 at-risk acres of WUI identified in the 2009 Pinal County CWPP due to increases in developed areas, the inclusion of the Gila River riparian corridor between Kearny and Florence, as well as modifications to the WUI boundary to be more consistent with land ownership boundaries (refer to Figure 2.2). During the revision of this Pinal County CWPP, the Core Team identified 2,002,277 acres of land considered at risk of wildland fire that were included in the revised WUI (refer to Table 2.1 and Figure 2.2).

<sup>3</sup> Refer to <https://azsf.az.gov/fire/prevention/az-wrap>

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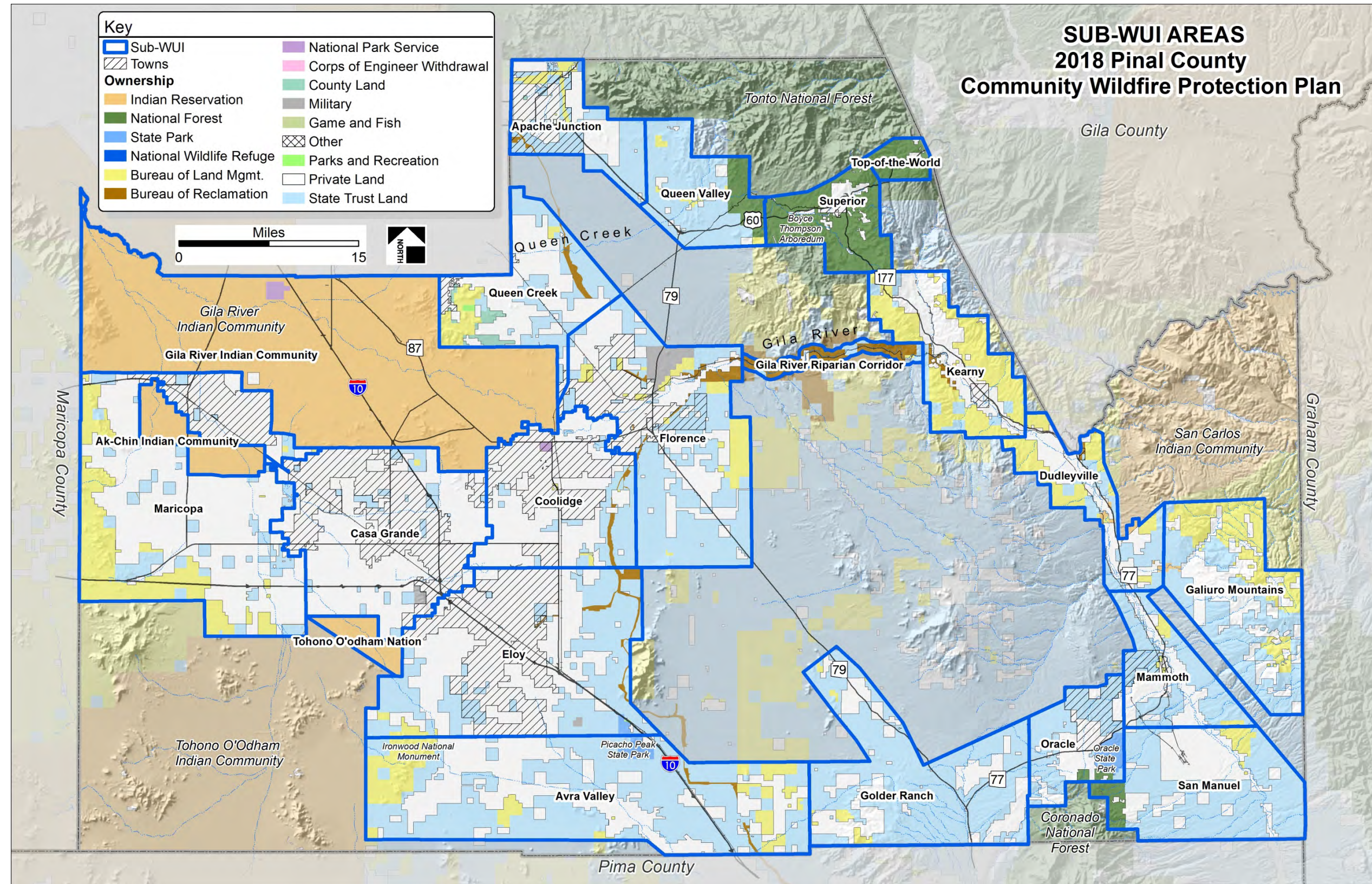


Figure 2.1. Pinal County CWPP Sub-WUIs



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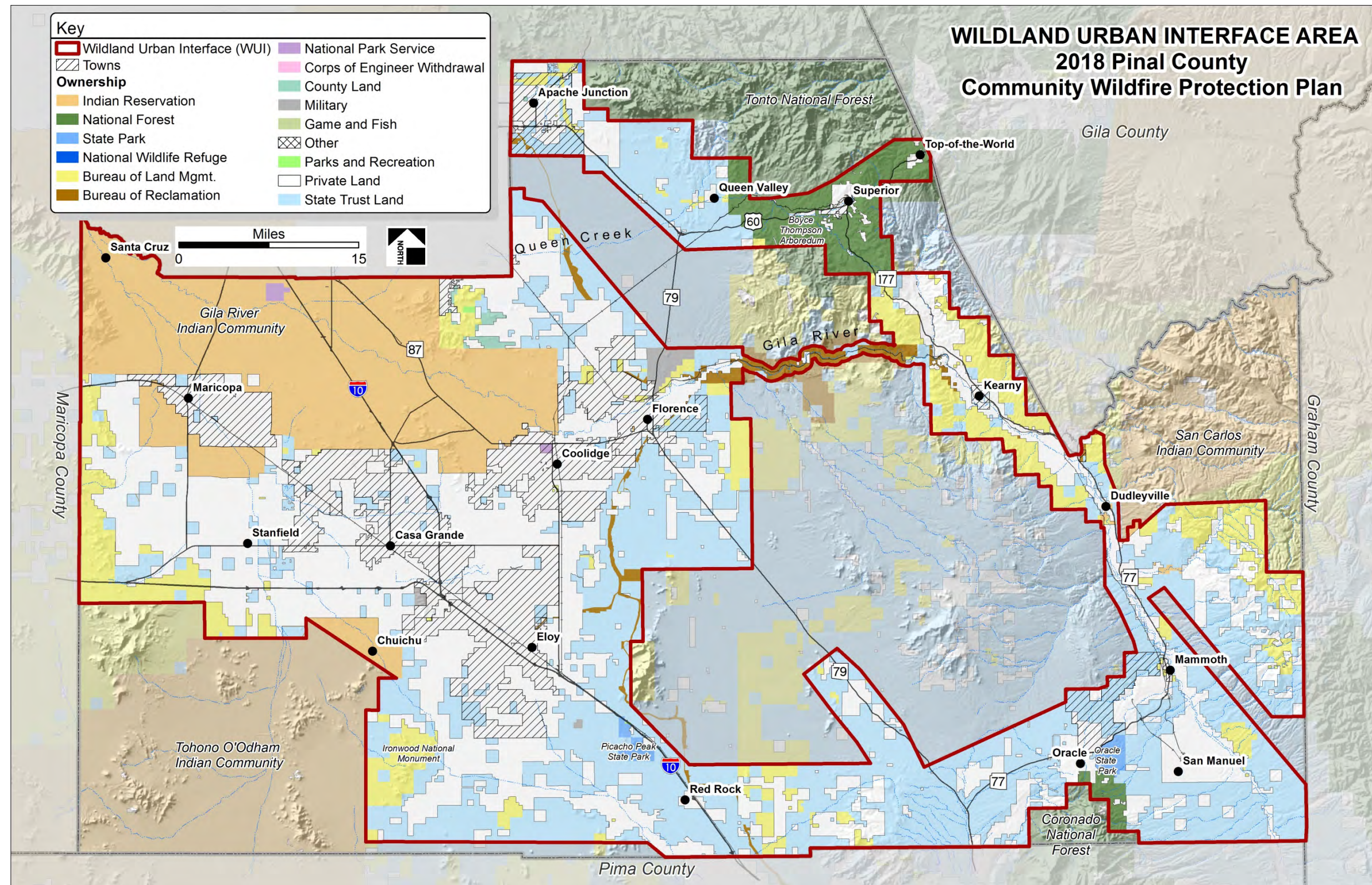


Figure 2.2. Pinal County WUI Analysis Area Land Ownership



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Primary landownership in the Pinal County CWPP analysis area is a mosaic of privately owned lands; Arizona State Trust lands managed by ASLD, BLM, CNF, TNF, tribal trust lands, and other lands (refer to Table 2.1).

**Table 2.1. Land Management within the WUI**

Ownership Type	Total Acres	% of Total*
Private	810,438	40.5
Arizona State Trust	605,971	30.3
Gila River Indian Reservation	276,650	13.8
Bureau of Land Management	174,057	8.7
Tonto National Forest	52,275	2.6
Bureau of Reclamation	22,259	1.1
Ak-Chin Indian Reservation	21,452	1.1
Tohono O'odham Indian Reservation	11,169	0.6
Military Reservation	6,776	0.3
Coronado National Forest	6,055	0.3
Other	15,174	0.8
<b>Total</b>	<b>2,002,277</b>	<b>100</b>

*Note:* WUI = wildland-urban interface.

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

Private land within the WUI composes 810,438 acres, or roughly 40.5 percent, of the WUI. Private lands are mostly clustered near the developed communities, with some scattered private inholdings located throughout the WUI. The municipalities of Florence, Coolidge, Apache Junction, Queen Creek, Eloy, Superior, Casa Grande, Mammoth, Maricopa, and Kearny and the communities of Queen Valley, Dudleyville, Stanfield, Picacho, Thunderbird Ranch, Oracle Junction/Saddlebrook, and Oracle contain the majority of private land acreage within the WUI. Commercial structures are clustered along state and federal highways within community centers, and it is assumed these existing areas will remain the principal commercial corridors within the Pinal 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 Pinal County WUI, 605,971 acres (30.3 percent) of State Trust lands are managed primarily for recreation, natural resource protection, and livestock grazing.

Of the federal lands within the WUI, BLM, TNF, Bureau of Reclamation, and CNF lands compose 254,646 acres, or approximately 12.7 percent, of the WUI. These federal lands provide extensive and popular hiking, hunting, and recreational access within or adjacent to the WUI.

## **B. Fire Management Units (FMUs)**

### **1. BLM Gila District**

The majority of federally managed public lands within the Pinal County CWPP analysis area are administered by BLM. In accordance with the Approved Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management and Decision Record (BLM 2004a and BLM 2004b) and the 2013 Arizona BLM Gila District Fire Management Plan, BLM-administered public lands are assigned to one of two land use allocations for fire management. Allocation 1 lands include areas where fire is desired and there are few or no constraints for its use. Wildland fire may be used to achieve resource objectives, such as improved watershed or wildlife habitat. Where fuel loading is high and conditions are not initially suitable for wildland fire, fuel loads may be reduced by mechanical, chemical, or biological means to acceptable levels and to meet resource objectives. Allocation 2 lands include areas where mitigation and suppression are required to prevent direct threats to life or property. It also includes areas where fire never played a large role in ecosystem management and where unplanned ignitions would have negative effects on resources. In these areas, BLM will implement programs to reduce unwanted ignitions and emphasize prevention, detection, and rapid suppression. In addition to both land use allocations, BLM will undertake education, enforcement, and administrative fire-prevention measures to reduce human-caused fire.

Two BLM Fire Management Units (FMUs) are located within the CWPP WUI area and include the northwest portion of FMU 2 – Muleshoe-Black Hills – Peloncillo Mountains and FMU 5 – Altar Valley-Ironwood-Middle Gila which is located in the central and eastern portions of WUI.

FMU 2 is bordered by the San Carlos Apache tribal lands and the Apache-Sitgreaves National Forest to the north; the Arizona-New Mexico state border to the east; I-10 to the south; and State Route 77 (SR 77) to the west. Lower elevations are characterized by desert shrubs, trees, and cacti. Deep, upland sites have overstories of mesquite and palo verde with understories of perennial and annual grasses and forbs. This area also supports saguaro cactus as well as a wide variety of *Opuntia* species (cholla and prickly pear species) and other cacti on the upland and hill slopes. The upper elevations in this FMU (>3,000 feet) can be characterized as open grasslands dominated by tobosa, vine mesquite, and bottlebrush squirreltail. This area is a mixture of transition from Upper Sonoran Desert to Interior Chaparral and as such it is not uncommon to see species like saguaro and juniper together on steep southern exposures. Recommended objectives and strategies associated with communities include identifying hazardous fuel reduction projects, public and firefighter safety issues, and partnering opportunities with local Firewise groups (BLM 2013).

FMU 5 is bordered by the TNF and San Carlos Apache Tribal Lands to the north; SR 77 along the northeast; I-19 along the southeast; the Arizona-Mexico International boundary to the south; the Tohono O’odham Tribal Lands to the west; and private and Arizona State Trust land to the northwest. The BLM-administered lands are not contiguous; they are located from the north end of the Altar Valley, north of Tucson to just north of the Gila River east to Kearny and Dudleyville. These lands are interspersed primarily with ASLD-managed lands as well as with numerous privately-owned land

parcels. The Dripping Springs area is located in the northern portion of the FMU and contains the Needle's Eye and White Canyon Wilderness Areas. Vegetation from the Ironwood National Monument to the Dripping Springs area, including the Needle's Eye and White Canyon Wilderness Areas, is dominated by desert shrubs, trees, and cacti. The eastern portion of the Dripping Springs area is characterized as a well-developed interior chaparral zone where nearly continuous stands of low evergreen shrubs occur on specific hillsides. Recommended objectives and strategies associated with communities in this area include identifying hazardous fuel reduction projects, public and firefighter safety issues, and partnering opportunities with local Firewise groups. This can be accomplished by completing CWPPs with all federal, state, county, city, private, and local partners; implementing recommended actions within completed CWPPs or agency equivalent prevention and mitigation plans; and coordinating and collaborating with CWPP partners during hazardous fuels modification and treatment implementation (BLM 2013).

## 2. USFS

National forest lands within the Pinal County CWPP analysis area fall under either Ecosystem Management Areas (EMAs) within the CNF or FMUs within the TNF.

### ***Coronado National Forest – Santa Catalina Ranger District***

The Santa Catalina EMA is located in the southeastern portion of the WUI adjacent the community of Oracle and Oracle State Park. The Santa Catalina EMA within the CNF Santa Catalina Ranger District is a 265,142-acre EMA that wraps around the northern and eastern sides of the Tucson basin. Elevations range from 2,200 feet at the valley edges to 9,200 feet on Mount Lemmon. The EMA includes the Santa Catalina Mountains. The east-west leg of the EMA that outlines the Santa Catalina Mountains is termed the front-range, and includes Pusch Ridge, Finger Rock, Cathedral Peak, and other peaks lying along the eastward extension of Pusch Ridge. The front-range is dissected from the main part of the mountain mass by Sabino Basin and Romero Pass. The northwest and northeast borders of the EMA include Samaniego and Oracle Ridges, which form the apex of the triangular-shaped Santa Catalina Mountain range. Many of the steep, rocky canyons contain intermittent streams, which drain into the San Pedro and Santa Cruz Rivers (USFS 2013).

Management objectives within the Santa Catalina EMA as stated in the CNF Spatial Fire Management Plan include the following:

#### *Forestwide Strategic Objectives:*

- All human-caused fires shall be suppressed using appropriate suppression response strategies.
- The appropriate management response for each natural ignition will vary across the Forest but will include the full spectrum of options, from aggressive initial attack to management to achieve resource objectives.

#### *Forest-wide Management Requirements:*

- Firefighter and public safety shall be the first priority in all fire management activities.

- Cooperate with other Federal, state and local regulatory agencies to protect air quality as required by the Clean Air Act.
- Wildland fire suppression responses shall minimize costs of suppression, resource impacts, and risks to life and property.
- For all management areas, management of lightning-caused fires should be considered to restore fire's natural role in maintaining a healthy, diverse, and resilient ecosystem resistant to natural disturbances.

### ***Tonto National Forest – Mesa and Globe Ranger Districts***

FMU 1 consists of the Sonoran Desert and is represented by National Fire Danger Rating System (NFDRS) Fuel Model T. Areas that have burned at a high intensity have been converted from Sonoran Desert to desert grasslands composed of nonnative grasses. Fire intensities from the nonnative species have compounded the problem. The two species that classify this FMU are the saguaro cactus and the palo verde tree. Wildfire will be managed consistent with resource objectives. Capital investments within these areas will be protected from fire. Actions taken will be consistent with the Appropriate Management Response (AMR) for this area. The AMR is any specific action suitable to meet fire management objectives within a given management area. Wildfires, or portions of wildfires, that adversely affect forest resources, endanger public safety, or have a potential to damage private lands will be suppressed. Suppression efforts will be accomplished with minimal ground disturbance and least cost suppression methods will be initiated when possible (that is, using existing natural or human-made features as control lines).

FMU 4 consists of pinyon pine, juniper, and chaparral and is represented by NFDRS Fuel Model B. Much of this FMU contains a thick overstory and shrubby understory. Many of the chaparral stands contain old, decadent components. In areas where the pinyon pines and junipers are less dense, there is often a dense layer of herbaceous vegetation. Wildfires will be managed consistent with resource objectives. Wildland fire not meeting management objectives will receive an AMR. Fire management objectives for this area include providing a mosaic of age classes within the total type, which will provide for a mix of successional stages, and allowing fire to resume its natural ecological role within ecosystems. Wildfires, or portions of wildfires, will be suppressed when they adversely affect forest resources, endanger public safety, or have a potential to damage significant capital investments.

FMU 5 consists of the Superstition Wilderness areas on the TNF and is represented mostly by NFDRS Fuel Models B and T and partly by Fuel Model U. This FMU contains fuel characteristics that are found in all the other FMUs, at all elevations, and contains much of the TNF's various vegetation types. Wildfires occurring within this FMU will receive an AMR and be managed consistent with wilderness resource objectives. Wildfires may be allowed to burn, to function in their natural ecological role, and to reduce unnatural fuel hazards as identified in the Forest Service Manual and approved Wilderness Implementation Plan.

FMU 6 consists of national forest lands adjacent to private lands with developments and most infrastructure sites on national forest lands. This land is defined by a 0.5-mile buffer on each side of a structure or private boundary. Wildfires occurring within this FMU will be immediately suppressed at the smallest acreage possible. Both mechanical treatment and prescribed fire will be used to reduce potential wildfire intensity.

Management Prescriptions identified as part of Amendment 25 to the 1985 Tonto National Forest Plan (USFS 2007) include the following:

- All Wildland Fire occurring within the Sonoran Desert and riparian communities will receive an AMR. Suppression strategy is to minimize damage within this ecosystem.
- All reported wildland fires will receive a strategic fire size-up. Wildland fires meeting locally developed operating guidelines listed below may be managed for resource benefit.
  - Fire cause is from a natural ignition.
  - Fire does not threaten life, property, public and firefighter safety.
  - Fire does not threaten fire sensitive cultural resources.
  - ADEQ, Air Quality Division procedures and guidelines for consultation and management of smoke will be implemented.
  - Wildland Fire managed for resource benefit must meet Tonto, Regional, and National fire situation parameters.
  - No site specific resource objective is threatened.
- For each wildland fire located in an FMU approved for wildland fire use and naturally ignited, a decision criteria checklist will be prepared to determine whether or not it should be declared a Wildland Fire use candidate. If approved, a Wildland Fire Implementation Plan (WFIP) will be prepared that identifies specific resource concerns.
- Designated Wildland Fires managed for resource benefit will be monitored according to established guidelines.
- Wildland Fire suppression actions using accepted fire management tactics will be taken if any of the above parameters are not met. Suppression of fires, or portions thereof, will be undertaken where they adversely affect forest resources, endanger public safety and/or have a potential to damage private lands.

### **C. Fire Regime and Condition Class**

Before European settlement of North America, fire played a natural (historical) role in many of the vegetated landscapes in Pinal County. Five historical fire regimes have been identified; these regimes are based on the average number of years between fires (fire frequency) combined with the severity of fire (amount of overstory replacement) on the dominant overstory vegetation (FRCC Interagency Working Group 2005a, 2010) (refer to Table 2.2).

**Table 2.2. Fire Regime Information**

	Frequency	Severity <sup>a</sup>
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.

<sup>a</sup>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). Vegetation condition class 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 (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 land cover that existed on the landscape in 2014.

The following descriptions of fire regime condition classes are provided by the National Interagency Fire Center (NIFC):

**Condition Class 1:**

Fire regimes are within the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances. Fire behavior, effects, and other associated disturbances are similar to those that occurred prior to fire exclusion (suppression) and other types of management that do not mimic the natural fire regime and associated vegetation and fuel characteristics. Composition and structure of vegetation and fuels are similar to the natural (historical) regime. The risk of loss of key ecosystem components (e.g. native species, large trees, and soil) is low.

**Condition Class 2:**

Fire regimes show moderate departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances. Fire behavior, effects, and other associated disturbances are moderately departed (more or less severe). Composition and structure of vegetation and fuel are moderately altered. Uncharacteristic conditions range from low to moderate. The risk of loss of key ecosystem components is moderate.

**Condition Class 3:**

Fire regimes show high departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances. Fire behavior, effects, and other associated disturbances are highly departed (more or less severe). Composition and structure of vegetation and fuel are highly altered. Uncharacteristic conditions range from moderate to high. The risk of loss of key ecosystem components is high. (NIFC 2003)

According to the LANDFIRE VCC data, the Pinal County WUI includes 255,798 acres of land classified as urban, water, sparsely vegetated and barren landscapes (approximately 12.8 percent of WUI acres) and 351,660 acres of agricultural land (approximately 19.3 percent of WUI acres) (LANDFIRE 2018). Table 2.3 details the acreage of WUI areas that fall into the different VCC classes. Almost 70 percent of WUI acres are not considered to be within the natural range of variation of historical wildland fire regimes.

**Table 2.3. Vegetation Condition Classes  
within the Pinal County WUI**

<b>Vegetation Condition Class</b>	<b>Acreage (%)</b>
VCC I	872,632 (43.6)
VCC II	499,165 (24.9)
VCC III	23,023 (1.1)

*Source:* LANDFIRE 2018.

Because VCC categories are based on coarse-scale data that are intended to support national level planning, any interpolation of national data for localized conditions may not be valid (FRCC Interagency Working Group 2005b). They also may not be valid due to invasive perennial and annual grasses, exotic forbs, and woody-species encroachment in native habitats, which alters local fire regimes. Therefore, local agencies are asked to provide data for localized vegetative conditions that reflect an accurate, current FRCC USFS 2000). The amount of land disturbance causing the growth of flammable annuals (e.g., pigweed, Asian mustard, and thistles) and invasive grasses (e.g., buffelgrass) in affected WUI areas can rapidly alter the potential of a vegetation association to support unwanted wildland fire. In addition, increasing woody-species invasions, especially saltcedar/ tamarisk within the riparian corridors, indicate that the perennial and ephemeral riparian, upland, and desert grassland habitats no

longer conform to components of VCC 1 lands. Invasive nonnative plants have severe ecological impacts on vegetative structure (Arizona Wildlands Invasive Plant Working Group 2005). Therefore, local conditions indicate that the majority of wildland habitats within the WUI actually fall within VCC 2 and VCC 3 (Photograph 2.1).



**Photograph 2.1. VCC 3- Saltcedar/ tamarisk-invaded riparian habitat**

The desired future condition of federal land within the Pinal County CWPP analysis area is to return to or maintain wildland within VCC 1, as described in *Fire Regime and Condition Class (FRCC) Interagency Handbook Reference Conditions*:

Open park-like savanna grassland, or woodland, or shrub structures maintained by frequent surface or mixed severity fires... Surface fires typically burn through the understory removing fire-intolerant species and small-size classes and removing less than 25 percent of the upper layer, thus maintaining an open single-layer overstory of relatively large trees... Mosaic fires create a mosaic of different-age, postfire grassland, savannah woodlands, or open shrub patches by leaving greater than 25 percent of the upper layer (generally less than 40 hectares [100 acres]). Interval[s] can range up to 50 [years] in systems with high temporal variability. (FRCC Interagency Working Group 2005a)

Desired future conditions for Great Basin Pinyon-Juniper Woodland, Lower Sonoran Desert Scrub, Montane Conifer Forest, and Riparian habitats, as described in the *Approved Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management and Decision Record*, are as follows:

Great Basin Pinyon-Juniper Woodland habitat:

Annual weeds such as cheatgrass are controlled, ladder fuels and downed woody debris are limited or not present, and juniper and piñon pine tree densities and cover occur at their historic range of variation.



Lower Sonoran Desert Scrub habitat:

An adequate cover of and mix of natural plant species that have good vigor. Wildland fire would control or reduce the exotic annual weeds such as red brome and to limit woody vegetation to nonhazardous levels.

Montane Conifer Forest habitat:

Dog-hair thickets are controlled, ladder fuels and downed woody debris are limited or not present, a high percentage of large trees are maintained, and tree stand vigor is maintained through controlled fire and mechanical treatments.

Riparian habitat:

Annual weed cover and density is controlled and ladder fuels and downed woody debris are limited or not present. Disturbances that can potentially reduce natural vegetation cover and vigor are managed to maintain cover and mix of native riparian plant species.  
(BLM 2004a: 2– 3)

#### **D. Fire Threat**

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. Existing data obtained through LANDFIRE.gov was used to determine the existing land cover and fire behavior models for the Pinal County WUI. Vegetation associations within the WUI were identified and mapped using the LANDFIRE.gov Existing Vegetation Type data layer, which represents the species composition present at a given site up to the year 2010 (LANDFIRE 2018). 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 2018). These data sets were used to digitize vegetative landcover types (refer to Figure 2.3) and display the distribution and abundance of vegetation associations and associated fire behavior models over the Pinal County WUI (refer to Figure 2.4a). The Core Team used the FlamMap fire mapping and analysis system (Finney 2006; Stratton 2006) to depict potential fire behavior for constant environmental conditions (weather and fuel moisture), which produces an estimate of flame height as a surrogate for prediction of fire intensity over the landscape (refer to Figure 2.4a). Further, as a result of the 2005 fire season and its remarkable increase in number of fires and acres burned, the Core Team wanted to analyze what a similar scenario might look like if it occurred again in the future. The increase in fire was a result of a particular wet year leading to an increase in light grass and shrub fuels. To model this, two fuel models were altered (GR1 to GR2 and GS1 to GS2) to account for an increase in light fuels when analyzing the wildland fire threat (refer to Figure 2.4b). These data sets provide the level of landscape description and vegetative landcover detail necessary for aligning wildland fuel flammability with existing vegetation. Each vegetation association consists of various fuel properties that can produce differing wildfire

behavior based on environmental condition. These properties are then assigned to distinguishable fuel models.

The normalized vegetative data and associated range of assigned fuel models for predicting wildfire behavior for each vegetation association is shown in Table 2.4. The predicted flame length from the FlamMap fire map model as well as the characteristic rate of spread were used to determine the high, moderate, or low wildland fire risk to communities (refer to Table 2.5). The relationship of surface-fire flame length to suppression actions is the basis for assigning wildland fire risk. 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 11 feet are assigned high risk (Heinsch and Andrews 2010). Rate of spread is defined the relative movement of a fire in a horizontal dimension. Rate of spread is a fire behavior output that is influenced by three environmental factors; fuels, weather, and topography. It is an indicator of how quickly a fire is spreading or moving horizontally and is expressed in feet-per-minute (AZWRAP 2017). Rate of spread thresholds associated with the West Wide Risk Analysis as part of AZWRAP have been applied. Flame length and rate of spread characteristics were combined and applied to both normal and extraordinary rainfall years (refer to Figures 2.4a and 2.4b) to represent fire behavior characteristics associated with vegetation and potential environmental factors within the WUI. Table 2.6 lists the predicted flame height, rate of spread and associated wildfire risk rating.

The Arizona State Forester has established the following guidelines for evaluating risk:

**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. (ADFFM 2007:1)

Risk Factor 1: Fire Behavior Potential in the WUI can be classified under Situations 1, 2, and 3, as described by the Arizona State Forester below:

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.

(ADFFM 2007:1-2)

The Pinal County WUI includes five major vegetative fuel types composed of 21 ecological system vegetation communities (including agricultural lands), two mostly nonvegetated associations, and six developed land covers (LANDFIRE 2018). 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 (refer to Table 2.5).

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).

**Table 2.4. Pinal County WUI Fuel Types and Vegetation Associations**

Fuel Type	Vegetation Association	Total Acres (%) <sup>a</sup>
Shrublands	Big Sagebrush Shrubland and Steppe <sup>b</sup>	578 (<0.1)
	Blackbrush Shrubland <sup>b</sup>	52 (<0.1)
	Chaparral	49,608 (2.5)
	Creosotebush Desert Scrub	273,833 (13.8)
	Deciduous Shrubland	23 (<0.1)
	Desert Scrub	852,691 (42.6)
	Introduced Riparian Vegetation	41 (<0.1)
	Salt Desert Scrub	15,416 (0.8)
Grasslands	Grassland	3,038 (0.2)
	Grassland and Steppe	12,799 (0.6)
	Introduced Annual Grassland	10,399 (0.5)
	Introduced Annual and Biennial Forbland	28,254 (1.4)
	Introduced Perennial Grassland and Forbland	450 (<0.1)
Woodlands	Conifer-Oak Forest and Woodland	36 (<0.1)
	Juniper Woodland and Savanna	2,771 (0.1)
	Juniper-Oak	12,352 (0.6)
	Mesquite Woodland and Scrub	63,536 (3.2)
	Pinyon-Juniper Woodland	34,541 (1.7)
	Ponderosa Pine Forest, Woodland and Savanna	9 (<0.1)
	Western Riparian Woodland and Shrubland	47,121 (2.4)
Non-vegetated / Sparsely Vegetated Lands	Barren	4,303 (0.2)
	Developed-High Intensity	805 (<0.1)
	Developed-Medium Intensity	3,305 (0.2)
	Developed-Low Intensity	17,715 (0.9)
	Developed-Roads	81,610 (4.1)
	Developed-Upland	78,966 (3.9)
	Open Water	3,161 (0.2)
	Sparse Vegetation	7,844 (0.4)
	Quarries-Strip Mines-Gravel Pits	10,818 (0.5)
Agricultural lands	Agriculture	386,200 (19.3)
<b>Total</b>		<b>2,002,277(100)</b>

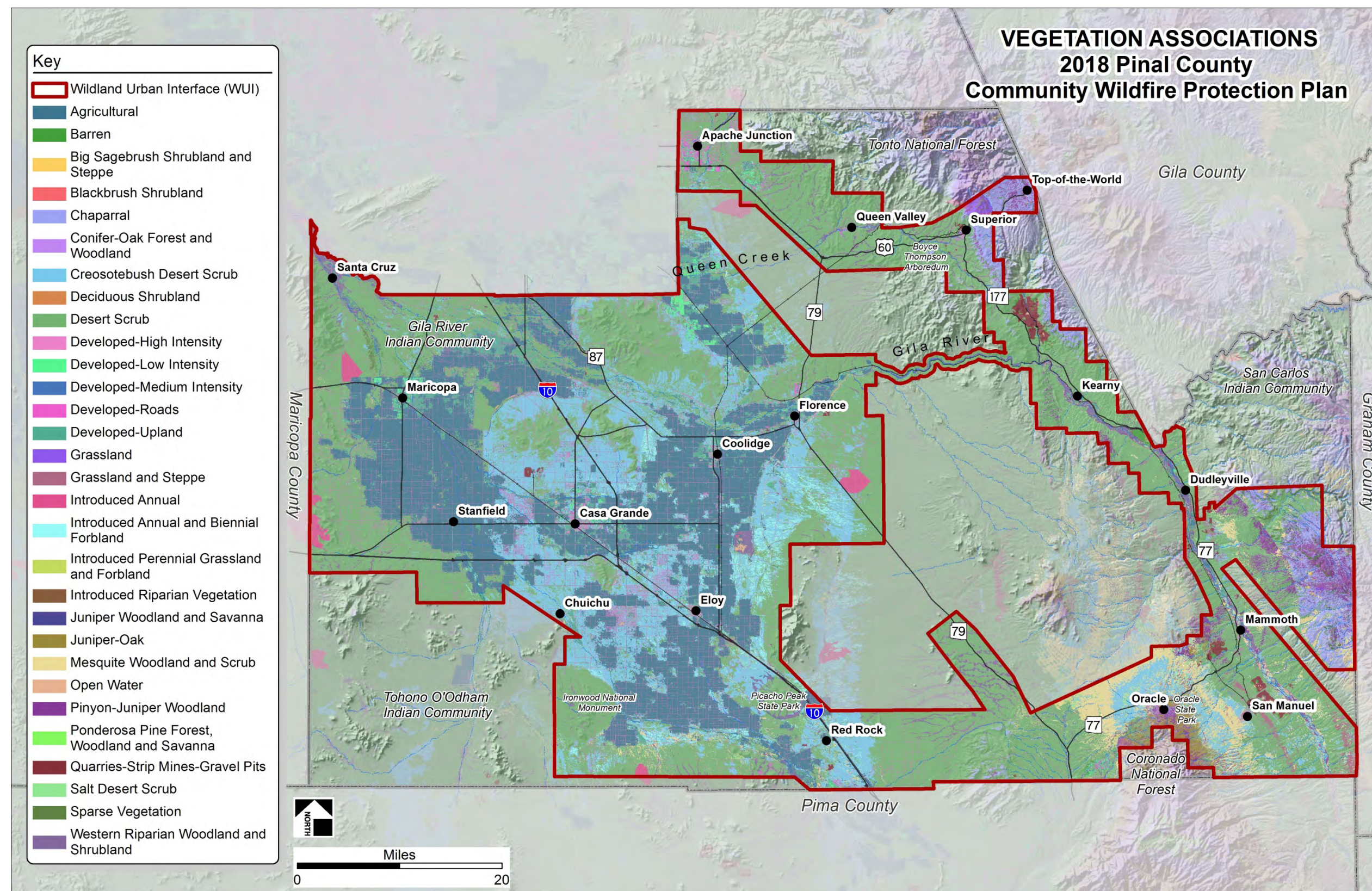
Source: LANDFIRE 2018

Note: WUI = wildland-urban interface.

<sup>a</sup> Actual percentages may not add to 100% because of rounding.

<sup>b</sup> May or may not physically occur in analysis area, due to computer classification of vegetation data.





**Figure 2.3. Pinal County CWPP Vegetation Associations**



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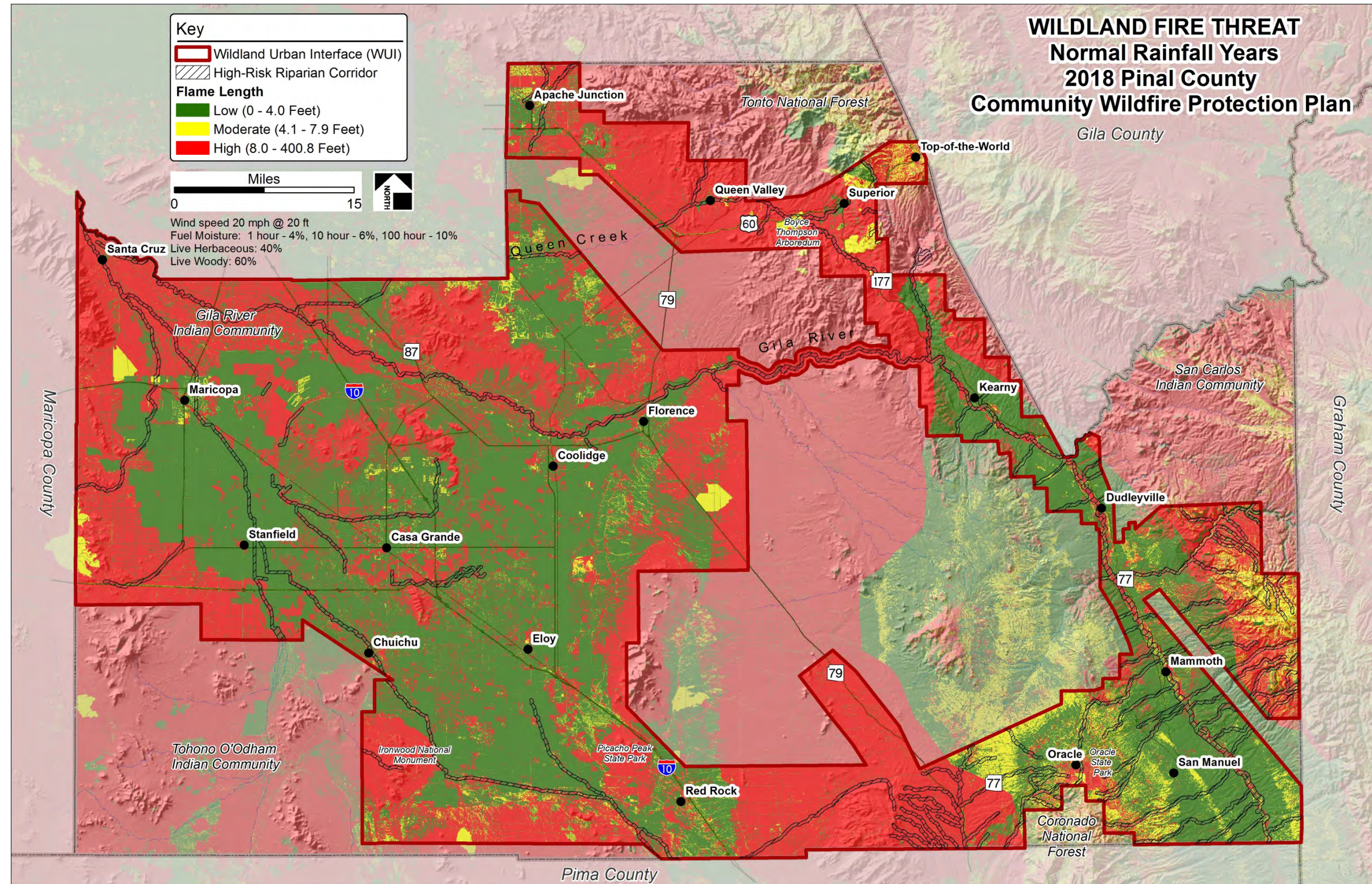


Figure 2.4a. Pinal County CWPP Wildland Fire Threat – Normal Rainfall Years



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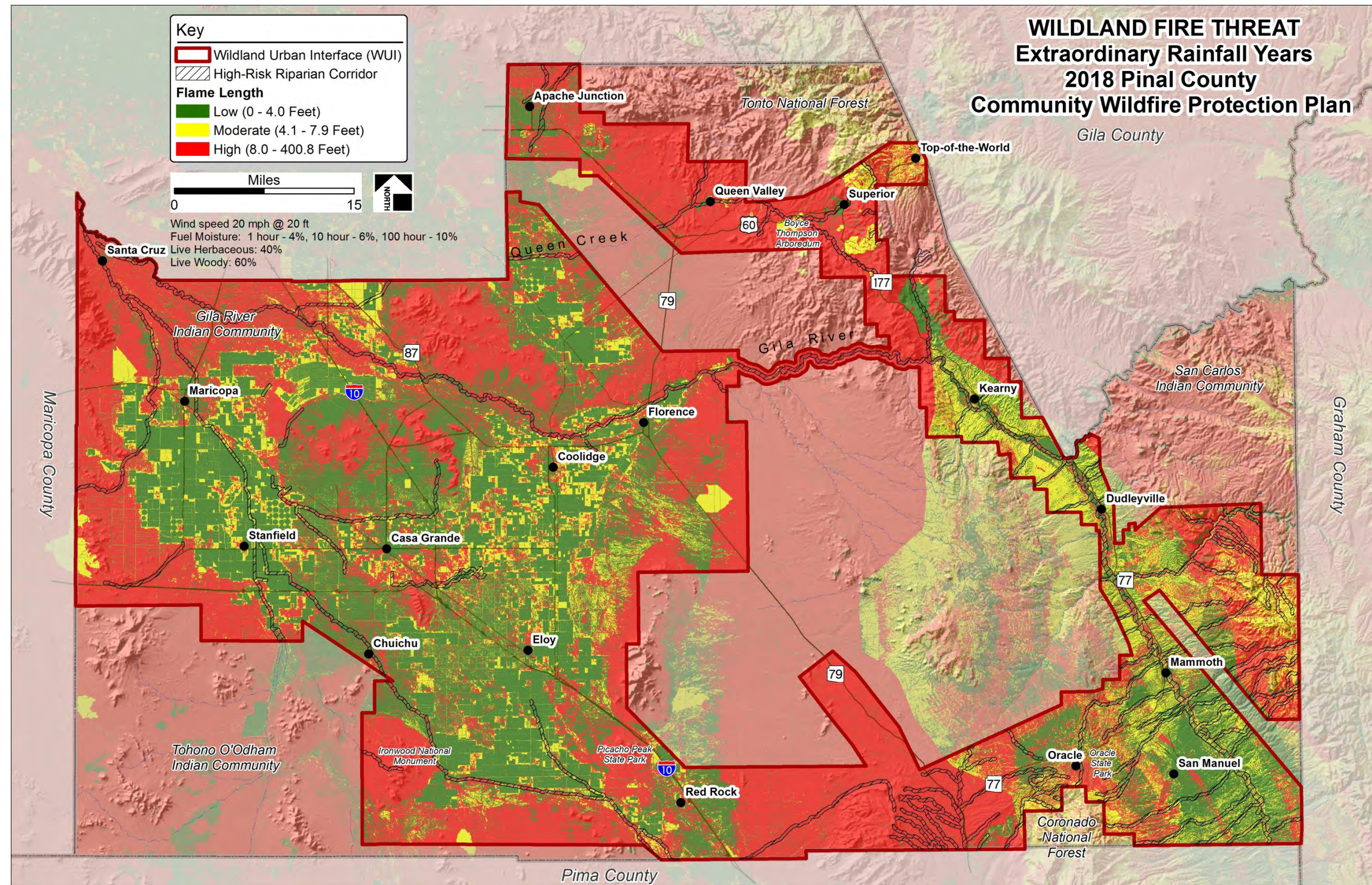


Figure 2.4b. Pinal County CWPP Wildland Fire Threat – Extraordinary Rainfall Years



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Table 2.5. Fuel Models, Fuel Descriptions, and Fire Behavior Models

Fuel Model	Fuel Description	Wildfire Risk Rating <sup>a</sup>	Anderson Fuel Model	Fire-Danger Rating Model <sup>b</sup>	Flame Length in feet	Flame Length in feet Low Dead Fuel Moisture	Fire Intensity Level from Fire Behavior Fuel Model <sup>c</sup>	Rate of Spread in feet/hour (chains/hour) Low Dead Fuel Moisture <sup>d</sup>	Acre (%) <sup>e</sup>
<b>Shrub (SH)—Shrubs Cover at Least 50 Percent of the Site; Grass Sparse to Nonexistent (Shrub)</b>		<b>L</b>	<b>5-6</b>	<b>L and T</b>	<b>1–5</b>				
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	1	7–132 (0–2)	338,321 (16.9)
SH2	Moderate fuel load (higher than SH1), depth about 1 foot; no grass fuel present. Spread rate low; flame length low.					1.5–5.0	1–3	0-1188 (0–18)	54 (<0.1)
SH3	Moderate load, humid climate shrub, woody shrubs and shrub litter; possible pine overstory; depth 2-3 feet. Spread rate low, flame length low.					0.7- 4.8	1-3	0-1254 (0-19)	13 (<0.1)
SH5	Heavy shrub load, depth 4 to 6 feet. Spread rate very high; flame length very high.					4.0–25.0	2–6	0–16500 (0–250)	17,067(0.9)
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	2–6	0–11889 (0–180)	27,009 (1.3)
<b>Grasslands (GR)—Nearly Pure Grass and/or Forb Type</b>		<b>M</b>	<b>1,2</b>	<b>F and T</b>	<b>1-8</b>				
GR1	Grass is short, patchy, and possibly heavily grazed. Spread rate moderate; flame length low.					0.5–1.7	1	0–990 (0–15)	237,185(11.8)
GR2	Moderately coarse continuous grass, average depth about 1 foot. Spread rate high; flame length moderate.					1.0–8.0	4	0–7920 (0–120)	39,846 (2.0)
<b>Grass-Shrub (GS)—Mixture of Grass and Shrub, up to about 50 Percent Shrub Coverage (Grass-Shrub)</b>		<b>M</b>	<b>1,2</b>	<b>A (B) and T</b>	<b>1–8</b>				
GS1	Shrubs are about 1 foot high, low grass load. Spread rate moderate flame length low.					1.0–6.0	1–3	0–3960 (0–60)	73,363 (3.7)
GS2	Shrubs are 1 to 3 feet high, moderate grass load. Spread rate high; flame length moderate					1.5–10.0	2–5	0–>6600 (0–100)	867,506 (43.9)
<b>Timber-Understory (TU)—Grass or Shrubs Mixed with Litter from Forest Canopy (Timber-Understory)</b>		<b>M</b>	<b>6-7</b>	<b>F and T</b>	<b>1-16</b>				
TU1	Fuelbed is low load of grass and/or shrub with litter. Spread rate low; flame length low					1.0–4.0	1–3	0–990 (0–15)	5,233 (0.3)
TU2	Fuelbed is moderate litter load with shrub component. Spread rate; moderate; flame length low.					1.0–8.0	1–5	0–5,280 (0–80)	1 (<0.1)

Section II. Community Assessment and Analysis									
Fuel Model	Fuel Description	Wildfire Risk Rating <sup>a</sup>	Anderson Fuel Model	Fire-Danger Rating Model <sup>b</sup>	Flame Length in feet	Flame Length in feet Low Dead Fuel Moisture	Fire Intensity Level from Fire Behavior Fuel Model <sup>c</sup>	Rate of Spread in feet/hour (chains/hour) Low Dead Fuel Moisture <sup>d</sup>	Acre (%) <sup>e</sup>
Timber Litter (TL)—Dead and Down Woody Fuel (Litter) beneath a Forest Canopy (Timber Litter)		H	4-5	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	1	0–66 (0–1)	33 (<0.1)
TL2	Low load, compact. Spread rate very low; flame length very low.					0.3–1.0	1	0–132 (0–2)	820 (<0.1)
TL3	Moderate-load conifer litter. Spread rate very low; flame length low.					0.4–1.3	1	0–198 (0–3)	2,429 (0.1)
TL5	High-load conifer litter; light slash or mortality fuel. Spread rate low; flame length low.					4.0–4.5	1-3	0 –1452 (0-22)	78 (<0.1)
TL6	Moderate load broadleaf litter. Spread rate moderate, flame length moderate.					1.0-6.2	1-4	0–1650 (0-25)	1,137 (0.1)
TL8	Moderate load and compactness may include small amount of herbaceous load. Spread rate moderate; flame length low.					1.0–8.0	1–5	0–66 (0–1)	28 (<0.1)
Nonburnable (NB)—Insufficient Wildland Fuel to Carry Wildland Fire under Any Condition (Nonburnable)									
NB1	Urban or suburban development; insufficient wildland fuel to carry wildland fire.								111,752 (5.6)
NB3	Agricultural field, maintained in nonburnable condition.								243,968 (12.2)
NB8	Open water.								3,169 (0.2)
NB9	Bare ground.								22,264(1.1)
								Total	2,002,277 (100)

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

<sup>a</sup> L = low; M = moderate; H = high; NA = not applicable.

<sup>b</sup> National Fire Danger Rating System.

<sup>c</sup> 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 fire line intensity based on flame length (in feet): FIL1 = 0–2 feet; FIL2 = 2.1–4 feet; FIL3 = 4.1-6 feet; FIL4 = 6.1–8 feet; FIL5 = 8.1–12 feet; FIL6 > 12 feet.

<sup>d</sup> Flame length predicted by FlamMap (LANDFIRE 2018). 1 Chain = 66 feet.

<sup>e</sup> Actual percentages may not add to 100% because of rounding.

**Table 2.6. Wildland Fire Threat**

<b>Vegetation type and density</b>	<b>Influence</b>
Predicted flame length greater than 8 feet	High
Predicted flame length of 4 to 8 feet	Moderate
Predicted flame length of less than 4 feet	Low
Rate of spread greater than 33 feet per minute	High
Rate of spread 11 to 32.9 feet per minute	Moderate
Rate of spread 0 to 10.9 feet per minute	Low

*Source:* Logan Simpson 2018.

### **E. Conditions of Ignition and Past Fire Occurrence**

Past regional wildfire events are important to consider when determining the potential occurrence of unwanted wildland fire in any area of the WUI. Based on the combination of recurring dry conditions and a regional history of fires, it is expected that there will be wildland fire ignitions within the WUI that must be suppressed. The fire history of the Pinal County CWPP analysis 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 (refer to Figure 2.5).

Table 2.7 details the high, moderate, and low positive-influence values assigned to fire-start incidents. These include concentrated areas of lightning strikes and human-caused ignitions with high-potential areas having the greatest number of fire starts per 1,000 acres. High, moderate, and low determinations are based on the same density and distribution matrices as identified in AZWRAP. Wildland fire ignition data were obtained from the Federal Wildland Fire Occurrence Internet Mapping Service web site and database ([USDA and USDI 2017](#)) and from the National Fire and Aviation Management Web Applications Data Warehouse ([FAMWEB 2018](#)). Data sets were combined with redundant ignitions counted as a single ignition. The data sets used 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, 1,171 wildfire ignitions have been reported within the WUI from 2007 through 2016.

**Table 2.7. Ignition History and Wildfire Occurrence**

<b>Wildfire Occurrence</b>	<b>Value</b>
0–2 fire ignitions/1000 acres	Low
2–5 fire starts/1000 acres	Moderate
>5 fire starts/ 1000 acres	High

A growing body of evidence shows that the climate has changed substantially since the year 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 areas with the greatest potential for fire ignition, either from natural or human (though unplanned) causes, are found within the northwestern portion of the WUI, including the Gila River Indian Community. Moderate fire occurrences are found in the northeastern portion of the WUI near community of Queen Valley and town of Superior, as well as the southwestern portion of the WUI near the city of Eloy, along the I-10 and SR 87 corridors, and on the Tohono O'Odham Indian Community (refer to Figure 2.5).

## **F. Wildfire Effects**

Valued at-risk community resources can often include private and community structures, communication facilities, local recreation areas, cultural and historic areas, sensitive wildlife habitat, watersheds, natural resources, and air quality. As agreed to by the Core Team, developed land and other infrastructure within the area of highest wildfire threat were given the highest influencing value of wildfire effects. In accordance with the risk to "Social, Cultural and Community Resources" (Risk Factor 2) identified by the ADFFM, the Core Team has determined that the Pinal County WUI does include areas consistent with Situations 1, 2, and 3, as follows:

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. (ADFFM 2007:2)



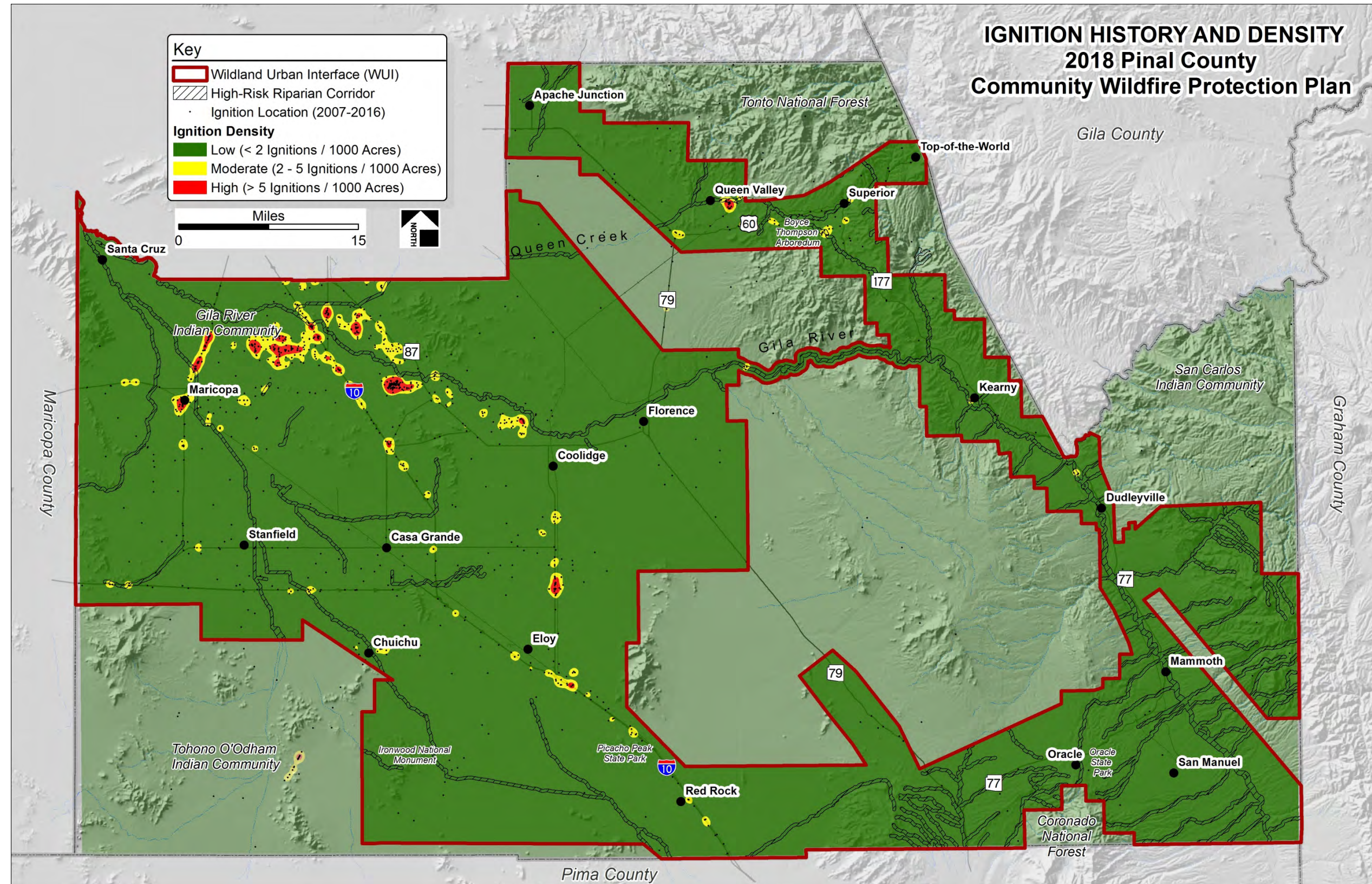


Figure 2.5. Pinal County WUI Ignition History



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

High wildfire-effects areas, including major community cores and portions of major highways and roadways, were identified within the 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 available for each land parcel within the WUI (Pinal County 2018) and analyzed structure distribution and density to determine areas of low, moderate, and high structural density. This data was then portioned into wildfire-effects categories according to the density of structures and presence of natural or developed landcover types. This includes:

- a. areas of highly developed lands that lack significant open space or natural land covers,
- b. moderately developed private lands where an intermingling of public and private lands occur, and
- c. where the major portion of the landscape is composed of natural landcover types, and lightly developed private lands where the majority of land cover is composed of natural land cover (refer to Photograph 2.2).

Areas of highest development and areas lacking development are considered to have lower wildfire-effects; areas of moderate development where the majority of land cover is composed of natural land cover are considered to have high wildfire effects; and areas of light development are considered to have moderate wildfire effects (refer to Table 2.8).



**Photograph 2.2. 2017 Roach Fire in the area of Dudleyville, AZ**

During the 2009 Pinal County CWPP analysis process, the Core Team identified high-risk transportation corridors within the WUI including portions of I-10 and I-8, US Highway 60 (US 60), SR 77, SR 177, SR 79, SR 347, SR 238 and SR 87. These corridors continue to be vital routes and have been carried into this 2018 Pinal County CWPP as transportation corridors that will serve as

evacuation routes and resource distribution corridors during a wildland fire. Fuel modifications and treatments as appropriate along evacuation corridors will provide for safe evacuation, as well as emergency vehicle response during a catastrophic wildland fire in the WUI.

## **2. Recreation Areas/Natural Habitat**

Recreational features are located within and adjacent to the WUI throughout Pinal County, including recreational and camping areas associated with the San Tan Mountain Regional Park; Lost Dutchman, Oracle, and Picacho Peak State Parks; Boyce Thompson SW Arboretum; and designated camping and recreation areas within CNF, TNF, and BLM-managed public lands. These parks and recreational areas provide camping and scenic vistas of deep canyons, dry washes, sheer cliffs, distant mountain ranges, colorful soils and rock formations, and a mosaic of vegetation.

The Pinal County CWPP analysis area includes three rivers: the San Pedro, the Santa Cruz, and the Gila. The San Pedro River flows north from the Mexican state of Sonora into Arizona to join the Gila River near Winkelman. The river is located in the southeastern portion of the county and enters Pinal County from Pima County. It is one of the last few large undammed rivers in the Southwest. The San Pedro River supports nearly two-thirds of the avian diversity in the United States; about 100 species of birds breed around the river, and an additional 250 species use the corridor for migration and winter range. The San Pedro River also provides habitat for 80 species of mammals.

The Santa Cruz River has its headwaters in the high intermontane grasslands of the San Rafael Valley just north of the US-Mexican border. It flows southward into Mexico, turns westward, and reenters the United States just east of Nogales and continues northward past Tucson to the Santa Cruz Flats just south of Casa Grande and the Gila River. The river is located in the southern portion of the County and nearly parallels Interstate 10 (I-10) to its east as it enters Pinal County from Pima County. The Santa Cruz River is usually a dry riverbed throughout much of the year, unless the area receives significant rainfall.

The Gila River is a tributary of the Colorado River. It begins in western New Mexico, flows southwest and westward into Arizona, emerges from the mountains into the valley southeast of Phoenix where it crosses the Gila River Indian Reservation as an intermittent stream, flows westward and southward past Gila Bend, and joins the Colorado River near Yuma, Arizona. The river spans the entire north half of the County from east to west, and forms parts of its boundary on the northwest with Maricopa County and northeast with Gila County. It is one of the largest desert rivers in the world and provides an important riparian corridor for a variety of animal species (refer to Photograph 2.3). The western portion of the Gila River is largely a dry river bed in part due to irrigation and municipal water uses, though it can carry massive volumes of water after rain storms.



**Photograph 2.3. Gila River Riparian Corridor March 1, 2018**

The WUI also includes known and potential habitat areas for several threatened, endangered, and sensitive (TES) plants and animals. Uplands within the WUI may provide habitat for the Sonoran desert tortoise (*Gopherus morafkai*), an Arizona Game and Fish Department (AGFD) species of concern. Riparian corridors contain suitable habitat for the federally-endangered southwestern willow flycatcher (*Empidonax traillii extimus*), as well as the yellow-billed cuckoo (*Coccyzus americanus*), which is listed as federally threatened. To mitigate risk to these species, the land management agencies use conservation strategies and implement programs that meet goals and objectives of natural resource management. Wildland fuel and vegetative restoration treatments within sensitive species habitat may require additional site-specific analysis regardless of land management status because of the extraordinary circumstances created by the presence of sensitive species or their habitats. Before any vegetation treatment by the BLM, TNF, or CNF, a biological assessment and evaluation will be conducted by the appropriate federal land management agencies wildlife biologist to determine the extent of impacts the treatments will have on TES species and habitats. Section 102.a.5.B of HFRA identifies 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**

The Insurance Services Office (ISO) conducts assessments and rates 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, type and availability of equipment, personnel, ongoing training, and the community's alarm and paging system. Water supply—the most important factor—accounts for 40 percent of the total rating. Areas within the WUI that are not located within a fire district

are identified as having an ISO rating of 10. Municipalities or areas with urban development within the WUI and are within a fire department or district have ISO ratings ranging from 3 to 9. ISO ratings have been combined with structure density as an influencing factor in the overall risk analysis. ISO ratings will vary within fire departments and districts depending on housing densities and the distance of structures that are isolated (usually 5 miles or more) from a fire station. Local populations and structure density within the Pinal County WUI will determine the extent of initial attack; sustained responses; structural protection; and public safety protection, including potential evacuation of a community.

The wildland and structural fire response within the WUI is provided by local fire departments and districts. The BLM, TNF, CNF, and local fire departments and districts provide support for initial wildland fire attack for areas within and adjacent to the Pinal County WUI. 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 ADFFM and adjacent fire departments and districts.

Land use in the WUI consists primarily of residences, agriculture, livestock production, community businesses, and community-based services and facilities. Surrounding areas are dominated by Arizona State Trust lands; BLM, TNF, and CNF lands; and private properties. Land uses within or close to the WUI include recreational activities such as hiking, hunting, fishing, bird watching, nature study, photography, and off-highway-vehicle use. Section II.G of this CWPP provides more detailed community assessments.

Table 2.8 identifies the different influence-factor weightings given to these community value components; these components were also mapped and are depicted in Figure 2.5. Note that when structure density reaches greater than 2.0 structures/acre, the wildland fire effects ratings are low. This is because the risk from house-to-house ignitions is greater at such densities, but the wildland fuel aspect is missing, and thus the effects strictly from wildland fire are lowered.

**Table 2.8. Wildland fire Effects**

<b>Component</b>	<b>Value</b>
> 2.0 structures/acre	Low
0.2–2.0 structures/acre	High
0.1–0.2 structure/acre	Moderate
0 - 0.1 structure/acre	Low
ISO less than 8	Low
ISO greater than 8	High

*Source:* Logan Simpson 2018.



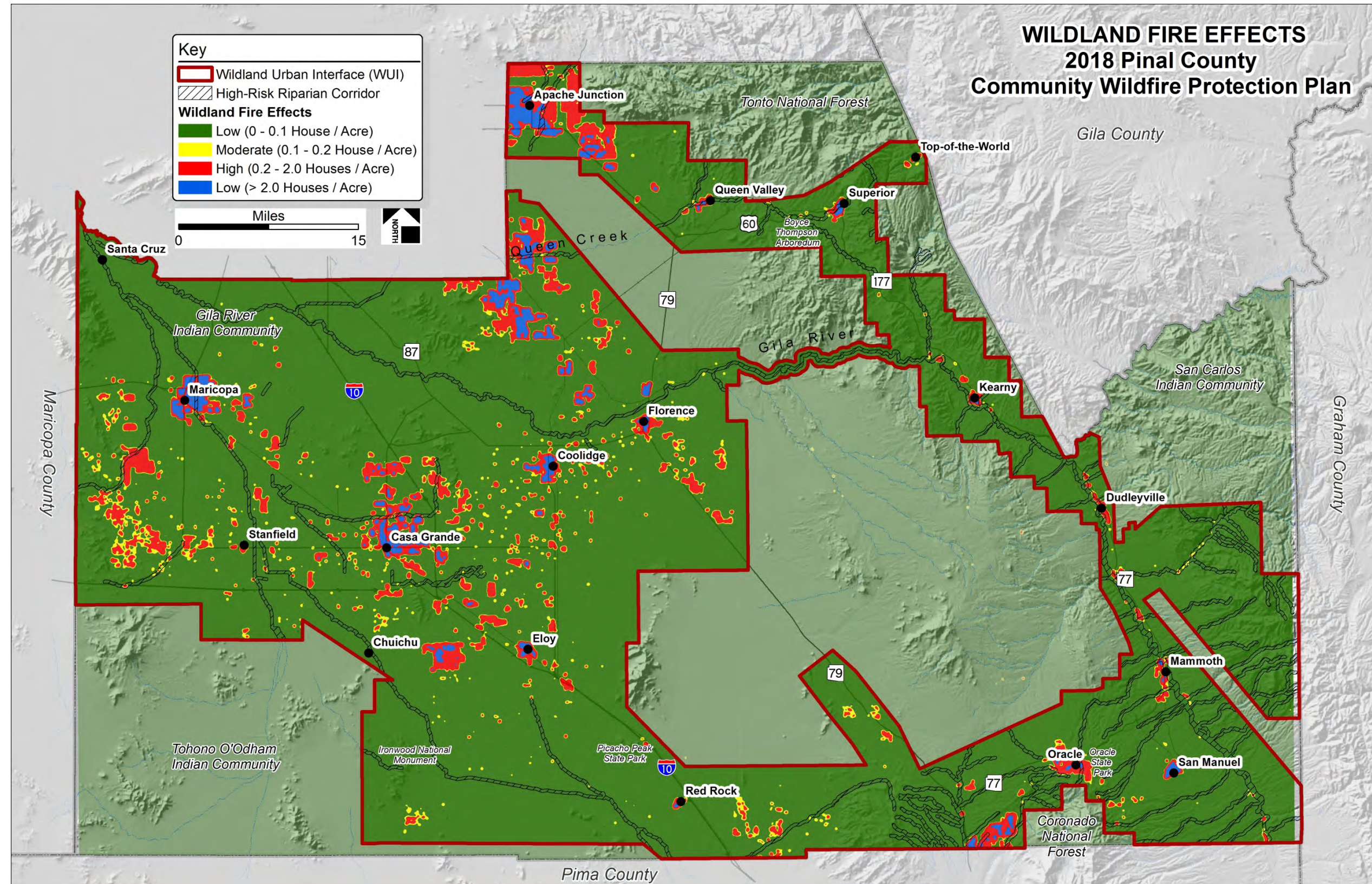


Figure 2.6. Pinal County CWPP Wildland Fire Effects Assessment



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## **G. Summary of Community Assessment and Fire Risk Analysis**

The major concerns identified by the Core Team during the revision of this Pinal 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; (4) structures, subdivisions, and communities that do not have fire protection because they are not within the jurisdiction of a fire department or district; (5) and the spread of non-native invasive grasses that contribute to fuel loading within the WUI, including along roadways where firebreak effectiveness may be compromised. Additionally, many residences in the identified WUI 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.

Some fire departments and districts have developed an incident action plan for sections of the WUI, such as is disclosed in the *Oracle Community Wildfire Protection Plan* (Oracle Fire District 2008), but further assessments continue to be needed. 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 sub-WUI communities within the WUI area are described below in more detail and shown in Figure 2.1 above. 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 2016 American Community Survey (ACS) 5-Year Estimates data (US Census 2016) unless noted otherwise.

### **1. Eastern Pinal County Sub-WUI Communities**

#### ***Apache Junction Sub-WUI***

The Pinal County CWPP analyses determined that 43 percent of the Apache Junction sub-WUI (Figure 2.6 above) is at moderate risk and that 55 percent is at low risk for wildland fire. Due to areas of high-low wildfire threat, low ignition history, and low to high wildfire effects, the overall wildland fire risk rating of the Apache Junction sub-WUI is low.

Apache Junction is a rural community located within Pinal County along US 60 approximately 30 miles east of Phoenix. US 60 is the major transportation route for this community; SR 79 also serves as a transportation route for Apache Junction. The Superstition Fire & Medical District (formerly known as Apache Junction Fire District) encompasses 62 square miles and serves the city of Apache Junction and the unincorporated areas of Gold Canyon, Superstition Foothills, and the Goldfield Foothills area. The Apache Junction sub-WUI consists primarily of bedroom communities. According to 2016 ACS

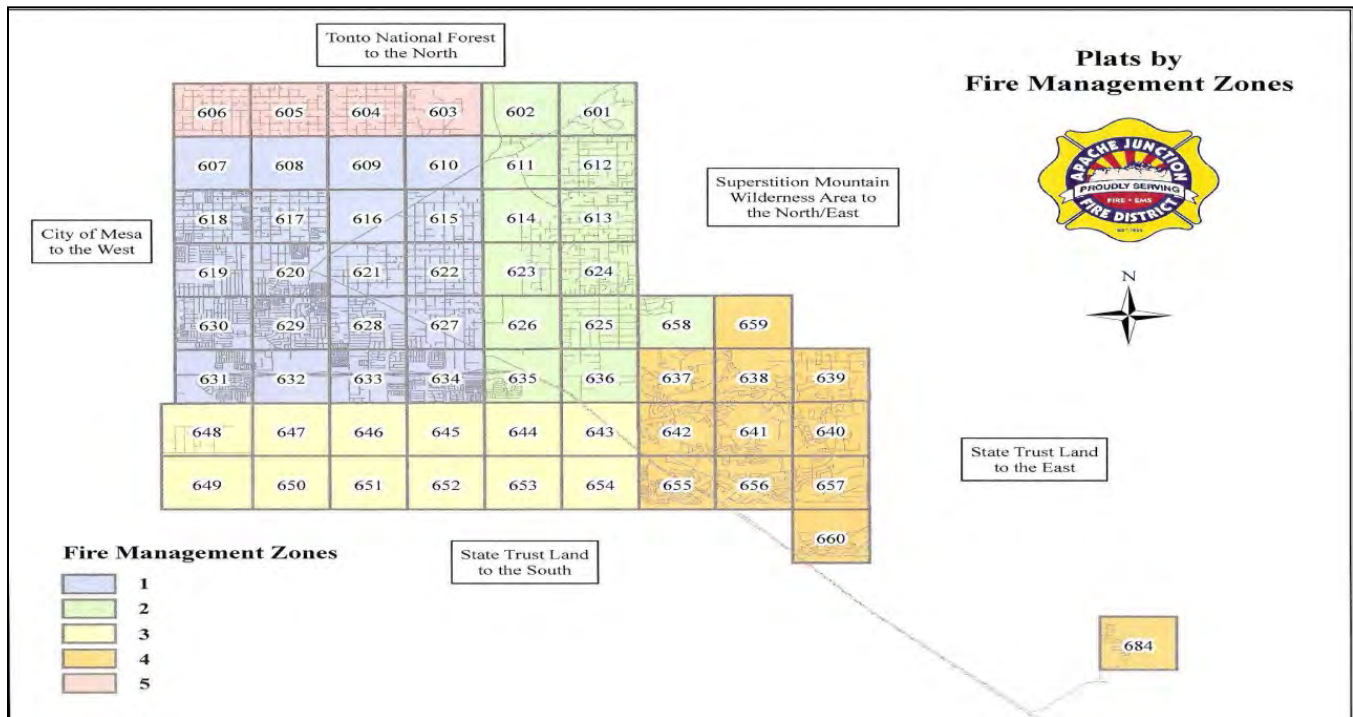
data, the population of Apache Junction is 37,775 (18.7 percent increase from the 2000 Census data), with 22,204 housing units (a 2.5 percent decrease). Land ownership is primarily private, ASLD, and BLM. The Superstition Fire & Medical District has an ISO rating of 3. The fire district is bordered by the TNF as well as State Trust lands. These border areas are defined as WUI areas and are the focus of this Pinal County CWPP for this sub-WUI.

The Superstition Fire & Medical District is divided into separate and distinct fire management zones (FMZs; refer to Figure 2.7) for response and deployment analysis and planning:

- FMZ 1 encompasses the majority of the populated area within the city of Apache Junction. Fire Stations 261 and 263 provide primary response coverage for the city's inhabited 20 square miles. The population of FMZ 1 is estimated at 55,245 (Superstition Fire & Medical District 2009 and US Census 2016).
- FMZ 2 comprises the Superstition Mountain Foothills area. Fire Station 262 provides primary response coverage for the area's 13 square miles. The population of FMZ 2 is estimated at 5,973 (Superstition Fire & Medical District 2009 and US Census 2016).
- FMZ 3 covers 12 square miles of mostly vacant state trust land south of US 60. This FMZ receives service primarily from Fire Stations 263 and 262. The population of FMZ 3 is estimated at 0 (Superstition Fire & Medical District 2009 and US Census 2016).
- FMZ 4 encompasses 13 square miles and includes the communities of Gold Canyon, Mountain Brook, Kings Ranch, Superstition Mountain and Peralta Trails and the surrounding areas. Fire Station 264 provides primary response coverage for the area. The population of FMZ 4 is estimated at 22,117 (Superstition Fire & Medical District 2009 and US Census 2016).
- FMZ 5 encompasses the Goldfield Foothills area. This area, encompassing 4 square miles, receives service primarily from Fire Stations 261 and 263. The population of FMZ 5 is estimated at 3,107 (Superstition Fire & Medical District 2009 and US Census 2016).

The areas at highest risk for wildland fires within the Apache Junction sub-WUI occur primarily along the slopes of the Superstition Mountains in the eastern portion of the sub-WUI and the Goldfield Mountains in the northern portion of the WUI. Vegetation associations within this sub-WUI range from desert scrub types on the desert floor to mixed desert shrub associations in the mountain foothills. During extraordinary rainfall years, changes in vegetation could result in higher wildland fire risk. Analysis of fire-start data from 2007 to 2016 indicates that the highest incidences of ignition occur within or adjacent to the sub-WUI either within or adjacent to the TNF lands along the northern and eastern portions of the sub-WUI, and along the US 60 corridor (Figures 2.2 through 2.5 above).





**Figure 2.7. Superstition Fire & Medical District Fire Management Zones**

### **Dudleyville Sub-WUI**

The Pinal County CWPP analyses determined that approximately 86 percent of the Dudleyville sub-WUI (Figure 2.6 above) is at moderate risk for wildland fire. Due to an elevated threat of fire from within and adjacent to the riparian corridor, and limited access and wildland fire response, the overall wildland fire risk rating of the sub-WUI is moderate. Localized areas of high in the vicinity of Dudleyville can be attributed to housing density and high ISO rating.

Dudleyville is located primarily within the riparian corridor of the San Pedro River adjacent to SR 77 between the communities of Mammoth and Kearny. The community of Dudleyville, listed as low risk in the *Arizona-Identified Communities at Risk* (ADFFM 2009), is located within the Dudleyville sub-WUI. According to 2016 ACS data, the population of Dudleyville is 352 (a 73.4 percent decrease from the 2000 Census data), with 307 housing units (a 46.3 percent decrease). Land ownership is primarily private, State Trust, and San Carlos Indian Reservation Land. The Dudleyville Fire District provides structural and wildland fire protection services to the community. The areas at highest risk for wildland fires within the Dudleyville sub-WUI are primarily along the San Pedro and Gila River riparian corridors and associated side channels and upland areas with ascending slope to the east and west of the river corridors. Additionally, areas of higher fire threat can be found within the riparian corridor where saltcedar-invaded riparian vegetation with heavy ground fuels is found within or adjacent to structures. In July 2017, the Roach Fire burned over 300 acres within the riparian corridor affecting nearby structures and residents. Developed lands occur on both sides of the riparian corridor, with few roads crossing the river channel. Firefighting response and community evacuation (when necessary) could be delayed due to limited access. Analysis of fire-start data from 2007 to 2016 indicates that the highest

incidences of ignition are within the riparian corridor to the northwest of the sub-WUI. Wildfire ignitions have been recorded on both sides of the riparian corridor (Figures 2.2 through 2.5 above).

### ***Galiuro Mountains Sub-WUI***

The Pinal County CWPP analyses determined that 94 percent of the Galiuro Mountains sub-WUI (Figure 2.6 above) is at moderate risk for wildland fire. Due to areas of moderate to high threat, low ignition history, and overall low wildfire effects other than those associated with Aravaipa Canyon West which are moderate, the overall wildland fire risk rating of the Galiuro Mountains sub-WUI is moderate.

The Galiuro Mountains Sub-WUI is located east of the San Pedro River corridor and includes private, mostly undeveloped lands, located on the west-facing foothills of the Galiuro Mountains. Aravaipa Canyon West is a community located within the Galiuro Mountains and has been a recognized Firewise community since 2014, investing over \$57,000 towards reducing their wildland fire risk (NFPA 2018b). These private lands are not within a fire department or district, with no obligated structural fire protection is available to residents. Wildland fire responses would be provided by ADFFM, BLM, or USFS wildfire response resources. Analysis of fire-start data from 2007 to 2016 indicates that the highest incidences of ignition are within the upper elevations of the Galiuro Mountains in the easternmost portion of the WUI. Vegetation associations occurring in higher elevations create a high fire risk during normal fire seasons. In extraordinary rainfall years, production of light fuels from invasive grasses will produce areas of high risk on the lower foothills where woodland vegetation associations are associated with steep slopes and southerly exposures. Numerous xeroriparian areas traverse the sub-WUI from east to west, from the higher elevations of the Galiuro Mountains to the San Pedro River; this creates additional areas of potential elevated wildfire concern. Although areas of high and moderate wildland fire threat dominate large areas of this sub-WUI, wildfire mitigation should be focused on developed areas associated with Aravaipa Canyon (Figures 2.2 through 2.5 above).

### ***Golder Ranch Sub-WUI***

The Pinal County CWPP analyses determined that approximately 80 percent of the Golder Ranch sub-WUI (Figure 2.6 above) is at moderate risk and 19 percent is at low risk for wildland fire. Due to an overall wildfire threat, low ignition history, overall low to moderate wildfire effects, and proximity to high-threat wildland fuels and elevated areas of threat from several xeroriparian areas the overall wildland fire risk rating of the Golder Ranch sub-WUI is moderate.

This sub-WUI includes the developed areas in the Golder Ranch Fire District within Pinal County including the Saddlebrook developments along SR 77, the Oracle Junction area, and developed parcels north along a segment of SR 79 northwest to the area above Three Buttes. Outside the Saddlebrook development, this sub-WUI is sparsely populated. However, areas of high risk occur along the Pinal-Pima county border and within the western portion of the sub-WUI toward the Tortolita Mountains as well as throughout the WUI where desert shrub-scrub associations occur in conjunction with southerly exposed slopes. Additionally, there are several large and converging xeroriparian areas of elevated concern of wildland fire threat that occur within the WUI (Figures 2.2 through 2.5 above).

### ***Kearny Sub-WUI***

The Pinal County CWPP analyses determined that approximately 83 percent of the Kearny sub-WUI (Figure 2.6 above) is at moderate risk for wildland fire. Due to an elevated threat of fire from within and adjacent to the riparian corridor, and limited access and wildland fire response, and an overall low ignition history the overall wildland fire risk rating of the sub-WUI is moderate.

The Kearny sub-WUI includes the incorporated community of Kearny and areas along the Gila River riparian corridor south of the confluence of the Gila and San Pedro Rivers and north of the municipality along SR 177 to south of the town of Superior. The community of Kearny, listed as moderate risk in the *Arizona-Identified Communities at Risk* (ADFFM 2009), is located within the Kearny sub-WUI. Kearny is a rural community located along SR 177 and adjacent to the Gila River riparian corridor. SR 177 is the only major transportation route for this community; it connects to SR 77 to the southeast and US 60 to the northwest. According to 2016 ACS data, the population of the town of Kearny is 2,306 (a 2.5 percent increase from the 2000 Census data) with 897 housing units (3.0 percent increase). Land ownership within the sub-WUI is primarily private with BLM land in the northeast and southwest areas of the main developed areas of the community. ASLD owns land parcels along the Gila River riparian corridor and areas along SR 77 and SR 177. The areas at highest risk for wildland fires within the WUI occur along both sides of the Gila River riparian corridor in areas on ascending slope in conjunction with woodland vegetation associations. The Gila River riparian corridor, with associated side channels and drainages within and to the west of the Kearny sub-WUI, are also considered areas of elevated threat from wildland fire. Vegetation associations at highest risk for wildfire consist primarily of riparian, woodland, and mixed desert scrub. Analysis of fire-start data from 2007 to 2016 indicates that the highest incidences of ignition are within the riparian corridor (Figures 2.2 through 2.5 above).

### ***Mammoth Sub-WUI***

The Pinal County CWPP analyses determined that approximately 87 percent of the Mammoth sub-WUI (Figure 2.6 above) is at moderate risk for wildland fire. Due to an elevated threat of fire from within and adjacent to the riparian corridor, and limited access and wildland fire response, the overall wildland fire risk rating of the sub-WUI is moderate. Localized areas of high in the vicinity of Mammoth can be attributed to housing density and high ISO rating.

The Mammoth sub-WUI includes the community of Mammoth and areas outside the Mammoth Fire District boundary along the San Pedro River riparian corridor, north of the Veterans Memorial Blvd intersection with SR 77, and north along SR 77 to just south of the confluence of the San Pedro River and Aravaipa Creek. Mammoth is a rural community located along SR 77 and adjacent to the San Pedro River riparian corridor. SR 77 is the only major transportation route for this community. According to 2016 ACS data, the population of the community of Mammoth is 1,553 (an 11.9 percent decrease from the 2000 Census data), with 646 housing units (a 4.9 percent decrease). Land ownership is primarily private and State Trust land, with small portions of BLM land near SR 77. The areas at highest risk for wildland fires within the WUI occur primarily along the San Pedro River riparian corridor and in upland areas with ascending slope to the east of the riparian corridor. The San Pedro River riparian

corridor, with associated side channels and drainages within the community of Mammoth, are considered areas of elevated threat from wildland fire. Vegetation associations at highest risk for wildfire consist primarily of riparian, woodland, and mixed desert scrub. Analysis of fire-start data from 2007 to 2016 indicate little to no ignitions within the Mammoth Sub-WUI (Figures 2.2 through 2.5 above).

### **Oracle Sub-WUI**

The Pinal County CWPP analyses determined that approximately 57 percent of the Oracle sub-WUI (Figure 2.6 above) is at moderate risk and that 43 percent is at low risk for wildland fire. Due to areas of low to high wildfire threat, low ignition history, and low-high wildfire effects, the overall wildland fire risk rating of the Oracle Community WUI is moderate.

The Oracle sub-WUI includes the unincorporated community of Oracle and areas outside the Oracle Fire District south to the CNF, east along SR 77 to the Mammoth/San Manuel sub-WUI boundary, and west to the Golder Ranch Sub-WUI. Oracle is a rural community located along SR 77 at an elevation of approximately 4,500 feet. The community of Oracle, listed as high risk in the *Arizona-Identified Communities at Risk* (ADFFM 2009), is located within the Oracle Sub-WUI. SR 77 is the only major transportation route for this community. According to 2016 ACS data, the population of the town of Oracle is 3,735 (a 4.8 percent increase from the 2000 Census data), with 1,907 housing units (a 21.4 percent increase). The Oracle Fire District covers 31 square miles and includes 106 fire hydrants that produce 400 to 1,250 gallons of water per minute. The Oracle Fire District provides structural and wildland fire response to over 1,500 structures. The fire district is staffed year-round on a daily basis by full-time, part-time, and volunteer firefighters and maintains mutual-aid agreements with neighboring fire departments and districts. The Oracle Fire District has an ISO rating of 7. The Oracle sub-WUI also includes Oracle State Park, a 4,000-acre environmental education facility and park in the foothills of the Catalina Mountains. Public use of the state park in proximity to the community does increase risk of wildfire ignitions notification and evacuation of park visitors should be evaluated in the event of a wildfire within or surrounding the park. Since becoming a Firewise Site in 2005 and the development of the 2008 Oracle CWPP, the community has been active in public outreach, including participation in major community events, a newly established Firewise Web site, spring and fall newsletters mailed to all households, wildfire prevention workshops, on-site property evaluations, operation of a community brush-disposal site, and cooperation in vegetative fuel reduction projects with the Arizona Department of Corrections Wildland Crews and CNF personnel.

The areas at highest risk for wildland fires within the Oracle sub-WUI occur primarily along the upland slopes of the Catalina Mountains in the southern portion of the WUI. Vegetation associations within the community include woodland and chaparral types that have a high potential to support and transport wildland fire. The southern and eastern portions of the sub-WUI with ascending slopes are at greatest wildfire risk. Additionally, these areas of high wildland fire threat, including the xeroriparian areas of Cottonwood Wash and Big Wash, which bisect SR 77; wildfires within this area of the sub-WUI could create concerns for wildfire response resources and community evacuation along SR 77. Analysis of

fire-start data from 2007 to 2016 indicates that the highest incidences of ignition occur within or adjacent to the sub-WUI either within or adjacent to the CNF (Figures 2.2 through 2.5 above).

### ***Queen Valley Sub-WUI***

The Pinal County CWPP analyses determined that approximately 92 percent of the Queen Valley sub-WUI (Figure 2.6 above) is at moderate risk for wildland fire. Due to an overall high wildfire threat, low to moderate ignition history, and overall low wildfire effects, with focused areas of high effects, the overall wildland fire risk rating of the WUI is moderate. Localized areas of high in the vicinity of Queen Valley can be attributed to high ignition history and high ISO rating.

Queen Valley sub-WUI is located in Township 1 South, Range 10 East, Sections 34 and 35 of Pinal County and has areas at high risk from brush fires around homes with a high density of brush growth on adjacent hillsides. According to 2016 ACS data, the population of Queen Valley is 712 (a 13.2 percent decrease from the 2000 Census data), with 639 housing units (a 7.4 percent increase). Land ownership is primarily State Trust and private, with smaller portions of BLM land to the east and west. The Queen Valley Fire District has an ISO rating of 8. The Queen Valley Fire District has designated five high-risk wildland fire areas within the community:

- Area 1 is about 0.25 mile long and is bounded by Queen Anne Drive to the east, East Victoria View to the south, Queen Valley Drive to the north, and North Charlotte Street to the west. This area has a westerly aspect and a 34 percent slope. The bottom of the slope is a xeroriparian area with heavy vegetative fuel loads and several undeveloped residential parcels with moderate to heavy fuels. Residences are located at the top of the slope, and vegetation overhangs some of the residential structures.
- Area 2 is bounded by West Morris Drive to the north, West Sahuaro Drive to the south, South Pomeroy Road to the west, and Arizona State Trust lands to the east. Some lands in this area have a slope of over 60 percent with a northwest aspect. This slope has a moderate to heavy vegetative fuel growth and limited access, making hand-crew maintenance and wildfire suppression difficult; fire suppression would involve using large hand lines and smooth bore nozzles. Hydrants in the area have a capacity of 500 gallons per minute or less. Homes in this area have porches instead of yards. The initial attack plan consists of setting up a sprinkler system on the high-risk back porches to reduce stricter risk. All of the homes on West Sahuaro Drive are manufactured homes, most of them built in 1980.
- Area 3 is a large area of federal land in the southeast quarter of Section 34 that is bounded by East Silver King Road to the north, West Kirk Drive to the south, North Sharon Drive to the east, and El Camino Viejo to the far west. Residences are located within the south, east, and northern portions of the area. Queen Creek Wash bisects the area and is mostly composed of heavy xeroriparian vegetative fuels. The initial attack consists of having the local water company open and clear the two-track road running from Sharon Drive north to Silver King Road and then starting back burning at the east end of this area.



- Area 4 is bound by North Victoria View to the north and North Charlotte Street to the west, including North Elizabeth Street. This alignment is located within a xeroriparian area with residences immediately adjacent. The area also includes a gradual 65-foot elevation change on an east- and west-facing slope. Moderate to heavy fuels with a light base fuel in this area could act like a chute under certain winds, pushing the fire south through several structures and then toward Arizona State Trust land.
- Area 5 is composed of North Cleopatra Street to the east, North Rita Avenue to the west, Queen Creek Drive to the north, and state trust lands to the south. The area includes a 64-foot gradual elevation change on a west-facing slope, from Rita Avenue to Cleopatra Street. Winds from the southeast would push the fire through homes on North Cleopatra Street and toward state trust lands.

The Queen Valley sub-WUI consist of a steadily rising elevation and areas of increasing slope from the lower elevations of Queen Valley to the foothills of the Superstition Mountains within the northern portion of the sub-WUI. Vegetation associations within this sub-WUI range from desert scrub types on the desert floor to mixed desert shrub and woodlands in the foothills of the Superstition Mountains. Analysis of fire start data from 2007 to 2016 indicated a hotspot of ignitions just to the east of Queen Valley along the Queen Creek corridor (Figures 2.2 through 2.5 above).

### ***San Manuel Sub-WUI***

The Pinal County CWPP analyses determined that approximately 90 percent of the San Manuel sub-WUI (Figure 2.6 above) is at moderate risk for wildland fire. Due to a low-moderate wildfire threat, low ignition history, and overall low wildfire effects, the overall wildland fire risk rating of the San Manuel sub-WUI is moderate.

The San Manuel sub-WUI includes the unincorporated community of San Manuel and areas outside the San Manuel Fire District north to SR 77, east of the San Pedro River corridor, south to the Pinal County boundary, and west to the Oracle Sub-WUI. San Manuel is a rural community located adjacent to the San Pedro River riparian corridor on Veterans Memorial Blvd south of the community of Mammoth. Veterans Memorial Blvd is the only major transportation route for this community; it connects to SR 77 northwest of San Manuel. According to 2016 ACS data, the population of the town of San Manuel is 3,725 (a 14.9 percent decrease from the 2000 Census data) with 1,635 housing units (a 10.8 percent decrease). Land ownership is almost entirely private with State Trust land beyond. The areas at highest risk for wildland fires within the WUI occur primarily along the San Pedro River riparian corridor and in upland areas with ascending slope to the east of the riparian corridor. Additionally, areas of high risk are located within the southwestern portion of the sub-WUI, within woodland vegetation associations occurring adjacent to the CNF, and within the area extending northeast of the CNF to SR 77. Fires in this area of the sub-WUI could create concerns for wildfire response resources and community evacuation along Veterans Memorial Blvd north to SR 77. In extreme wildfire conditions community evacuations may be directed south along Veterans Memorial Blvd toward the community of Cascabel and eventually to I-10 at Benson. The San Pedro River riparian corridor, with associated side channels

and drainages within the San Manuel sub-WUI, are considered areas of elevated risk from wildland fire. Vegetation associations at highest risk for wildfire consist primarily of riparian, woodland, and mixed desert scrub. Analysis of fire-start data from 2007 to 2016 indicate little to no ignitions within the San Manuel Sub-WUI (Figures 2.2 through 2.5 above).

### ***Superior Sub-WUI***

The Pinal County CWPP analyses determined that approximately 76 percent of the Superior sub-WUI (Figure 2.6 above) is at moderate risk for wildland fire. There is an elevated risk from a density of developed areas in proximity to high threat wildland fuels and elevated areas of risk in the Queen Creek riparian corridor. Due to a generally moderate to high wildfire threat, generally low ignition history, and overall low fire effects, the overall wildland fire risk rating of the Superior sub-WUI is moderate.

The town of Superior is located on SR 60 at the junction of SR 177 and was established initially as a silver and copper mining community. The Oak Flats campground and Boyce Thompson Southwestern Arboretum are significant attractions near the community. Superior has identified three historic districts. According to 2016 ACS data, the population of Superior is 2,895 (an 11.0 percent decrease from the 2000 Census data), with 1,459 housing units (a 0.7 percent decrease). Land ownership is primarily private, surrounded by TNF. The Superior Fire Department has an ISO rating of 3. Vegetative associations within this sub-WUI range from desert scrub types on the desert floor to mixed desert shrub associations in the mountain foothills. During extraordinary rainfall years, changes in vegetation could result in higher wildland fire risk. Analysis of fire-start data from 2007 to 2016 indicates that the highest incidences of ignition occur within or adjacent to the sub-WUI either within or adjacent to TNF lands along the northern portion of the sub-WUI (Figures 2.2 through 2.5 above).

### ***Top of the World Sub-WUI***

The Pinal County CWPP analyses determined that approximately 93 percent of the Top of the World sub-WUI (Figure 2.6 above) is at moderate risk for wildland fire. Due to a moderate to high wildfire threat, low ignition history, and overall low wildfire effects, the overall wildland fire risk rating of the Top of the World sub-WUI is moderate. Localized areas of high in the vicinity of Top of the World can be attributed to housing density and high ISO rating.

The Top of the World sub-WUI includes the unincorporated community of Top of the World and the Oak Flats area. Top of the World is a rural community located in northeast Pinal County along US 60. The community of Top of the World, listed as moderate risk within the *Arizona-Identified Communities at Risk* (ADFFM 2009). US 60 is the only major transportation route for this community. According to 2016 ACS data, the population of the community of Top of the World is 236 (a 28.5 percent decrease from the 2000 Census data), with 131 housing units (a 28.8 percent decrease). Land ownership is primarily private and TNF. Top of the world is not within a fire district and therefore has an ISO rating of 10. The Top of the World sub-WUI is composed, almost exclusively, of areas at high wildland fire risk. Highest risk for wildland fires within the Top of the World sub-WUI is a result of the combination of volatile vegetative associations occurring in conjunction with southerly exposures of increasing steep

slopes. During extraordinary rainfall years, changes in vegetation could result in higher wildland fire risk. Analysis of fire-start data from 2007 to 2016 indicates that the highest incidences of ignition occur within or adjacent to the sub-WUI either within or adjacent to the TNF lands along the northern and eastern portions of the sub-WUI (Figures 2.2 through 2.5 above).

## **2. Western WUI Communities**

### ***Ak-Chin Indian Community Sub-WUI***

The Pinal County CWPP analyses determined that approximately 76 percent of the Ak-Chin sub-WUI (Figure 2.6 above) is at low risk for wildland fire. Due to areas of generally low wildfire threat, low ignition history, and overall low wildfire effects, the overall wildland fire risk rating of the Ak-Chin sub-WUI is low.

The Ak-Chin Indian Community sub-WUI is restricted to tribal trust lands within the Pinal County CWPP analysis area. The Ak-Chin Indian Community comprises 21,452 acres approximately 30 miles south Phoenix. It is situated in the Santa Cruz Valley, a nearly flat landscape of deep sandy soils composed primarily of lower-elevation desert scrub-shrub vegetative communities. The community of Maricopa Colony, listed as low risk within the *Arizona-Identified Communities at Risk* in 2007, but not listed in 2009 (ADFFM 2007, 2009) is located within the Ak-Chin sub-WUI. Land use within the Ak-Chin sub-WUI is primarily agricultural. Additionally, the Ak-Chin Indian Community owns a 109-acre industrial park, located at the southeast corner of the reservation, adjacent to the Maricopa-Casa Grande Highway and the Southern Pacific Railroad. Major transportation corridors for the community include SR 238, which intersects the community at the northeast corner, and SR 347, which bisects the community connecting I-8 and I-10. According to the 2016 ACS data, the population of the Ak-Chin Indian Community is 1,351 (an 82.1 percent increase from the 2000 Census data), with 403 total housing units (a 72.2 percent increase). Structural and wildland fire protection is provided by the Ak-Chin Fire Department. The Ak-Chin Fire Department has identified areas of elevated concern due to wildland vegetative fuels in proximity to residential and community structures.

The vegetation of the sub-WUI is composed primarily of desert scrub-shrub vegetative communities. Creosotebush flats dominate the landscape and are not conducive to intensive wildland fire due to noncontiguous aerial or ground fuels. However, during extreme rainfall years the deep loamy soils can produce abundant light flues from invasive annual and perennial grasses. In extreme rainfall years significant ground fuels are produced within the identified areas of concern, creating isolated areas of high threat. Analysis of fire start data from 2007 to 2016 indicates greater numbers of ignitions in the northwest portion of the Ak-Chin sub-WUI (Figures 2.2 through 2.5 above).

### ***Avra Valley Sub-WUI***

The Pinal County CWPP analyses determined that approximately 57 percent of the Avra Valley sub-WUI (Figure 2.6 above) is at moderate risk and that 42 percent is at low risk for wildland fire. Due to areas of low to high wildfire threat, low ignition history, and overall low wildfire effects, the overall wildland fire risk rating of the Avra Valley Community sub-WUI is moderate.

This sub-WUI includes the communities and isolated private lands along the I-10 corridor. These include the communities of Red Rock and Picacho and the Picacho Peak State Park, all of which are located within the lower Santa Cruz River Valley. According to 2016 ACS data, the population of Avra Valley is 5,606 (an 11.3 percent increase from the 2000 Census data), with 2,484 housing units (a 31.1 percent increase). Land ownership is primarily State Trust, private, and State Park land. The Avra Valley Fire District was formed in 1977 to ensure the safety to these communities. Fire stations within the fire district are staffed 24 hours with professional firefighters trained in both structural and wildfire response. The fire district encompasses over 265 square miles across Pinal and Pima Counties and serves nearly 10,000 residents within the combined counties. The Avra Valley Fire District has an ISO rating of 3. Areas of high risk from wildland fire occur on the southern and western portion of this sub-WUI in proximity to the foothills of the Sacaton Mountains, as well as the foothills area of Picacho Peak within and adjacent to the Picacho Peak State Park. During extreme rainfall years, increased production of fine fuels from invasive annual forbs (pigweed) and grasses (Mediterranean grass) as well as the continually increasing invasion of perennial grasses, such as buffelgrass, creates areas of high risk during spring/summer drought months in areas of increasing slope and southerly exposures. Analysis of fire starts from 2007 to 2016 indicate the greatest number of ignitions along the I-10 corridor (Figures 2.2 through 2.5 above).

### ***Casa Grande Sub-WUI***

The Pinal County CWPP analyses determined that approximately 62 percent of the Casa Grande sub-WUI (Figure 2.6 above) is at low risk and that 31 percent is at moderate risk for wildland fire. Due to areas of generally low wildfire threat, generally low ignition history and varying wildfire effects, the overall wildland fire risk rating of the Casa Grande sub-WUI is low.

The Casa Grande sub-WUI includes the incorporated city of Casa Grande and areas outside the fire department south to the I-10/I-8 interchange, north along the I-10 corridor to the crest of the Sacaton Mountains, and just west of the Greene and Santa Rosa Washes. The Union Pacific Railroad traverses the WUI north to south. There are several large xeroriparian areas, including Santa Rosa Wash, Greene Wash, and the Casa Grande Canal downstream of the Picacho Reservoir, within this sub-WUI that are considered areas of elevated wildland fire concern. This is a rural-to-urban community located along I-10 between Tucson and Phoenix. I-10 and SR 84 are major transportation routes for this city. Additionally, several state routes and local roads feed into and out of the city. According to 2016 ACS data, the population of Casa Grande is 51,571 (a 104.4 percent increase from the 2000 Census data), with 21,811 housing units (a 99.4 percent increase). The Casa Grande Fire Department has an ISO rating of 4. The majority of the Casa Grande sub-WUI is classified as low wildland fire risk. Analysis of fire starts from 2007 to 2016 indicates several ignitions, primarily along roadways and in populated areas. The relatively flat landscape composed of desert scrub-shrub vegetative communities that dominate the landscape is not conducive to intensive wildland fire due to noncontiguous aerial or ground fuels. However, during extreme rainfall years, abundant annual and invasive grasses can create areas of high risk within the foothills of the Sacaton and Casa Grande Mountains as well as within the major xeroriparian areas within the sub-WUI (Figures 2.2 through 2.5 above).

### ***Coolidge Sub-WUI***

The Pinal County CWPP analyses determined approximately 60 percent of the Coolidge sub-WUI is at low risk for wildland fire. Due to generally low wildfire threat, low ignition history, and localized wildfire effects, the overall wildland fire risk rating of the Coolidge sub-WUI is low.

The Coolidge sub-WUI (Figure 2.6 above) includes the incorporated city of Coolidge and developed and agricultural lands surrounding the city. This is a rural city located along SR 87 and SR 287 east of Casa Grande. SR 87 and SR 287 are the major transportation routes for the city; SR 87 connects to I-10 to the south at Eloy and connects to SR 587 (Arizona Avenue) northwest of Coolidge. Additionally, numerous local roads feed into and out of the city. The Union Pacific Railroad traverses the WUI north to south. The Coolidge Fire Department provides fire protection to 10,800-plus residents and covers an area of 65-plus square miles within this sub-WUI. The fire department currently responds from two stations and is staffed by a combination of fully and partially paid and firefighters. According to 2016 ACS data, the population of Coolidge is 12,073 (a 55.1 percent increase from the 2000 Census data), with 4,472 housing units (a 40.7 percent increase). The majority of open lands within the sub-WUI are privately-owned agricultural lands. Coolidge has been the center of Arizona's cotton industry, and agriculture remains a significant economic component of the city. The majority of the sub-WUI is classified as low risk of wildland fire. The relatively flat landscape composed of desert scrub-shrub vegetative communities that dominate the landscape is not conducive to intensive wildland fire due to noncontiguous aerial or ground fuels. However, during extreme rainfall years, abundant annual and invasive grasses can create areas of high risk within the southern foothills of the Sacaton Mountains in the northeastern portion of the WUI (Figures 2.2 through 2.5 above).

### ***Eloy Sub-WUI***

The Pinal County CWPP analyses determined that approximately 52 percent of the Eloy sub-WUI (Figure 2.6 above) is at moderate risk and that 45 percent is at low risk for wildland fire. Due to areas of generally low wildfire threat, low ignition history that is localized to major roadways and localized wildfire effects, the overall wildland fire risk rating of the Eloy sub-WUI is moderate.

The Eloy WUI includes the incorporated city of Eloy and adjacent lands outside the fire district, including the communities of Arizona City and Toltec. Structural and wildland fire protection for these communities is from the Eloy and Arizona City Fire Districts. This sub-WUI is primarily composed of rural communities located along I-10 and SR 87 south of Casa Grande and encompasses a low to moderate population density. I-10 is the major transportation route for the communities; SR 87 provides access to the communities and connectivity to communities to the north. Additionally, numerous local roads feed into and out of the communities. The Union Pacific Railroad parallels SR 87 through the sub-WUI. According to 2016 ACS data, the population of Eloy is 17,128 (a 65.1 percent increase from the 2000 Census data), with 3,651 housing units (a 33.4 percent increase). Arizona City is a planned community at the midpoint of the Phoenix-Tucson I-10 corridor. The area supports industrial, commercial, and residential developments. The community was established in 1960 and has not been incorporated. The community also includes a 48-acre lake available for recreational boating and fishing.



The estimated population of the Arizona City area from the 2016 ACS data is 10,489, with 5,187 housing units. The Eloy sub-WUI is located within the Santa Cruz Flat, which is composed of desert scrub-shrub vegetative communities that dominate the landscape and that are not conducive to intensive wildland fire due to noncontiguous aerial or ground fuels. Analysis of fire start data from 2007 to 2016 indicates relatively high numbers of ignitions along the I-10 and SR 87 roadway corridors, but few outside of those areas. The Eloy sub-WUI includes the area surrounding the, primarily private, developed and agricultural lands that include the community of La Palma, which is located between the municipalities of Coolidge and Eloy. This sub-WUI also includes Picacho Reservoir and associated adjacent lands. Areas of highest wildfire risk are located on the eastern and southeastern portion of the area within the foothills of the Picacho Mountains, Picacho Peak State Park, and in the riparian habitats within the Picacho Reservoir and its associated canals and drainages (Figures 2.2 through 2.5 above).

### ***Florence Sub-WUI***

The Pinal County CWPP analyses determined that approximately 65 percent of the Florence sub-WUI (Figure 2.6 above) is at moderate risk and that 32 percent is at low risk for wildland fire. Due to areas of generally low wildfire threat, low ignition history and localized wildfire effects, the overall wildland fire risk rating of the Florence sub-WUI is moderate.

The Florence sub-WUI includes the municipality of Florence and surrounding primarily private, agricultural, and developed lands. The sub-WUI includes portions of the Gila River and Florence–Casa Grande Canal riparian corridors. Florence is the capital seat of Pinal County, located on SR 79 and SR 287 west of I-10 approximately 61 miles southeast of Phoenix and 70 miles northwest of Tucson. The Florence sub-WUI includes one of Arizona’s state prison complexes as well as Florence Military Reservation an Arizona Army National Guard Training Site. According to 2016 ACS data, the population of Florence is 26,221 (a 53.8 percent increase from the 2000 Census data), with 7,639 housing units (a 137.5 percent increase). Land ownership is primarily private and State Trust land, with smaller portions of BLM land scattered throughout. The Florence sub-WUI is located within the relatively flat lowlands of the Gila River Valley. The vegetation of the sub-WUI ranges from desert scrub-shrub communities (primarily creosotebush flats), which dominate the landscape and are not conducive to intensive wildland fire due to noncontiguous aerial or ground fuels, to upland Sonoran desert shrub communities, which during extreme rainfall years can produce abundant light fuels from invasive annual and perennial grasses. In extreme rainfall years significant ground fuels are produced within the bajadas of the western slopes of the Tortilla Mountains and the ascending slopes north of the community to the Mineral Mountain and White Canyon Wilderness area, which create areas of high risk for wildland fire within southerly exposed steep slopes. Analysis of fire start data from 2007 to 2016 indicates the Florence sub-WUI does not have a history of a high number of wildland fire ignitions (Figures 2.2 through 2.5 above).

### ***Gila River Indian Community Sub-WUI***

The Pinal County CWPP analyses determined that approximately 82 percent of the Gila River Indian Community Sub-WUI (Figure 2.6 above) is at moderate risk for wildland fire. Due to areas of generally

high wildfire threat, moderate to high ignition history, and generally low wildfire effects, the overall wildland fire risk rating of the Gila River Indian Community Sub-WUI is low.

The Gila River Indian Community consists of 372,686 acres approximately 25 miles south of Phoenix and 70 miles north of Tucson. The tribal administrative offices and departments are located in Sacaton, Arizona, and serve residents within seven community districts. The communities of Santa Cruz and St. John, both listed as moderate risk within the Arizona *Identified Communities at Risk* (ADFFM 2009), are located adjacent to the Gila River within the Gila River sub-WUI. The principal land use within the sub-WUI is agricultural, with steadily increasing industrial, retail, and recreational development. The community owns and operates three industrial parks—the Lone Butte Park is considered one of the most successful tribal industrial parks. Structural and wildland fire protection is provided to the communities by the Gila River Fire Department. According to 2016 ACS data, the population of the Gila River Indian Community is 13,031 (a 15.8 percent increase from the 2000 census data), with 4,213 housing units (no housing data available from the 2000 Census data). The vegetation of the sub-WUI consists primarily of desert scrub-shrub vegetation associations. Creosotebush flats dominate the upland landscape and are not conducive to intensive wildland fire due to noncontiguous aerial or ground fuels. However, during extreme rainfall years the deep loamy soils can produce abundant light fuels from invasive annual and perennial grasses. The highest wildland fire risk within the sub-WUI is related to the Gila River riparian corridor that has been heavily invaded by saltcedar. Wildland fires within dominant stands of saltcedar can burn at high intensities and have relatively high rates of spread. During normal burning conditions, fire brands will commonly move in excess of 700 feet in front of the headfire. Analysis of fire start data from 2007 to 2016 indicates the Gila River sub-WUI has the greatest number and highest density of fire starts compared to the other sub-WUIs. Many of these ignitions have occurred within agricultural lands and are consistent with normal agricultural practices. However, ignitions, whether natural or human caused, within proximity to the riparian corridor have the potential to create unwanted wildfire. Wildfires that occur within riparian corridors can have significant watershed and community water supply impacts due to ash, increased heavy metals, and soil erosion following extreme wildfire behavior that removes vegetative cover (Figures 2.2 through 2.5 above).

### ***Maricopa Sub-WUI***

The Pinal County CWPP analyses determined that approximately 51 percent of the Maricopa sub-WUI (Figure 2.6 above) is at high risk and that 39 percent is at moderate risk for wildland fire. Due to areas of low-high wildfire threat, generally low ignition history, and dispersed wildfire effects, the overall wildland fire risk rating of the Maricopa sub-WUI is moderate. Localized areas of high in the western portion of the Maricopa WUI can be attributed to housing density and high ISO rating.

The Maricopa WUI includes the municipality of Maricopa and the community of Stanfield, as well as developed and agricultural lands surrounding the communities. The Ak-Chin Indian Community sub-WUI is located between the communities of Maricopa and Stanfield. Land ownership is primarily private. The communities are located south of I-10 and north I-8, in western Pinal County. Maricopa serves as a bedroom community for the Greater Phoenix Valley communities. Although the

communities have primarily been agricultural, they are expanding to include housing and light industry; for example, Volkswagen and Nissan have automobile proving grounds in the communities. SR 84, SR 347, and SR 238 are the primary routes for the communities, with I-10 and I-8 as the major transportation routes north and south of the communities. The Union Pacific Railroad parallels SR 238 through the sub-WUI. According to 2016 ACS data, the population of Maricopa is 45,473, with 16,983 housing units. The 2016 ACS data estimates the population of the Stanfield area at 332, with 162 housing units. Structural and wildland fire protection is provided to the communities by the Maricopa Fire Department and the Stanfield Fire District. The Maricopa sub-WUI is located within the relatively flat low valleys of the Santa Cruz River Valley and the Santa Rosa and Greene wash drainages. This low desert valley area is composed of desert scrub-shrub vegetative communities, which dominate the landscape and are not conducive to intensive wildland fire due to noncontiguous aerial or ground fuels. However, in extreme rainfall years significant ground fuels are produced within the foothills of the Sacaton Mountains on the eastern portion of the WUI and also within the foothills of the Table Top Mountains along the south and southwest corner of the Pinal County WUI boundary; these conditions create areas of high risk within southerly exposed steep slopes. Analysis of fire start data from 2007 to 2016 indicates Maricopa and the area to the northeast of Maricopa have one of the highest ignition densities in the WUI (Figures 2.2 through 2.5 above).

### ***Queen Creek Sub-WUI***

The Pinal County CWPP analyses determined that 83 percent of the Queen Creek sub-WUI (Figure 2.6 above) is at low risk for wildland fire. Due to areas of low to high wildfire threat, low ignition history, and a variety of wildfire effects, the overall wildland fire risk rating of the Queen Creek sub-WUI is low.

The Queen Creek sub-WUI includes the San Tan Mountain Regional Park and the portion of the incorporated town of Queen Creek that lies within Pinal County; much of Queen Creek is within Maricopa County, and this portion was not included in the analysis. Queen Creek is easily accessible from many directions and has easy access to US 60 to the north and I-10 to the west. The WUI includes a portion of the Union Pacific Railroad. According to 2000 census data, the population of Queen Creek was 4,316 residents. According to 2016 ACS data, the population of Queen Creek is 30,849 (a 714 percent increase from the 2000 Census data), with 10,545 housing units (a 331.7 percent increase). Land ownership is primarily private and State Trust land. Analysis of fire start data from 2007 to 2016 indicates very few ignitions within the Queen Creek sub-WUI. The majority of the relatively flat landscape composed of desert scrub-shrub vegetative communities that dominate the eastern half of the sub-WUI is not conducive to intensive wildland fire due to noncontiguous aerial or ground fuels and does not have a history of high wildland fire ignitions (Figures 2.2 through 2.5 above).

### ***Tohono O'odham Nation Sub-WUI***

The Pinal County CWPP analyses determined that approximately 93 percent of the Tohono O'odham Nation sub-WUI (Figure 2.6 above) is at moderate risk for wildland fire. Due to areas of generally low

wildfire threat, localized ignition history and low wildfire effects, the overall wildland fire risk rating of the Tohono O’odham Nation sub-WUI is moderate.

The Tohono O’odham Nation is located in the southern portion of the Pinal County CWPP analysis area and includes the tribal community of Chuichu. Chuichu is primarily an agricultural community located adjacent to Greene Wash. According to 2016 ACS data, the population of Chuichu is 417 (a 23.0 percent increase from the 2000 Census data), with 117 housing units (a 33.0 percent increase). The sub-WUI has a low population density. Structural and wildland fire protection for the community is provided by the Tohono O’odham Fire Department. The Greene Wash riparian corridor is a major drainage originating in Aguirrie Valley and flowing through the Santa Cruz Valley along the eastern foothills of the Sawtooth Mountains to its confluence with the Gila River to the north. The riparian corridor does, under normal rainfall years, produce significant amounts of fine and moderate fuel within areas heavily vegetated with perennial grasses, such as cane canary grass, and areas of heavy fuels from deciduous desert riparian vegetation. The upland vegetation associations of the sub-WUI include desert scrub composed of creosotebush associations and shrub associations consisting of Sonoran-Paloverde mixed cacti associations. Creosotebush flats, which dominate the nearly level lower-elevation valley floor, are not conducive to intensive wildland fire due to noncontiguous aerial or ground fuels. Upland shrub associations, during extreme rainfall years, can produce abundant light fuels from invasive annual and perennial grasses. The highest wildland fire risk within the sub-WUI is related to the Greene Wash xeroriparian corridor that has been invaded by annual and perennial grasses and saltcedar. Analysis of fire start data from 2007 to 2016 indicates the Tohono O’odham Sub-WUI has a history of little to no wildland fire ignitions (Figures 2.2 through 2.5 above).

## **H. Wildfire Risk Analysis**

The wildfire risk analysis synthesizes the risk associated with fuel hazards, wildfire ignitions, wildfire occurrence, and community values. Overall risk is determined by wildfire-threat analyses (composed of potential wildfire behavior and wildfire ignition history) and by wildfire-effects analyses (composed of structure density and wildfire response within the WUI in consideration of fire suppression resources). These components were analyzed spatially and combined to determine the cumulative wildfire risk for the WUI. Figure 2.8 and Table 2.9 display the results of the wildfire risk analysis, identifying the areas and relative percentages of WUI areas of high, moderate, and low wildfire risk.



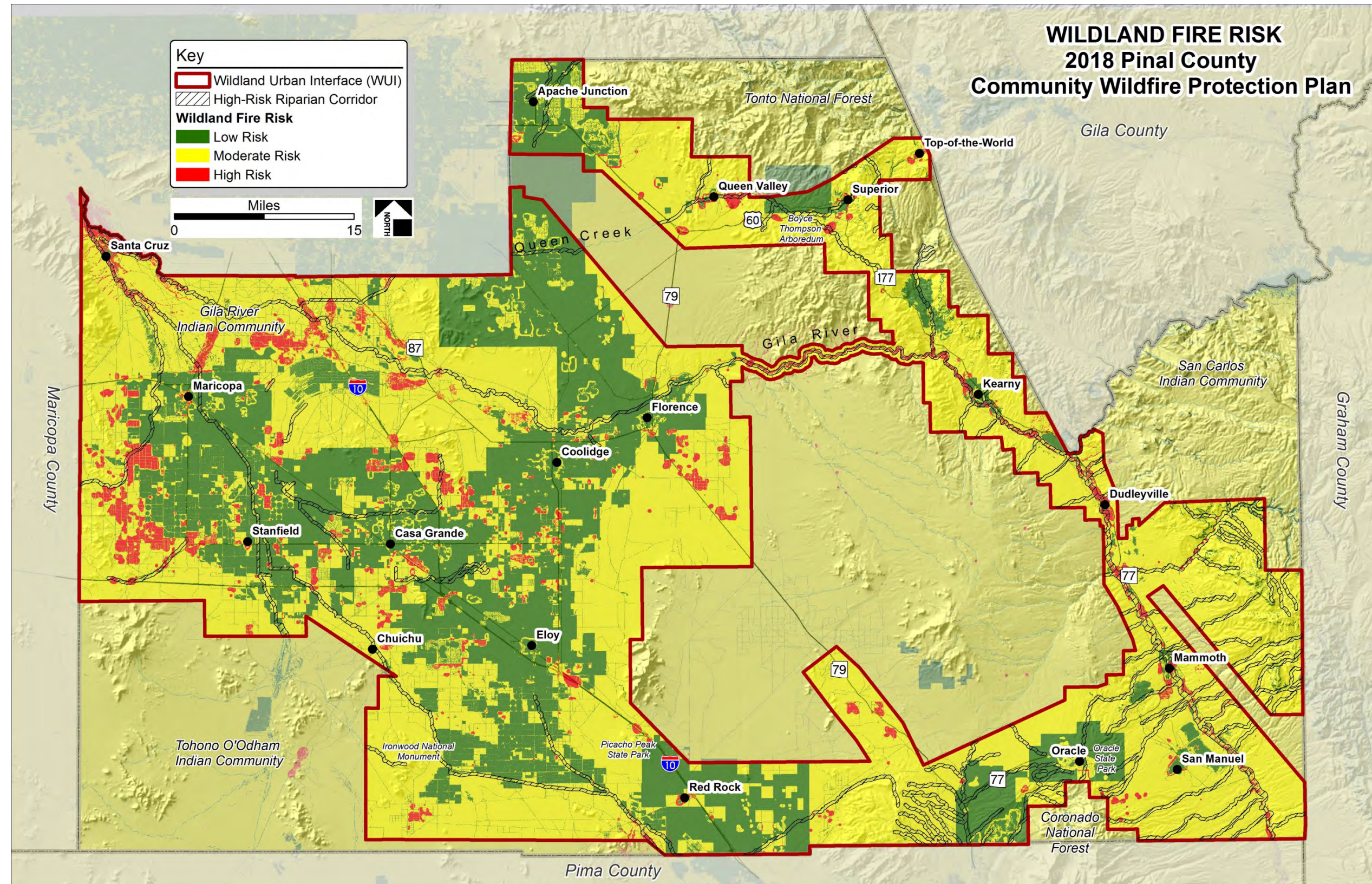


Figure 2.8. Pinal County CWPP Wildland Fire Risk Analysis



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**Table 2.9. Wildfire Threat Assessment by Percentage and Acreage of the WUI**

Pinal County CWPP Community sub-WUI	High risk		Moderate Risk		Low Risk		Total acres
	(%)	Acres	(%)	Acres	(%)	Acres	
Ak-Chin Indian Community	0.4	94	23.4	5,027	76.1	16,327	21,448
Apache Junction	1.6	799	43.1	21,660	55.3	27,834	50,294
Avra Valley	1.1	2,249	57.1	113,938	41.8	83,373	199,561
Casa Grande	7.1	9,581	31.0	41,867	61.9	83,553	135,001
Coolidge	3.7	3,455	36.4	33,847	59.9	55,762	93,064
Dudleyville	8.1	3,914	86.0	41,537	5.9	2,840	48,291
Eloy	2.3	3,950	52.4	91,181	45.3	78,740	173,871
Florence	3.2	4,724	65.0	95,576	31.8	46,832	147,132
Galiuro Mountains	0.3	307	93.8	84,349	5.9	5,312	89,968
Gila River Indian Community	7.3	20,235	82.1	229,092	10.6	29,610	278,937
Gila River Riparian Corridor	15.4	1,920	84.5	10,540	0.1	11	12,471
Golder Ranch	1.7	1,968	79.5	93,988	18.8	22,285	118,240
Kearny	3.1	2,060	83.4	55,694	13.6	9,056	66,810
Mammoth	5.4	2,540	86.7	40,569	7.9	3,695	46,804
Maricopa	10.4	21,098	50.9	103,163	38.7	78,591	202,851
Oracle	0.2	99	57.1	23,771	42.7	17,774	41,644
Queen Creek	<0.1	13	17.0	12,652	83.0	61,846	74,511
Queen Valley	4.7	2,371	92.3	46,290	3.0	1,511	50,172
San Manuel	3.0	2,638	90.4	80,805	6.7	5,983	89,426
Superior	3.4	1,368	76.4	31,206	20.2	8,264	40,839
Tohono O'odham Nation	2.6	291	92.5	10,248	4.9	544	11,084
Top of the World	3.8	373	90.4	8,912	5.8	573	9,859
<b>Total</b>	<b>4.3</b>	<b>86,049</b>	<b>63.7</b>	<b>1,275,912</b>	<b>32.0</b>	<b>640,317</b>	<b>2,002,277</b>

Source: Logan Simpson 2018.

Note: WUI = wildland-urban interface.

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### III. COMMUNITY MITIGATION PLAN

This section of the Pinal County CWPP outlines the revised priorities for wildland fuels modifications and treatments, as well as the recommended methods of treatment and management strategies for mitigating the potential spread of catastrophic wildland fire throughout the WUI. The Pinal County municipalities and communities, BLM, CNF, and TNF have conducted wildland fuels modifications and treatments as well as forest restoration projects within and adjacent to the WUI since development of the 2009 Pinal County CWPP. The previous treatment areas were reviewed and current priority areas were chosen for future fuels modification and restoration treatments that are described in this revised Pinal County 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 Management Priorities

Wildland fuel reduction and restoration treatments have occurred within or proximate to the WUI from 2008 through 2017. For example, the CNF has an active fuels and restoration program that includes the use of wildfire (planned and unplanned natural ignitions) and mechanical treatments. Since 2009, the CNF has treated approximately 590 acres within the Pinal County CWPP analysis area. Mechanical treatments (mastication, thinning) were conducted for the majority of those acres. Additionally, the City of Apache Junction has conducted fuel reduction treatments on approximately 40 acres of private and public lands in last nine years.

Future wildland fire mitigation projects are being proposed for at-risk federal, public, and private lands that have not had prior fuel reduction or restoration treatments. These proposed actions are recommended 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 defensible space<sup>4</sup> within fire-adapted communities. A primary goal of the revised Pinal County CWPP is for proposed treatments to be continuous across property boundaries, which would allow for the most effective protection from wildfires and would complement those fuel mitigation and restoration treatments conducted since development of the 2009 Pinal County CWPP.

To prioritize wildland fuel mitigation projects, wildland fire risk was calculated through analyzing fire threat, fire effects, and fire history. Wildland fire effects were analyzed through determination of proximity of structure density and local wildfire response capabilities to 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 (refer to Figure 2.8 in Section II). The 2009 Pinal County CWPP identified and categorized a total of 153 treatment management units (TMUs) within the 21 sub-WUI areas, with an overall risk value determined for each TMU. The TMUs from the 2009 Pinal County CWPP were reviewed and revised in accordance with the

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<sup>4</sup> A “defensible 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.



current risk assessment. The Core Team has identified 125 TMUs (refer to Figure 3.1 and Table 3.2) based on similar risk values and fuel reduction treatments necessary to meet fire-adapted community goals. Detail TMU maps are located in Appendix C.

## **B. Fuels Modifications and Treatments**

After determining areas currently at greatest risk for wildland fire (refer to Section II of this CWPP), the Core Team reviewed and amended the 2009 proposed wildland fire mitigation recommendations for residential treatments, fuel breaks<sup>5</sup> appropriate for the wildland fuel types, and fuel mitigation treatments for undeveloped landscapes, as necessary (refer to Table 3.1). The series of fuel reduction and restoration recommendations in Table 3.1 meet agency and community wildfire preparedness goals.

Hazardous fuels reduction recommendations on federal and private lands within or adjacent to the WUI vary between implementing single fuel breaks and applying broader land treatments. Additional fuel breaks or hazardous fuels reduction projects from those implemented since the 2009 Pinal County CWPP are recommended and conform to the types of treatment recommendations developed by the 2009 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 defensible wildland fire space on their lands and within 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 wildland fire protection and the creation of defensible space in fire-adapted communities. The Core Team 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 recommended land treatments and fuel breaks will enhance public and firefighter safety, protect community values, restore native vegetation, reduce spread of non-native grasses, and provide for wildlife habitat needs. Several federally designated wilderness areas are within or adjacent to the Pinal County WUI: Superstition, Table Top, Aravaipa Canyon, and White Canyon wilderness areas. Wildland fuel mitigation treatments within wilderness areas will be conducted by BLM and TNF under appropriate wilderness regulations. Fuel breaks may be recommended along specific, identified private in-holdings adjacent to wilderness boundaries to allow federal partners to use appropriate management response.

These revised wildland vegetative fuel and fuel break recommended treatments meet the revised Pinal County CWPP 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.

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<sup>5</sup> In this plan, “fuel break” is a strip of land where vegetation has been modified so that fires burning into it can be more readily controlled.



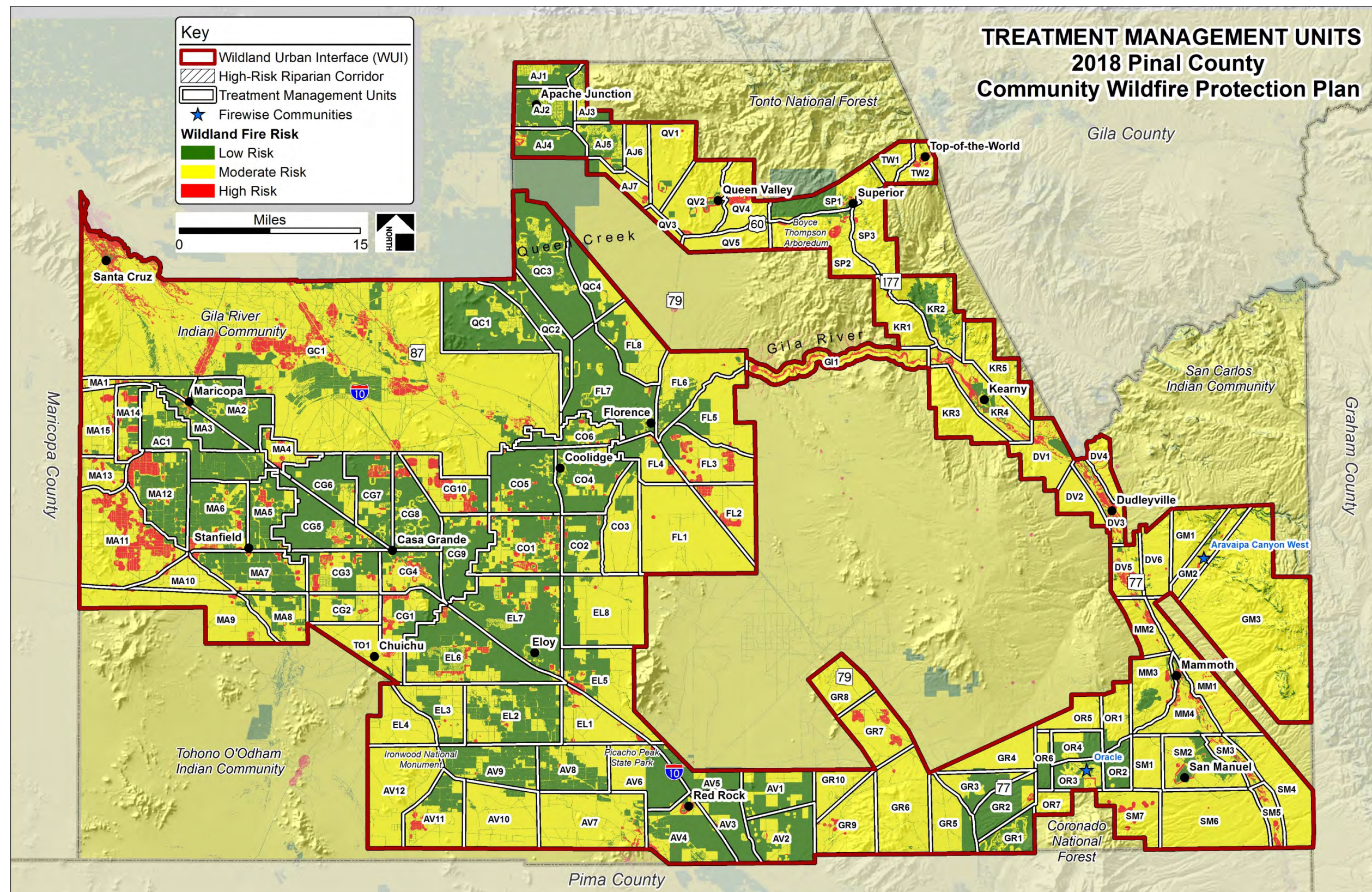


Figure 3.1. Pinal County CWPP Treatment Management Units



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Table 3.1. Fuel Modification and Treatment Plans

Treatment No.	1 Developed private parcels <2 acres				2 Undeveloped private parcels or single-structure parcels >2 acres		3 Grassland firebreaks		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 from structures)	Slopes <20%	Streambeds, channels, and slopes ≥20%	Slopes <20%	Slopes ≥20%	Landscape treatment outside firebreaks	Firebreaks
Vegetation	<p>Remove ladder fuels by pruning the lower third of trees or shrubs up to a maximum of 10 feet to reduce flammable vegetation.</p> <p>Remove and destroy insect-infested, diseased, and dead trees and shrubs.</p> <p>Grasses and forbs may be cut with a mower to a 4-inch stubble.</p> <p>Remove dead plant material from ground; prune tree limbs overhanging roof; remove branches within 10 feet of chimney; remove flammable debris from gutters and roof surfaces.</p> <p>Any large propane tanks on a property should be free and clear of any vegetation.</p>	<p>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.</p> <p>Create separation between trees, tree crowns, and other plants based on fuel type, density, slope, and other topographical features.</p> <p>Reduce continuity of fuels by creating a clear space around brush or planting groups.</p> <p>Grasses and forbs may be cut with a mower to a 4-inch stubble.</p> <p>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.</p> <p>Any large propane tanks on a property should be free and clear of any vegetation.</p>	<p>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.</p> <p>Maximum density of trees (whichever is greater: 60 BA at 80–100 trees/acre or average density of 100 trees/acre).</p> <p>Grasses and forbs may be cut with a mower to a 4-inch stubble.</p> <p>Any large propane tanks on a property should be free and clear of any vegetation.</p>	<p>For natural areas, thin selectively and remove highly flammable vegetation.</p> <p>Carefully space trees; choose Firewise plants.</p> <p>Any large propane tanks on a property should be free and clear of any vegetation.</p>	<p>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.</p> <p>Maximum density of trees (whichever is greater: 60 BA at 80–100 trees/acre or average density of 100 trees/acre)</p> <p>Refer to the Fuel Modification Plan discussion in this section developed to promote riparian health, to prevent spread of fire to adjacent property, and to create defensible space with considerations for wildlife and groundwater protection.</p> <p>Single structure or structures on parcels exceeding 2 acres should include Treatment 1 inch proximity to structures and Treatment 2 for remaining acres.</p>	<p>Remove dead, diseased, and dying trees. Fell dead trees away from stream channels with defined bed and banks.</p> <p>Areas should be hand-thinned and hand-piled; inaccessible areas may be treated with periodic Rx.</p> <p>Develop fuel modification plan (this section) for treatments.</p>	<p>Grassland types may be mechanically treated, including mowing, chopping, or mastication, to reduce or remove vegetation or may be grazed to a stubble height. Ensure that removal of vegetation within a designed firebreak of &gt;1 chain (66 feet) in width and length is sufficient to protect federal, state, or private land values.</p> <p>Fuel reduction treatments within grassland vegetation types may include multiple-entry burns to maintain stand structure and reduce fine fuels. Trees and shrubs &gt;8 inch drc should be thinned to a variable distance of 15–35 feet between trees. Trees and shrubs &lt;8 inches drc should be removed.</p> <p>Mechanical/chemical or grazing treatment may be used to maintain firebreaks on private lands.</p> <p>Refer to 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.</p>	<p>Same as for slopes &lt;20%. Fuel treatments may require hand-thinning and hand-piling or grazing in steep slopes. Rx may be used to reduce high fire potential (refer to Treatment 5). Designated firebreaks may be increased to no more than 2 chains in steep slopes where herbaceous (fine fuels) and subshrub species fuel loads increase to pretreatment levels within 3 years.</p> <p>Refer to 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.</p>	<p>Spacing may be variable with a 20- to 35-foot minimum 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 and Rx (refer to Treatment 5) can be used to reduce vegetative fuels and move stands toward potential natural vegetation groups as described in the <i>FRCC Interagency Handbook</i> (FRCC Interagency Working Group 2005a) or grazed to like conditions. All trees &gt;10 inches drc will be targeted as “leave trees” unless removal is necessary to achieve the desired spacing.</p>	<p>Woodland and shrub trees &lt;8 inches drc will be thinned to a spacing of 15 feet between trees, or Rx will be applied to achieve like conditions. Shrub and tree trunks will be severed &lt;4 inches from the ground. Mechanical treatments, such as crushing, chipping, mastication, and Rx, may be used to create open stands that produce flame lengths of ≤4 feet to minimize crown-fire potential and producing vegetative fuel conditions conducive to suppression action. Herbaceous and subshrub understory may be mechanically treated, including mowing, chopping, and masticating, or grazed to limit fine-fuel loading while protecting soil integrity from rainfall runoff.</p>
Slash	<p>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.</p>	<p>Control soil erosion from small waterflow channels by using rock or noncombustible velocity-reducing structures.</p> <p>Remove all leaf litter to a depth of 1 inch.</p>	<p>Same as Zones 1 and 2.</p>	<p>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.</p>	<p>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.</p>	<p>Clean dead and down debris in channels where debris may be mobilized in floods, thus creating downstream jams.</p> <p>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.</p>	<p>Slash from grassland treatments may be burned, removed, masticated, or turned (disked).</p>	<p>Same as for slopes &lt;20%; however, slash may be hand-piled and ignited with Rx as the primary slash reduction treatment.</p>	<p>Slash may be burned, piled and burned, or chipped and removed. Slash from grassland treatments may be burned, removed, masticated, or turned.</p>	<p>Slash may be burned, piled and burned, or chipped and removed. Slash from grassland treatments may be burned, removed, masticated, or turned.</p>

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Treatment No.	5 Prescribed fire	6 Escape and resource transportation corridors (federal and nonfederal lands)	7 Riparian areas (federal, nonfederal, and private lands)		8 Conditional suppression areas (federal and nonfederal lands)	9 Saltcedar removal for restoration purposes (federal and nonfederal lands)
Treatment category	Federal, state, or private lands	Federal, state, or local government where designated as escape route	Federal or state lands	Firebreaks on private lands	Federal, state, or private lands	Federal, state, or private lands
Vegetation	<p>Prescribed fire will be used as a tool to accomplish specific resource management objectives in accordance with ADFFM, CNF, TNF, and/or BLM standards and guides.</p> <p>Prescribed fire on federal land is authorized if part of an approved prescribed-fire burn plan. Specific authorities exist for each federal agency to use prescribed fire. All project decisions to use prescribed fire are subject to the agency's analysis, documentation, and disclosure requirements for complying with the National Environmental Policy Act (NEPA), National Historical Preservation Act (NHPA) and Endangered Species Act (ESA) requirements. As additional areas within the WUI are identified, prescribed fire may be used as a treatment tool provided the above mentioned requirements have been met.</p> <p>Prescribed fire can occur at low, moderate, and high intensity. Moderate and/or high-intensity fire may be used to create openings where desirable in vegetation types with dense canopies (shrubs, trees).</p>	<p>Reduce fuel loading by thinning trees &lt;10 inches drc. Reduce trees to 15-foot spacing. Shrub and tree trunks will be cut no less than 4 inches from the ground. Stands will be variable across the landscape, such as retention of bands of higher-density vegetation with sufficient understory to maintain functionality of important wildlife movement corridors in areas of low structure density.</p> <p>Mechanical treatments may include chipping, piling and burning, or removal and Rx in the project area.</p> <p>Trees may be left in clumps with fuel ladders removed from below. Dead, diseased, and dying trees of all sizes will be emphasized for removal. Some trees &gt;8 inches drc may be cut to reduce safety hazards or when needed to reach desired 15-foot spacing.</p> <p>Escape and resource transportation corridors may serve as firebreaks in all vegetative types.</p> <p>Firebreaks for each vegetative type, as described in this table, would be implemented at appropriate distance from the centerline of the escape and resource transportation corridors to produce fire-resilient stands and to enhance evacuation and response access.</p> <p>Emphasis will be placed on removing nonnative and flammable species.</p> <p>Grasses and forbs may be cut with a mower to 4-inch stubble.</p>	<p>Riparian treatments will be limited in scope. The majority of riparian areas that fall within the WUI boundary will be avoided unless deemed a fuel hazard.</p> <p>Clearing or cutting of any material by mechanized equipment within 10 feet of any stream on federal land may be prohibited to prevent the risk of accelerating erosion.</p> <p>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).</p> <p>Treatments will emphasize nonnative species. Snags &gt;8 inches may be retained. All presettlement trees, including snags, will be targeted for retention.</p> <p>Restricting the removal of the vegetative overstory in the riparian areas to the period of October 15–March 31 will prevent the disturbance of any nesting by neotropical migrant bird species, including the southwestern willow flycatcher. Fuels reduction should occur October 15–March 31 in riparian areas, as long as fire danger is not extreme.</p>	<p>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.</p> <p>All mechanized equipment must meet state and local fire-department/district standards. Perform treatments October–March annually. Treatment of annuals may be best when annuals are green.</p>	<p>This prescription includes lands with desert shrub/scrub vegetative types in which no fuel modification treatments have been identified as necessary to provide protection from wildland fire. The threat from catastrophic wildland fire is low or nonexistent. This includes areas in which fire never played a historical role in developing and maintaining ecosystems. Historically, in these areas, fire return intervals were very long. These are areas in the WUI in which fire could have negative effects unless fuel modifications take place. These include areas in which the use of fire may have ecological, social, or political constraints and areas in which mitigation and suppression are required to prevent direct threats to life or property. Wildland fire growth within these areas will be monitored for private property, ecological, and cultural threats before initiating suppression. Agency and fire-department/district policy provisions will determine suppression response.</p> <p>During years of extraordinary rainfall, land treatments such as mowing annual vegetation may be necessary to reduce the threat of wildfire as described in Section II.</p>	<p>Areas of monotypic saltcedar or in mix with mesquite or other riparian tree species may be treated mechanically or chemically or by controlled burning and reburning to reduce stem density, canopy, and excessive fuel loading. Mechanical removal for saltcedar by cutting below the root collar during November–January is preferred. Mechanical whole-tree extraction has achieved as high as 90% mortality on initial treatments and may be considered a preferred treatment. Low-volume oil-based herbicide applications in late spring through early fall would be considered for controlling small plants (&lt;2 inches drc). Low-volume cut-stump herbicide applications will be considered in combination with mechanical treatment. Preferred phenological stage for burning is peak summer months and postavian breeding months. Black lines and appropriate headfires should be initiated depending on site-specific vegetative and burning conditions. Maintenance, revegetation, restoration, and monitoring should follow as needed for each treatment area.</p>
Slash	<p>Slash, jack piles, and down logs may be burned as appropriate in consideration of local conditions and distance from private property. Pile or Rx 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.</p>	<p>Snags, slash, and down logs will be removed in proximity to private land. Pile burning or Rx can be used to remove fuel. Snags and down woody material may be retained in areas where fire resilience is not compromised. Vehicle pullouts should be planned in appropriate numbers and locations where vegetation, slope, and terrain permit.</p>	<p>After removal of heavy woody fuels, fine fuels may be maintained by cool-season low-intensity Rx that moves slowly downslope or into prevailing winds to midslope. Large down woody material and snags (≥12 inches) may be retained in riparian areas.</p>	<p>Fuel treatments and woody material removal will occur on existing roads. Cool-season low-intensity Rx may be used for maintenance of fine fuels. Pile or jackpot burning will not occur in ephemeral, intermittent, or perennial stream channels.</p>	<p>Response will be full suppression when firefighter and public safety, property, improvements, or natural resources are threatened.</p>	<p>Created slash will be made available for woody biomass use. If not used for wood-related products, slash will be piled with preexisting fuels and burned, or otherwise used for soil stabilization. Disturbed areas should be immediately revegetated with a native plant community that contains no invasive species and meets other land use objectives, such as wildlife habitat enhancements or recreational-use benefits.</p>

*Note:* BA = basal area, Rx = prescribed fire, drc = diameter at root collar.

**Table 3.2. Identified TMUs**

<b>Treatment management unit</b>	<b>Map ID</b>	<b>Risk value</b>	<b>Fuel model(s)</b>	<b>Recommended treatment<sup>a</sup></b>	<b>Total acres</b>	<b>Federal acres</b>	<b>State Trust acres</b>	<b>Other Nonfederal acres</b>
<b>Ak-Chin Indian Community (AC)</b>	AC1	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3, TL6	1,2,3,5,6,7,8,9	21,448	21,432	0	16
<b>Apache Junction (AJ)</b>	AJ1	L	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH5, TL2, TL3	1,2,3,4,5,7,8,9	6,379	2,451	1,564	2,364
	AJ2	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, TL2, TL3	1,2,3,4,5,6,7,8,9	11,155	722	1,491	8,942
	AJ3	L	GR1, GR2, GS1, GS2, NB1, SH1, SH5, TL2, TL3	1,2,3,4,5,8	4,643	111	1,445	3,088
	AJ4	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, TL2, TL3, TL5	1,2,3,4,5,6,7,8	8,991	34	7,036	1,921
	AJ5	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,4,5,6,7,8	7,707	244	1,003	6,459
	AJ6	M	GR1, GR2, GS1, GS2, NB1, SH1, SH5, TL2, TL3	1,2,3,4,5,8	6,015	2	5,973	40
	AJ7	M	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, TL2, TL3	1,2,3,4,5,6,8	5,404	0	5,206	198
<b>Avra Valley (AV)</b>	AV1	L	GR1, GR2, GS1, GS2, NB1, SH1, SH5, TL2	1,2,3,5,8	13,167	4,812	3,726	4,629
	AV2	L	GR1, GR2, GS1, GS2, NB1, NB9, SH1	1,2,3,5,8	14,512	3,115	6,219	5,179
	AV3	L	GR1, GR2, GS1, GS2, NB1, NB9, SH1, SH5, TL2, TL3	1,2,3,6,8	10,368	0	7,651	2,717
	AV4	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3, TL5	1,2,3,6,7,8,9	18,304	0	11,352	6,951
	AV5	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, SH1, SH5, TL2, TL3, TL6	3,6,8	7,433	0	6,650	783
	AV6	M	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH5, TL2, TL3	1,2,3,6,8	16,191	0	11,790	4,401
	AV7	M	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH5, SH7, TL2, TL3	1,2,3,5,7,8,9	26,950	603	14,962	11,384
	AV8	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, SH1, SH5, TL2, TL3, TL6	1,2,3,7,8,9	15,039	0	10,504	4,535
	AV9	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,5,7,8,9	16,506	50	2,709	13,747
	AV10	M	GR1, GR2, GS1, GS2, NB1, NB3, SH1, SH5, TL2, TL3	3,5,7,8,9	20,478	2,163	11,283	7,032
	AV11	M	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH5, TL2,	1,2,3,7,8,9	15,842	0	7,507	8,335

Treatment management unit	Map ID	Risk value	Fuel model(s)	Recommended treatment <sup>a</sup>	Total acres	Federal acres	State Trust acres	Other Nonfederal acres
			TL3, TL6					
	AV12	M	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH5, SH7, TL2, TL3	3,5,7,8,9	24,772	14,017	9,829	925
<b>Casa Grande (CG)</b>	CG1	H	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH5, TL2, TL3	1,2,3,6,7,8,9	11,272	812	1,586	8,874
	CG2	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL3	1,2,3,7,8,9	9,615	11	599	9005
	CG3	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, SH7, TL2	1,2,3,7,8,9	14,764	0	169	14,594
	CG4	H	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,6,7,8,9	11,434	0	0	11,434
	CG5	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3, TL6	1,2,3,7,8,9	18,138	0	78	18,061
	CG6	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2	1,2,3,7,8,9	11,795	6	422	11,367
	CG7	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,7,8,9	14,727	0	1,251	13,476
	CG8	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, SH1, SH5, TL2, TL3	1,2,3,6,7,8,9	14,730	0	1,487	13,243
	CG9	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,6,7,8,9	14,806	0	44	14,762
	CG10	H	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,6,7,8,9	13,720	163	2,867	10,690
<b>Coolidge (CO)</b>	CO1	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2	1,2,3,8	20,712	0	895	19,817
	CO2	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, SH7, TL2, TL5	1,2,3,5,8	10,886	335	1,483	9,068
	CO3	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, SH1, SH5, TL2	1,2,3,5,8	15,157	19	10,840	4,298
	CO4	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL5	1,2,5,7,8,8	17,409	43	587	16,778
	CO5	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,5,8	19,621	519	646	18,456

Treatment management unit	Map ID	Risk value	Fuel model(s)	Recommended treatment <sup>a</sup>	Total acres	Federal acres	State Trust acres	Other Nonfederal acres
	CO6	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,7,8,9	9,279	0	288	8,991
<b>Dudleyville (D)</b>	DV1	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH7, TL3, TL5, TU1	1,2,3,4,5,6,7,8,9	12,241	7,157	3	5,082
	DV2	M	GR1, GR2, GS1, GS2, NB1, NB3, SH1	3,4,5,6,7,8,9	6,770	3,301	1,994	1,475
	DV3	H	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH7, TL3, TL5, TL8, TU1, TU2	1,2,3,4,5,6,7,8,9	6,891	618	1,969	4,304
	DV4	M	GR1, GR2, GS1, GS2, NB1, NB8, NB9, SH1, SH7, TL3, TU1	3,4,5,6,7,8,9	4,949	2,674	1,497	779
	DV5	H	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH7, TL3, TL5, TL8, TU1	1,2,3,4,5,6,7,8,9	7,506	472	3,044	3,990
	DV6	M	GR1, GR2, GS1, GS2, NB3, NB8, NB9, SH1, SH7, TL5, TU1	1,2,3,4,5,6,7,8,9	9,935	2,135	5,019	2,781
<b>Eloy (EL)</b>	EL1	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3, TL6	1,2,3,5,6,8	13,097	336	8,885	3,876
	EL2	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL6	1,2,3,6,7,8,9	25,982	0	3,418	22,564
	EL3	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL6	1,2,3,5,7,8,9	12,287	109	5,424	6,754
	EL4	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, SH1, SH5, TL2	3,5,7,8,9	12,171	2,033	7,399	2,738
	EL5	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3, TL8	1,2,3,5,6,	20,009	0	13,432	6,576
	EL6	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3, TL6	1,2,3,5,6,8	30,709	67	2,578	28,064
	EL7	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3, TL6	1,2,3,5,6,7,8,9	32,839	0	1,211	31,628
	EL8	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, SH7, TL2, TL3, TL5	1,2,3,5,8	26,778	0	15,643	11,135
<b>Florence (FL)</b>	FL1	M	GR1, GR2, GS1, GS2, NB1, NB8, NB9, SH1, TL5	1,2,3,5,6,8	33,780	110	28,410	5,261
	FL2	H	GR1, GR2, GS1, GS2, NB1, NB3, SH1	1,2,3,5,6,8	12,243	441	7,591	4,211
	FL3	H	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1	1,2,3,5,6,8	15,943	3,269	5,771	6,895



Treatment management unit	Map ID	Risk value	Fuel model(s)	Recommended treatment <sup>a</sup>	Total acres	Federal acres	State Trust acres	Other Nonfederal acres
	FL4	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2	1,2,3,5,6,8	8,946	0	4,362	4,585
	FL5	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,5,7,8,9	16,006	4,088	7,605	4,313
	FL6	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,5,6,7,8,9	17,250	5,405	3,618	8,228
	FL7	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,5,6,7,8,9	27,864	1,590	3,214	23,060
	FL8	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,5,6,8	15,109	1,992	5,254	7,864
<b>Gila River Indian Community (GC)</b>	GC1	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH3, SH5, SH7, TL2, TL3, TL6	1,2,3,5,6,7,8,9	278,937	278,237	6	694
<b>Gila River Riparian Corridor (GI)</b>	GI1	H	GR1, GR2, GS1, GS2, NB3, NB8, NB9, SH1, SH5, SH7	7,9	12,471	9,842	2,077	553
<b>Galiuro Mountains (GM)</b>	GM1	M	GR1, GR2, GS1, GS2, NB9, SH1, SH5, SH7, TL3, TU1	3,4,5,7,8,9	9,874	5,468	3,764	643
	GM2	M	GR1, GR2, GS1, GS2, NB3, NB9, SH1, SH5, SH7, TL3, TL5, TU1	1,2,3,4,5,7,8,9	7,805	2,804	2,445	2,556
	GM3	M	GR1, GR2, GS1, GS2, NB3, NB9, SH1, SH2, SH5, SH7, TL1, TL3, TL8, TU1, TU2	1,2,3,4,5,7,8,9	72,289	16,577	31,226	24,487
<b>Golder Ranch (GR)</b>	GR1	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH3, SH5, SH7, TL2, TL3, TL6, TU1	1,2,3,4,6,7,8,9	7,662	13	2,929	4,721
	GR2	L	GR1, GR2, GS1, GS2, NB1, NB9, SH1, SH7, TL2, TL3, TU1	1,2,3,4,6,7,8,9	10,037	0	8,538	1,499
	GR3	L	GR1, GR2, GS1, GS2, NB1, NB3, SH1, SH7, TL2, TL3	1,2,3,4,6,7,8,9	8,031	0	4,252	3,779
	GR4	M	GR1, GR2, GS1, GS2, NB1, SH1, SH7, TL2, TL3, TU1	1,2,3,4,6,7,8,9	10,698	0	9,275	1,423
	GR5	M	GR1, GR2, GS1, GS2, NB1, NB9, SH7, TL2, TL3	1,2,3,4,6,7,8,9	12,004	0	11,816	188
	GR6	M	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH5, SH7, TL2, TL3	1,2,3,4,6,7,8,9	22,956	36	19,418	3,502
	GR7	M	GR1, GR2, GS1, GS2, NB1, NB9, SH1, SH5, SH7, TL2, TL3	1,2,3,4,6,8	13,966	0	9,598	4,368
	GR8	M	GR1, GR2, GS1, GS2, NB1, SH1, SH5, TL2	1,2,3,4,5,6,8	9,907	552	7,102	2,253

Treatment management unit	Map ID	Risk value	Fuel model(s)	Recommended treatment <sup>a</sup>	Total acres	Federal acres	State Trust acres	Other Nonfederal acres
	GR9	M	GR1, GR2, GS1, GS2, NB1, NB9, SH1, SH5, SH7, TL2	1,2,3,4,5,7,8,9	15,756	1,802	6,512	7,443
	GR10	M	GR2, GS1, GS2, NB1, SH5, SH7, TL2, TL3	1,2,3,4,5,7,8,9	7,223	58	5,973	1,192
<b>Kearny (KR)</b>	KR1	M	GR1, GR2, GS1, GS2, NB1, NB9, SH1, SH5, SH7, TL2, TL3	1,2,3,4,5,6,7,8,9	9,935	7,585	785	1,564
	KR2	M	GR1, GR2, GS1, GS2, NB1, NB8, NB9, SH1, SH2, SH5, SH7, TL2, TL3, TL8	1,2,3,4,5,6,7,8,9	15,797	2,308	1,962	11,526
	KR3	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH7, TL3, TU1	3,4,5,6,7,8,9	13,670	9,024	3,317	1,329
	KR4	H	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, SH7, TL2, TL3, TL5, TU1	1,2,3,4,5,6,7,8,9	14,095	2,295	1,844	9,956
	KR5	M	GR1, GR2, GS1, GS2, NB1, NB9, SH1, SH5, SH7, TL3, TU1	3,4,5,6,7,8,9	13,314	12,151	242	921
<b>Maricopa (MA)</b>	MA1	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,5,7,8,9	5,322	274	1,695	3,354
	MA2	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3, TL6	1,2,3,7,8,9	16,281	1	78	16,202
	MA3	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, SH1, SH5, TL2, TL3, TL6	1,2,3,7,8,9	8,105	1	346	7,758
	MA4	H	GR1, GR2, GS1, GS2, NB1, NB3, SH1, SH5, TL6	1,2,3,5,7,8,9	5,466	358	1,110	3,999
	MA5	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2	1,2,3,5,7,8,9	12,296	34	2,924	9,338
	MA6	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, TL2, TL3	1,2,3,7,8,9	18,374	0	646	17,727
	MA7	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,5,7,8,9	17,181	204	3,607	13,370
	MA8	M	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH5, TL2, TL3	1,2,3,5,7,8,9	10,714	741	1,696	8,278
	MA9	M	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH5, TL2, TL3	1,2,3,5,7,8,9	22,520	14,851	1,437	6,232
	MA10	M	GR1, GR2, GS1, GS2, NB1, NB3, SH1, SH5, TL2, TL3	1,2,3,5,7,8,9	8,082	3,627	1,151	3,305
	MA11	H	GR1, GR2, GS1, GS2, NB1, NB3, SH1, SH5, TL2, TL3	1,2,3,5,7,8,9	33,544	13,365	4,725	15,453

Treatment management unit	Map ID	Risk value	Fuel model(s)	Recommended treatment <sup>a</sup>	Total acres	Federal acres	State Trust acres	Other Nonfederal acres
	MA12	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,7,8,9	19,555	22	2,505	17,028
	MA13	H	GR1, GR2, GS1, GS2, NB1, NB3, SH1, SH5, TL2, TL3	1,2,3,5,7,8,9	6,441	2,519	291	3,631
	MA14	H	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH5, TL2, TL3, TL6	1,2,3,7,8,9	8,291	7	166	8,118
	MA15	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, SH1, SH5, TL2, TL3	1,2,3,5,8	10,678	5,981	1,005	3,693
<b>Mammoth (MM)</b>	MM1	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, TL3, TL5, TU1	1,2,3,4,5,7,9	7,273	15	4,664	2,595
	MM2	M	GR1, GR2, GS1, GS2, NB1, NB9, SH1, SH7, TL3, TU1	1,2,3,4,5,7,9	15,857	1,718	12,201	1,937
	MM3	M	GR1, GR2, GS1, GS2, NB1, NB8, NB9, SH1, SH7, TL3, TU1	1,2,3,4,5,7,9	12,212	236	5,834	6,141
	MM4	H	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH7, TL2, TL3, TL5, TL8, TU1	1,2,3,4,5,7,9	11,462	83	4,763	6,616
<b>Oracle (OR)</b>	OR1	M	GR1, GR2, GS1, GS2, NB1, NB9, SH1, SH7, TL3, TU1	1,2,3,4,5,6,7,9	7,519	33	4,955	2,531
	OR2	L	GR1, GR2, GS1, GS2, NB1, SH1, SH5, SH7, TL3, TU1	1,2,3,4,5,6,7,9	5,482	598	705	4,179
	OR3	L	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH2, SH5, SH7, TL3, TL5, TU1	1,2,3,4,5,6,7,9	6,713	733	1,577	4,403
	OR4	L	GR1, GR2, GS1, GS2, NB1, NB3, SH1, SH7, TL3, TL5, TU1	1,2,3,4,6,7,9	6,611	0	2,482	4,129
	OR5	M	GR1, GR2, GS1, GS2, SH1, SH7, TU1	3,4,7,9	7,116	0	6,243	873
	OR6	L	GR1, GR2, GS1, GS2, NB1, NB8, NB9, SH1, TL3, TU1	1,2,3,4,6,7,9	4,240	0	3,770	470
	OR7	M	GR1, GR2, GS1, GS2, NB1, NB9, SH1, SH7, TL3, TU1	1,2,3,4,7,9	3,963	8	1,892	2,063
<b>Queen Creek (QC)</b>	QC1	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH7, TL2, TL3	1,2,3,5,8	26,123	6,867	2,290	16,966
	QC2	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3	1,2,3,8	11,285	0	4,888	6,397
	QC3	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5, TL2, TL3, TL6	1,2,3,5,7,8,9	27,786	477	8,915	18,394
	QC4	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, SH1, SH5, TL2	1,2,3,5,7,8,9	9,317	0	6,320	2,997

Treatment management unit	Map ID	Risk value	Fuel model(s)	Recommended treatment <sup>a</sup>	Total acres	Federal acres	State Trust acres	Other Nonfederal acres
<b>Queen Valley (QV)</b>	QV1	M	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH5, SH7, TL2, TL3	1,2,3,4,5,6,8	13,965	717	12,630	619
	QV2	M	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH5, SH7, TL2, TL3	1,2,3,4,5,6,7,8,9	15,957	519	13,430	2,008
	QV3	M	GR1, GR2, GS1, GS2, NB1, SH1, TL2, TL3	3,4,6,7,9,8	1,851	0	1,755	96
	QV4	H	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH1, SH5, SH7, TL2, TL3	1,2,3,4,5,6,7,8,9	10,394	7,406	2,505	483
	QV5	M	GR1, GR2, GS1, GS2, NB1, SH1, SH5, SH7, TL2, TL3	3,4,5,6,7,8,9	8,004	1,992	5,486	526
<b>San Manuel (SM)</b>	SM1	M	GR1, GR2, GS1, GS2, NB1, SH1, SH7, TL3	3,4,6,7,8,9	7,566	1	6,708	857
	SM2	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH7, TL3, TU1	1,2,3,4,7,8,9	15,317	0	1,770	13,547
	SM3	H	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH7, TL2, TL3, TL5, TU1	1,2,3,4,5,7,8,9	5,079	467	306	4,306
	SM4	M	GR1, GR2, GS1, GS2, NB8, NB9, SH1, SH7, TL5	3,4,5,7,8,9	18,075	2,572	14,673	830
	SM5	H	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH7, TL2, TL3, TL5, TL8, TU1	1,2,3,4,7,8,9	4,648	0	2,804	1,844
	SM6	M	GR1, GR2, GS1, GS2, NB1, NB9, SH1, SH7, TL3, TU1	1,2,3,4,7,8,9	27,054	0	23,262	3,793
	SM7	M	GR1, GR2, GS1, GS2, NB3, NB9, SH1, SH5, SH7, TL3, TL8, TU1	1,2,3,4,5,7,8,9	11,687	4,703	4,106	2,879
<b>Superior (SP)</b>	SP1	L	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH2, SH5, SH7, TL2, TL3	1,2,3,4,5,6,7,9	12,073	9,160	0	2,913
	SP2	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH2, SH5, SH7, TL2, TL3, TL8	1,2,3,4,5,6,7,8,9	16,698	14,735	0	1,962
	SP3	M	GR1, GR2, GS1, GS2, NB1, SH1, SH5, SH7, TL1, TL2, TL3, TL8	1,2,3,4,5,6,7,8,9	12,068	10,769	85	1,214
<b>Tohono O'odham Nation (TO)</b>	TO1	M	GR1, GR2, GS1, GS2, NB1, NB3, NB8, NB9, SH1, SH5	1,2,3,5,6,7,8,9	11,084	11,076	5	3
<b>Top-of-the-World (TW)</b>	TW1	M	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH5, SH7, TL3	3,4,5,6,7,9	4,800	4,788	0	11
	TW2	M	GR1, GR2, GS1, GS2, NB1, NB3, NB9, SH2, SH5, SH7, TL1, TL3	1,2,4,5,6	5,059	4,071	0	988

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

<sup>a</sup>Refer to Table 3.1 for recommended treatments.



The Core Team mapped the location of each TMU in the WUI and assigned recommended treatments for each TMU (refer to Table 3.2). The TMUs listed in Table 3.2 do not always coincide with fire department or district boundaries. Some TMUs are not located within a fire department or district and therefore have no structural fire protection. For example, the Top of the World community and sub-WUI are not within any fire departments or districts or under USFS jurisdiction for fire protection, and therefore, no fire departments or districts are responsible for fire response for private lands within the community.

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 in-home fuelwood (e.g., family/personal cooking, heating, etc.). Commercial use of the woody material from fuel reduction treatments is also primarily limited to fuelwood, and any commercial value of treatment by-products is not anticipated to significantly affect land treatment costs.

For private land treatments to be both fiscally reasonable and timely, the Core Team investigated land treatment costs from a variety of sources. Equivalent land treatment costs are not directly available for the Pinal County WUI. Costs estimates for timbered lands within the WUI can average \$12,000/acre on private parcels and slightly less than \$600/acre for forested landscape treatments that produce a fire resilient stand appropriate for the habitat. Within non-timbered vegetative stands in the Pinal County WUI, the estimates for land treatment costs vary by vegetation type, geography, and distance from communities. The cost estimates for land treatments on non-timbered stands are based on per-acre estimates for thinning by hand, roller chopping, mastication, and other mechanical vegetative fuel treatments, including broadcast burning at \$150 to \$200 per acre for desert grasslands and \$350 to \$500 per acre for oak woodlands.

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 alternate vegetative treatments to achieve wildland vegetative fuel mitigation objectives, such as an experimental grazing program using primary grazers within the WUI adjacent to state or federal lands. It is recommended that fallow agricultural lands be restored through the planting of native vegetation species in accordance with the *National Conservation Practice Standards, Range Planting*, Code 550 (NRCS 2010). It is also recommended that firebreaks constructed on public and private lands to restrict wildland fire movement be maintained in accordance with the above-mentioned mitigation measures and stipulations on a rotating 2- or 3-year interval, or as deemed necessary, to ensure the integrity of the firebreak through removal of fine and light vegetative fuels.

Recent costs of fuels mitigation treatment on USFS lands within the WUI are estimated to be \$100 per acre for mowing and \$250 per acre for mastication. Approximate costs of fuels mitigation associated

with forest treatments conducted by the USFS within the WUI are \$350 per acre. If wildland fuel modification prescriptions require follow-up pile burning or herbicide application after vegetation treatment, the cost per acre could also include \$50 to \$100 for burning and \$200 to \$250 for foliar herbicide application (Mr. Chris Stetson, CNF, personal communication, March 19, 2018).

The Core Team recommends that, when available, wildland fuel modification projects be contracted to ADFFM through the use of the Department of Correction fire and fuels management crews to ensure that treatments are conducted in a timely fashion and at a reasonable cost. For example, the estimates of daily costs for a 20-person labor crew and a chipper for a 100-mile roundtrip to the project site by an ADFFM crew carrier as of February 2018, are as follows:

- 10-hour day—\$1,475.00
- 12-hour day—\$1,655.00

These estimates are based on information provided by the ADFFM for the Fire and Fuels Crew treatments for both federal and nonfederal land (refer to Table 3.3). The ADFFM 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 per acre for federal lands, which is comparable to the estimated cost of the ADFFM 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 influence the ability of the Core Team to meet the goals of the revised Pinal County CWPP.

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

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

### **1. Alternate Federal, State, or Private Land Wildland Fuel Modification Plan**

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 to order to properly incorporate Firewise methods where appropriate. Fuel

modification plans for federal and state lands within 0.5 mile of private lands may be prepared for wildlife and watershed benefits, such as 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 defensible space. The action identified by the fuel modification plan should be completed before development of the property, and identified during project initiation.

A fuel modification plan for federal and state lands will follow agency-specific procedures, standards, and guidelines. Fuel modification treatment plans for private land parcels 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 Section III)

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 among participating parties is maintained (USDA and USDI 2004).

The recommended treatments within this Pinal County CWPP have been developed to be consistent with state and federal land-management action alternatives, and are intended to reduce risks to communities caused by severe fires and to restore fire-adapted ecosystems. They facilitate efficient planning and decision-making for fuels mitigation treatments and habitat restoration on public and private lands (USFS 2000).

### **C. Prevention and Loss Mitigation**

The Core Team intends this revised Pinal County CWPP to be used as a resource to help coordinate long-term interagency mitigation of potential catastrophic wildfire events in at-risk communities within

Pinal County. For this Pinal County CWPP, the 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
- Recommend measures to reduce structural ignitability in the Pinal County WUI
- Preserve the aesthetics and wildlife values within riparian areas
- Restore forest and rangelands to historic conditions which support native plant and wildlife values as part of a fire resilient landscape
- Identify funding needs and opportunities
- Expedite project planning through partnerships with ADFFM, BLM, CNF, TNF, 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

This Pinal County CWPP will be reviewed annually and updated every 5 years, or as needed, for example, accomplishment of identified priorities or changes in local conditions. Successful implementation of this CWPP will require collaboration among numerous government entities and community interests. The PCOEM and Core Team have also discussed the advantage of working cooperatively with Salt River Project (SRP) and Arizona Public Service (APS) utility companies in maintaining acceptable wildland fuel conditions within SRP and APS existing utility corridor rights-of-ways and easements, within high risk areas of the WUI. The Core Team, APS, and SRP also recognize the benefits of working cooperatively to achieve acceptable wildland fuel conditions adjacent to APS and SRP easements and rights-of-ways. The Core Team recognizes existing agreements between SRP, APS, land management agencies, and private landowners for vegetative treatments within rights-of-ways and easements, and agree this Pinal County CWPP does not bind or obligate SRP and APS in maintenance of vegetative fuels outside their rights-of-ways or easements. The Core Team believes these agreements and resultant vegetative treatments are complimentary to the objectives of this Pinal County CWPP. Therefore, at the request of PCOEM and Core Team, APS and SRP have agreed to be included as signatories to this Pinal County CWPP and to become partners in implementation of action recommendations.

The Core Team and collaborators have revised the “Action Recommendations and Implementation” from the 2009 Pinal County CWPP and proposed the revised action recommendations listed below to meet the goals of this revised Pinal County CWPP.

### **1. Administer and Implement the Pinal County CWPP**

The Core Team recommends establishing a Pinal County CWPP working group—composed of Pinal County fire chiefs, PCOEM, ADFFM, BLM, CNF, TNF, community members, concurring agencies, County and local planning and zoning departments to organize individual agency implementation of the



recommendations for fuel modification, public outreach, protection capability, and structural ignitability within the Pinal County WUI, including fuel hazards removal on private lands within the WUI.

## **2. Improve Protection Capability and Reduction in Structural Ignitability**

The Core Team considers the risks of wildland fire igniting and spreading throughout the WUI a serious threat. The Core Team and collaborators believe that actions to reduce risk and promote effective responses to wildland fires must be undertaken. The following are recommendations prepared by the Core Team to enhance protection capabilities for at-risk communities within Pinal County:

- Obtain one fully functional type 6 engine and one fully functional type 1 engine for wildland fire response by local fire departments and districts.
- Obtain a medium-size water tender for use by local fire departments and districts
- Improve additional water-storage tanks, wells, or other water sources for tender filling throughout the fire departments and districts; make them available and usable for aerial operations.
- Improve water supply capacity within private water districts that support local fire departments
- Maintain helicopter landing sites. Establish 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.
- Obtain a chipper/shredder, tub grinder, air curtain destructor, and other equipment necessary for treatment and processing of vegetative slash for use by local fire departments and districts for wildland fuel mitigation projects.
- Obtain one multipurpose utility vehicle with attachments for chipping, brush cutting, and mini-water tending, such as the Bobcat Toolcat.
- Implement / Update GIS (Geographic Information Systems) and GPS (Global Positioning System) software and laptops to update mapping capabilities of local fire departments and districts.
- Arrange for the acquisition, operation, and maintenance of a green-waste disposal site within reasonable proximity to Pinal County communities and encourage the use of the disposal site for all vegetative material removed during wildland fuel treatments on private lands within the WUI.
- 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.
- Meet annually with representatives from APS and SRP to mutually identify locations of needed vegetative treatments within rights-of-ways in high risk areas of the WUI and support the Core Team in obtaining grants and agreements necessary to implement vegetative fuel reduction projects adjacent to rights-of-ways.
- Develop a pre-suppression plan with BLM, CNF and TNF along the boundary of the WUI.
- Develop additional wildland fire preplans for all high-hazard locations across Pinal County where they have not been adopted.
- Encourage and support local governments, Pinal County, and fire department/districts in fuel hazards removal including activities to mitigate the spread of non-native invasive grasses within the WUI including transportation corridors.
- Develop intergovernmental agreements (IGAs) with Pinal County on nuisance-abatement projects located in high-hazard communities.
- Meet annually, immediately before the fire season, to coordinate early suppression deployment and to determine training and equipment needs.



**Photograph 3.1. 2017 Roach Fire**

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

Pinal 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, defensible space, and naturally functioning wildland systems through restoration management and rapid response to wildland fire. This Pinal County CWPP is intended to be a long-term strategic plan containing prescriptive recommendations to address hazardous fuels, enhance wildfire preparedness, and create fire-adapted communities. A grassroots collaborative

structure of individual citizens, supported by local governments as full partners, will provide the most effective longterm means to achieve these goals and to maintain community momentum. The components of such a structure include the following recommendations:

- Assist in implementing the Firewise Communities/USA Recognition program and the Fire Adapted Communities program in communities where the programs are supported by the local fire departments and districts. The Firewise and Fire Adapted 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 and Fire Adapted 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 distributed via local government television channels; mailers to homeowners; presentations by the PCOEM, ADFFM, BLM, CNF, and TNF; the use of the Arizona Firewise Partners Public Information Trailer (BLM Tucson Field Office) at community events and local fire departments and districts; and through the development of specific promotional materials by the Core Team.
- 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 ADFFM, BLM, CNF, TNF, and Pinal County.
- Place and maintain bilingual wildfire caution signs within camping areas and access routes in select 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 defensible space and create fire-adapted communities. Pinal County should continue to support and promote new businesses involved in the wood-products market. Pinal County, local municipalities, CNF, TNF, BLM, and local fire departments and districts are committed to encouraging, as appropriate, the use of vegetative by-products from the WUI fuel management program for use by commercial entities or community service organizations. Possible by-product uses encouraged by the Core Team include the following:

- Bagged mesquite wood for sale to visitor and larger-community markets as “campfire cooking” for commercial or personal culinary uses
- Firewood marketed to local residents, visitors, and adjacent communities
- Mesquite, pinyon pine, and juniper wood marketed for artwork, furniture, and other specialty wood products

#### **IV. PINAL COUNTY CWPP 2018 PRIORITIES: ACTION RECOMMENDATIONS AND IMPLEMENTATION**

The Core Team reviewed the “CWPP Priorities: Action Recommendations and Implementation” developed for the 2009 Pinal County CWPP. The action recommendations were updated as needed to meet the revised Pinal County CWPP objectives (refer to Section III of this CWPP). This updated Pinal County CWPP is composed of a series of recommendations intended to reduce structural ignitability, improve fire prevention and suppression, and enhance public outreach that are based on the wildfire threat, wildfire effects, and wildfire risk assessment conducted by the Core Team.

The Core Team recommends that projects implemented from these action recommendations be monitored for effectiveness in meeting Pinal County CWPP objectives. For the life of the Pinal County CWPP, recommendations for additional projects or wildland fuel mitigation treatments can be made on the basis of project performance from previously implemented projects.

##### **A. Administrative Oversight**

The 2009 Pinal County CWPP established a Working Group and an administrator to monitor implementation of the CWPP. Generally, the most efficient way to manage the mitigation of wildland fire risk in the WUI is through identifying, delegating, implementing, and then monitoring the action recommendations of the Pinal County CWPP. Establishing a unified approach to collaboratively implement the Pinal County CWPP will allow for embracing adaptive management principles that enhance decision making and reduce inconsistency at all levels of government.

The Core Team recommends that the CWPP Working Group and concurring agencies work collaboratively toward accomplishing the recommendations for outreach and structural ignitability within the Pinal County WUI, which include fuel hazards removal on private lands within the WUI. It is recommended that the CWPP Working Group consist of representatives from local fire departments and districts and, as needed, representatives from the Fire Chief Association of Pinal County, ADFFM, PCOEM, CNF, TNF, BLM, county and local municipalities, and other concurring agencies. The Core Team may solicit representatives from communities that are not serviced by a fire department or district, as well as other interested individuals or agencies, to participate in the Working Group. The PCOEM would be the lead agency and would be responsible for coordinating the Working Group, producing monitoring reports, and making any updates to the CWPP.

As established in the 2009 Pinal County CWPP, the charter of the Pinal County CWPP Working Group will be as follows:

1. Prioritize wildland fuel modification, structural ignitability, protection capability, and public outreach projects listed in the approved Pinal County CWPP on a countywide basis and review for possible reprioritization at least once annually, starting within 2 months of final Pinal County CWPP approval by ADFFM.



*Note:* Prioritization of fuel modification and community planning, outreach, and warning programs will be conducted by the Pinal County CWPP Working Group as a whole; recommendations for other projects involving firefighter training, equipment, communications, facilities, and apparatus will be made by the Pinal County Fire Officers Association representatives in the Pinal County CWPP Working Group.

2. Provide Pinal County and/or the Core Team the opportunity to participate in any burned area emergency response (BAER) Team established subsequent to a wildfire.
3. Support fire departments and districts or local governments and municipalities in the submittal of grant applications and the solicitation of other funding opportunities to implement wildland fuel modification, structural ignitability, protection capability, and public outreach projects established as priorities by the Pinal County CWPP Working Group.

*Note:* Individual agencies will be able to seek letters of support from the Pinal County CWPP Working Group or partner agencies in applying for funding for projects identified as priorities by the Working Group.

4. Support fire departments and districts, local governments and municipalities, and community groups in the implementation of projects established as priorities by the Pinal County CWPP Working Group.
5. Conduct annual monitoring and reporting to provide information on additional measures necessary to meet Pinal County CWPP goals, including additional future recommendations from fire departments and districts and other agencies for inclusion in the priorities list.
6. Act as an advisory group to Pinal County Planning and Zoning and to developers in outlying areas to ensure adequate road conditions 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.
7. Recommend the establishment of fire services in grandfathered developments within the WUI when residential and commercial densities and vegetation/fuel-load factors reach levels that create a potential for high wildland fire risk to public and firefighter safety and private property protection.
8. Use the following general criteria for prioritizing proposed projects and action items:
  - a. Geographic/fuel-load/residential density:
    - i. The Top of the World, Oracle, Superior, and Queen Valley sub-WUIs will receive long-term priority due to the vegetation type, high fuel load, ignition history, and threatened communities present.

- ii. In any given year, the Pinal County CWPP Working Group will evaluate countywide weather, vegetation, and fuel-load conditions and projections, as well as current residential and commercial densities, to determine short-term priority adjustments for projects in all WUI areas of the county for that year.
- iii. In any given year, the Pinal County CWPP Working Group will evaluate the progress of new developments and any increases to residential and commercial densities to determine potential needs and priorities within the WUI for the next 3 years following that given year.
- b. Categorical/functional criteria—priorities will generally be established in the order listed below; these priorities are subject to review and change by the Pinal County CWPP Working Group on an ongoing basis:
  - i. Fuel modification projects (first priorities will be for those projects within fire department and fire district, CNF, TNF, BLM, or ADFFM jurisdictions)
  - ii. Enhanced wildland firefighter training and acquisition of personal protective equipment (PPE)
  - iii. Wildland fire suppression equipment and tools, including brush engines and tenders
  - iv. Water-storage sites and supply facilities
  - v. Community planning and outreach activities, including warning signs/systems, identification/ improvement of evacuation routes
  - vi. Radios for primary use by trained and designated wildland fire crews
  - vii. Helicopter pads for firefighter deployment or evacuation
  - viii. Structural fire engines
  - ix. Fire stations in areas with sufficiently high threat and population densities as determined annually by the Pinal County CWPP Working Group.
  - x. Other communications projects

The agencies involved in the formation of this plan support local community efforts and are encouraged to work with the communities toward accomplishing action items. BLM, CNF, TNF, ADFFM, PCOEM, local municipalities, fire departments and districts, in coordination with the established Working 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 Working 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 Core Team also encourages 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 conducted by the Working Group would provide information on additional measures necessary to meet Pinal County CWPP goals.

## B. Priorities for Mitigation of Hazardous Wildland Fuels

Table 4.1 displays the priorities for wildland fuel treatments within the WUIs as recommended by the Core Team. These action recommendations would 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 enhance community preparedness for wildland fire.

**Table 4.1. Action recommendations for wildland fuel modification**

Treatment Management Unit	Location and description	Project partners	Estimated treatment cost <sup>a</sup>
QV2	Lands adjacent the community of Queen Valley	Pinal County, PCOEM, MLC, ADFFM, BLM and TNF	685 high-risk acres = \$239,750; \$47,950 / year for 5 years (FY 2019 to 2024). Estimate based on \$350/acre average cost.
SP2	Lands adjacent the community of Superior and Boyce Thompson Arboretum	Pinal County, PCOEM, MLC, TNF, ADFFM and Superior Fire Department	761 high-risk acres = \$266,350; \$53,270 / year for 5 years (FY 2019 to 2024). Estimate based on \$350/acre average cost.
TW2	Lands adjacent the community of Top of the World	Pinal County, PCOEM, TNF and ADFFM	373 high-risk acres = \$130,550; \$26,110 / year for 5 years (FY 2019 to 2024). Estimate based on \$350/acre average cost.
KR4	General vicinity north and south of the Town of Kearny	Pinal County, PCOEM, MLC, ADFFM, BLM and Kearny Fire Department	1,890 high-risk acres = \$661,500; \$132,300 / year for 5 years (FY 2019 to 2024). Estimate based on \$350/acre average cost.
DV3	Lands adjacent the Town of Dudleyville	Pinal County, PCOEM, MLC, ADFFM, BLM and Dudleyville Fire District	2,051 high-risk acres = \$717,850; \$143,570 / year for 5 years (FY 2019 to 2024). Estimate based on \$350/acre average cost.
MM2	Lands associated with Gila River corridor adjacent to residences	Pinal County, PCOEM, MLC, ADFFM, BLM, and Mammoth Fire District	665 high-risk acres = \$232,750; \$46,550 / year for 5 years (FY 2019 to 2024). Estimate based on \$350/acre average cost.

*Note:* ADFFM = Arizona Department of Forestry and Fire Management; ASLD = Arizona State Land Department; BLM = Bureau of Land Management; FY = fiscal year; MLC = Municipalities and local communities, PCOEM = Pinal County Office of Emergency Management; TNF = Tonto National Forest.

<sup>a</sup>Total acres to be treated during the life of the plan; acres estimated to be treated will be based on site-specific analysis, which will determine actual acres available for treatment in each area. Verification of actual cost will be needed based on site conditions.

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

The 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 Core Team for consideration by individual fire departments and districts for reduced structural ignitability and public outreach within their respective jurisdictions. Table 4.3 lists the future recommendations for wildland fire protection and reduced ignitability.

After the ADFFM's final approval of the Pinal County CWPP, the Working Group would meet to review projects for the upcoming year and, thereafter, would meet annually or as necessary to reevaluate projects and revise priorities as needed. Such prioritization by the Working Group would not impinge on or interfere with the fire departments' and districts' opportunities to independently seek funding for projects within their jurisdictions.

**Table 4.2. Action recommendations for structural ignitability and public outreach**

Project partner	Recommendation type	Specific recommendation	Estimated cost	Timeline
Pinal County, PCOEM, MLC, TNF, CNF, ADFFM, ASLD, and fire departments and districts	1.2 Wildland Fire Protection and Reduced Ignitability	Construct a series of 5,000-gal water-storage facilities located strategically throughout residential areas	Install water-storage facility/year: \$5,000/facility	Locate and install 1 water-storage facility each year for three years beginning FY2020
	1.3 Enhanced Public Education, Information, and Outreach	Work with land 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	Begin planning with agencies in FY 2018/2019; implement in FY 2020/2021
Pinal County, PCOEM, MLC, TNF, CNF, ADFFM, ASLD, and fire departments and districts	1.2 Wildland Fire Protection and Reduced Ignitability	Obtain 10 handheld programmable radios for firefighter dispatch and communication	King digital programmable handheld radios, \$1,380/radio: \$13,800	Obtain grant funding in 2019
Pinal County, PCOEM, MLC, TNF, CNF, ADFFM, ASLD, and fire departments and districts	1.3 Enhanced Public Education, Information, and Outreach	Develop a fire-safety awareness program for community groups	Promote and conduct a community fire-awareness day at local fire departments and districts: \$2,000	Solicit funds for promotion, brochures, and event materials in 2018/2019; conduct in 2020
		Create fire-safety and fire-awareness posters for public places	Development, printing, and distribution costs: \$5,000	Solicit funds for production and printing in 2018/2019; conduct in 2020

*Note:* ADFFM = Arizona Department of Forestry and Fire Management; ASLD = Arizona State Land Department; CNF = Coronado National Forest; FY = fiscal year; MLC = Municipalities and local communities, PCOEM = Pinal County Office of Emergency Management; MLCTNF = Tonto National Forest.

<sup>a</sup> 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**

<b>Project Partner</b>	<b>Project<sup>a</sup></b>	<b>Equipment/Expense</b>	<b>Timeline</b>
Pinal County, PCOEM, ADFFM, USFS, and associated fire departments and districts	E1—Obtain a medium-size water tender to better able traverse rural landscape than larger units	1,500-gal water tenders, 4-wheel drive: \$65,000	Acquire tender in FY 2020; assess additional tender needs in FY 2021
Pinal County, PCOEM, MLC, ADFFM, USFS, and associated fire departments and districts	I1—Retrofit existing wells or water supplies for local fire department/district use (outlet pipes, valves, and hose thread adaptors); maintain sites; cost-share hose and nozzle for immediate protection at site	Pipe and valve installation and site maintenance: \$10,000 initial, \$2,500 annually	Begin in FY 2018/2019; maintain annually
Pinal County, PCOEM, MLC, ADFFM, CNF, TNF, BLM, and associated fire departments and districts	A1—Develop and maintain written mutual-aid agreements with neighboring fire departments and districts for wildland fire, structure fire, and other emergency response	Staff time, coordination efforts, research, and meetings: \$5,000	Inventory existing agreements; determine deficiencies and implement any needed agreements in FY 2018
Pinal County, PCOEM, MLC, ADFFM, CNF, TNF, BLM, and associated fire departments and districts	A2—Work with Pinal County to develop a notification and evacuation plan for the community	Staff time, coordination efforts, research, and meetings: \$5,000	Begin planning in FY 2018/2019; implement in FY 2019
Pinal County, PCOEM, MLC, ADFFM, CNF, TNF, BLM, APS, SRP and associated fire departments and districts	A3—Work with SRP and APS on vegetative management treatments within and adjacent to utility corridors where opportunities exist	Staff time, coordination efforts, research, and meetings: \$5,000	Begin planning in FY 2018/2019; implement in FY 2020
Pinal County, PCOEM, MLC, ADFFM, TNF, BLM, and associated fire departments and districts	A4—Develop a pre-suppression plan with USFS, BLM, ADFFM and local fire departments and districts in areas near Top of the World and Oracle.	Staff time, coordination efforts, research, and meetings: \$5,000	Begin planning in FY 2019; implement in FY 2020

*Note:* ADFFM = Arizona Department of Forestry and Fire Management; APS = Arizona Public Service; ADFFM = Arizona Department of Forestry and Fire Management; BLM = Bureau of Land Management; CNF = Coronado National Forest; FY = fiscal year; MLC = Municipalities and local governments, PCOEM = Pinal County Office of Emergency Management; SRP = Salt River Project; TNF = Tonto National Forest; USFS = US Forest Service.

<sup>a</sup> Projects are designated by project type (E = equipment; I = Infrastructure; A = administrative) but not ranked in order of importance.

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

PCOEM and the Working Group would 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 defensible space goals of the 2018 Pinal County CWPP

Table 4.4 lists the 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. Project partners would include Pinal County, PCOEM, m, CNF, TNF, BLM, ADFFM, and associated fire departments and districts. The Working Group would use the resources of the ADFFM and BLM 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, ADFFM, and BLM.

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

Project	Equipment/Expense	Timeline
Establish and maintain roadside fire-danger warning signs and other informational and directional road signs along major roads as determined by the Pinal County Fire Officers Association	Construction and placement: \$5,000	Construct and implement in FY 2018/19
Create and distribute community bulletin	Development, printing, and distribution costs: \$5,000	Develop in FY 2019; distribute continually
Acquire Redzone 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 Assessment completion: \$2,000	Acquire software and complete assessments in FY 2019; implement recommendations in FY 2020
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 2019
Replace and maintain fencing adjacent to high OHV use areas	Assess in 2019, initial plan for 1 mile of new or repaired fencing	Estimate \$6,000 per mile of standard 4-wire fencing

*Note:* ADFFM = Arizona Department of Forestry and Fire Management; BLM = Bureau of Land Management; CNF = Coronado National Forest; FY = fiscal year; MLC = Municipalities and local governments; OHV = off-highway vehicle; PCOEM = Pinal County Office of Emergency Management; PDAs = personal digital assistants; TNF = Tonto National Forest; WUI = wildland-urban interface.

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## V. MONITORING PLAN

Monitoring following implementation of the action recommendations is essential to ensure that the revised goals of the 2018 Pinal County CWPP are met. It is recommended that the CWPP Working Group will monitor the progress of the revised CWPP action recommendations to determine the effectiveness of ongoing and completed projects in meeting the revised Pinal County objectives, as well as to recommend future projects necessary to meet the 2018 Pinal County CWPP revised goals.

In accordance with Section 102.g.5 of HFRA, communities within Pinal County would be provided an opportunity to participate in any multiparty monitoring program established by other interested parties, such as state and federal agencies, and would be allowed to assess progress toward meeting the 2018 Pinal County CWPP objectives. The Core Team believes that participation in multiparty monitoring would provide effective and meaningful ecological and socioeconomic feedback on fuel modification and treatment projects. Multiparty monitoring would also help BLM, ADFFM, PCOEM, ASLD, Pinal County municipalities, and fire departments and districts better plan future land-management projects.

The Pinal County CWPP administrators may request participation in any post-wildfire analysis and BAER planning effort with lead state or federal agencies. Immediate post-wildfire analysis and planning is essential to Pinal County to protect public safety from possible flood and debris flows, municipal watershed pollution, and other post-wildfire habitat and community impacts.

This section details the performance measures that would be used to assess the effectiveness of implementing the 2018 Pinal County CWPP action recommendations. Monitoring would include assessing and evaluating the implementation of individual fuel modification and treatment projects and a given project's effectiveness in furthering the 2018 Pinal County CWPP objectives.

### A. Administrative Oversight, Monitoring, and Pinal County CWPP Reporting

The Pinal County CWPP Working Group—composed of representatives from the Fire Chiefs Association of Pinal County, PCOEM, CNF, TNF, ADFFM, and BLM as well as local fire departments and districts, county and local municipalities, and other concurring agencies—would mutually assist in conducting and monitoring Pinal County CWPP action recommendations. The CWPP Core Team should identify available grants and other funding mechanisms needed to finance implementation of the 2018 Pinal County CWPP action recommendations. Grant information should be routinely searched to identify updated grant application cycles. Potential grant and funding resources are listed in Appendix A of this CWPP.

Following project review, the PCOEM, in coordination with the CWPP Working Group, should report on the outcome of the project implementation and overall progress toward meeting Pinal County CWPP goals. The Core Team should report to the revised CWPP signatories any successful grant awards received for implementing the Pinal County CWPP action recommendations. The Core Team report should include recommendations to the revised CWPP signatories for updating the Community



Mitigation Plan and the Prevention and Loss Mitigation Plan portions of the revised Pinal County CWPP. The Core Team report should support timely decision-making for all levels of government and would provide input necessary for developing future work plans and for prioritizing project recommendations over the life of this Pinal County CWPP. Appendix B provides information on the data used in the analysis of this Pinal County CWPP and the appropriate contacts for updating the CWPP. Once the Pinal County CWPP is updated, it will be submitted to the PCOEM, ADFFM, all participating fire departments and districts, and municipal governments for adoption and signature as a planning document; it would also be provided to CNF, TNF, and BLM for concurrence. Once adoption, signature, and concurrence are achieved, the action recommendations of the updated Pinal County CWPP are to be referenced for funding as part of HFRA, and other available funding sources.

## B. Effectiveness Monitoring

Table 5.1 outlines the performance measures that the Core Team should use to monitor and assess status in meeting current Pinal County CWPP performance goals. The CWPP Working Group should assess the current status of wildland fuel hazards and look for any new or developing issues not covered by the 2018 Pinal County CWPP. As new issues arise, such as new invasive-species infestations, this Pinal County CWPP should be updated or amended as necessary to include any further risks and recommendations for treatment needed to meet Pinal County CWPP goals. To help track fuel treatments being planned and completed through local, state, and federal programs, the CWPP administrators should cooperatively provide detailed mapping information to the ADFFM office.

**Table 5.1. Performance measures to assess Pinal County CWPP progress**

Goal	Performance measure
<b>Improve fire prevention and suppression</b>	<p>Reduction of wildland fire occurrence and acres burned (unplanned) in the WUI:</p> <ul style="list-style-type: none"> <li>• PCOEM has implemented an emergency notification (autophone redial system) and evacuation plan.</li> <li>• Wildland fire preplans for all high-hazard locations across Pinal County have been adopted.</li> <li>• Local fire departments and districts have developed IGAs with Pinal County on nuisance-abatement projects located in high-hazard communities.</li> <li>• Effectiveness monitoring of fire prevention and suppression will include the following: <ul style="list-style-type: none"> <li>— Acres burned and degree of severity of wildland fire</li> <li>— Percentage of wildland fire controlled on initial attack</li> <li>— Number of homes and structures lost to wildland fire</li> </ul> </li> <li>• New water sources developed in key areas.</li> <li>• Consistent fire training in use</li> <li>• Wildland firefighter PPE acquired as needed.</li> <li>• Mutual-aid agreements with neighboring fire departments and districts updated and approved.</li> </ul>

Goal	Performance measure
<b>Reduce hazardous vegetative fuels</b>	<p>Effective treatment of high-risk areas effectively by acre:</p> <ul style="list-style-type: none"> <li>• Number of treated acres of nonfederal WUI lands that are in VCC or 3 are identified as high priorities by the Pinal County CWPP and should be moved to VCC 1 or another acceptable level of wildland fuel loading and continuity.</li> <li>• Acres treated to acceptable fuel levels within priority treatment management areas.</li> <li>• Total acres treated through any fuel reduction measures, including prescribed fire, that are conducted in, or adjacent to, the WUI. The change of condition class should be determined for small projects or treatment areas through the use of the LANDFIRE database.</li> </ul>
<b>Restore watershed health</b>	<p>Acres of fuel reduction or watershed enhancement treatments that meet restoration treatment guidelines for riparian habitats:</p> <ul style="list-style-type: none"> <li>• Coordination with and support of PCOEM, ADFFM, ASLD, and BLM in implementing and determining social, economic, and environmental effects of riparian restoration treatments (Treatments 7 and 9, see Section III, Table 3.1).</li> <li>• Acres of saltcedar-invaded riparian areas identified and undergoing restoration treatments.</li> </ul>
<b>Promote community involvement</b>	<p>Initiation of public outreach programs:</p> <ul style="list-style-type: none"> <li>• Countywide community CWPP Working Group initiated.</li> <li>• Public outreach programs and promotions implemented to enhance volunteer efforts to reduce hazardous fuels.</li> <li>• Number and areas (community or dispersed residents) of private landowners supporting and implementing fuel reduction projects.</li> <li>• PCOEM and local fire departments and districts developed and implemented evacuation plans for identified high-risk areas.</li> <li>• Individual home assessments completed in WUI boundary high-risk areas.</li> <li>• Roadside fire-danger warning signs in English and Spanish installed at strategic points within the WUI.</li> <li>• Green-waste disposal and processing site secured and operational.</li> <li>• Fire-awareness articles printed in local newspapers.</li> <li>• Fire-safety awareness program, posters, and information available in public places.</li> </ul>
<b>Encourage economic development</b>	<p>Wood products industry growth and diversification to use all sizes of material removed by fuel reduction treatments:</p> <ul style="list-style-type: none"> <li>• Number of value-added wood products developed by the community.</li> <li>• Number of new markets (local firewood sales) for local products created.</li> </ul>

*Note:* ADFFM = Arizona Department of Forestry and Fire Management; ASLD = Arizona State Land Department; BLM = Bureau of Land Management; IGA = intergovernmental agreement; PCOEM = Pinal County Office of Emergency Management; PPE = personal protective equipment; WUI = wildland-urban interface

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## VII. DECLARATION OF AGREEMENT AND CONCURRENCE

The following partners in the development of the 2018 Pinal County Community Wildfire Protection Plan have reviewed and do mutually agree or concur with its contents:

### Agreement

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Pinal County Board of Supervisors	Date
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City of Casa Grande	Date
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City of Apache Junction	Date
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Town of Florence	Date
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Town of Kearny	Date
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City of Maricopa	Date
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Town of Superior	Date
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Town of Coolidge	Date
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Arizona Public Service Company	Date
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Salt River Project	Date
Arizona City Fire District	Date
Avra Valley Fire District	Date
Casa Grande Fire Department	Date
Coolidge Fire Department	Date
Dudleyville Fire District	Date
Eloy Fire District	Date
Florence Fire Department	Date
Kearny Fire Department	Date
Mammoth Fire District	Date
Maricopa Fire Department	Date

North Hidden Valley Fire Department	Date
Oracle Fire District	Date
Pinal Rural Fire Rescue and Medical District	Date
Queen Valley Fire District	Date
Regional Fire District	Date
San Manuel Fire District	Date
Stanfield Fire District	Date
Superior Fire Department	Date
Superstition Fire and Medical District	Date
Thunderbird Fire District	Date

## CONCURRENCE

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Arizona State Forester Arizona Department of Forestry and Fire Management	Date
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Phoenix District Manager Bureau of Land Management	Date
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Gila District Manager Bureau of Land Management	Date
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Globe District Ranger Tonto National Forest	Date
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Mesa District Ranger Tonto National Forest	Date
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Catalina District Ranger Coronado National Forest	Date
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## VIII. GLOSSARY OF FIRE MANAGEMENT TERMS

### A

*Aerial Fuels:* All live and dead vegetation in the forest canopy or above surface fuels, including tree branches, twigs and cones, snags, moss, and high brush.

*Aerial Ignition:* Ignition of fuels by dropping incendiary devices or materials from aircraft.

*Air Tanker:* A fixed-wing aircraft equipped to drop fire retardants or suppressants.

*Agency:* Any federal, state, county, or city government organization participating with jurisdictional responsibilities.

*Anchor Point:* An advantageous location, usually a barrier to fire spread, from which to start building a fire line. An anchor point is used to reduce the chance of firefighters being flanked by fire.

*Appropriate Tools:* Methods for reducing hazardous fuels including prescribed fire, wildland fire use, and various mechanical methods such as crushing, tractor and hand piling, thinning (to produce commercial or pre-commercial products), and pruning. They are selected on a site-specific case and are ecologically appropriate and cost effective.

*Aramid:* The generic name for a high-strength, flame-resistant synthetic fabric used in the shirts and jeans of firefighters. Nomex, a brand name for aramid fabric, is the term commonly used by firefighters.

*Aspect:* Direction toward which a slope faces.

### B

*Backfire:* A fire set along the inner edge of a fire line to consume the fuel in the path of a wildfire and/or change the direction of force of the fire's convection column.

*Backpack Pump:* A portable sprayer with hand-pump, fed from a liquid-filled container fitted with straps, used mainly in fire and pest control. (see Bladder Bag)

*Bambi Bucket:* A collapsible bucket slung below a helicopter. Used to dip water from a variety of sources for fire suppression.

*Behave:* A system of interactive computer programs for modeling fuel and fire behavior that consists of two systems: BURN and FUEL.

*Bladder Bag:* A collapsible backpack portable sprayer made of neoprene or high-strength nylon fabric fitted with a pump. (see Backpack Pump)

*Blow-up:* A sudden increase in fire intensity or rate of spread strong enough to prevent direct control or to upset control plans. Blow-ups are often accompanied by violent convection and may have other characteristics of a fire storm. (see Flare-up)

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Glossary adapted from the NIFC, <http://www.nifc.gov/fireinfo/glossary.html> (2006). See also the *Glossary of Wildland Fire Terminology*, <http://www.nwccg.gov> (National Wildfire Coordinating Group, Incident Operations Standards Working Team, 2007).

*Brush:* A collective term that refers to stands of vegetation dominated by shrubby, woody plants, or low growing trees, usually of a type undesirable for livestock or timber management.

*Brush Fire:* A fire burning in vegetation that is predominantly shrubs, brush and scrub growth.

*Bucket Drops:* The dropping of fire retardants or suppressants from specially designed buckets slung below a helicopter.

*Buffer Zones:* An area of reduced vegetation that separates wildlands from vulnerable residential or business developments. This barrier is similar to a greenbelt in that it is usually used for another purpose such as agriculture, recreation areas, parks, or golf courses.

*Bump-up Method:* A progressive method of building a fire line on a wildfire without changing relative positions in the line. Work is begun with a suitable space between workers. Whenever one worker overtakes another, all workers ahead move one space forward and resume work on the uncompleted part of the line. The last worker does not move ahead until completing his or her space.

*Burnable Acres:* Any vegetative material/type that is susceptible to burning.

*Burned Area Rehabilitation:* The treatment of an ecosystem following fire disturbance to minimize subsequent effects. (1995 Federal Wildland Fire Policy.)

*Burn Out:* Setting fire inside a control line to widen it or consume fuel between the edge of the fire and the control line.

*Burning Ban:* A declared ban on open air burning within a specified area, usually due to sustained high fire danger.

*Burning Conditions:* The state of the combined factors of the environment that affect fire behavior in a specified fuel type.

*Burning Index:* An estimate of the potential difficulty of fire containment as it relates to the flame length at the most rapidly spreading portion of a fire's perimeter.

*Burning Period:* That part of each 24-hour period when fires spread most rapidly, typically from 10:00 a.m. to sundown.

*Burn Intensity:* The amount and rate of surface fuel consumption. It is not a good indicator of the degree of chemical, physical and biological changes to the soil or other resources. (see Fire Severity)

## C

*Campfire:* As used to classify the cause of a wildland fire, a fire that was started for cooking or warming that spreads sufficiently from its source to require action by a fire control agency.

*Candle or Candling:* A single tree or a very small clump of trees that is burning from the bottom up.

*Catastrophic:* Fire that burns more intensely than the natural or historical range or variability, thereby fundamentally changing the ecosystem, destroying communities and/or rare or threatened species/habitats,



or causing unacceptable erosion [definition added from the *Proposed Statewide Land Use Plan for Fire, Fuels and Air Quality Management* (USDI Bureau of Land Management 2004)]. (see Severe Wildland Fire)

*Chain*: A unit of linear measurement equal to 66 horizontal feet.

*Closure*: Legal restriction, but not necessarily elimination of specified activities such as smoking, camping, or entry that might cause fires in a given area.

*Cold Front*: The leading edge of a relatively cold air mass that displaces warmer air. The heavier cold air may cause some of the warm air to be lifted. If the lifted air contains enough moisture, the result may be cloudiness, precipitation, and thunderstorms. If both air masses are dry, no clouds may form. Following the passage of a cold front in the Northern Hemisphere, westerly or northwesterly winds of 15 to 30 or more miles per hour often continue for 12 to 24 hours.

*Cold Trailing*: A method of controlling a partly dead fire edge by carefully inspecting and feeling with the hand for heat to detect any fire, digging out every live spot, and trenching any live edge.

*Command Staff*: The command staff consists of the information officer, safety officer and liaison officer. They report directly to the incident commander and may have assistants.

*Community Impact Zone (CIZ)*: The zone around a community that may be impacted by wildfire. Similar to Defensible Space, but on a community level.

*Complex*: Two or more individual incidents located in the same general area, which are assigned to a single incident commander or unified command.

*Condition Class*: Based on coarse scale national data, Fire Condition Classes measure general wildfire risk as follows:

*Condition Class 1*. For the most part, fire regimes in this Fire Condition Class are within historical ranges. Vegetation composition and structure are intact. Thus, the risk of losing key ecosystem components from the occurrence of fire remains relatively low.

*Condition Class 2*. Fire regimes on these lands have been moderately altered from their historical range by either increased or decreased fire frequency. A moderate risk of losing key ecosystem components has been identified on these lands.

*Condition Class 3*. Fire regimes on these lands have been significantly altered from their historical return interval. The risk of losing key ecosystem components from fire is high. Fire frequencies have departed from historical ranges by multiple return intervals. Vegetation composition, structure and diversity have been significantly altered. Consequently, these lands verge on the greatest risk of ecological collapse. (Cohesive Strategy 2002, in draft)

*Contain a Fire*: A fuel break around the fire has been completed. This break may include natural barriers or manually and/or mechanically constructed line.

*Control a Fire*: The complete extinguishment of a fire, including spot fires. Fireline has been strengthened so that flare-ups from within the perimeter of the fire will not break through this line.

*Control Line:* All built or natural fire barriers and treated fire edge used to control a fire.

*Cooperating Agency:* An agency supplying assistance other than direct suppression, rescue, support, or service functions to the incident control effort; e.g., Red Cross, law enforcement agency, telephone company, etc.

*Coyote Tactics:* A progressive line construction duty involving self-sufficient crews that build fire line until the end of the operational period, remain at or near the point while off duty, and begin building fire line again the next operational period where they left off.

*Creeping Fire:* Fire burning with a low flame length and spreading slowly.

*Crew Boss:* A person in supervisory charge of usually 16 to 21 firefighters and responsible for their performance, safety, and welfare.

*Critical Ignition Zones:* Those areas that are likely to be key in the formation of large wildfires if ignition occurs at that location. These include locations such as at the bottom of a hill, or in fuels that will ignite easily and sustain growth of fire with increasing flame lengths and fire intensity.

*Crown Fire (Crowning):* The movement of fire through the crowns of trees or shrubs more or less independently of the surface fire.

*Curing:* Drying and browning of herbaceous vegetation or slash.

## D

*Dead Fuels:* Fuels with no living tissue in which moisture content is governed almost entirely by atmospheric moisture (relative humidity and precipitation), dry-bulb temperature, and solar radiation.

*Debris Burning:* A fire spreading from any fire originally set for the purpose of clearing land or for rubbish, garbage, range, stubble, or meadow burning.

*Defensible Space:* An area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and the loss to life, property, or resources. In practice, “defensible space” is defined as an area a minimum of 30 feet around a structure that is cleared of flammable brush or vegetation.

*Deployment:* See Fire Shelter Deployment.

*Detection:* The act or system of discovering and locating fires.

*Direct Attack:* Any treatment of burning fuel, such as by wetting, smothering, or chemically quenching the fire or by physically separating burning from unburned fuel.

*Dispatch:* The implementation of a command decision to move a resource or resources from one place to another.

*Dispatcher:* A person employed who receives reports of discovery and status of fires, confirms their locations, takes action promptly to provide people and equipment likely to be needed for control in first attack, and sends them to the proper place.

*Dispatch Center:* A facility from which resources are directly assigned to an incident.

*Division:* Divisions are used to divide an incident into geographical areas of operation. Divisions are established when the number of resources exceeds the span-of-control of the operations chief. A division is located with the Incident Command System organization between the branch and the task force/strike team.

*Dozer:* Any tracked vehicle with a front-mounted blade used for exposing mineral soil.

*Dozer Line:* Fire line constructed by the front blade of a dozer.

*Drip Torch:* Hand-held device for igniting fires by dripping flaming liquid fuel on the materials to be burned; consists of a fuel fount, burner arm, and igniter. Fuel used is generally a mixture of diesel and gasoline.

*Drop Zone:* Target area for air tankers, helitankers, and cargo dropping.

*Drought Index:* A number representing net effect of evaporation, transpiration, and precipitation in producing cumulative moisture depletion in deep duff or upper soil layers.

*Dry Lightning Storm:* Thunderstorm in which negligible precipitation reaches the ground. Also called a dry storm.

*Duff:* The layer of decomposing organic materials lying below the litter layer of freshly fallen twigs, needles, and leaves and immediately above the mineral soil.

## E

*Ecosystem:* A spatially explicit, relative homogeneous unit of the Earth that includes all interacting organisms and components of any part of the natural environment within its boundaries. An ecosystem can be of any size, e.g., a log, pond, field, forest, or the Earth's biosphere (Society of American Foresters, 1998).

*Ecosystem Integrity:* The completeness of an ecosystem that at geographic and temporal scales maintains its characteristics diversity of biological and physical components, composition, structure, and function (Cohesive Strategy, 2000).

*Energy Release Component (ERC):* The computed total heat released per unit area (British thermal units per square foot) within the fire front at the head of a moving fire.

*Engine:* Any ground vehicle providing specified levels of pumping, water and hose capacity.

*Engine Crew:* Firefighters assigned to an engine. The *Fireline Handbook* defines the minimum crew makeup by engine type.

*Entrapment:* A situation where personnel are unexpectedly caught in a fire behavior-related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or compromised. An entrapment may or may not include deployment of a fire shelter for its intended purpose. These situations may or may not result in injury. They include "near misses."

*Environmental Assessment (EA):* EAs were authorized by the National Environmental Policy Act (NEPA) of 1969. They are concise, analytical documents prepared with public participation that determine if an

Environmental Impact Statement (EIS) is needed for a particular project or action. If an EA determines an EIS is not needed, the EA becomes the document allowing agency compliance with NEPA requirements.

*Environmental Impact Statement (EIS):* EISs were authorized by the National Environmental Policy Act (NEPA) of 1969. Prepared with public participation, they assist decision makers by providing information, analysis and an array of action alternatives, allowing managers to see the probable effects of decisions on the environment. Generally, EISs are written for large-scale actions or geographical areas.

*Equilibrium Moisture Content:* Moisture content that a fuel particle will attain if exposed for an infinite period in an environment of specified constant temperature and humidity. When a fuel particle reaches equilibrium moisture content, net exchange of moisture between it and the environment is zero.

*Escape Route:* A preplanned and understood route firefighters take to move to a safety zone or other low-risk area, such as an already burned area, previously constructed safety area, a meadow that won't burn, natural rocky area that is large enough to take refuge without being burned. When escape routes deviate from a defined physical path, they should be clearly marked (flagged).

*Escaped Fire:* A fire that has exceeded or is expected to exceed initial attack capabilities or prescription.

*Extended Attack Incident:* A wildland fire that has not been contained or controlled by initial attack forces and for which more firefighting resources are arriving, en route, or being ordered by the initial attack incident commander.

*Extreme Fire Behavior:* "Extreme" implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.

## F

*Faller:* A person who fells trees. Also called a sawyer or cutter.

*Field Observer:* Person responsible to the Situation Unit Leader for collecting and reporting information about an incident obtained from personal observations and interviews.

*Fine (Light) Fuels:* Fast-drying fuels, generally with a comparatively high surface area-to-volume ratio, which are less than 1/4-inch in diameter and have a timelag of one hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.

*Fingers of a Fire:* The long narrow extensions of a fire projecting from the main body.

*Fire Behavior:* The manner in which a fire reacts to the influences of fuel, weather and topography.

*Fire Behavior Forecast:* Prediction of probable fire behavior, usually prepared by a Fire Behavior Officer, in support of fire suppression or prescribed burning operations.

*Fire Behavior Specialist:* A person responsible to the Planning Section Chief for establishing a weather data collection system and for developing fire behavior predictions based on fire history, fuel, weather and topography.

*Firebreak:* A natural or constructed barrier used to stop or check fires that may occur or to provide a control line from which to work.

*Fire Cache:* A supply of fire tools and equipment assembled in planned quantities or standard units at a strategic point for exclusive use in fire suppression.

*Fire Crew:* An organized group of firefighters under the leadership of a crew leader or other designated official.

*Fire Defense System:* The cumulative effect of the fire suppression system of a community, including fuels reduction programs, fire breaks, defensible space, and the response capabilities of emergency personnel.

*Fire Frequency:* The natural return interval for a particular ecosystem.

*Fire Front:* The part of a fire within which continuous flaming combustion is taking place. Unless otherwise specified the fire front is assumed to be the leading edge of the fire perimeter. In ground fires, the fire front may be mainly smoldering combustion.

*Fire Hazard Reduction Zone:* Home ignition zone area, where fuel reduction and home fire resistant projects should take place to reduce the risk of a wildfire damaging a structure.

*Fire Intensity:* A general term relating to the heat energy released by a fire.

*Fire Line:* A linear fire barrier that is scraped or dug to mineral soil.

*Fire Load:* The number and size of fires historically experienced on a specified unit over a specified period (usually one day) at a specified index of fire danger.

*Fire Management Plan (FMP):* A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land use plan. The plan is supplemented by operational plans such as preparedness plans, preplanned dispatch plans, prescribed fire plans, and prevention plans.

*Fire Management Planning:* A generic term referring to all levels and categories of fire management planning, including: preparedness, prevention, hazardous risk assessment, and mitigation planning.

*Fire Perimeter:* The entire outer edge or boundary of a fire.

*Fire-prone ecosystem:* Ecosystems that historically burned intensely at low frequencies (stand replacing fires), those that burned with low intensity at a high frequency (understory fires), and those that burned very infrequently historically, but are not subject to much more frequent fires because of changed conditions. These include fire-influenced and fire-adapted ecosystems (Cohesive Strategy, 2000).



*Fire Regime:* A generalized description of the role fire plays in an ecosystem. It is characterized by fire frequency, predictability, seasonality, intensity, duration, scale (patch size), as well as regularity or variability. Five combinations of fire frequency, expressed as fire return interval in fire severity, are defined:

*Groups I and II* include fire return intervals in the 0–35 year range. Group I includes Ponderosa pine, other long needle pine species, and dry site Douglas fir. Group II includes the drier grassland types, tall grass prairie, and some Pacific chaparral ecosystems.

*Groups III and IV* include fire return intervals in the 35–100+ year range. Group III includes interior dry site shrub communities such as sagebrush and chaparral ecosystems. Group IV includes lodgepole pine and jack pine.

*Group V* is the long interval (infrequent), stand replacement fire regime and includes temperate rain forest, boreal forest, and high elevation conifer species.

*Fire-Return Interval:* The number of years between successive fire events at a specific site or an area of a specified size.

*Fire Risk Reduction Zone:* A zone targeted for risk reduction, including measures such as fuels reduction, access protection, and construction of structures to minimize the risk of ignition from wildfire.

*Fire Season:* (1) Period(s) of the year during which wildland fires are likely to occur, spread, and affect resource values sufficient to warrant organized fire management activities. (2) A legally enacted time during which burning activities are regulated by state or local authority.

*Fire Severity:* The amount of heat that is released by a fire and how it affects other resources. It is dependent on the type of fuels and the behavior of the fuels when they are burned. (see Burn Intensity)

*Fire Shelter:* An aluminized tent offering protection by means of reflecting radiant heat and providing a volume of breathable air in a fire entrapment situation. Fire shelters should only be used in life-threatening situations, as a last resort.

*Fire Shelter Deployment:* The removing of a fire shelter from its case and using it as protection against fire.

*Firestorm:* A fire of great size and intensity that generates and is fed by strong inrushing winds from all sides; the winds add fresh oxygen to the fire, increasing the intensity.

*Fire Triangle:* Instructional aid in which the sides of a triangle are used to represent the three factors (oxygen, heat, fuel) necessary for combustion and flame production; removal of any of the three factors causes flame production to cease.

*Fire Use Module (Prescribed Fire Module):* A team of skilled and mobile personnel dedicated primarily to prescribed fire management. These are national and interagency resources, available throughout the prescribed fire season, that can ignite, hold and monitor prescribed fires.

*Fire Use:* The combination of wildland fire use and prescribed fire application to meet resource objectives.

*Fire Weather:* Weather conditions that influence fire ignition, behavior and suppression.

*Fire Weather Watch:* A term used by fire weather forecasters to notify using agencies, usually 24 to 72 hours ahead of the event, that current and developing meteorological conditions may evolve into dangerous fire weather.

*Fire Whirl:* Spinning vortex column of ascending hot air and gases rising from a fire and carrying aloft smoke, debris, and flame. Fire whirls range in size from less than one foot to more than 500 feet in diameter. Large fire whirls have the intensity of a small tornado.

*Firewise:* A public education program developed by the National Wildland Fire Coordinating Group that assists communities located in proximity to fire-prone lands. (For additional information, see <http://www.firewise.org>)

*Firefighting Resources:* All people and major items of equipment that can or potentially could be assigned to fires.

*Flame Height:* The average maximum vertical extension of flames at the leading edge of the fire front. Occasional flashes that rise above the general level of flames are not considered. This distance is less than the flame length if flames are tilted due to wind or slope.

*Flame Length:* The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface); an indicator of fire intensity.

*Flaming Front:* The zone of a moving fire where the combustion is primarily flaming. Behind this flaming zone, combustion is primarily glowing. Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front. Also called fire front.

*Flanks of a Fire:* The parts of a fire's perimeter that are roughly parallel to the main direction of spread.

*Flare-up:* Any sudden acceleration of fire spread or intensification of a fire. Unlike a blow-up, a flare-up lasts a relatively short time and does not radically change control plans.

*Flash Fuels:* Fuels such as grass, leaves, draped pine needles, fern, tree moss and some kinds of slash, that ignite readily and are consumed rapidly when dry. Also called fine fuels.

*Forb:* A plant with a soft, rather than permanent woody stem, that is not a grass or grass-like plant.

*Fuel:* Combustible material. Includes, vegetation, such as grass, leaves, ground litter, plants, shrubs and trees, that feed a fire. (see Surface Fuels)

*Fuel Bed:* An array of fuels usually constructed with specific loading, depth and particle size to meet experimental requirements; also, commonly used to describe the fuel composition in natural settings.

*Fuel Loading:* The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area.

*Fuel Model:* Simulated fuel complex (or combination of vegetation types) for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified.

*Fuel Moisture (Fuel Moisture Content):* The quantity of moisture in fuel expressed as a percentage of the weight when thoroughly dried at 212 degrees Fahrenheit.

*Fuel Reduction:* Manipulation, including combustion, or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control. Incorporated within this are treatments to protect, maintain, and restore land health and desired fire cycles.

*Fuel Type:* An identifiable association of fuel elements of a distinctive plant species, form, size, arrangement, or other characteristics that will cause a predictable rate of fire spread or difficulty of control under specified weather conditions.

*Fusee:* A colored flare designed as a railway-warning device and widely used to ignite suppression and prescription fires.

## G

*General Staff:* The group of incident management personnel reporting to the incident commander. They may each have a deputy, as needed. Staff consists of operations section chief, planning section chief, logistics section chief, and finance/administration section chief.

*Geographic Area:* A political boundary designated by the wildland fire protection agencies, where these agencies work together in the coordination and effective utilization of firefighting resources.

*Ground Fuel:* All combustible materials below the surface litter, including duff, tree or shrub roots, dried out dead wood, peat, and sawdust that normally support a glowing combustion without flame.

## H

*Haines Index:* An atmospheric index used to indicate the potential for wildfire growth by measuring the stability and dryness of the air over a fire.

*Hand Line:* A fire line built with hand tools.

*Hazard Reduction:* Any treatment of a hazard that reduces the threat of ignition and fire intensity or rate of spread.

*Hazardous Fuels Reduction:* “Fuel Reduction” is defined as the manipulation or removal of fuels, including combustion, to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control. Incorporated within this are treatments to protect, maintain, and restore land health and desired fire cycles. “Hazard Reduction” is defined as any treatment of a hazard that reduces the threat of ignition and fire intensity or rate of spread.

*Head of a Fire:* The side of the fire having the fastest rate of spread.

*Heavy Fuels:* Fuels of large diameter such as snags, logs, large limb wood, that ignite and are consumed more slowly than flash fuels.

*Helibase:* The main location within the general incident area for parking, fueling, maintaining, and loading helicopters. The helibase is usually located at or near the incident base.

*Helispot:* A temporary landing spot for helicopters.

*Helitack*: The use of helicopters to transport crews, equipment, and fire retardants or suppressants to the fire line during the initial stages of a fire.

*Helitack Crew*: A group of firefighters trained in the technical and logistical use of helicopters for fire suppression.

*Holding Actions*: Planned actions required to achieve wildland prescribed fire management objectives. These actions have specific implementation timeframes for fire use actions but can have less sensitive implementation demands for suppression actions.

*Holding Resources*: Firefighting personnel and equipment assigned to do all required fire suppression work following fire line construction but generally not including extensive mop-up.

*Home Ignitability*: The ignition potential within the Home Ignition Zone.

*Home Ignition Zone*: The home and its immediate surroundings. The home ignition zone includes the home and all ignitable materials up to 200 feet from the foundation.

*Hose Lay*: Arrangement of connected lengths of fire hose and accessories on the ground, beginning at the first pumping unit and ending at the point of water delivery.

*Hotshot Crew*: A highly trained fire crew used mainly to build fire lines by hand.

*Hotspot*: A particular active part of a fire.

*Hotspotting*: Reducing or stopping the spread of fire at points of particularly rapid rate of spread or special threat, generally the first step in prompt control, with emphasis on first priorities.

## I

*Incendiary*: Causing or capable of causing fire.

*Incident*: A human-caused or natural occurrence, such as wildland fire, that requires emergency service action to prevent or reduce the loss of life or damage to property or natural resources.

*Incident Action Plan (IAP)*: Contains objectives reflecting the overall incident strategy and specific tactical actions and supporting information for the next operational period. The plan may be oral or written. When written, the plan may have a number of attachments, including: incident objectives, organization assignment list, division assignment, incident radio communication plan, medical plan, traffic plan, safety plan, and incident map.

*Incident Command Post (ICP)*: Location at which primary command functions are executed. The ICP may be co-located with the incident base or other incident facilities.

*Incident Command System (ICS)*: The combination of facilities, equipment, personnel, procedure and communications operating within a common organizational structure, with responsibility for the management of assigned resources to effectively accomplish stated objectives pertaining to an incident.

*Incident Commander*: Individual responsible for the management of all incident operations at the incident site.

*Incident Management Team:* The incident commander and appropriate general or command staff personnel assigned to manage an incident.

*Incident Objectives:* Statements of guidance and direction necessary for selection of appropriate strategy(ies), and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed.

*Indigenous Knowledge:* Knowledge of a particular region or environment from an individual or group that lives in that particular region or environment, e.g., traditional ecological knowledge of American Indians (FS National Resource Book on American Indian and Alaskan Native Relations, 1997).

*Infrared Detection:* The use of heat sensing equipment, known as Infrared Scanners, for detection of heat sources that are not visually detectable by the normal surveillance methods of either ground or air patrols.

*Initial Attack:* The actions taken by the first resources to arrive at a wildfire to protect lives and property, and prevent further extension of the fire.

## J

*Job Hazard Analysis:* This analysis of a project is completed by staff to identify hazards to employees and the public. It identifies hazards, corrective actions and the required safety equipment to ensure public and employee safety.

*Jump Spot:* Selected landing area for smokejumpers.

*Jump Suit:* Approved protection suite work by smokejumpers.

## K

*Keech Byram Drought Index (KBDI):* Commonly used drought index adapted for fire management applications, with a numerical range from 0 (no moisture deficiency) to 800 (maximum drought).

*Knock Down:* To reduce the flame or heat on the more vigorously burning parts of a fire edge.

## L

*Ladder Fuels:* Fuels that provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. They help initiate and assure the continuation of crowning.

*Large Fire:* (1) For statistical purposes, a fire burning more than a specified area of land, for example, 300 acres. (2) A fire burning with a size and intensity such that its behavior is determined by interaction between its own convection column and weather conditions above the surface.

*Lead Plane:* Aircraft with pilot used to make dry runs over the target area to check wing and smoke conditions and topography and to lead air tankers to targets and supervise their drops.

*Light (Fine) Fuels:* Fast-drying fuels, generally with a comparatively high surface area-to-volume ratio, which are less than 1/4-inch in diameter and have a timelag of one hour or less. These fuels readily ignite and are rapidly consumed by fire when dry.



*Lightning Activity Level (LAL):* A number on a scale of 1 to 6 that reflects frequency and character of cloud-to-ground lightning. The scale is exponential, based on powers of 2 (i.e., LAL 3 indicates twice the lightning of LAL 2).

*Line Scout:* A firefighter who determines the location of a fire line.

*Litter:* Top layer of the forest, scrubland, or grassland floor, directly above the fermentation layer, composed of loose debris of dead sticks, branches, twigs, and recently fallen leaves or needles, little altered in structure by decomposition.

*Live Fuels:* Living plants, such as trees, grasses, and shrubs, in which the seasonal moisture content cycle is controlled largely by internal physiological mechanisms, rather than by external weather influences.

## M

*Micro-Remote Environmental Monitoring System (Micro-REMS):* Mobile weather monitoring station. A Micro-REMS usually accompanies an incident meteorologist and ATMU to an incident.

*Mineral Soil:* Soil layers below the predominantly organic horizons; soil with little combustible material.

*Mobilization:* The process and procedures used by all organizations, federal, state and local for activating, assembling, and transporting all resources that have been requested to respond to or support an incident.

*Modular Airborne Firefighting System (MAFFS):* A manufactured unit consisting of five interconnecting tanks, a control pallet, and a nozzle pallet, with a capacity of 3,000 gallons, designed to be rapidly mounted inside an unmodified C-130 (Hercules) cargo aircraft for use in dropping retardant on wildland fires.

*Mop-up:* To make a fire safe or reduce residual smoke after the fire has been controlled by extinguishing or removing burning material along or near the control line, felling snags, or moving logs so they won't roll downhill.

*Multiagency Coordination (MAC):* A generalized term that describes the functions and activities of representatives of involved agencies and/or jurisdictions who come together to make decisions regarding the prioritizing of incidents and the sharing and use of critical resources. The MAC organization is not a part of the on-scene ICS and is not involved in developing incident strategy or tactics.

*Mutual Aid Agreement:* Written agreement between agencies and/or jurisdictions in which they agree to assist one another upon request, by furnishing personnel and equipment.

## N

*National Environmental Policy Act (NEPA):* NEPA is the basic national law for protection of the environment, passed by Congress in 1969. It sets policy and procedures for environmental protection, and authorizes Environmental Impact Statements and Environmental Assessments to be used as analytical tools to help federal managers make decisions.

*National Fire Danger Rating System (NFDRS):* A uniform fire danger rating system that focuses on the environmental factors that control the moisture content of fuels.

*National Wildfire Coordinating Group (NWCG)*: A group formed under the direction of the Secretaries of Agriculture and the Interior and comprised of representatives of the US Forest Service, Bureau of Land Management, Bureau of Indian Affairs, National Park Service, US Fish and Wildlife Service, and Association of State Foresters. The group's purpose is to facilitate coordination and effectiveness of wildland fire activities and provide a forum to discuss, recommend action, or resolve issues and problems of substantive nature. NWCG is the certifying body for all courses in the National Fire Curriculum.

*Nomex*: Trade name for a fire-resistant synthetic material used in the manufacturing of flight suits and pants and shirts used by firefighters. (see Aramid)

*Normal Fire Season*: (1) A season when weather, fire danger, and number and distribution of fires are about average. (2) Period of the year that normally comprises the fire season.

## O

*Operations Branch Director*: Person under the direction of the operations section chief who is responsible for implementing that portion of the incident action plan appropriate to the branch.

*Operational Period*: The period of time scheduled for execution of a given set of tactical actions as specified in the Incident Action Plan. Operational periods can be of various lengths, although usually not more than 24 hours.

*Overhead*: People assigned to supervisory positions, including incident commanders, command staff, general staff, directors, supervisors, and unit leaders.

## P

*Pack Test*: Used to determine the aerobic capacity of fire suppression and support personnel and assign physical fitness scores. The test consists of walking a specified distance, with or without a weighted pack, in a predetermined period of time, with altitude corrections.

*Paracargo*: Anything dropped, or intended for dropping, from an aircraft by parachute, by other retarding devices, or by free fall.

*Peak Fire Season*: That period of the fire season during which fires are expected to ignite most readily, to burn with greater than average intensity, and to create damages at an unacceptable level.

*Performance Measures*: A quantitative or qualitative characterization of performance (Government Performance and Results Act of 1993).

*Personal Protective Equipment (PPE)*: All firefighting personnel must be equipped with proper equipment and clothing in order to mitigate the risk of injury from, or exposure to, hazardous conditions encountered while working. PPE includes, but is not limited to, 8-inch-high laced leather boots with lug soles, fire shelter, hard hat with chin strap, goggles, ear plugs, aramid shirts and trousers, leather gloves, and individual first aid kits.

*Preparedness*: Condition or degree of being ready to cope with a potential fire situation.

*Prescribed Fire:* Any fire ignited by management actions under certain, predetermined conditions to meet specific objectives related to hazardous fuels or habitat improvement. A written, approved prescribed fire plan must exist, and NEPA requirements must be met, prior to ignition.

*Prescribed Fire Plan (Burn Plan):* This document provides the prescribed fire burn boss information needed to implement an individual prescribed fire project.

*Prescription:* Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social, or legal considerations.

*Prevention:* Activities directed at reducing the incidence of fires, including public education, law enforcement, personal contact, and reduction of fuel hazards.

*Project Fire:* A fire of such size or complexity that a large organization and prolonged activity is required to suppress it.

*Pulaski:* A combination chopping and trenching tool, which combines a single-bitted axe-blade with a narrow adze-like trenching blade fitted to a straight handle. Useful for grubbing or trenching in duff and matted roots. Well-balanced for chopping.

## R

*Radiant Burn:* A burn received from a radiant heat source.

*Radiant Heat Flux:* The amount of heat flowing through a given area in a given time, usually expressed as calories/square centimeter/second.

*Rappelling:* Technique of landing specifically trained firefighters from hovering helicopters; involves sliding down ropes with the aid of friction-producing devices.

*Rate of Spread:* The relative activity of a fire in extending its horizontal dimensions. It is expressed as a rate of increase of the total perimeter of the fire, as rate of forward spread of the fire front, or as rate of increase in area, depending on the intended use of the information. Usually it is expressed in chains or acres per hour for a specific period in the fire's history.

*Reburn:* The burning of an area that has been previously burned but that contains flammable fuel that ignites when burning conditions are more favorable; an area that has reburned.

*Red Card:* Fire qualification card issued to fire rated persons showing their training needs and their qualifications to fill specified fire suppression and support positions in a large fire suppression or incident organization.

*Red Flag Warning:* Term used by fire weather forecasters to alert forecast users to an ongoing or imminent critical fire weather pattern.

*Rehabilitation:* The activities necessary to repair damage or disturbance caused by wildland fires or the fire suppression activity.

*Relative Humidity (Rh)*: The ratio of the amount of moisture in the air, to the maximum amount of moisture that air would contain if it were saturated. The ratio of the actual vapor pressure to the saturated vapor pressure.

*Remote Automatic Weather Station (RAWS)*: An apparatus that automatically acquires, processes, and stores local weather data for later transmission to the GOES Satellite, from which the data is re-transmitted to an earth-receiving station for use in the National Fire Danger Rating System.

*Resiliency*: The capacity of an ecosystem to maintain or regain normal function and development following disturbance (Society of American Foresters, 1998).

*Resources*: (1) Personnel, equipment, services and supplies available, or potentially available, for assignment to incidents. (2) The natural resources of an area, such as timber, grass, watershed values, recreation values, and wildlife habitat.

*Resource Management Plan (RMP)*: A document prepared by field office staff with public participation and approved by field office managers that provides general guidance and direction for land management activities at a field office. The RMP identifies the need for fire in a particular area and for a specific benefit.

*Resource Order*: An order placed for firefighting or support resources.

*Response Time*: The amount of time it takes from when a request for help is received by the emergency dispatch system until emergency personnel arrive at the scene.

*Retardant*: A substance or chemical agent that reduces the flammability of combustibles.

*Restoration*: The active or passive management of an ecosystem or habitat toward its original structure, natural compliment of species, and natural functions or ecological processes (Cohesive Strategy, 2000).

*Run (of a fire)*: The rapid advance of the head of a fire with a marked change in fire line intensity and rate of spread from that noted before and after the advance.

*Running*: A rapidly spreading surface fire with a well-defined head.

*Rural Fire Assistance*: The Department of the Interior Rural Fire Assistance program is a multi-million dollar program to enhance the fire protection capabilities of rural fire districts. The program will assist with training, equipment purchase, and prevention activities, on a cost-share basis.

## **S**

*Safety Zone*: An area cleared of flammable materials used for escape in the event the line is outflanked or in case a spot fire causes fuels outside the control line to render the line unsafe. In firing operations, crews progress so as to maintain a safety zone close at hand allowing the fuels inside the control line to be consumed before going ahead. Safety zones may also be constructed as integral parts of fuel breaks; they are greatly enlarged areas, which can be used with relative safety by firefighters and their equipment in the event of a blow-up in the vicinity.

*Scratch Line*: An unfinished preliminary fire line hastily established or built as an emergency measure to check the spread of fire.

*Severe Wildland Fire (catastrophic wildfire):* Fire that burns more intensely than the natural or historical range of variability, thereby fundamentally changing the ecosystem, destroying communities and / or rare or threatened species /habitat, or causing unacceptable erosion (GAO / T-RCED-99-79) (Society of American Foresters, 1998).

*Severity Funding:* Funds provided to increase wildland fire suppression response capability necessitated by abnormal weather patterns, extended drought, or other events causing abnormal increase in the fire potential and/or danger.

*Single Resource:* An individual, a piece of equipment and its personnel complement, or a crew or team of individuals with an identified work supervisor that can be used on an incident.

*Size-up:* To evaluate a fire to determine a course of action for fire suppression.

*Slash:* Debris left after logging, pruning, thinning or brush cutting; includes logs, chips, bark, branches, stumps and broken understory trees or brush.

*Sling Load:* Any cargo carried beneath a helicopter and attached by a lead line and swivel.

*Slop-over:* A fire edge that crosses a control line or natural barrier intended to contain the fire.

*Slurry:* A mixture typically of water, red clay, and fertilizer dropped from air tankers for fire suppression.

*Smokejumper:* A firefighter who travels to fires by aircraft and parachute.

*Smoke Management:* Application of fire intensities and meteorological processes to minimize degradation of air quality during prescribed fires.

*Smoldering Fire:* A fire burning without flame and barely spreading.

*Snag:* A standing dead tree or part of a dead tree from which at least the smaller branches have fallen.

*Spark Arrester:* A device installed in a chimney, flue, or exhaust pipe to stop the emission of sparks and burning fragments.

*Spot Fire:* A fire ignited outside the perimeter of the main fire by flying sparks or embers.

*Spot Weather Forecast:* A special forecast issued to fit the time, topography, and weather of each specific fire. These forecasts are issued upon request of the user agency and are more detailed, timely, and specific than zone forecasts.

*Spotter:* In smokejumping, the person responsible for selecting drop targets and supervising all aspects of dropping smokejumpers.

*Spotting:* Behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire.

*Staging Area:* Locations set up at an incident where resources can be placed while awaiting a tactical assignment on a three-minute available basis. Staging areas are managed by the operations section.

*Strategy:* The science and art of command as applied to the overall planning and conduct of an incident.



*Strike Team:* Specified combinations of the same kind and type of resources, with common communications, and a leader.

*Strike Team Leader:* Person responsible to a division/group supervisor for performing tactical assignments given to the strike team.

*Structure Fire:* Fire originating in and burning any part or all of any building, shelter, or other structure.

*Suppressant:* An agent, such as water or foam, used to extinguish the flaming and glowing phases of combustion when direction applied to burning fuels.

*Suppression:* All the work of extinguishing or containing a fire, beginning with its discovery.

*Surface Fuels:* Loose surface litter on the soil surface, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches that have not yet decayed enough to lose their identity; also grasses, forbs, low and medium shrubs, tree seedlings, heavier branchwood, downed logs, and stumps interspersed with or partially replacing the litter.

*Swamper:* (1) A worker who assists fallers and/or sawyers by clearing away brush, limbs and small trees. Carries fuel, oil and tools and watches for dangerous situations. (2) A worker on a dozer crew who pulls winch line, helps maintain equipment, etc., to speed suppression work on a fire.

## T

*Tactics:* Deploying and directing resources on an incident to accomplish the objectives designated by strategy.

*Tanker:* Either a tank truck used to deliver water from a water source to the scene of a fire, or a fixed wing aircraft used for fire suppression by dropping slurry on the flank or head of a fire.

*Temporary Flight Restrictions (TFR):* A restriction requested by an agency and put into effect by the Federal Aviation Administration in the vicinity of an incident that restricts the operation of nonessential aircraft in the airspace around that incident.

*Terra Torch:* Device for throwing a stream of flaming liquid, used to facilitate rapid ignition during burn out operations on a wildland fire or during a prescribed fire operation.

*Test Fire:* A small fire ignited within the planned burn unit to determine the characteristic of the prescribed fire, such as fire behavior, detection performance and control measures.

*Timelag:* Time needed under specified conditions for a fuel particle to lose about 63 percent of the difference between its initial moisture content and its equilibrium moisture content. If conditions remain unchanged, a fuel will reach 95 percent of its equilibrium moisture content after four timelag periods.

*Torching:* The ignition and flare-up of a tree or small group of trees, usually from bottom to top.

*Two-way Radio:* Radio equipment with transmitters in mobile units on the same frequency as the base station, permitting conversation in two directions using the same frequency in turn.

*Type*: The capability of a firefighting resource in comparison to another type. Type 1 usually means a greater capability due to power, size, or capacity.

## U

*Uncontrolled Fire*: Any fire that threatens to destroy life, property, or natural resources and (a) is not burning within the confines of firebreaks or (b) is burning with such intensity that it could not be readily extinguished with ordinary tools commonly available [Parts a and b of definition added from the National Wildfire Coordinating Group's *Glossary of Wildland Fire Terminology*, <http://www.nwccg.gov/pms/pubs/glossary>]. (see Wildfire)

*Underburn*: A fire that consumes surface fuels but not trees or shrubs. (see Surface Fuels)

*Unplanned and Unwanted Wildland Fires*: An unplanned and unwanted fire is one burning outside the parameters as defined in land use plans and fire management plans for that location (including areas where the fire can be expected to spread) under current and expected conditions. Unplanned and unwanted fires include fires burning in areas where fire is specifically excluded; fires that exhibit burning characteristics (intensity, frequency, and seasonality) that are outside prescribed ranges, specifically including fires expected to produce severe fire effects; unauthorized human caused fires (arson, escaped camp fires, equipment fires, etc.); and fires that occur during high fire dangers, or resource shortage, where the resources needed to manage the fire are needed for more critical fire management needs. Unplanned is not the same as unscheduled. The time of a lightning fire ignition is not known; however, a lightning-caused fire could still be used to meet fuels and ecosystem management objectives if that type of fire is expected to burn within the parameters of an approved plan; the fire is burning within the parameters for the area; is not causing, or has the potential to cause, unacceptable effects; and funding and resources to manage the fire are available.

## V

*Vectors*: Directions of fire spread as related to rate of spread calculations (in degrees from upslope).

*Volunteer Fire Department (VFD)*: A fire department of which some or all members are unpaid.

## W

*Water Tender*: A ground vehicle capable of transporting specified quantities of water.

*Weather Information and Management System (WIMS)*: An interactive computer system designed to accommodate the weather information needs of all federal and state natural resource management agencies. Provides timely access to weather forecasts, current and historical weather data, the National Fire Danger Rating System (NFDRS), and the National Interagency Fire Management Integrated Database (NIFMID).

*Wet Line*: A line of water, or water and chemical retardant, sprayed along the ground, that serves as a temporary control line from which to ignite or stop a low-intensity fire.

*Wildfire*: An unplanned, unwanted wildland fire including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fire where the objective is to put the fire out [definition added from the National Wildfire Coordinating Group's *Glossary of Wildland Fire Terminology*, <http://www.nwccg.gov/pms/pubs/glossary>]. (see Uncontrolled Fire; Wildland Fire)

*Wildland*: Wildland is an area of land where plants and animals exist free of human interference. Ecologists assert that wildlands promote biodiversity, that they preserve historic genetic traits and that they provide habitat for wild flora and fauna [definition added from Wikipedia, <http://en.wikipedia.org/wiki/Wildland>].

*Wildland Fire*: Any nonstructure fire, other than prescribed fire, that occurs in the wildland.

*Wildland Fire Implementation Plan (WFIP)*: A progressively developed assessment and operational management plan that documents the analysis and selection of strategies and describes the appropriate management response for a wildland fire being managed for resource benefits.

*Wildland Fire Situation Analysis (WFSA)*: A decision-making process that evaluates alternative suppression strategies against selected environmental, social, political, and economic criteria. Provides a record of decisions.

*Wildland Fire Use*: The management of naturally ignited wildland fires to accomplish specific, planned resource management objectives in predefined geographic areas outlined in Fire Management Plans. Wildland fire use is not to be confused with "fire use," which includes prescribed fire.

*Wildland Urban Interface (WUI)*: The line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels (*Glossary of Wildland Fire Terminology*, 1996).

*Wind Vectors*: Wind directions used to calculate fire behavior.

## **APPENDIX A. EDUCATIONAL RESOURCES**

### **A. Information**

#### **Arizona Department of Forestry and Fire Management**

<https://dffm.az.gov/fire/prevention/firewise>

#### **Arizona Interagency Fire Prevention**

<http://wildlandfire.az.gov/>

#### **Fire Adapted Communities**

<https://fireadapted.org/>

#### **Fire Adapted Communities Learning Network**

<https://fireadaptednetwork.org/>

#### **International Association of Fire Chiefs**

<https://www.iafc.org/topics-and-tools/wildland>

#### **National Cohesive Wildland Fire Management Strategy**

<https://www.forestsandrangelands.gov/strategy/thestrategy.shtml>

#### **National Fire Protection Association Firewise USA**

<https://www.nfpa.org/Public-Education/By-topic/Wildfire/Firewise-USA>

#### **Ready - National Public Service Campaign**

<https://www.ready.gov/wildfires>

#### **Southwest Fire Science Consortium**

<http://www.swfireconsortium.org/>

#### **Tamarisk Coalition**

<http://www.tamariskcoalition.org/>

#### **US Fire Administration**

<https://www.usfa.fema.gov/prevention/outreach/wildfire.html>

## **B. Grants**

### **Arizona Department of Forestry and Fire Management**

<https://dffm.az.gov/grants>

### **Federal Emergency Management Agency Hazard Mitigation Grant Program**

<https://www.fema.gov/hazard-mitigation-grant-program>

### **Grant Opportunities**

<http://www.grants.gov>.

### **National Association of State Foresters**

<https://stateforesters.org/current-issues-and-policy/current-issues/appropriations-0>

### **US Fire Administration**

<http://www.usfa.fema.gov/dhtml/inside-usfa/grants.cfm>



## APPENDIX B. INFORMATION DATA SHEET AND CONTACTS

### B.1. CWPP Base Information Data Source

Name	Type	Source	Contact / Web Address
Wildland Fuel Hazards	Feature Class	Logan Simpson Design Inc.	Roy Baker (480) 967-1343; rbaker@logansimpson.com
Wildland-Urban Interface (WUI)	Feature Class	Logan Simpson Design Inc.	Roy Baker (480) 967-1343; rbaker@logansimpson.com
Existing Vegetation Type	Raster	LANDFIRE (2014)	<a href="https://www.landfire.gov/vegetation.php">https://www.landfire.gov/vegetation.php</a>
Land Ownership	Feature Class	Arizona State Land Department	Land Resources Information System Published October 29, 2007 Gary Irish, (602) 542-2605
Structure Data	Feature Class	Pinal County	Pinal County GIS Benjamin Coker, (520) 866-6985
State Ignition History	Feature Class	FAMWEB	<a href="https://fam.nwcg.gov/fam-web/">https://fam.nwcg.gov/fam-web/</a>
Federal Ignition History	Feature Class	Federal Fire Occurrence Website	<a href="https://wildfire.cr.usgs.gov/firehistory/index.html">https://wildfire.cr.usgs.gov/firehistory/index.html</a>
Canopy Cover	Raster	LANDFIRE (2012)	<a href="https://www.landfire.gov/cc.php">https://www.landfire.gov/cc.php</a>
Fire Behavior Fuel Models	Raster	LANDFIRE (2012)	<a href="https://www.landfire.gov/fbfm40.php">https://www.landfire.gov/fbfm40.php</a>
Aspect	Raster	LANDFIRE (2012)	<a href="https://www.landfire.gov/aspect.php">https://www.landfire.gov/aspect.php</a>
Elevation	Raster	LANDFIRE (2012)	<a href="https://www.landfire.gov/elevation.php">https://www.landfire.gov/elevation.php</a>
Slope	Raster	LANDFIRE (2012)	<a href="https://www.landfire.gov/slope.php">https://www.landfire.gov/slope.php</a>
Flame Length	Raster	FlamMap Output (2018)	Roy Baker (480) 967-1343; rbaker@logansimpson.com
Rate of Spread	Raster	FlamMap Output (2018)	Roy Baker (480) 967-1343; rbaker@logansimpson.com

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 Pinal County Office of Emergency Services and at Logan Simpson.

***B.2. Pinal County CWPP Contacts***

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Emergency Manager  
Pinal County Office of Emergency Management  
31 N. Pinal Street, Building F  
Florence, Arizona 85132  
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Chris Bockey  
Project Manager  
Logan Simpson  
51 W. Third Street, Suite 450  
Phoenix, Arizona 85281  
Office: (480) 967-1343  
[cbockey@logansimpson.com](mailto:cbockey@logansimpson.com)

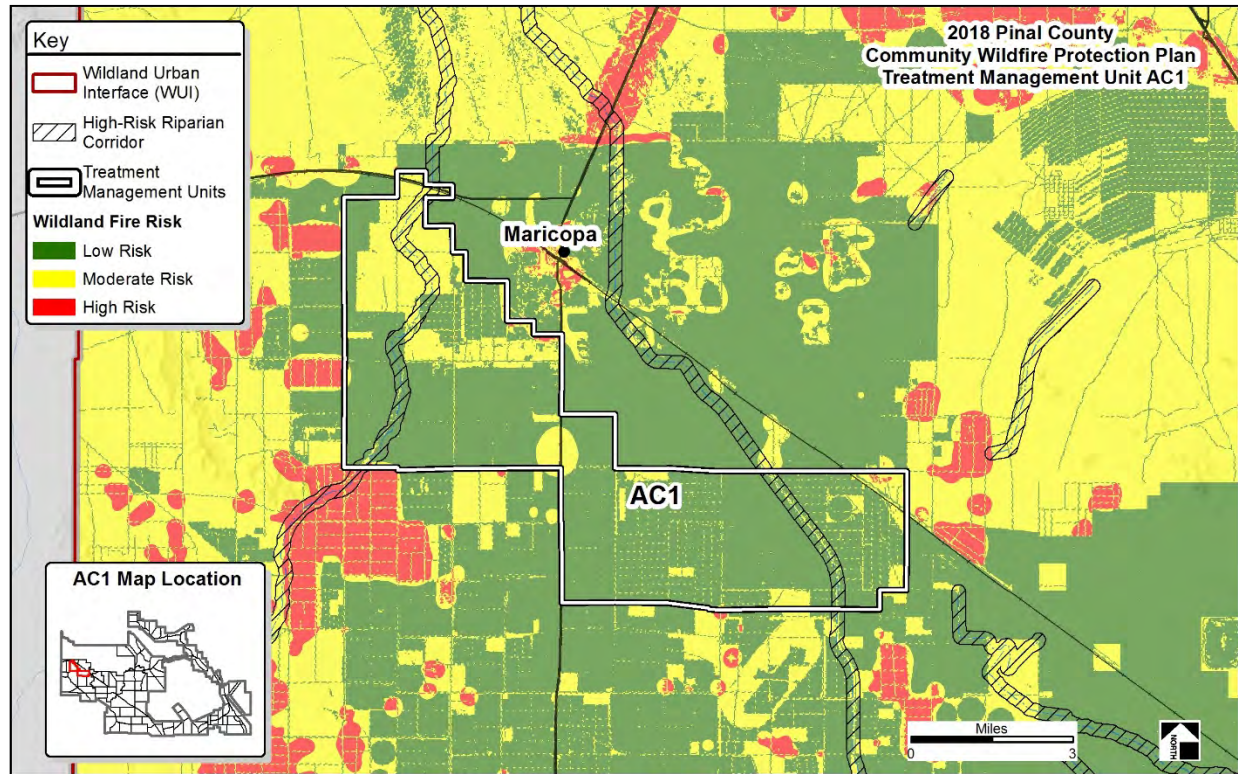
Roy Baker  
GIS Analyst  
Logan Simpson  
51 W. Third Street, Suite 450  
Tempe, Arizona 85281  
Office: (480) 967-1343  
[rbaker@logansimpson.com](mailto:rbaker@logansimpson.com)

**APPENDIX C. TREATMENT MANAGEMENT UNIT DETAIL MAPS**

<b>Ak-Chin Indian Community WUI .....</b>	<b>C-1</b>
<b>Apache Junction WUI .....</b>	<b>C-3</b>
<b>Avra Valley WUI .....</b>	<b>C-7</b>
<b>Casa Grande WUI.....</b>	<b>C-13</b>
<b>Coolidge WUI .....</b>	<b>C-19</b>
<b>Dudleyville WUI.....</b>	<b>C-23</b>
<b>Eloy WUI .....</b>	<b>C-27</b>
<b>Florence WUI.....</b>	<b>C-31</b>
<b>Gila River Indian Community WUI .....</b>	<b>C-35</b>
<b>Gila River Riparian Corridor WUI.....</b>	<b>C-37</b>
<b>Galiuro Mountains WUI .....</b>	<b>C-39</b>
<b>Golder Ranch WUI .....</b>	<b>C-41</b>
<b>Kearny WUI .....</b>	<b>C-47</b>
<b>Maricopa WUI .....</b>	<b>C-51</b>
<b>Mammoth WUI.....</b>	<b>C-59</b>
<b>Oracle WUI .....</b>	<b>C-61</b>
<b>Queen Creek WUI.....</b>	<b>C-65</b>
<b>Queen Valley WUI .....</b>	<b>C-67</b>
<b>San Manuel WUI.....</b>	<b>C-71</b>
<b>Superior WUI.....</b>	<b>C-75</b>
<b>Tohono O’odham Nation WUI .....</b>	<b>C-77</b>
<b>Top-of-the-World WUI.....</b>	<b>C-79</b>

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## AK-CHIN INDIAN COMMUNITY WUI

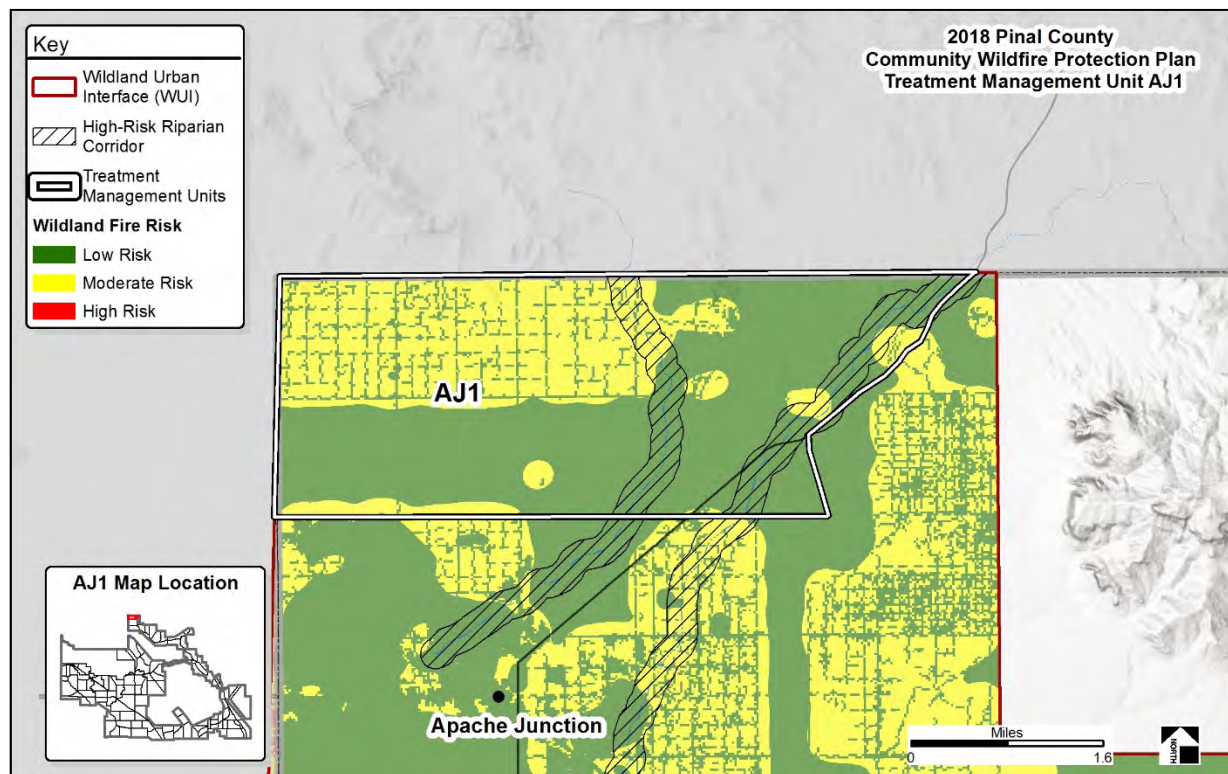


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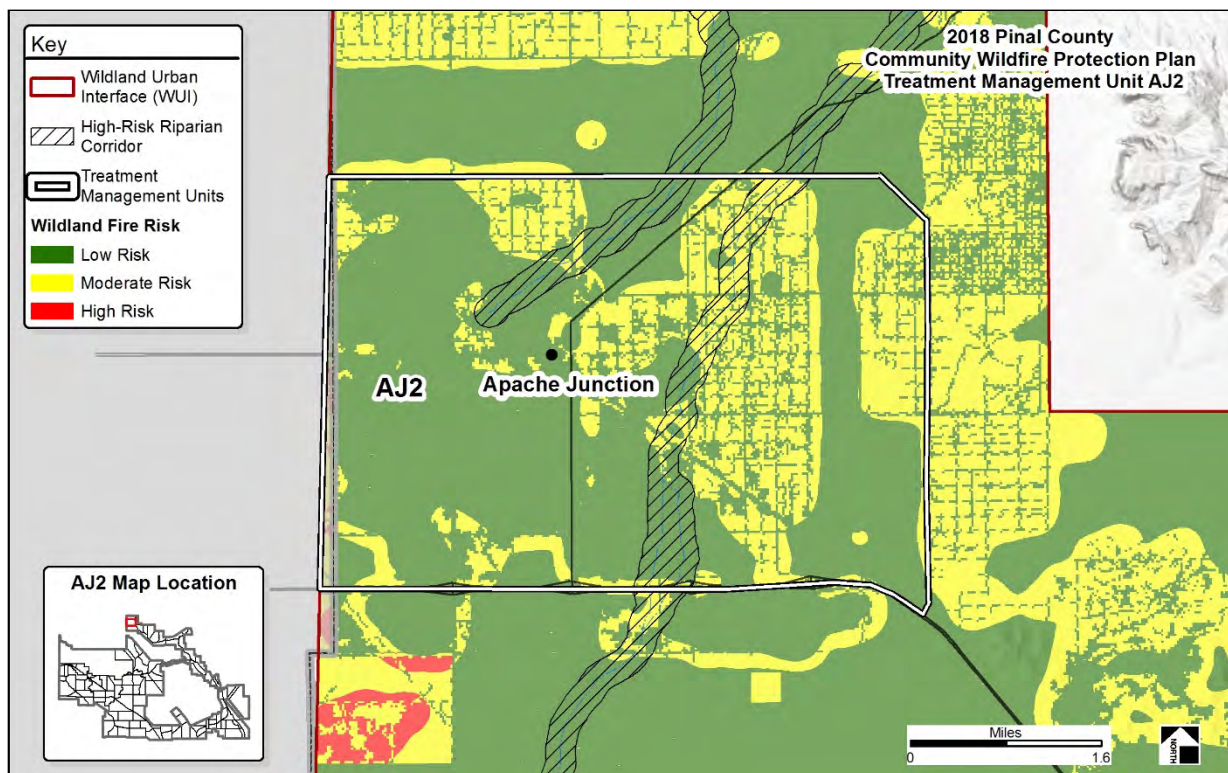
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## APACHE JUNCTION WUI

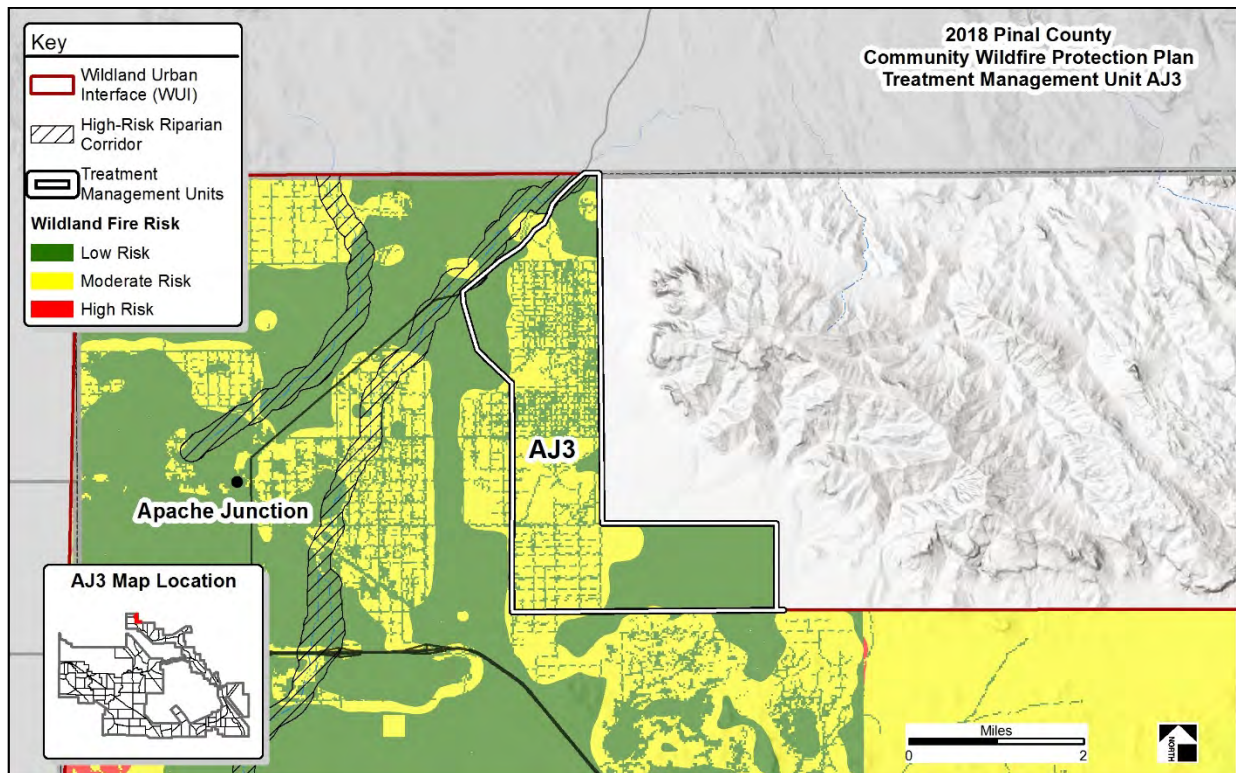


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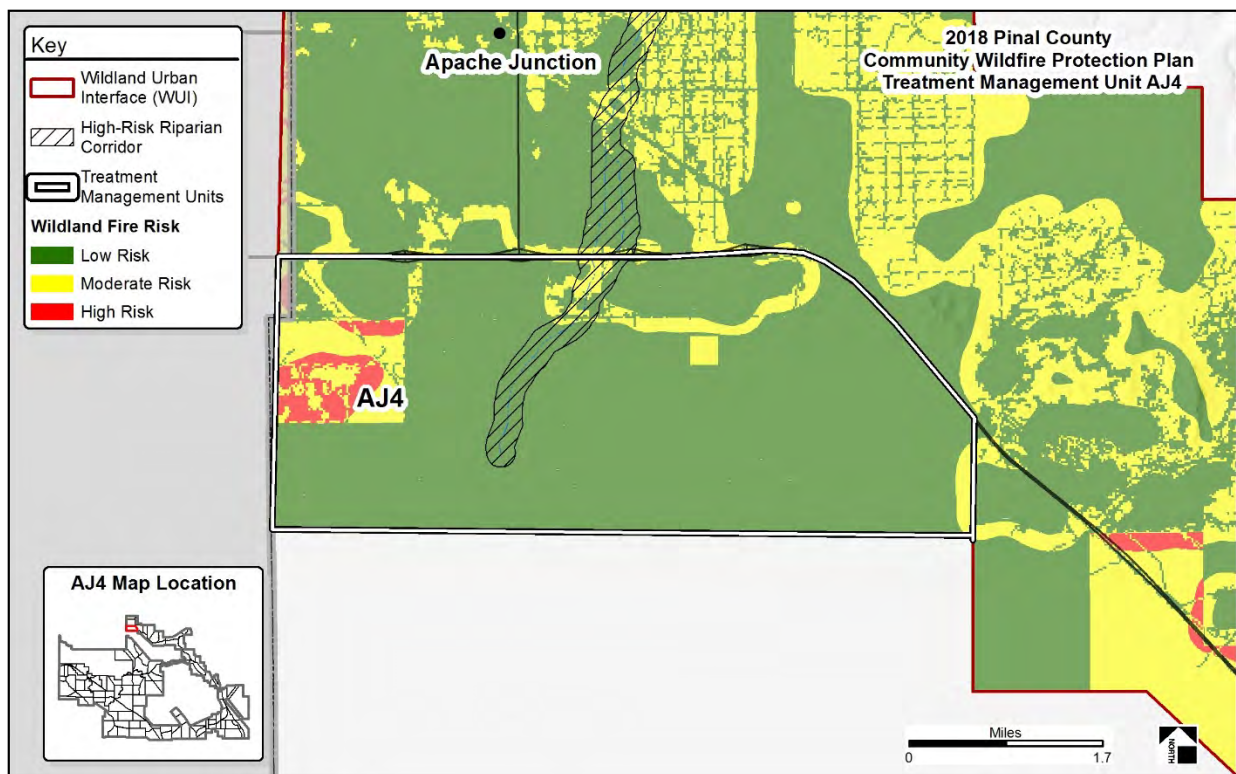


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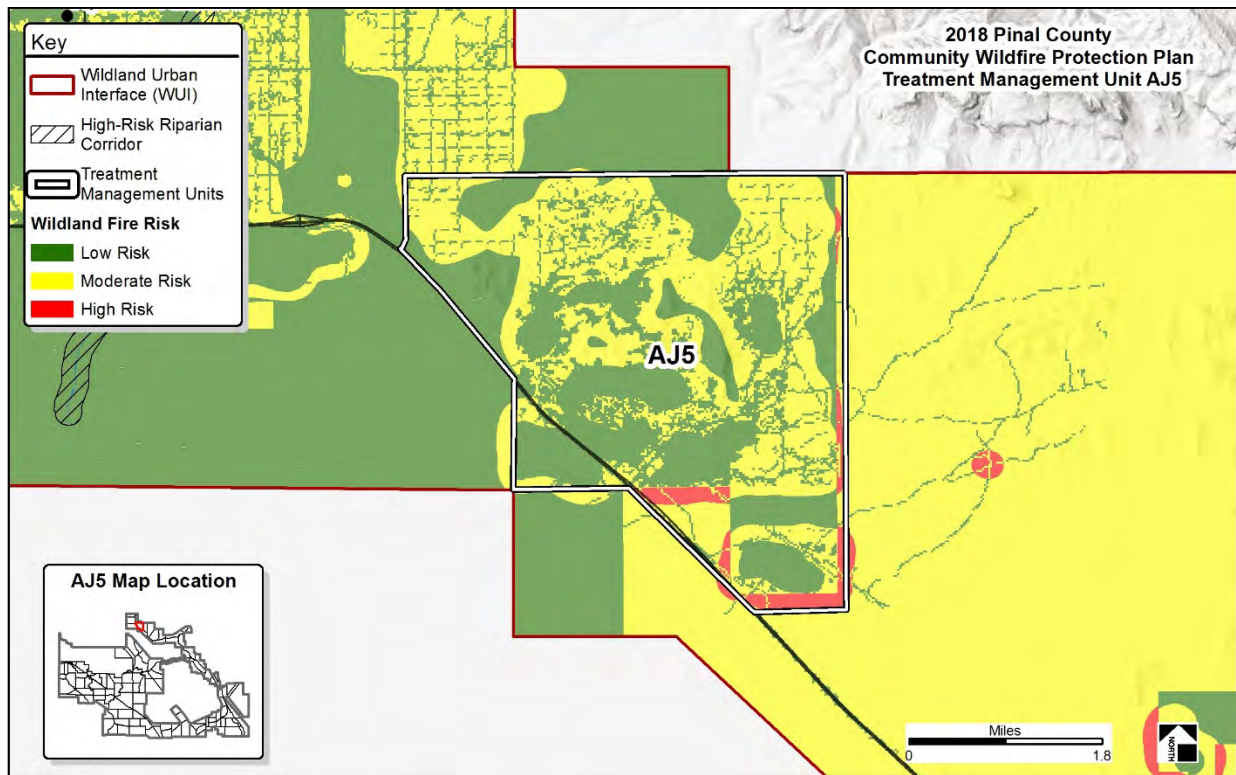




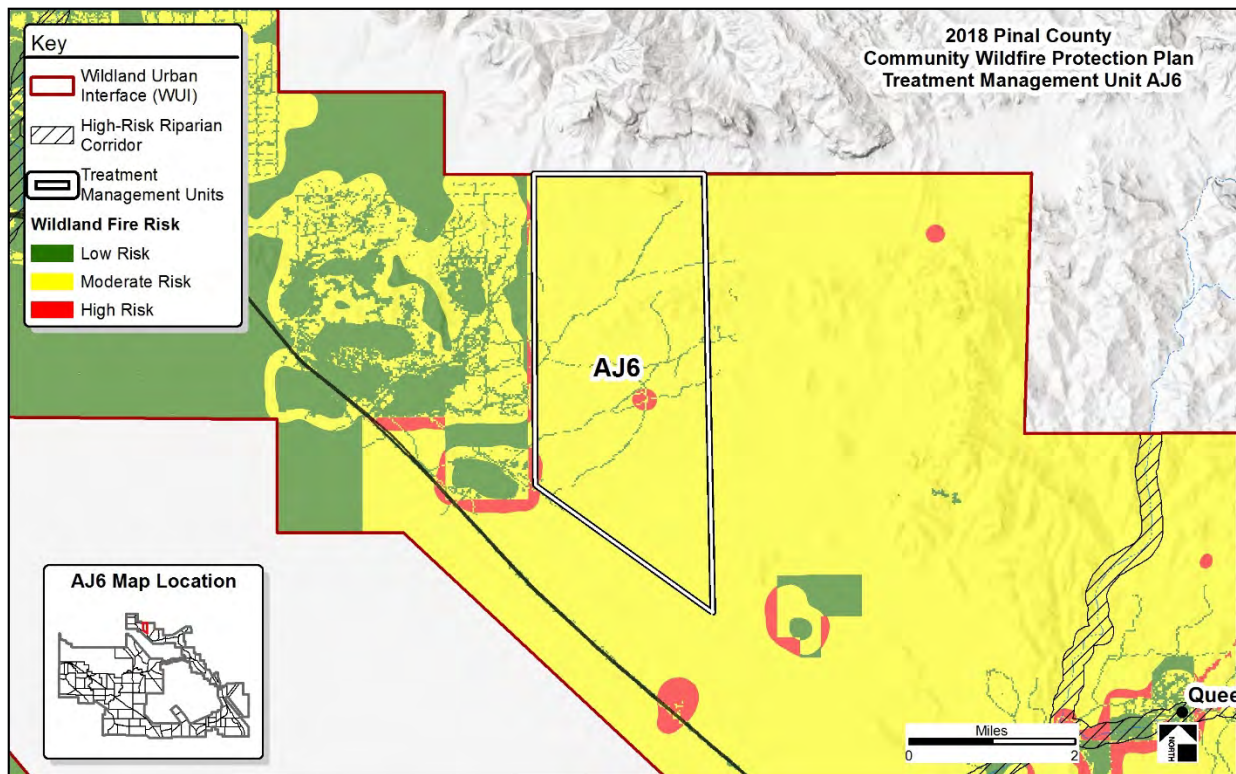
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TMU AJ4

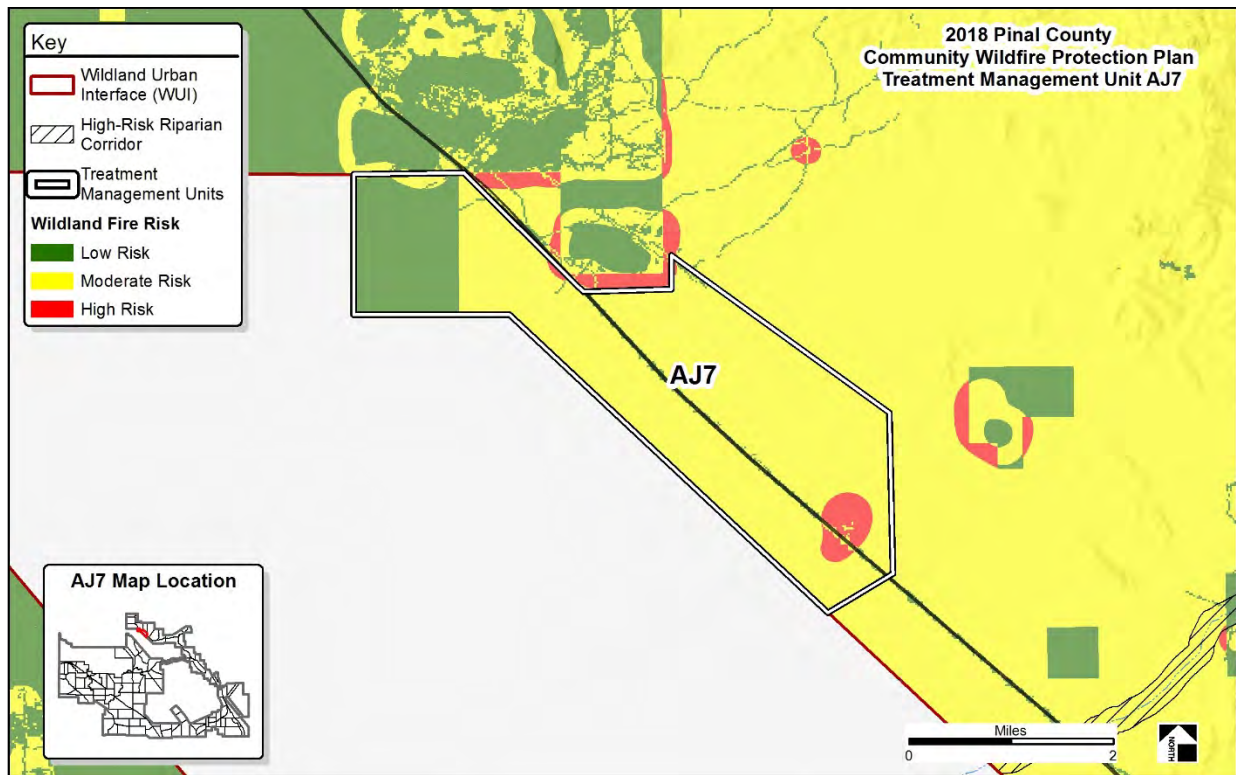


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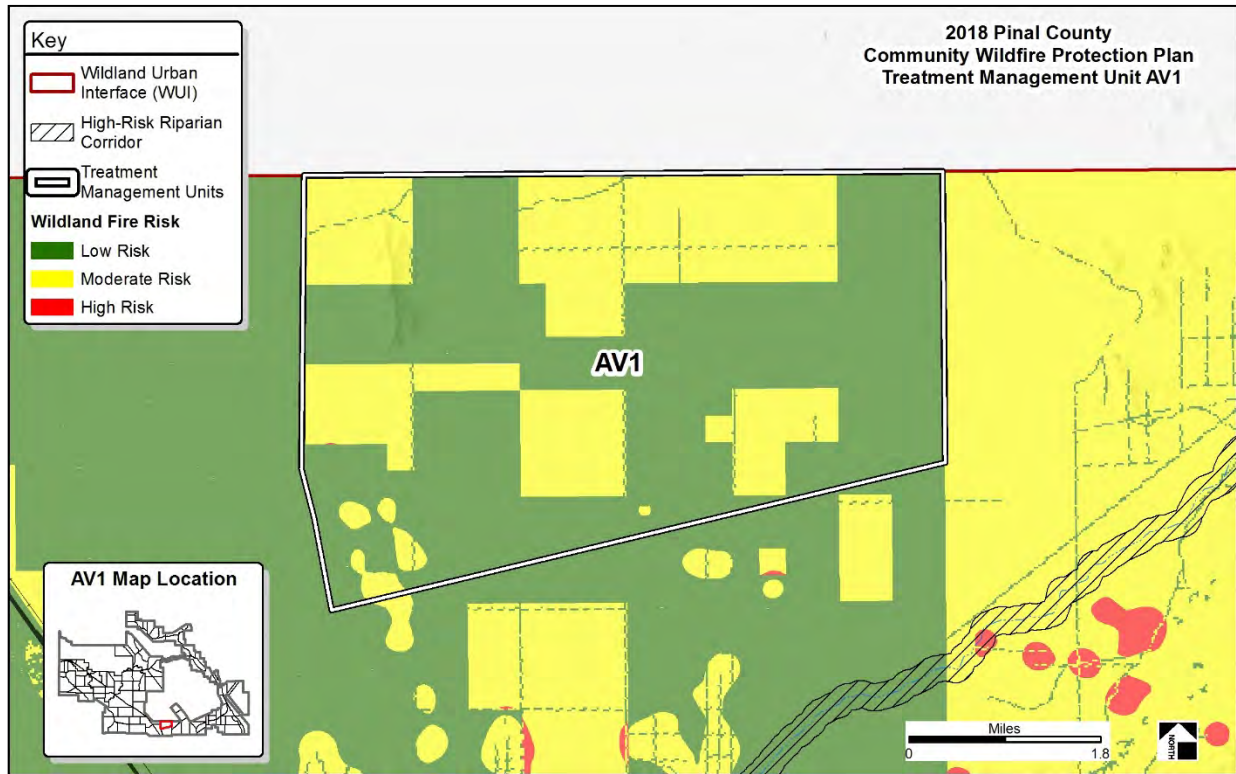
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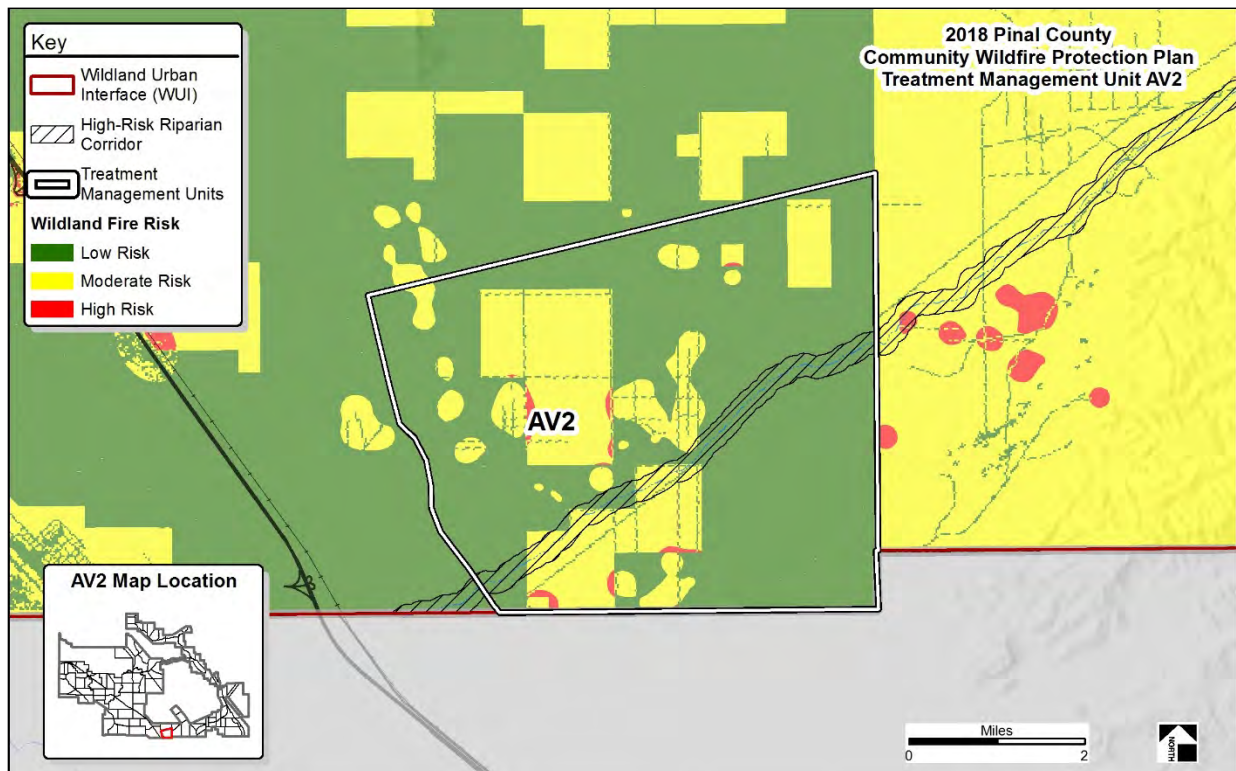


TMU AJ7

## AVRA VALLEY WUI

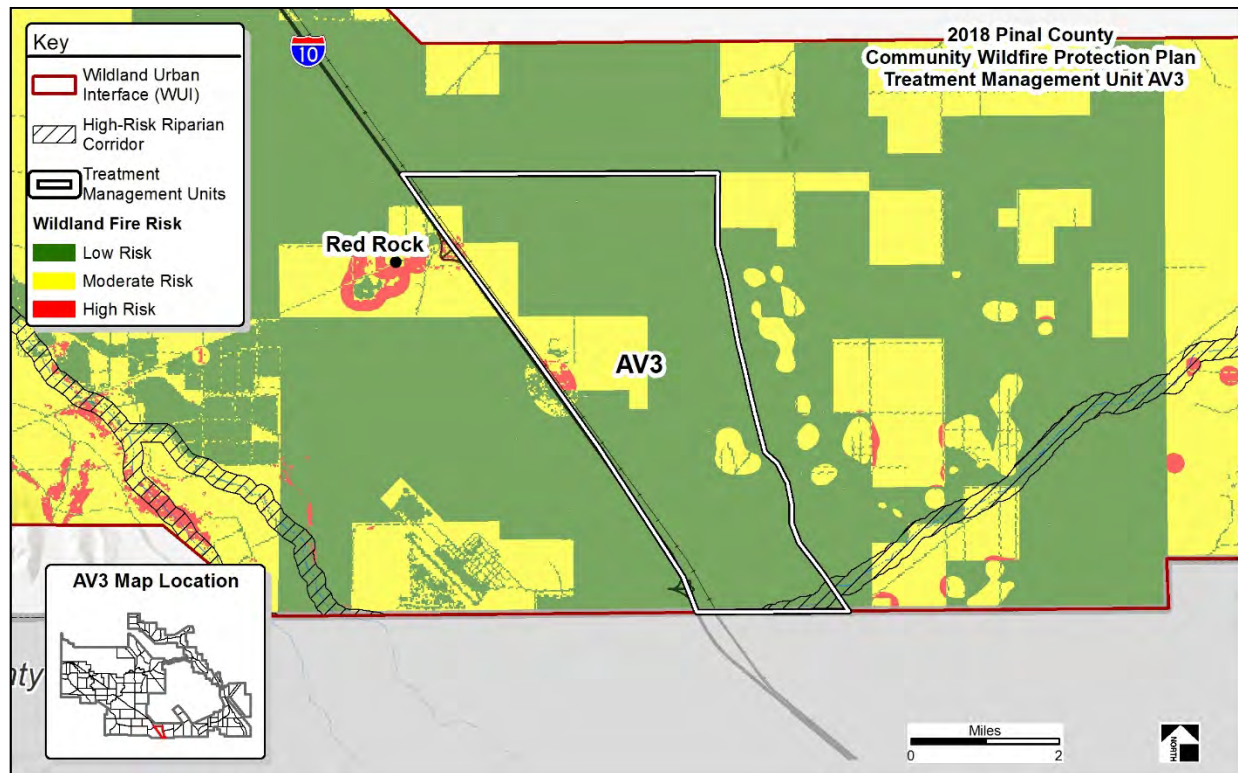


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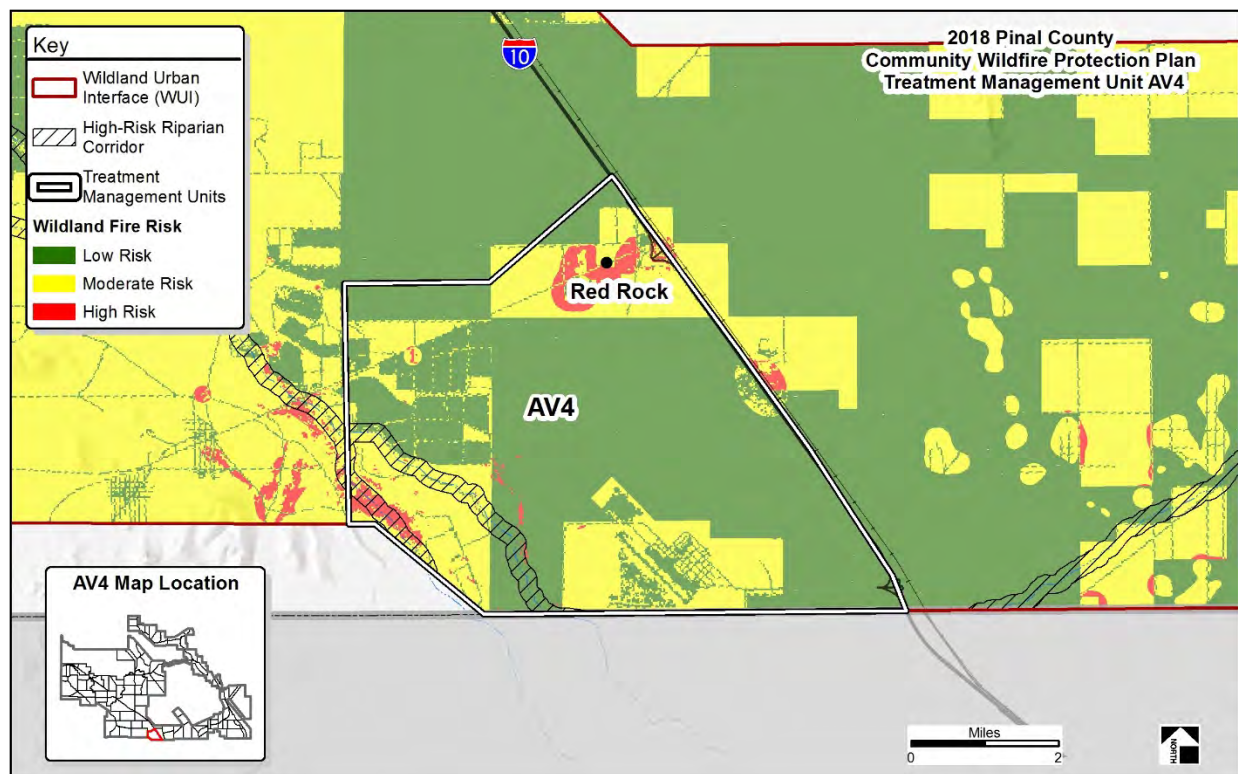


TMU AV2



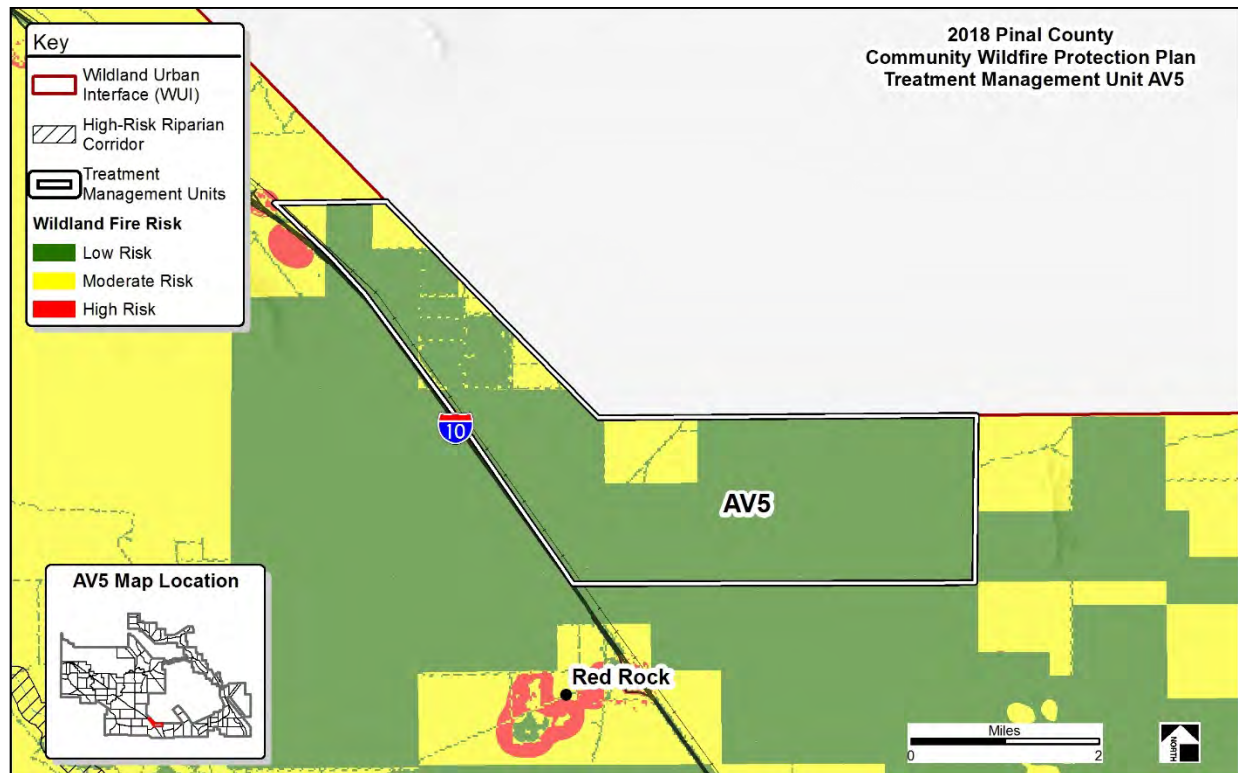


TMU AV3

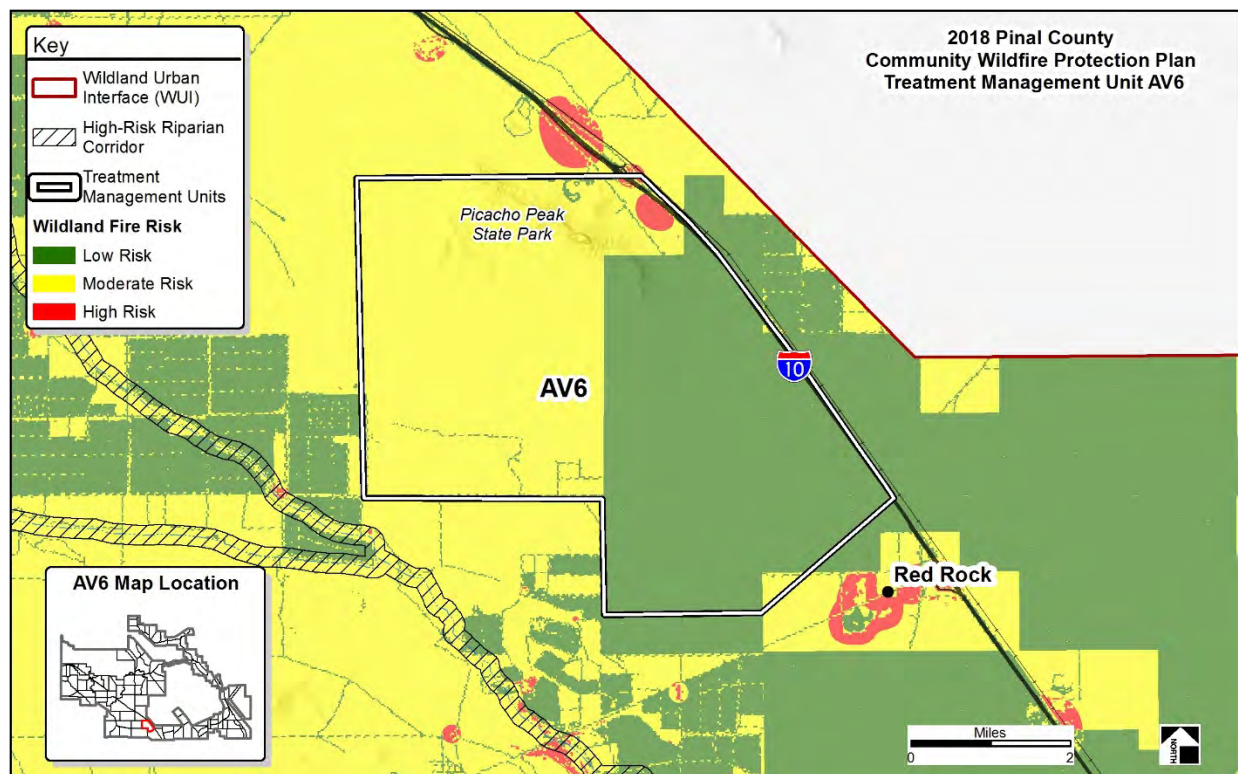


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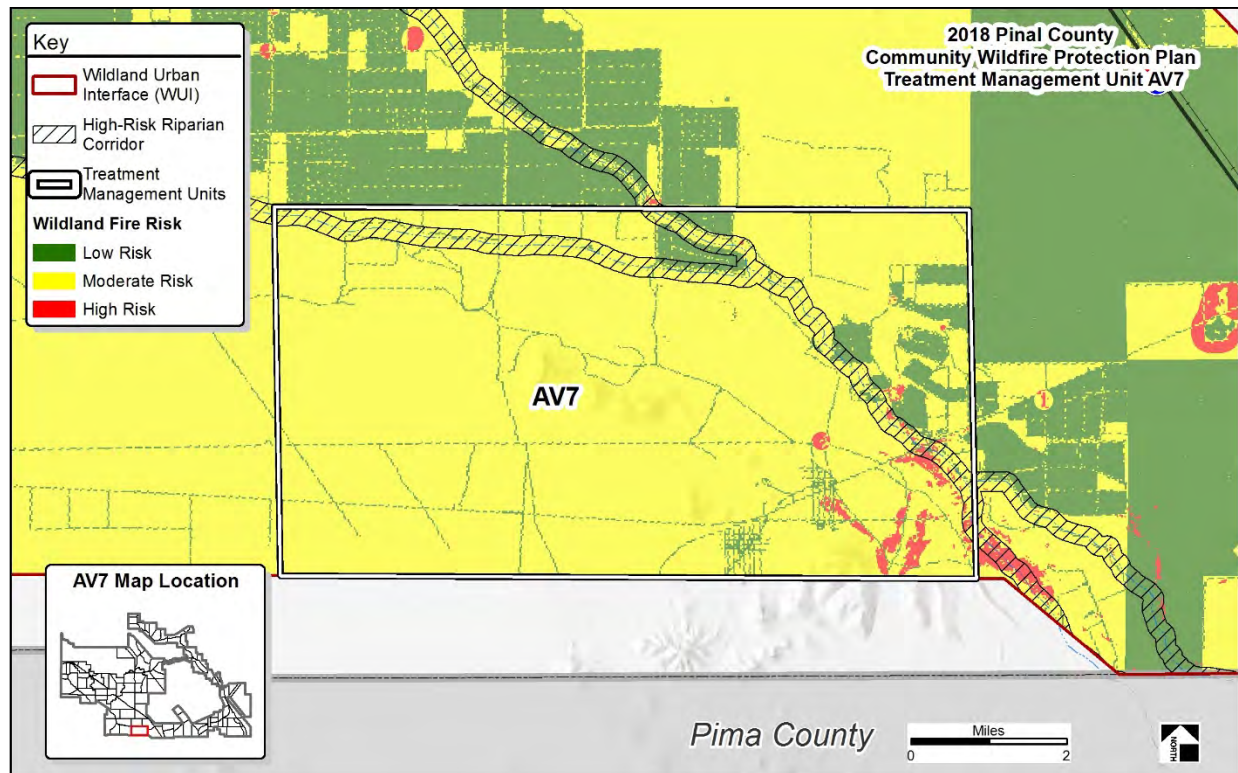




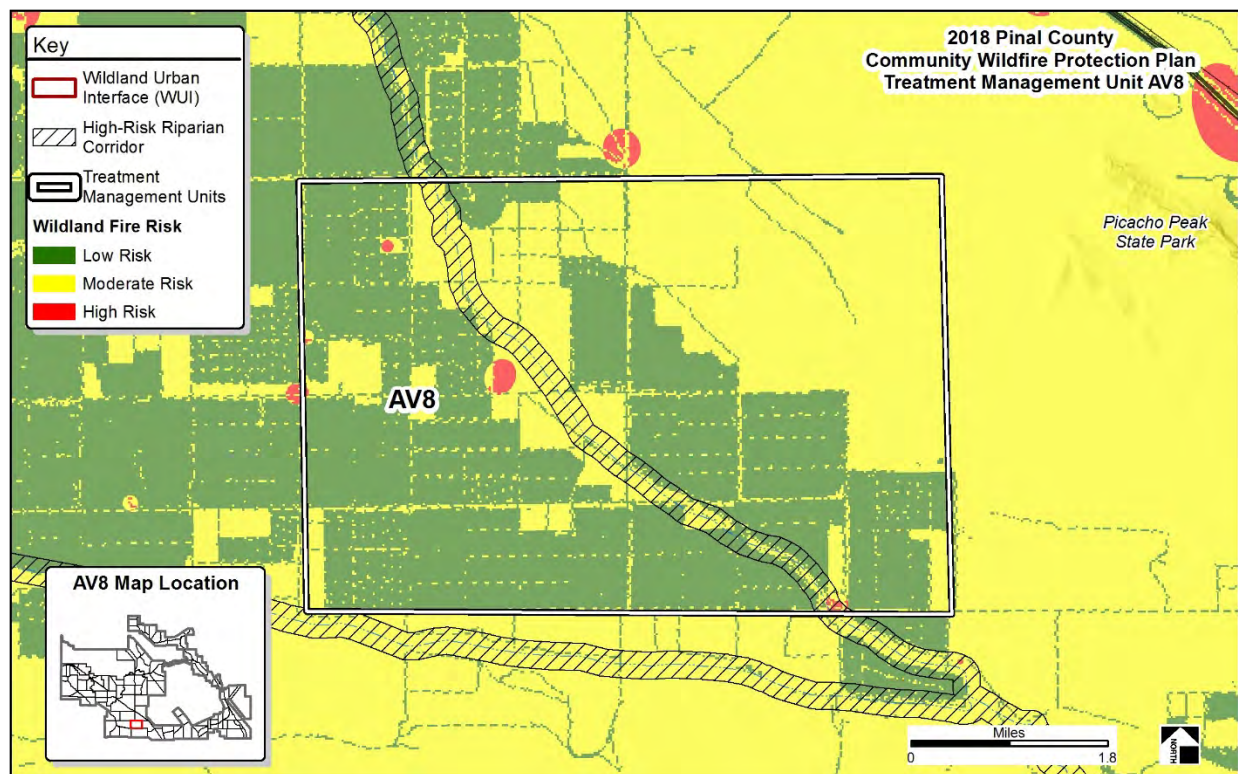
TMU AV5



TMU AV6

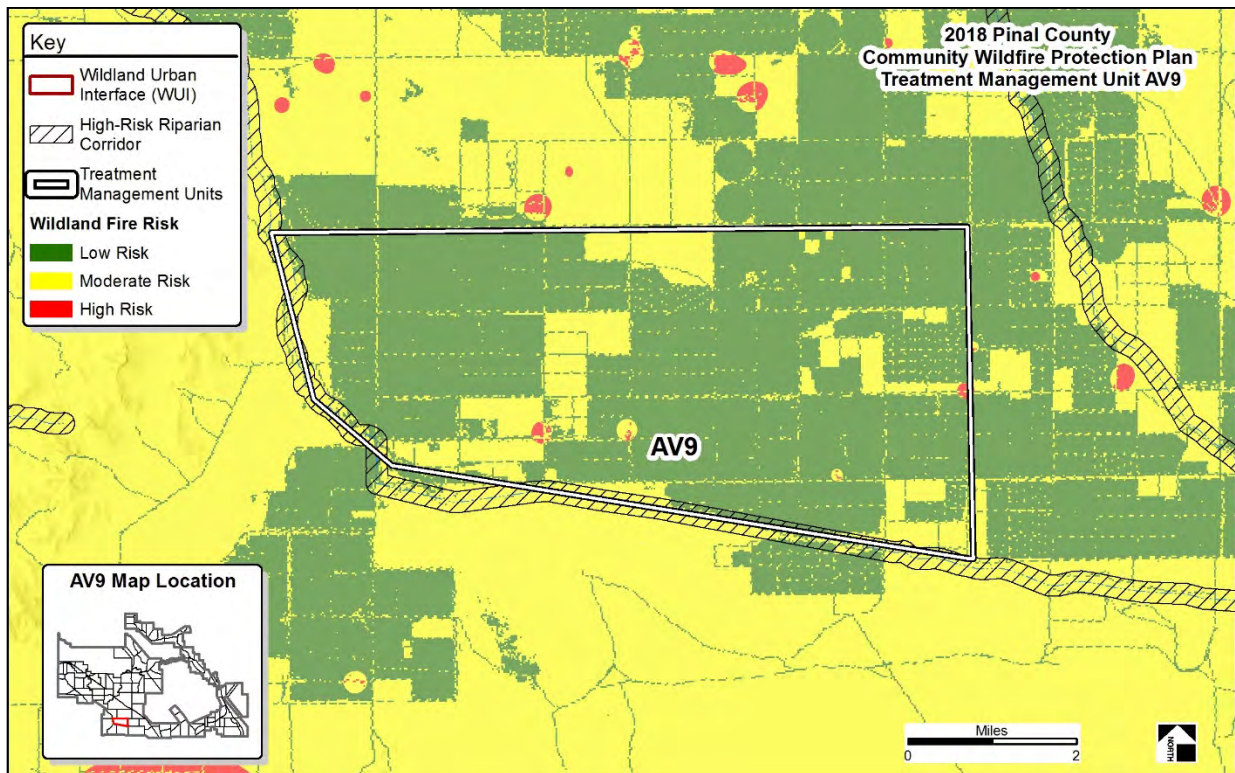


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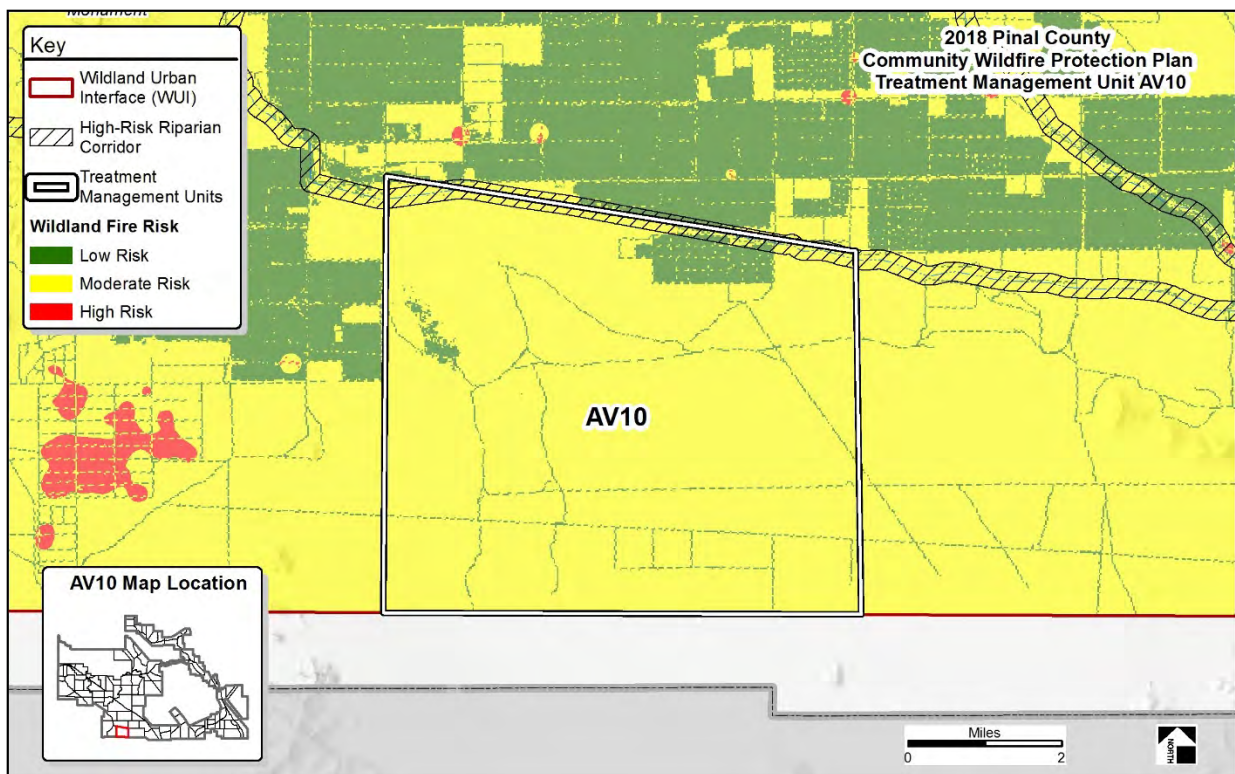


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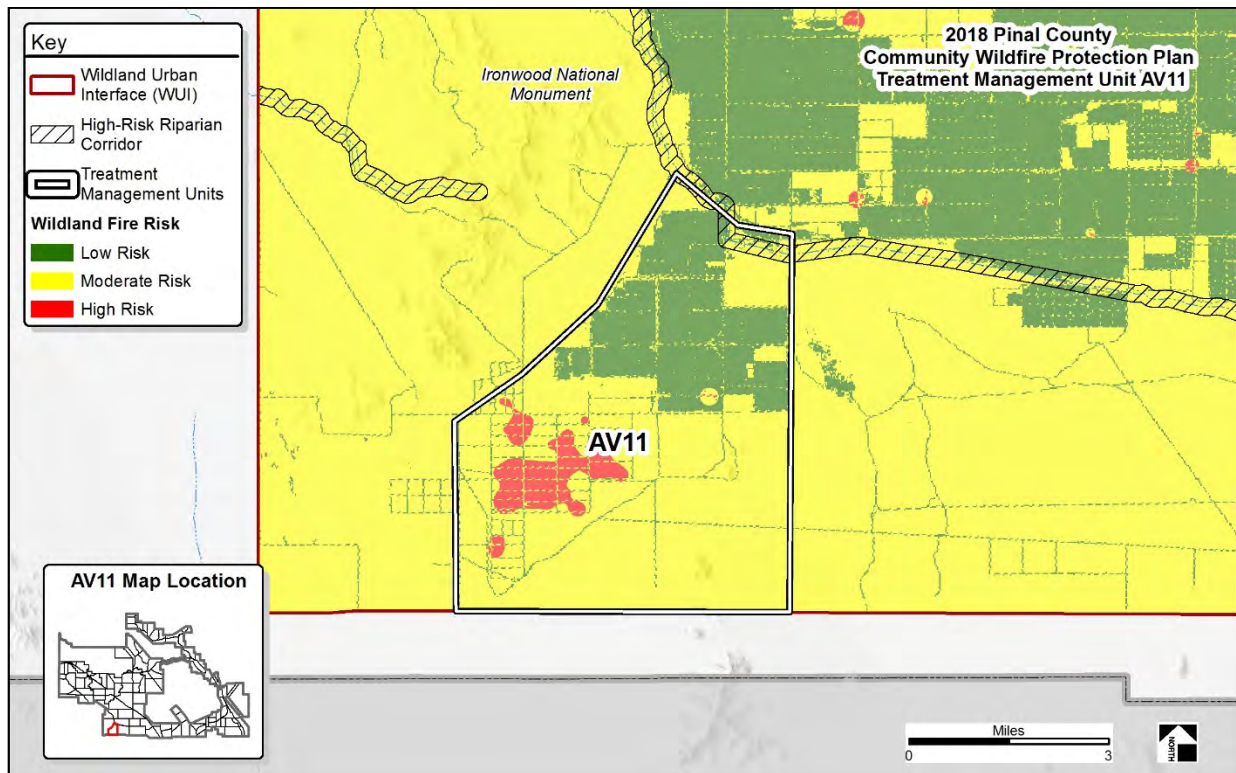


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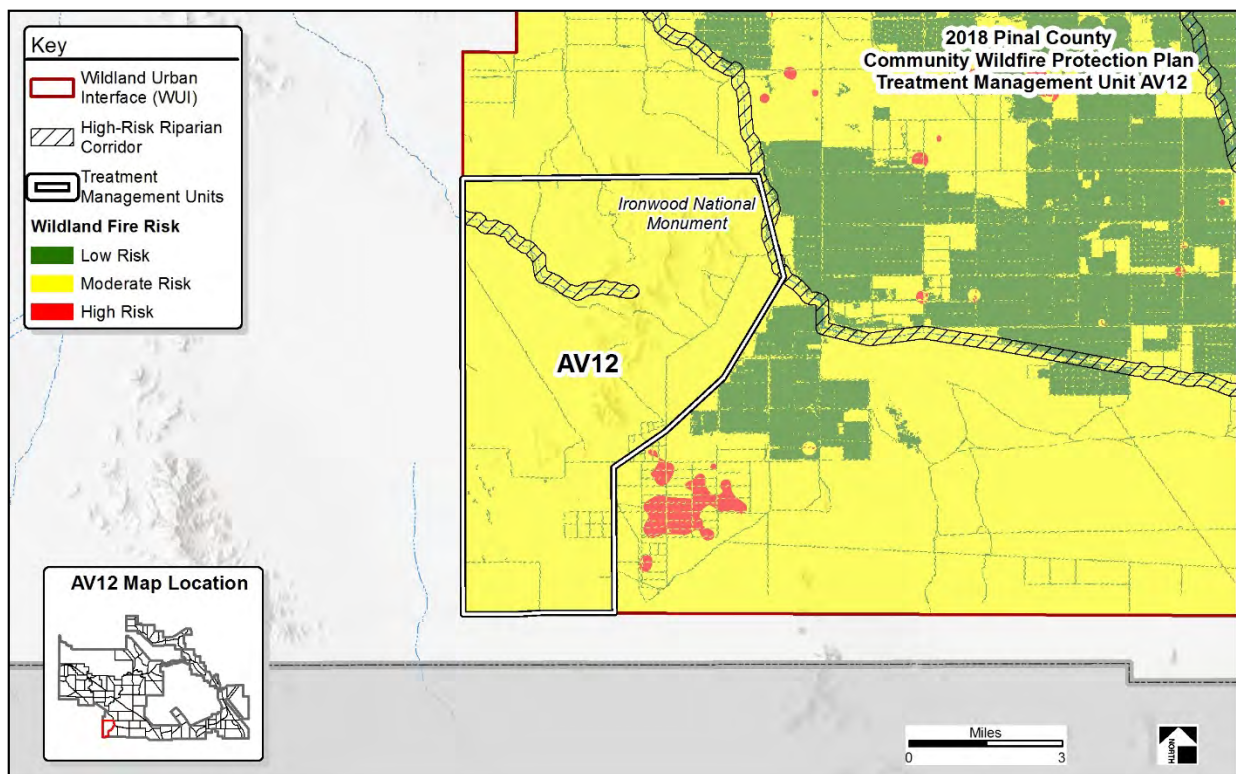


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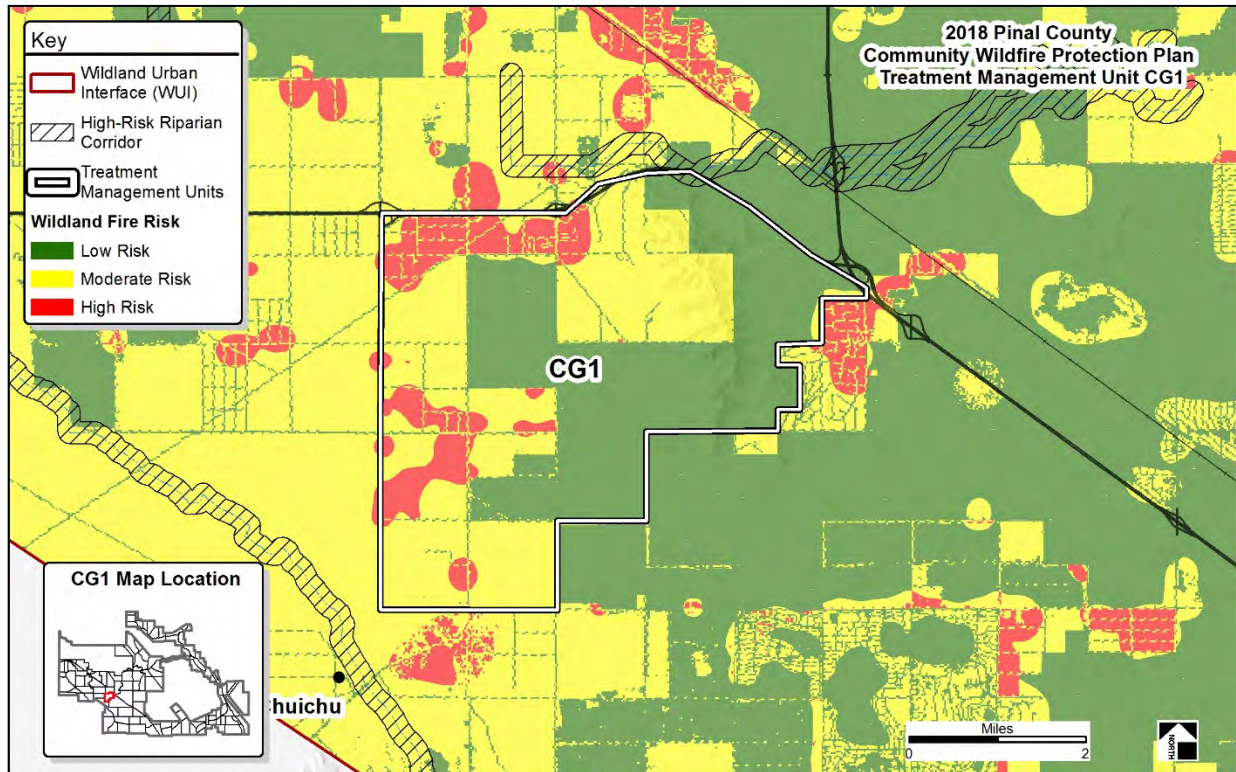
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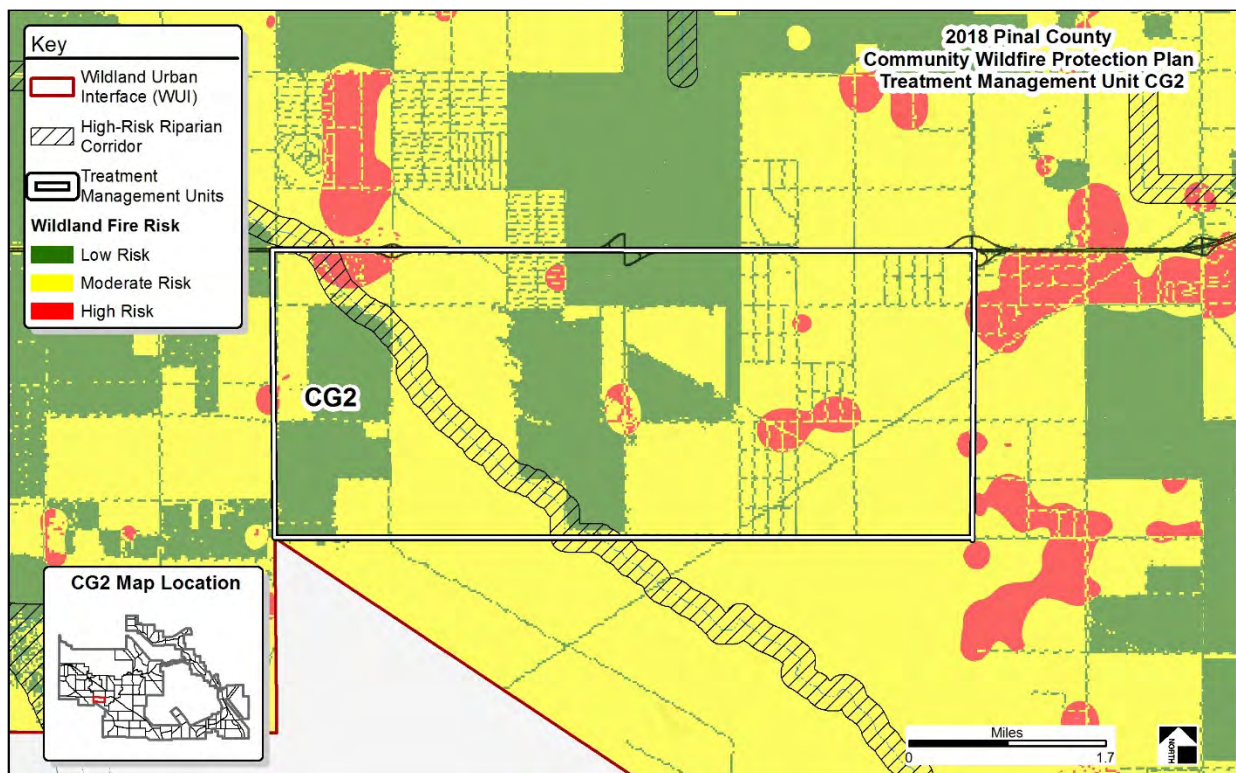
TMU AV12



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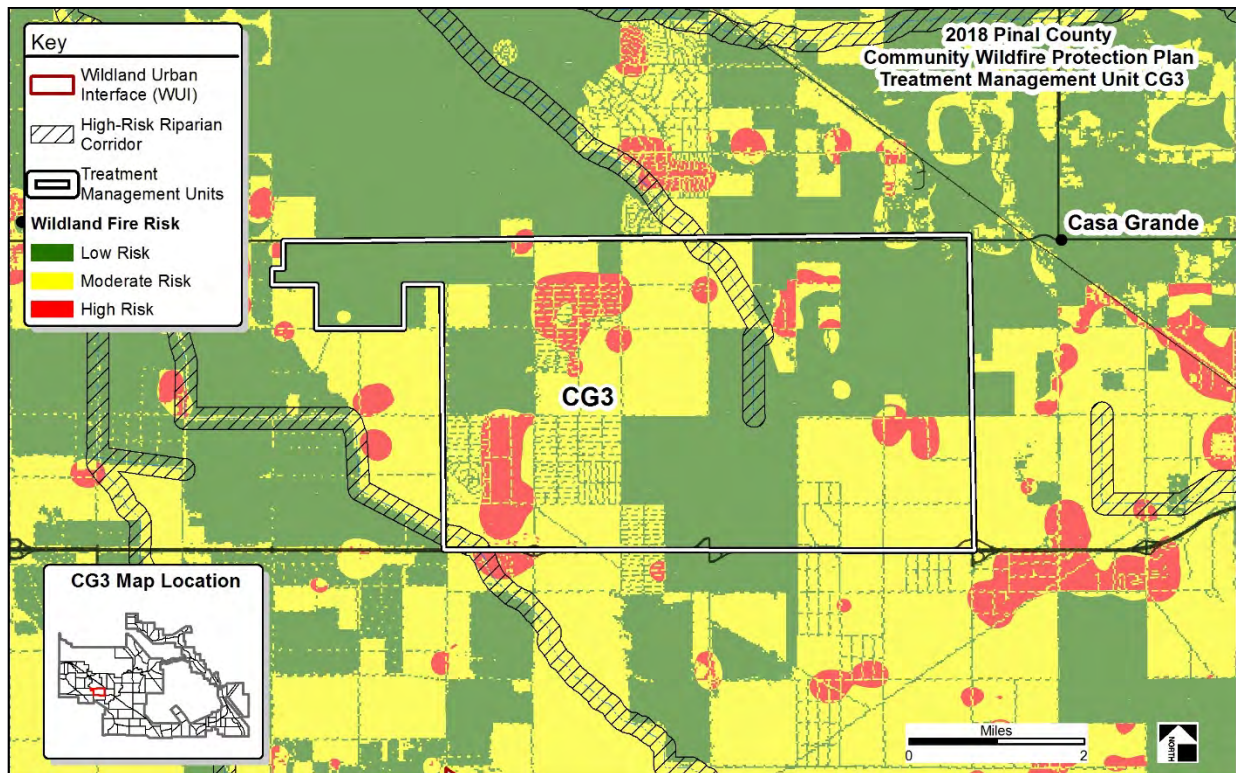


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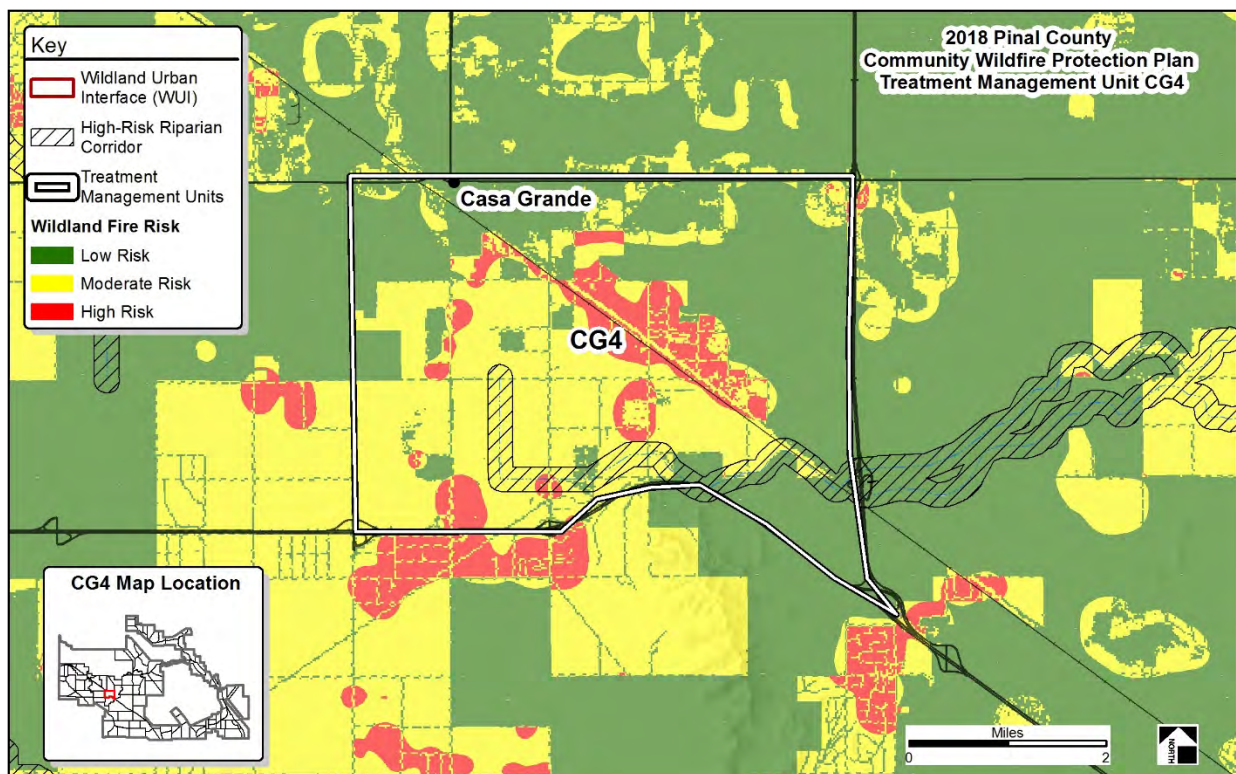


TMU CG2



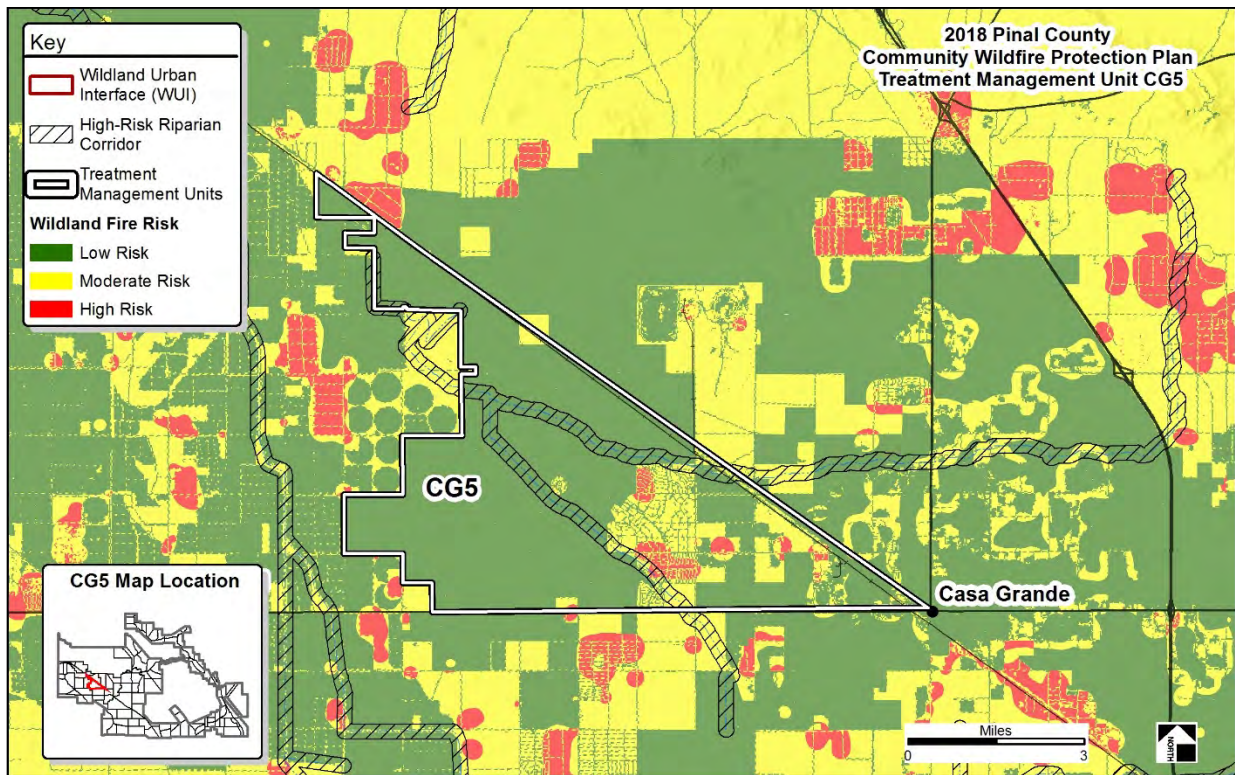


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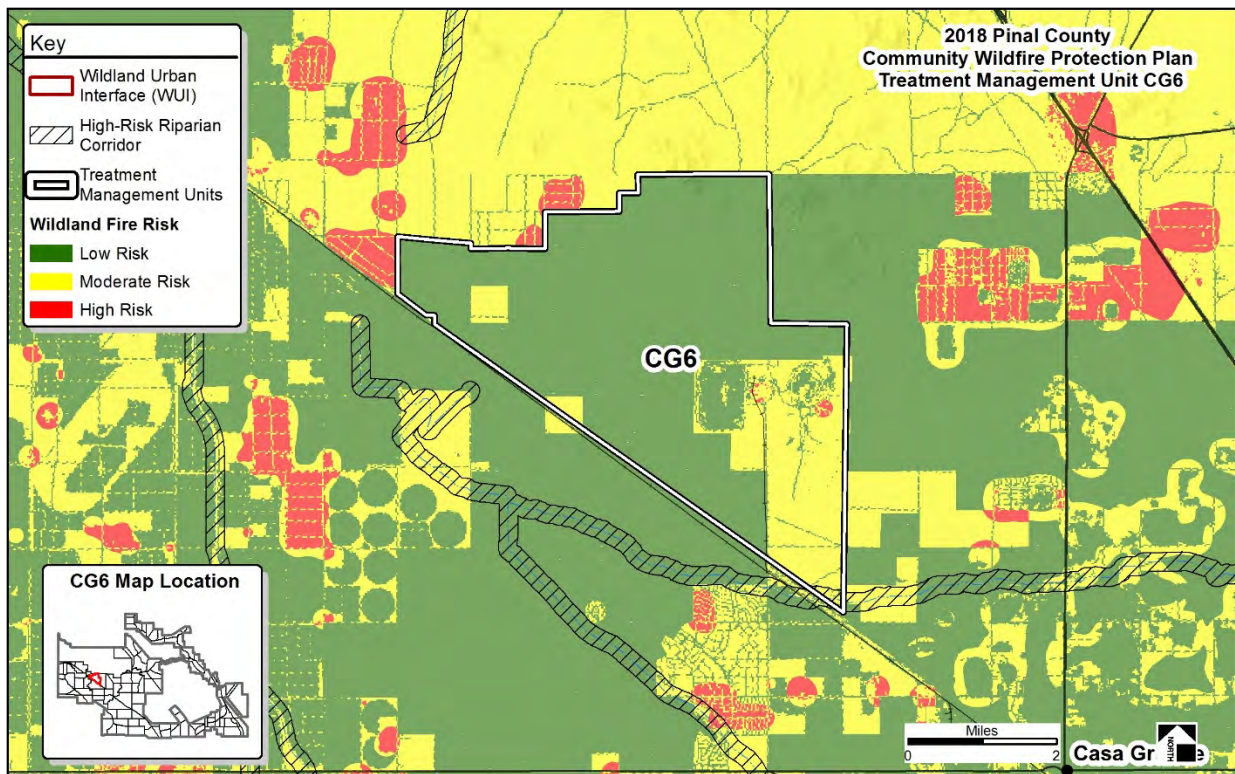


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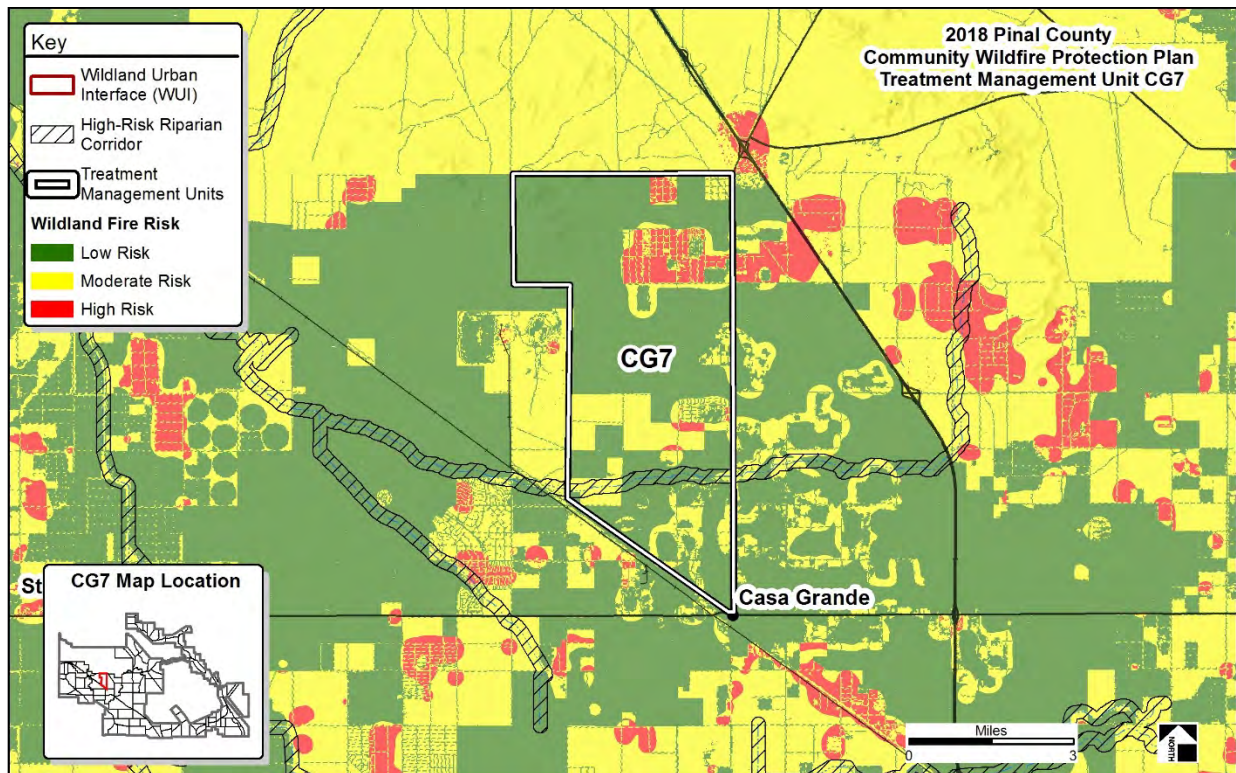


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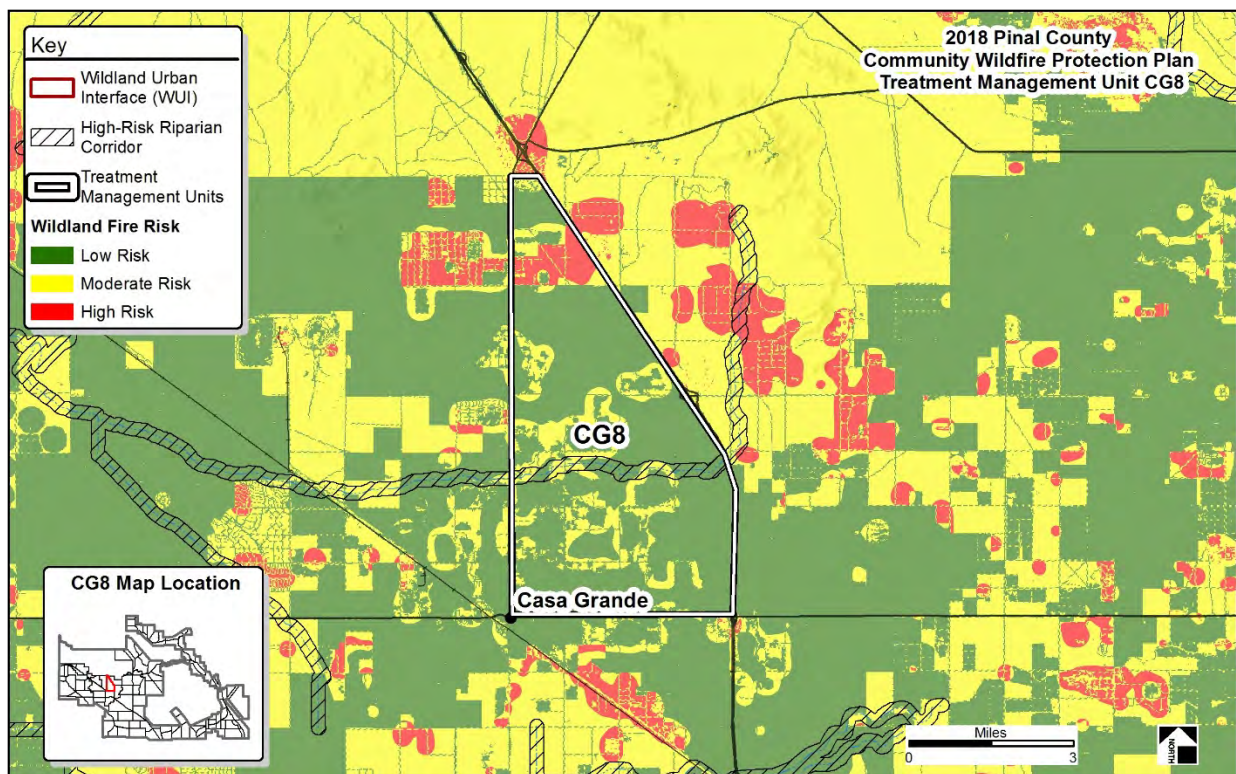


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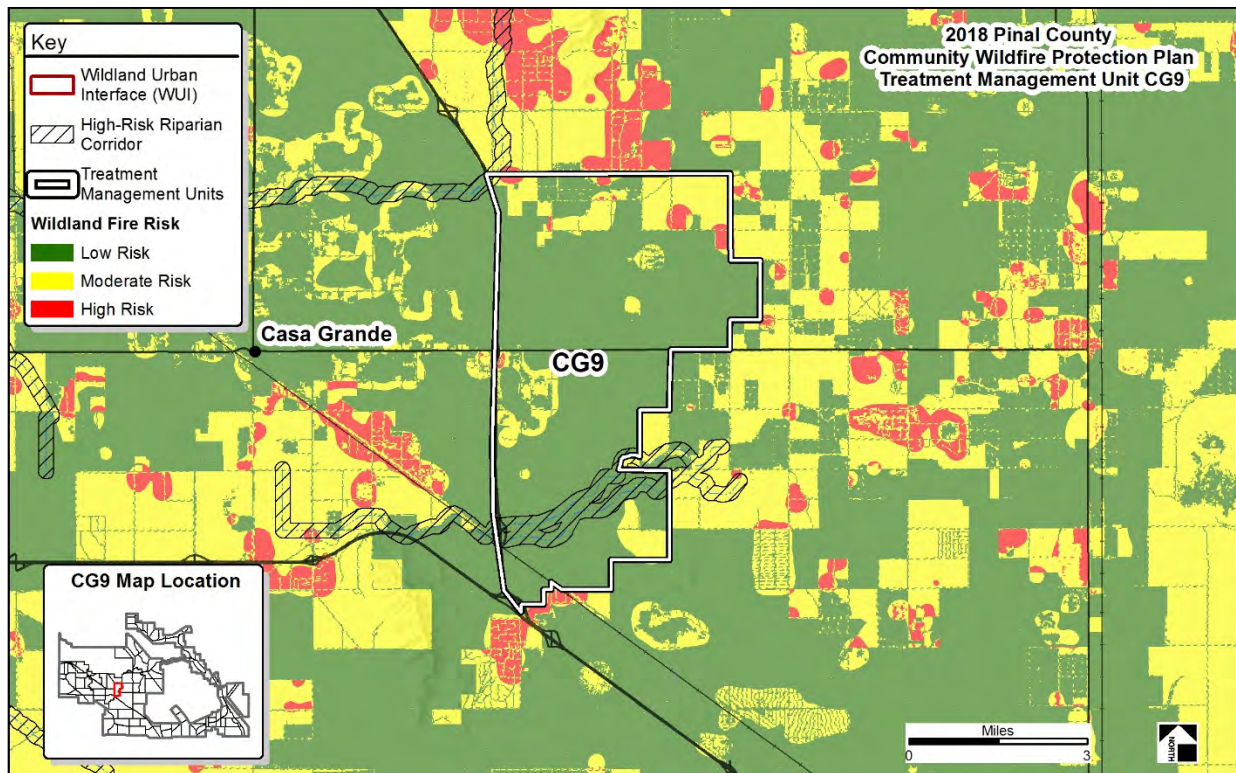


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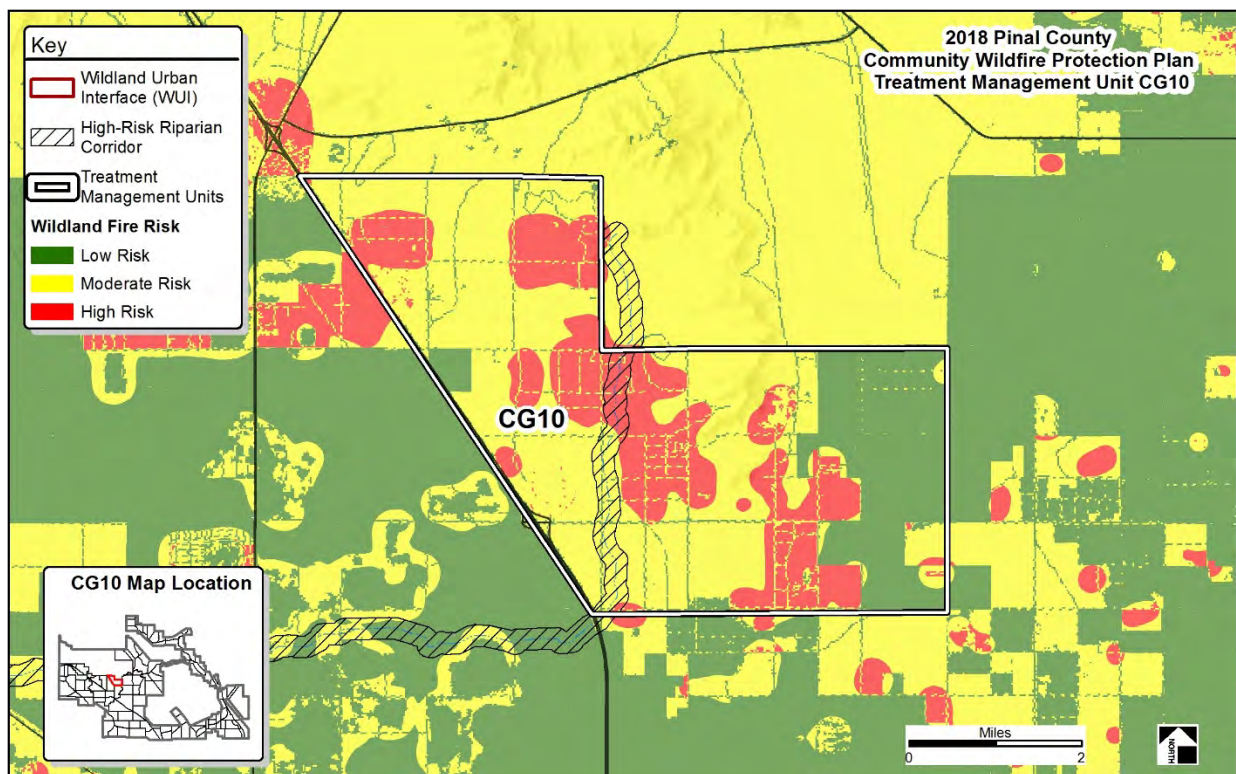


TMU CG8





TMU CG9

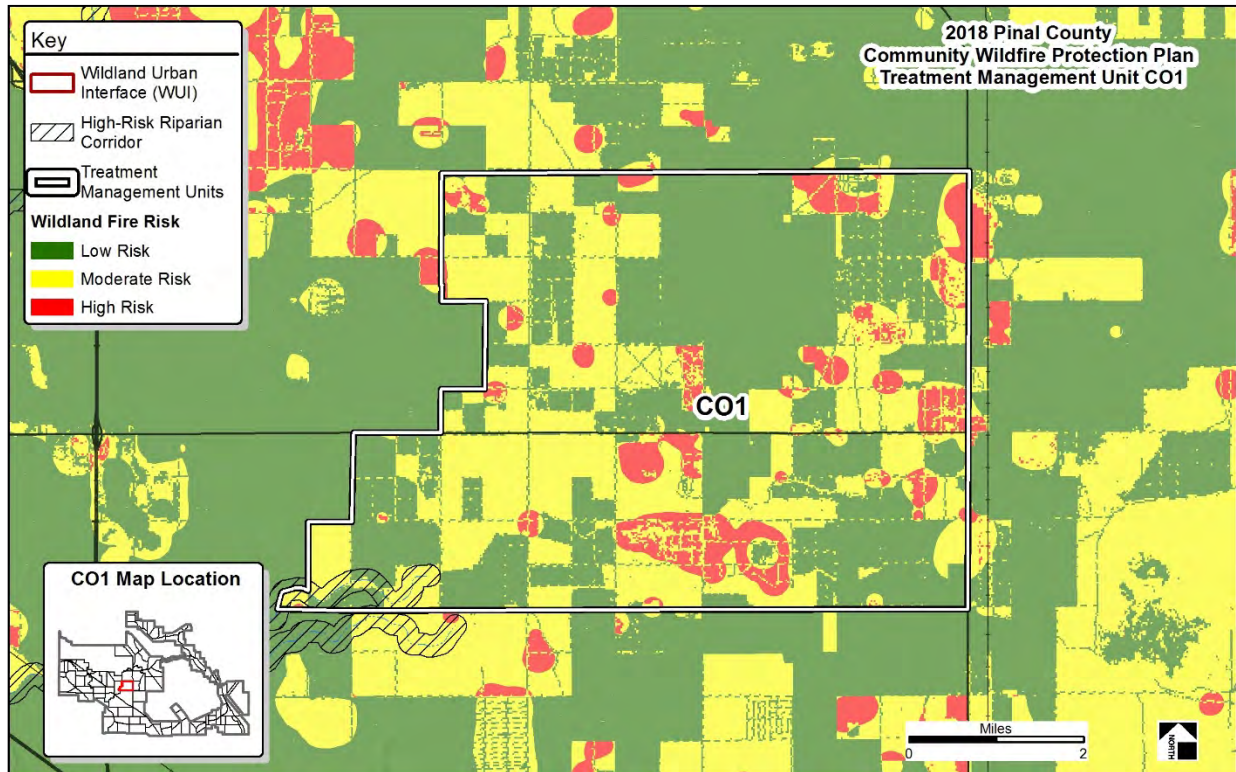


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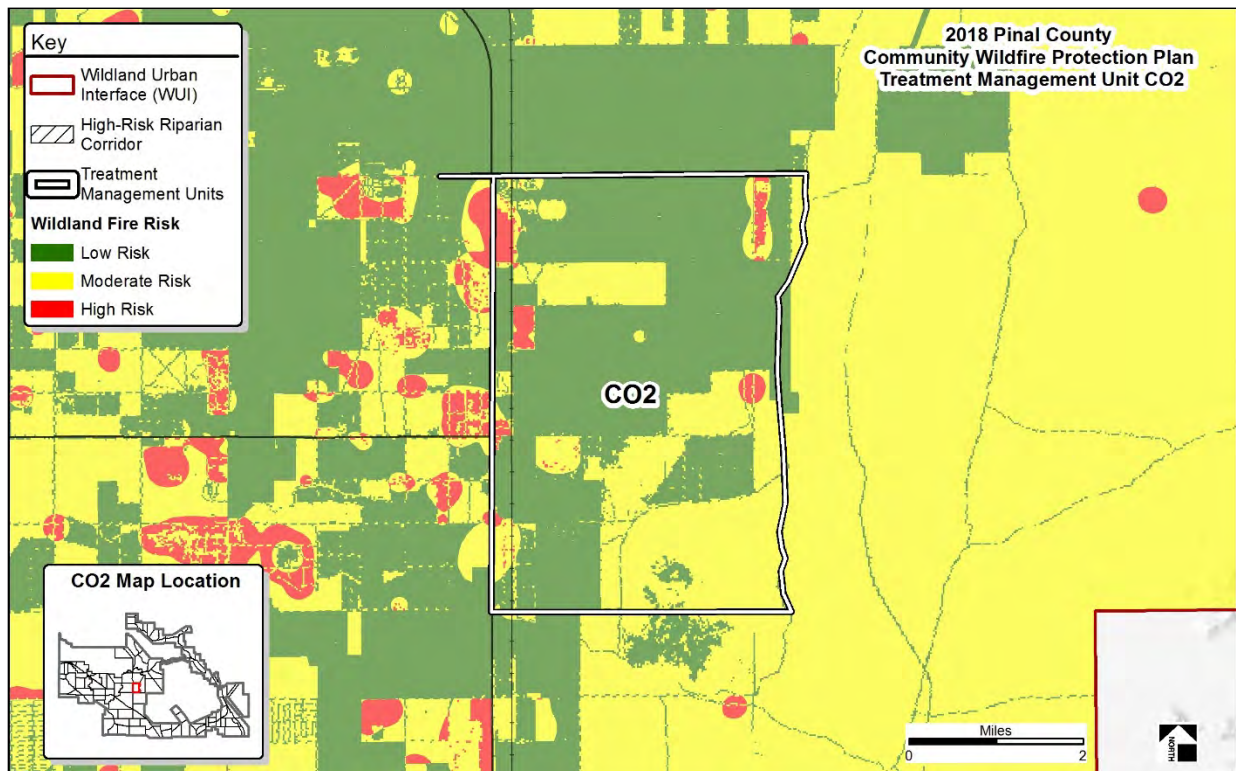
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## COOLIDGE WUI

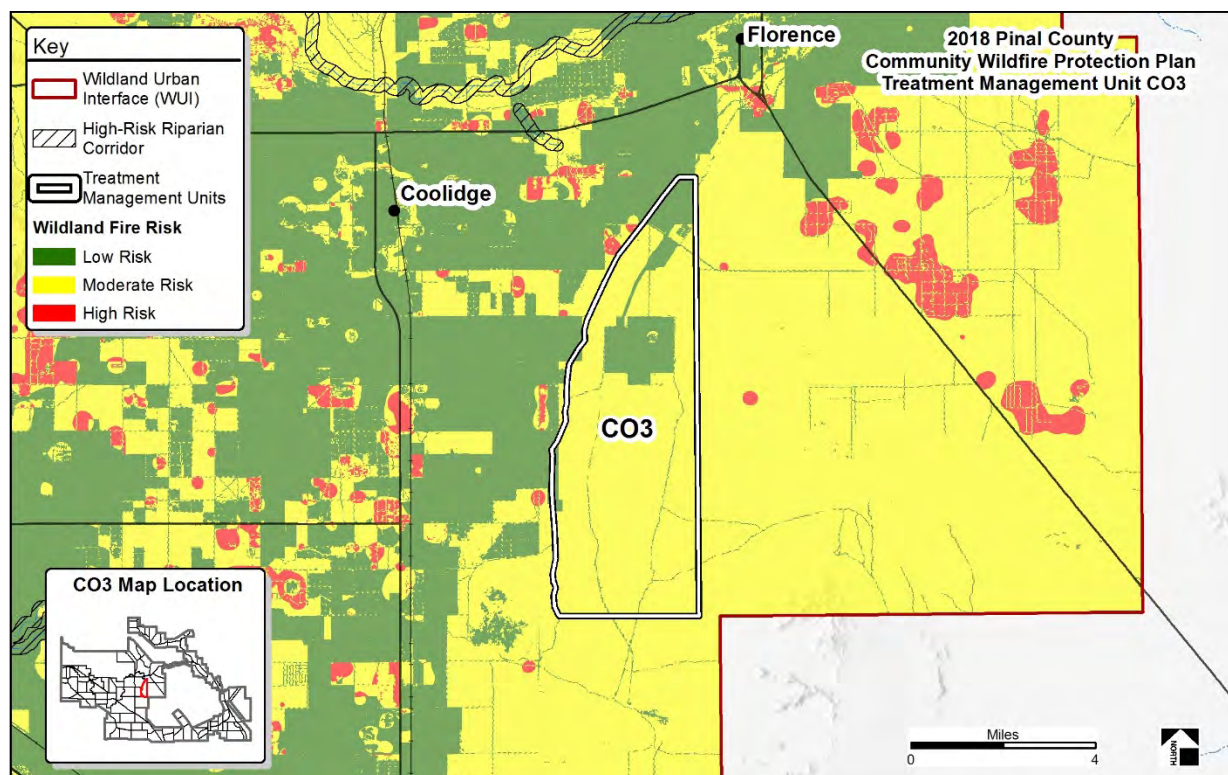


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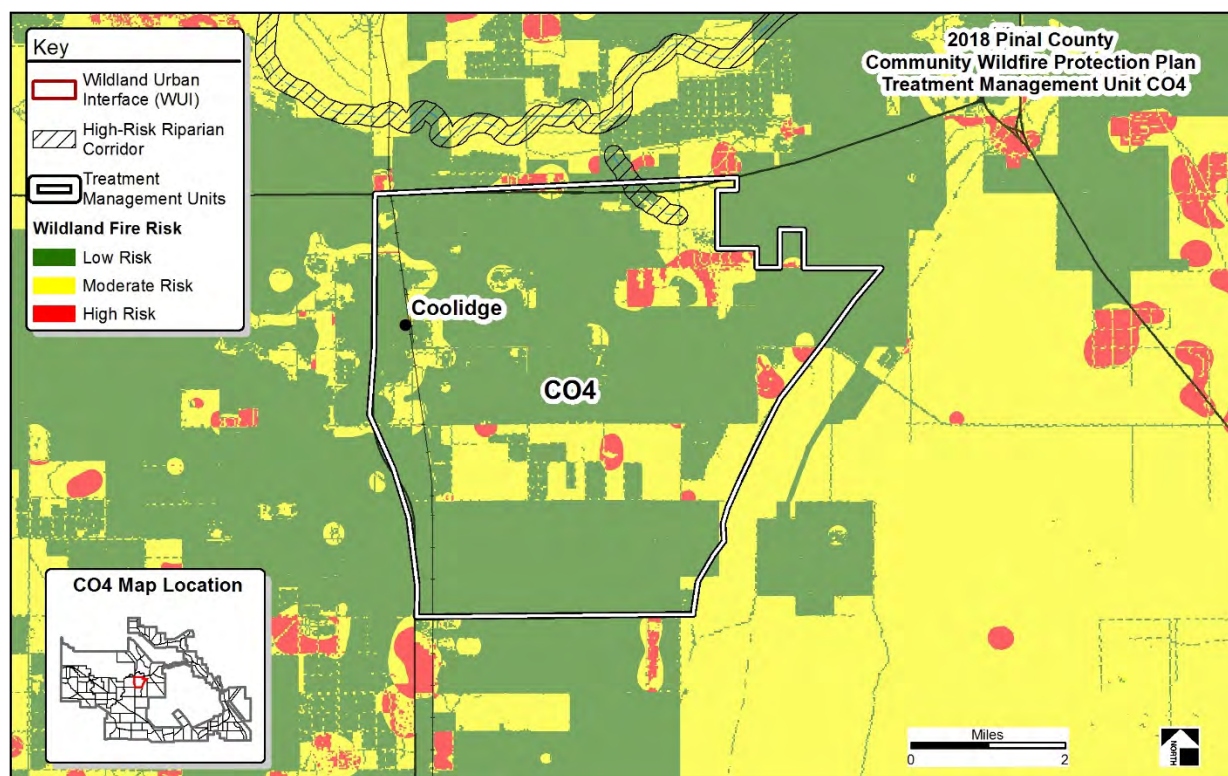


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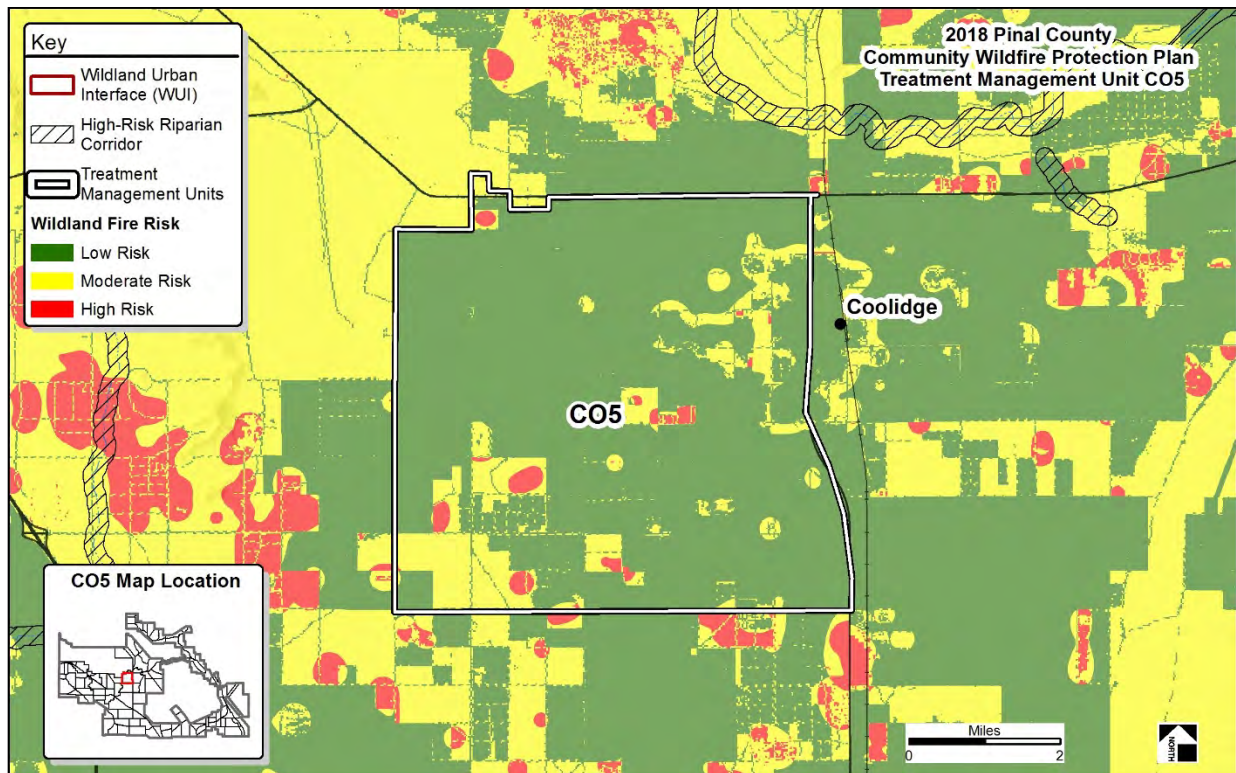


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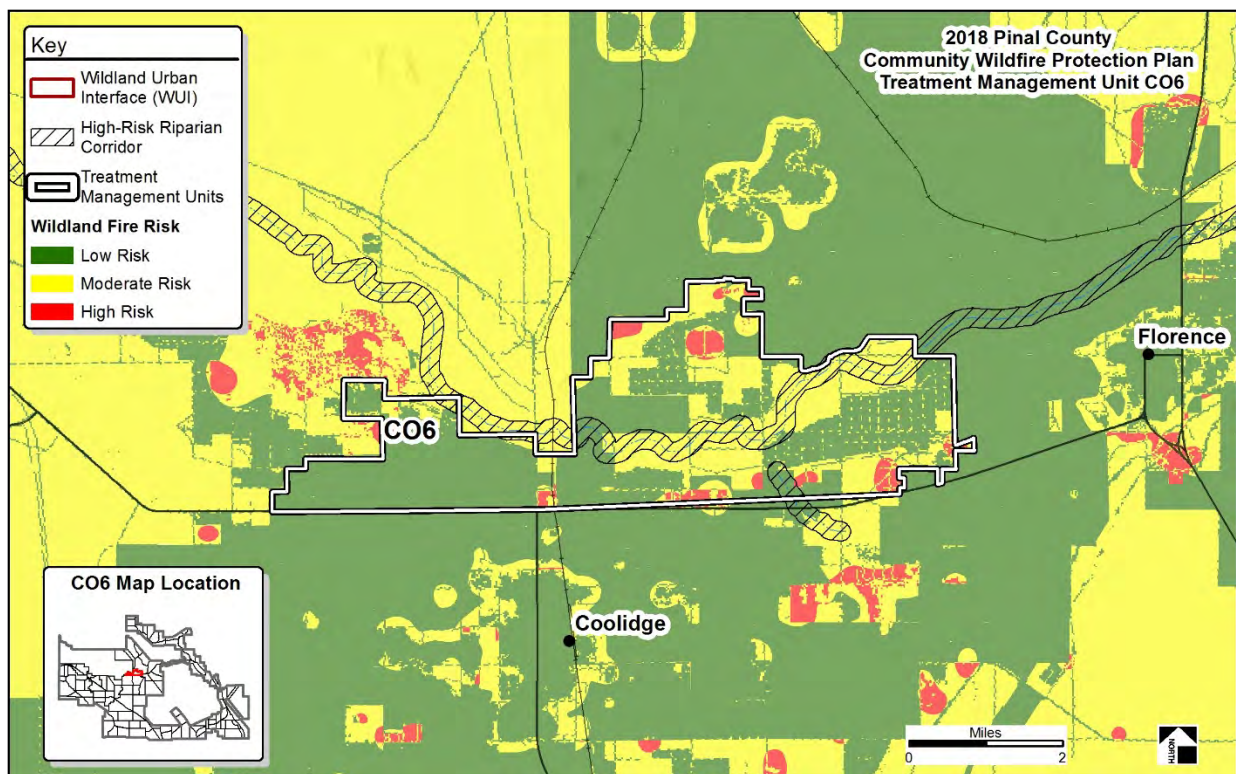


TMU CO4





TMU CO5

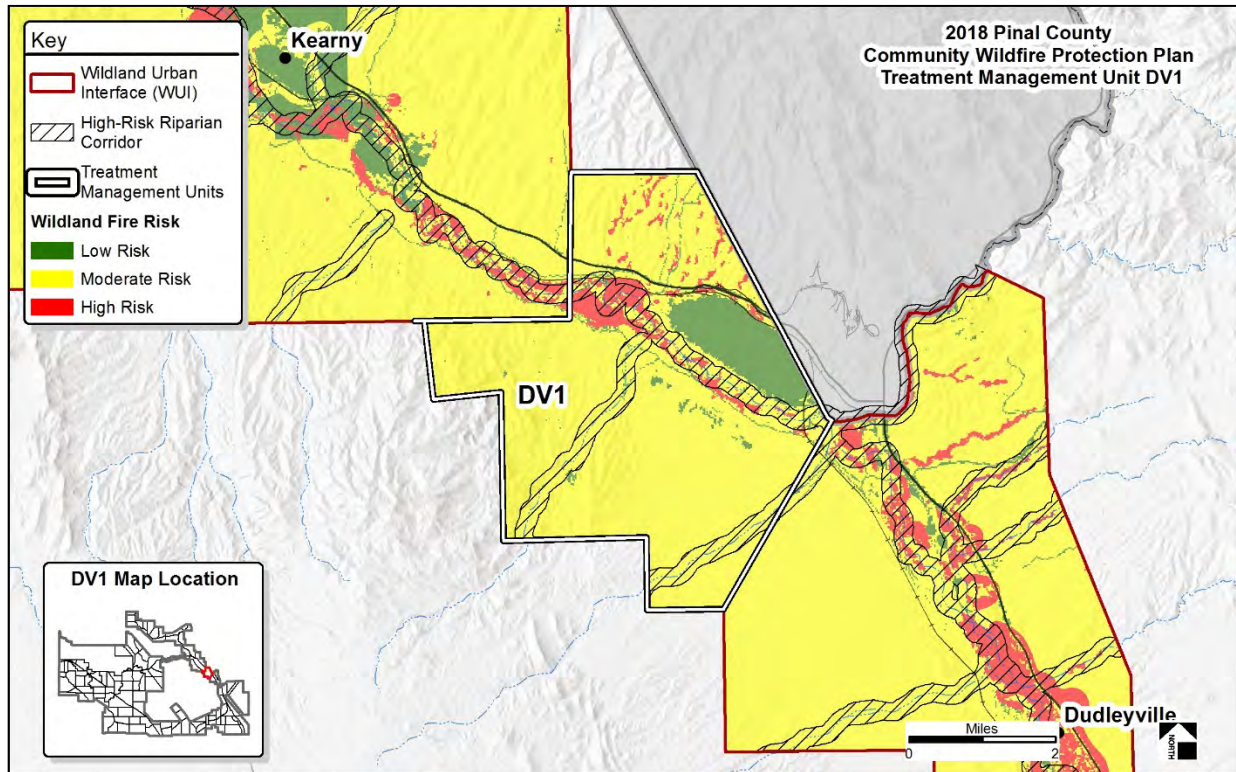


TMU CO6

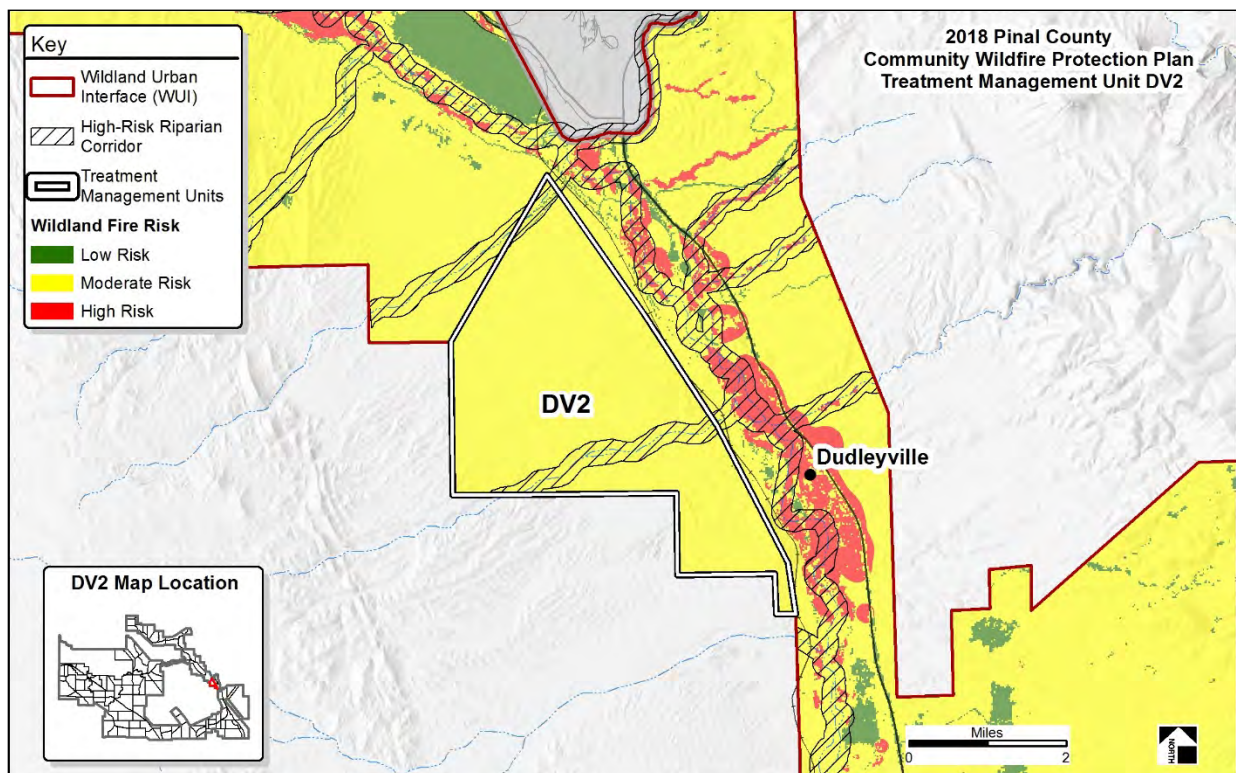
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## DUDLEYVILLE WUI

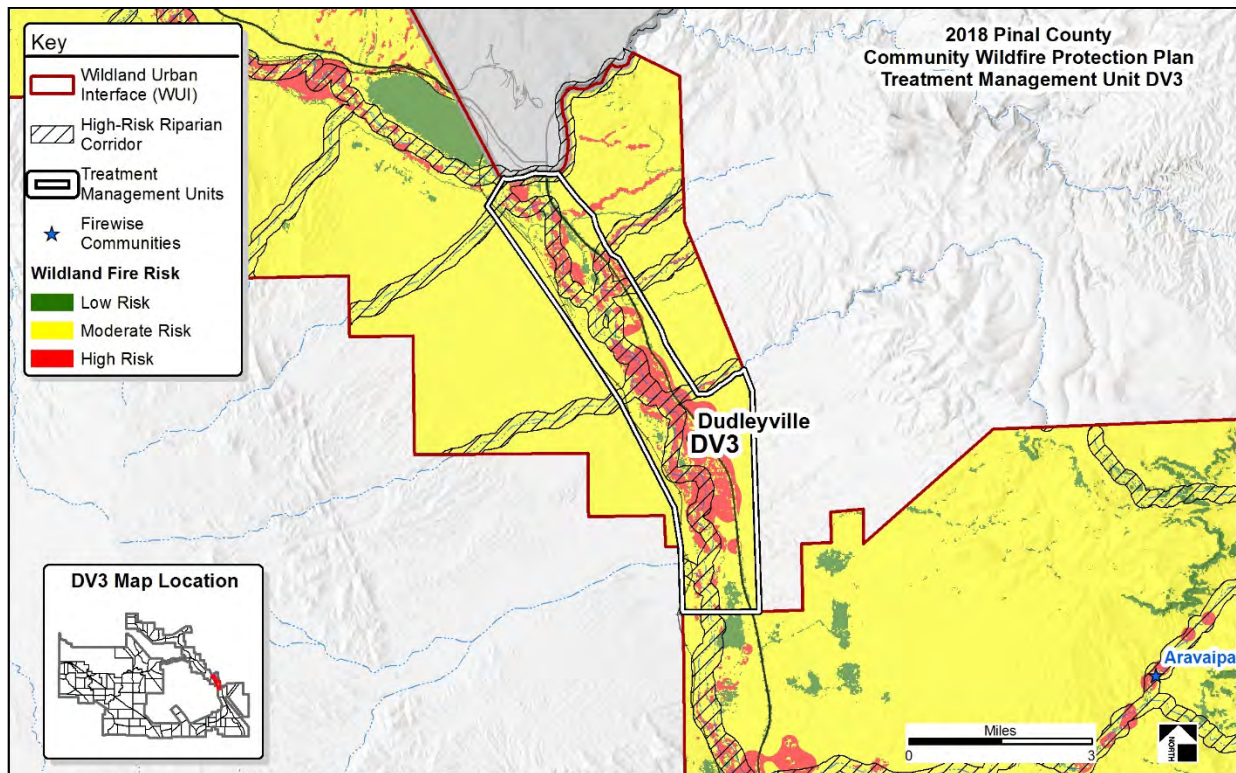


**TMU DV1**

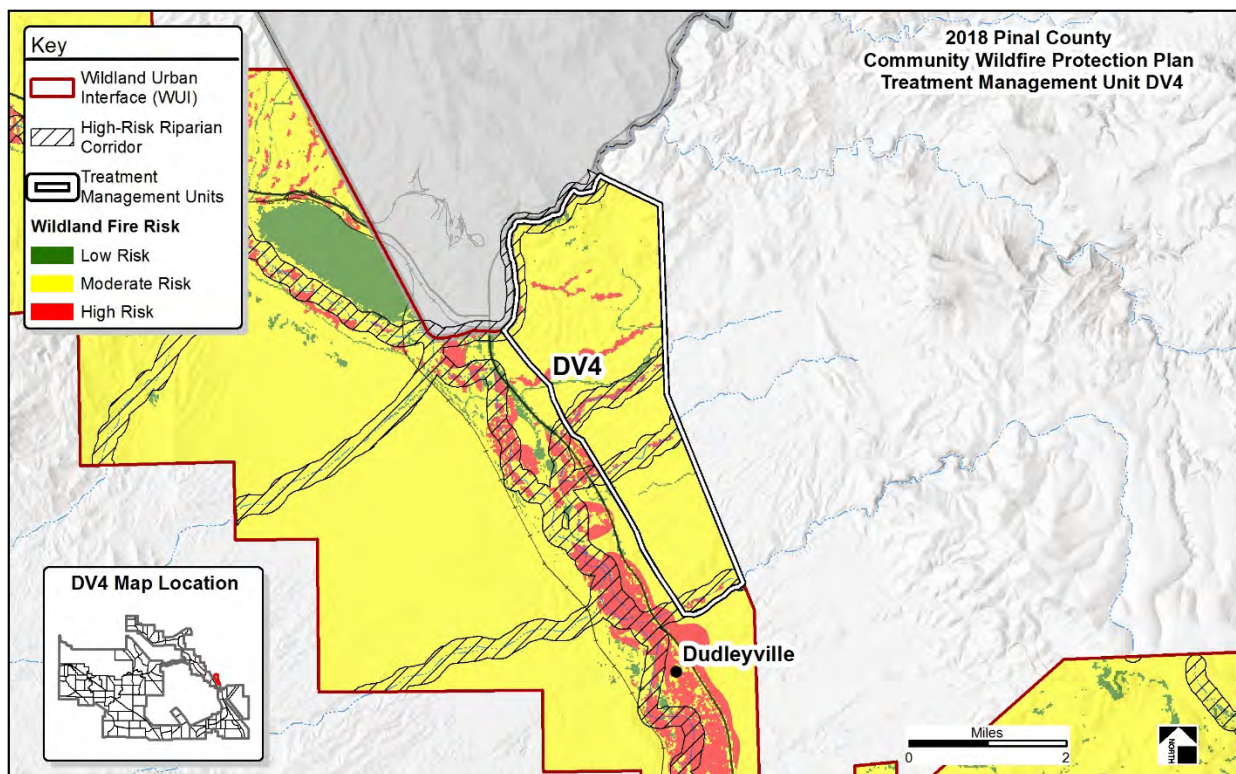


**TMU DV2**



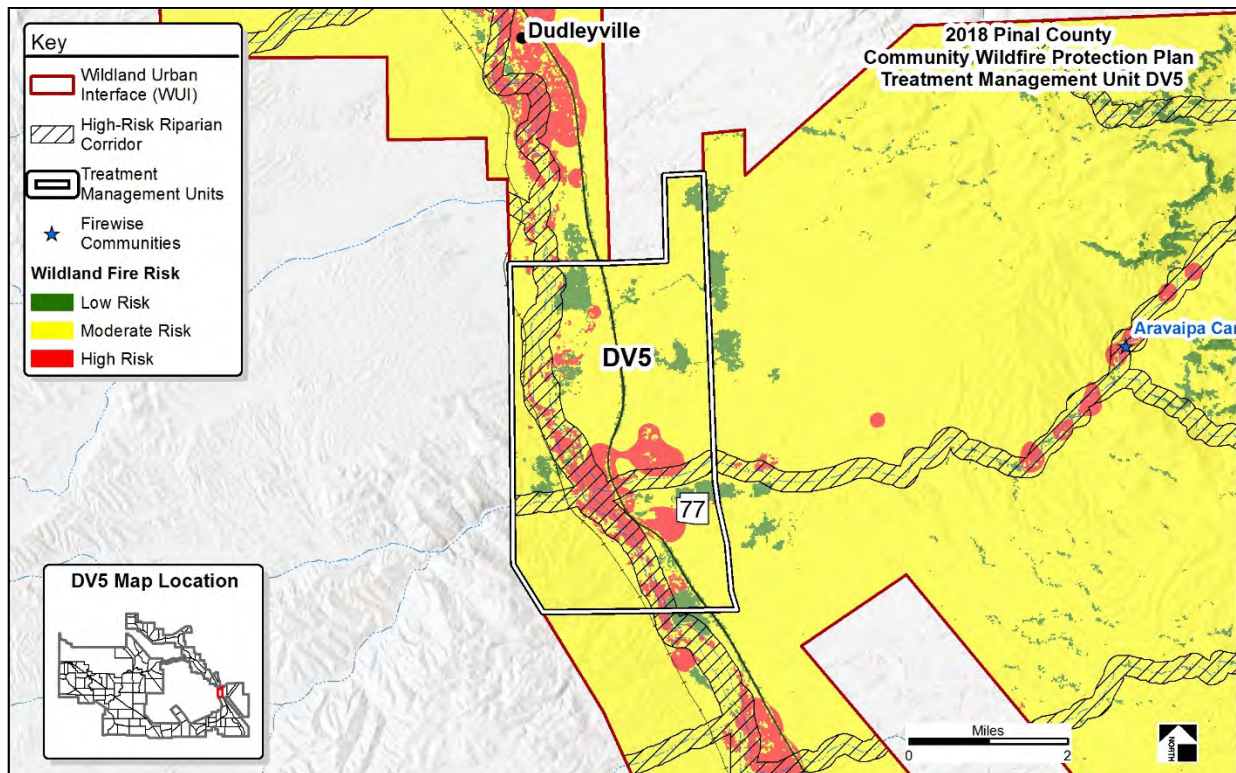


TMU DV3

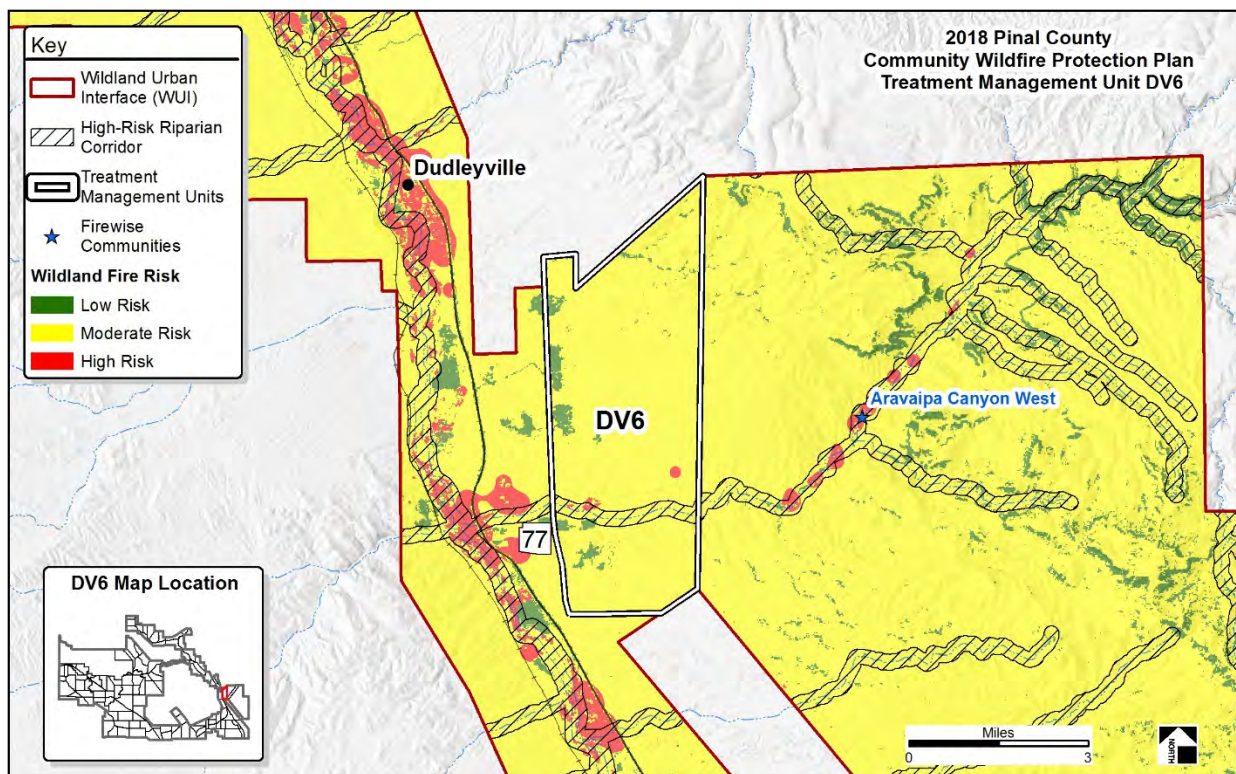


TMU DV4





TMU DV5

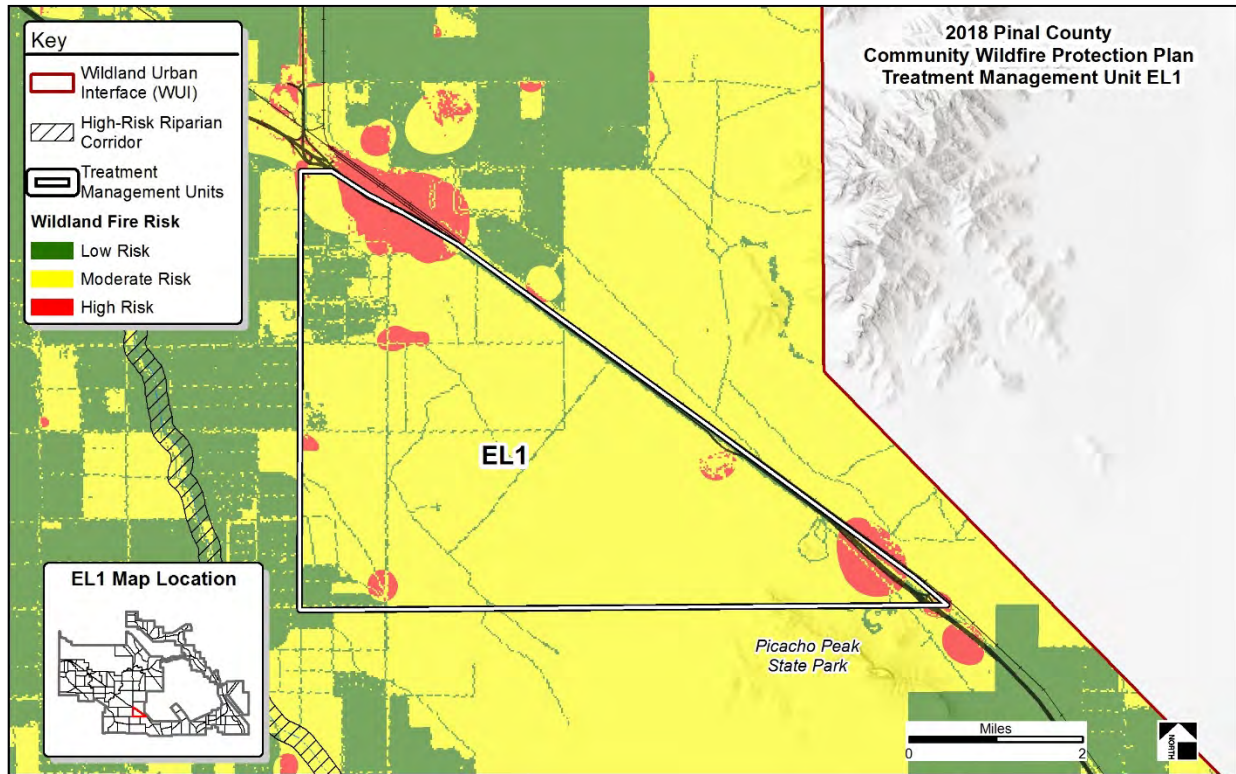


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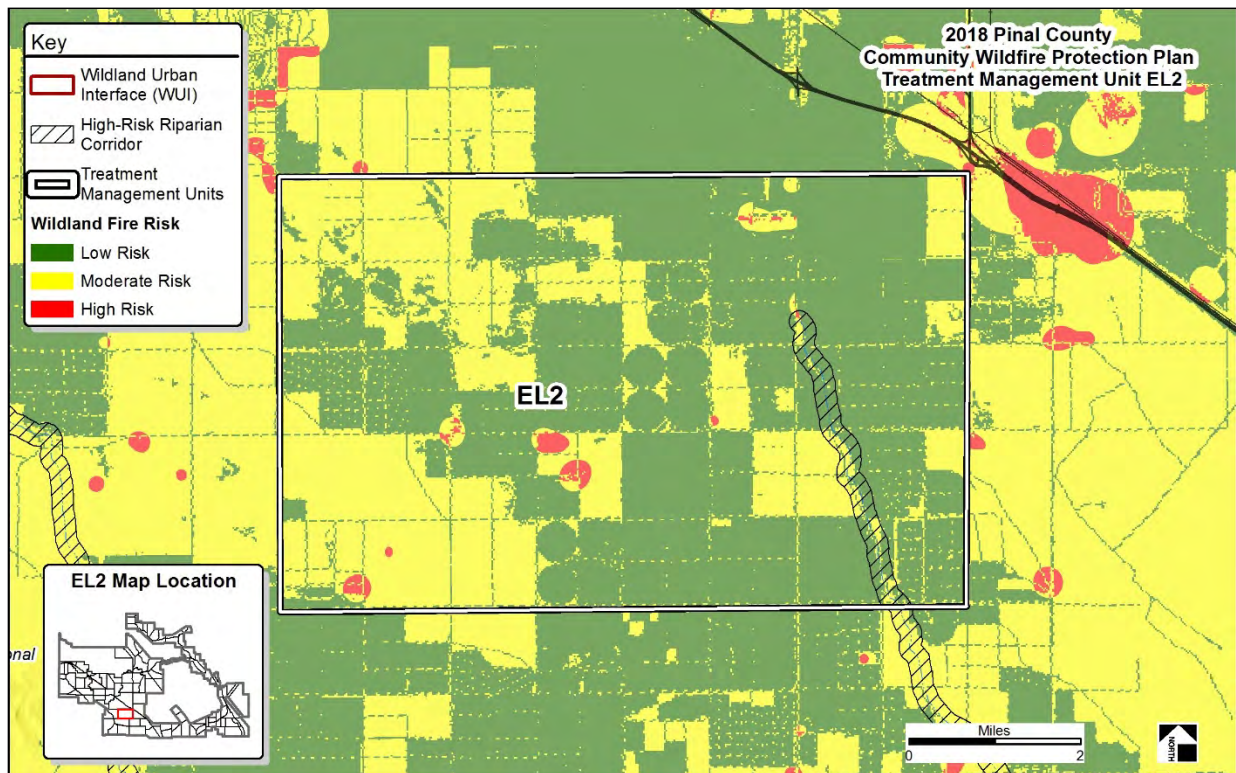
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## ELOY WUI

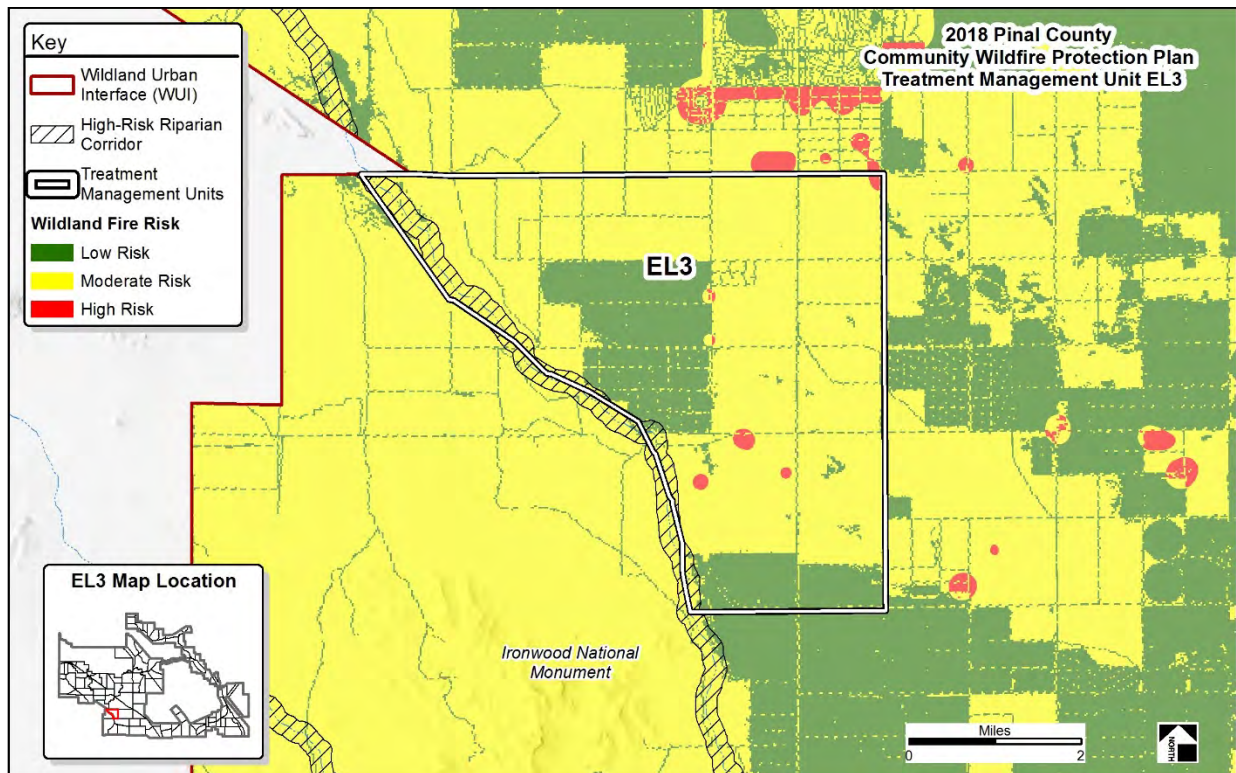


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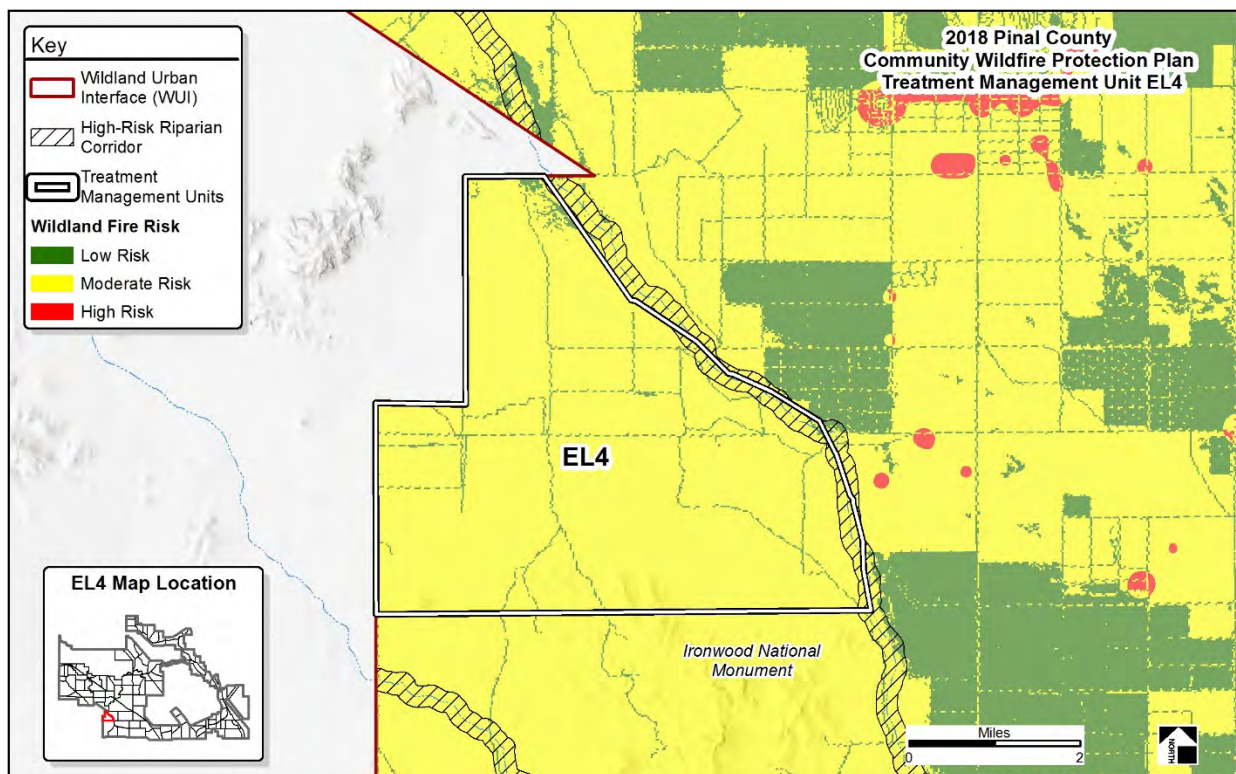


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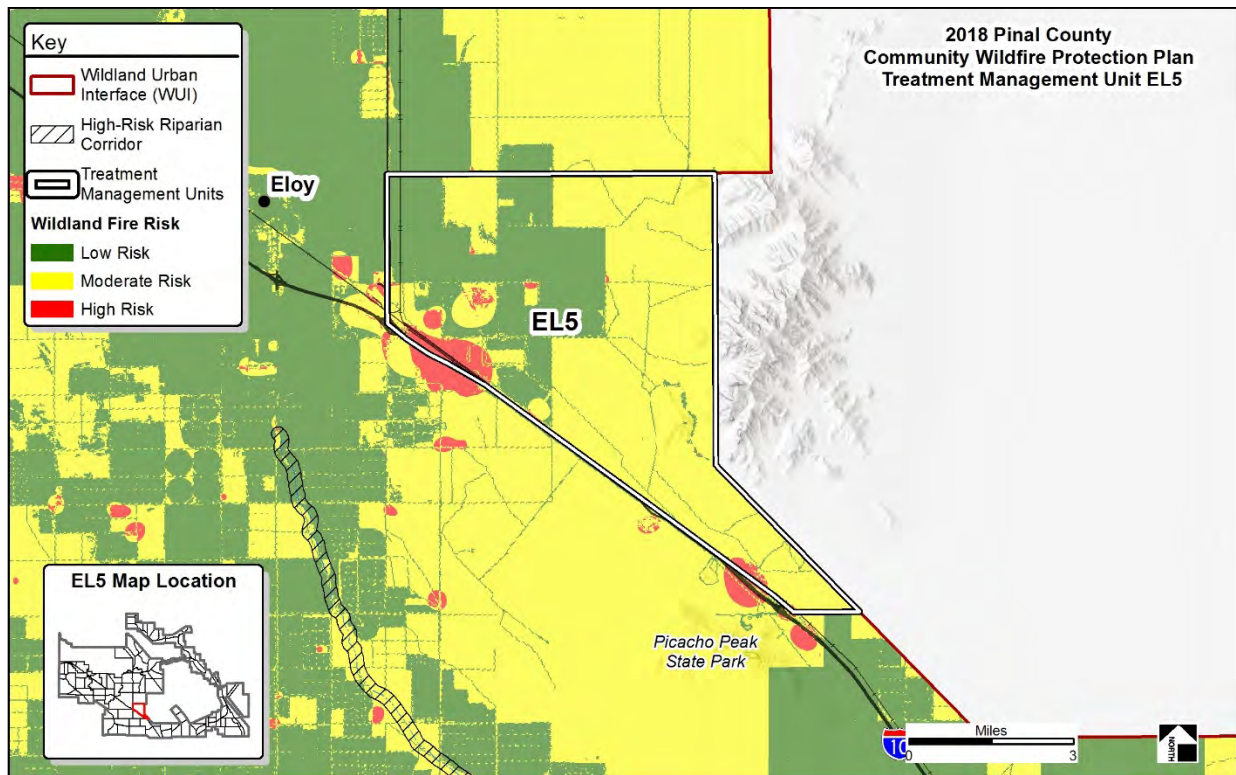


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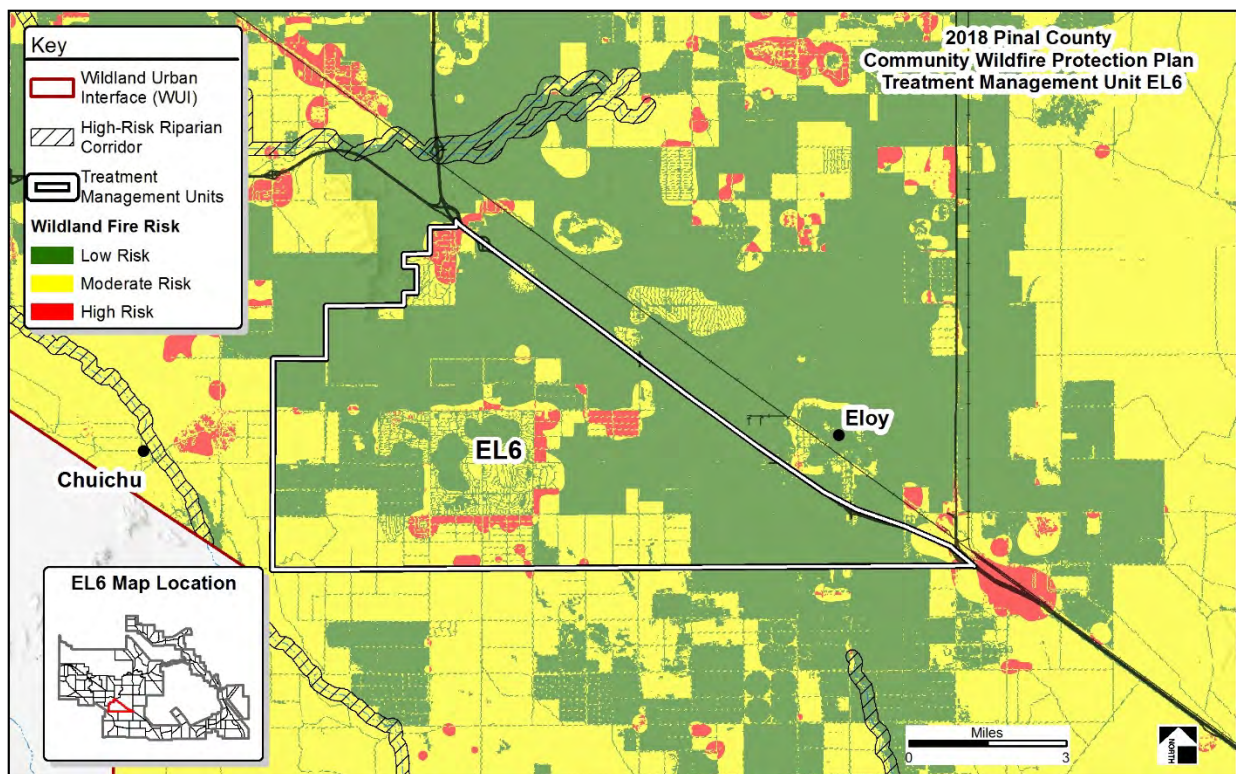


TMU EL4



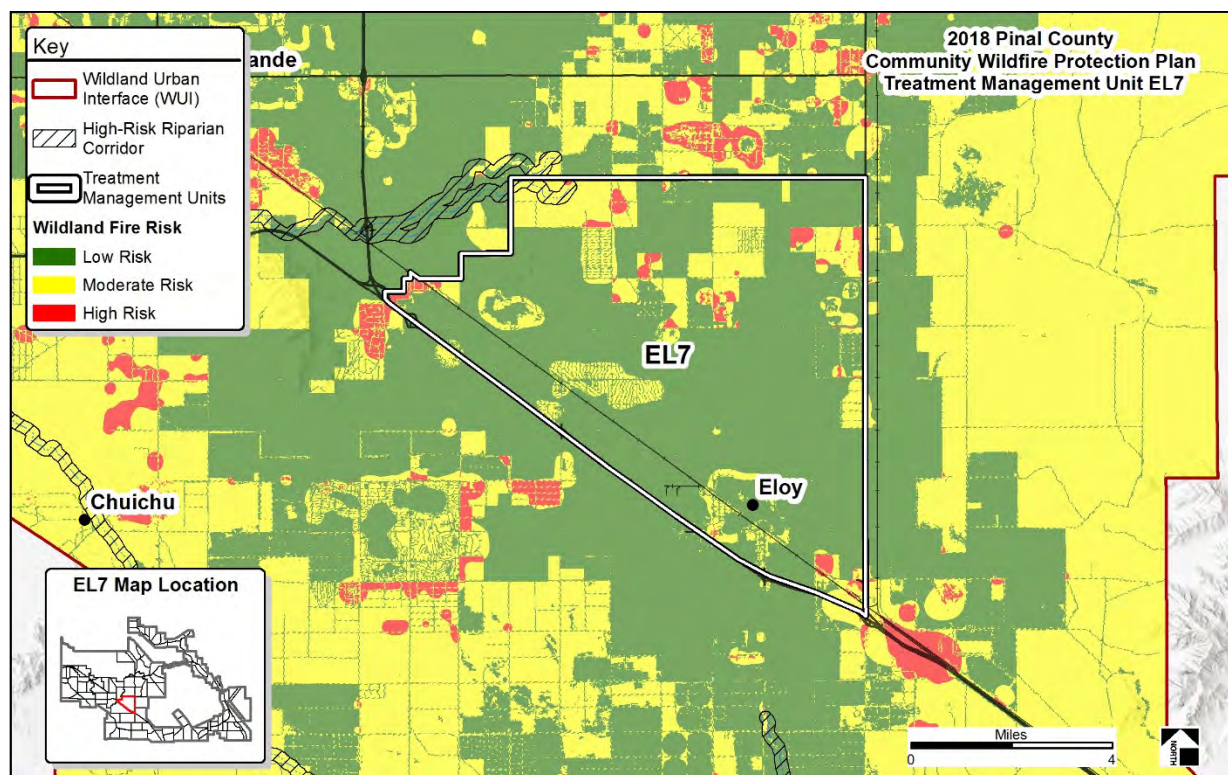


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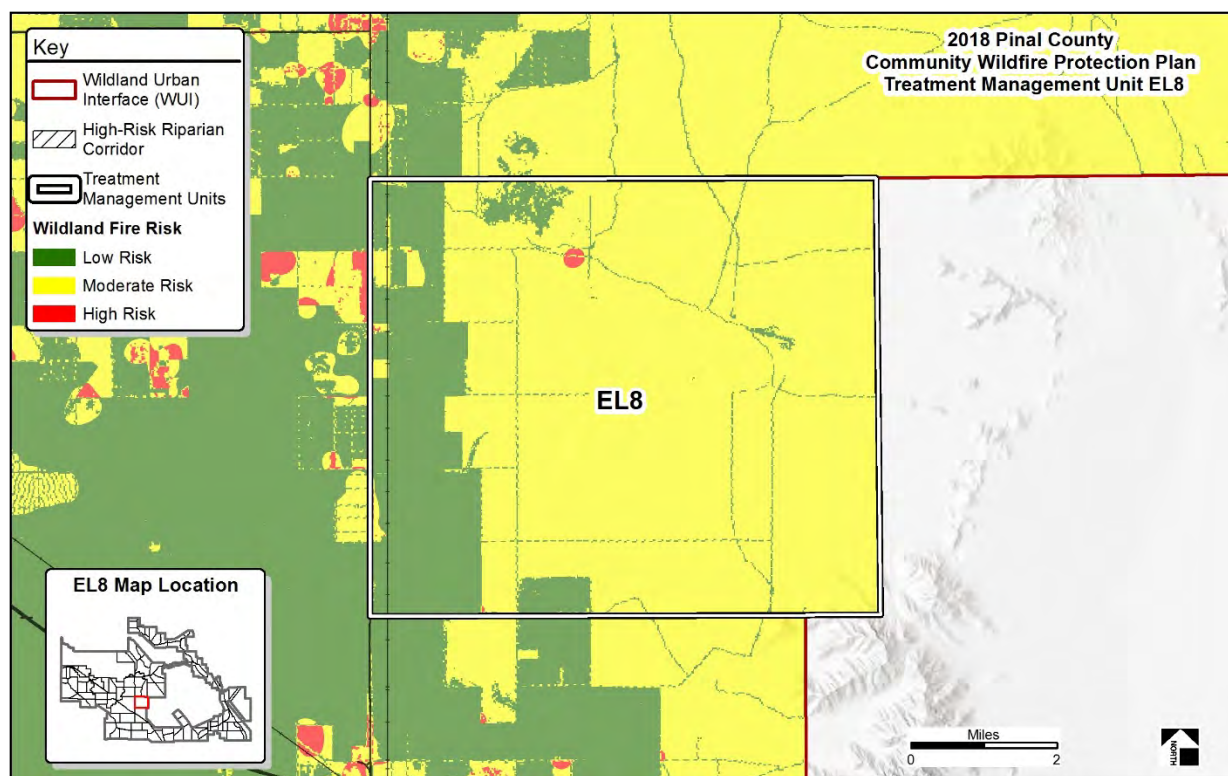


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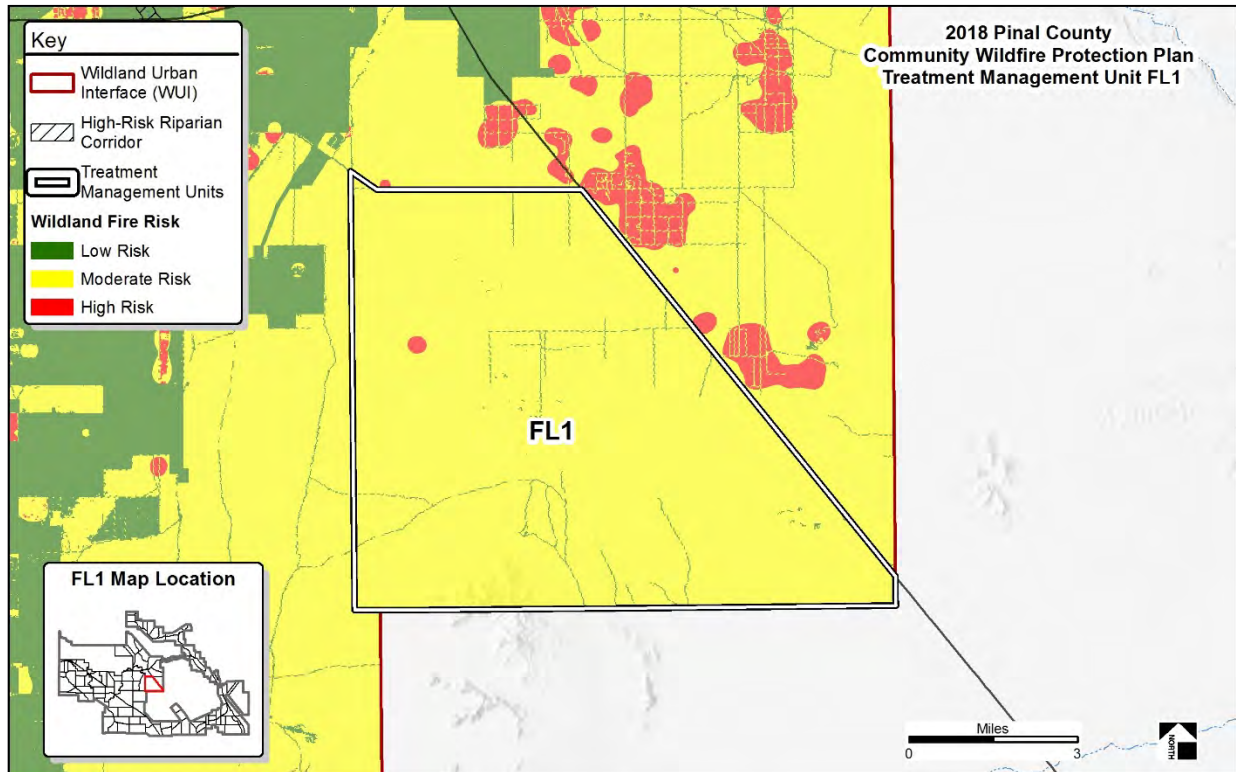
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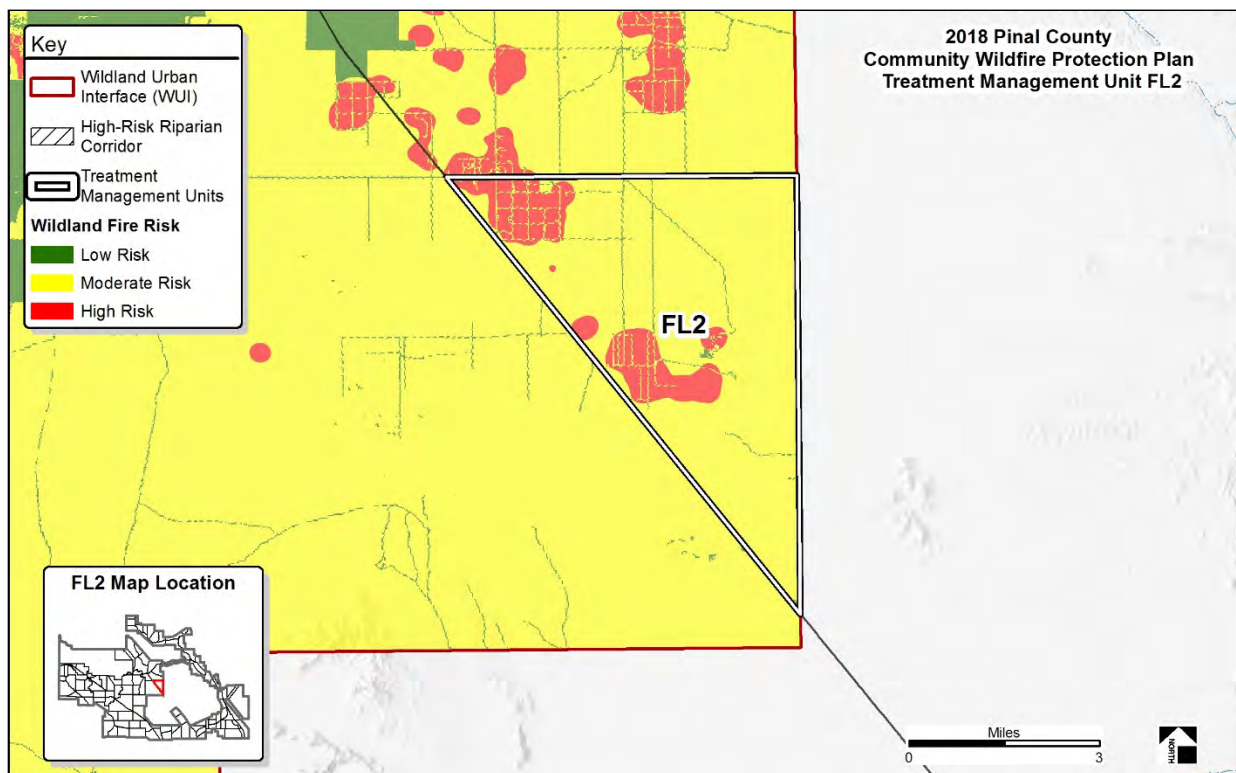
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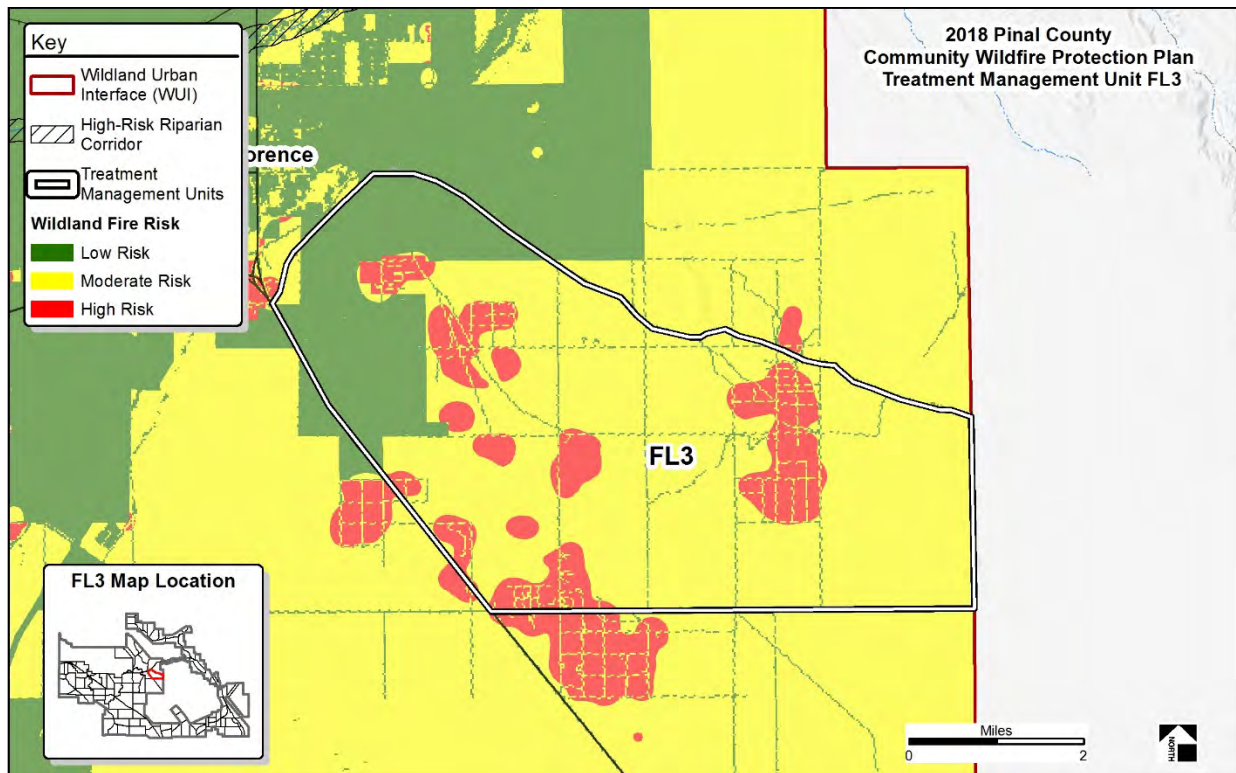
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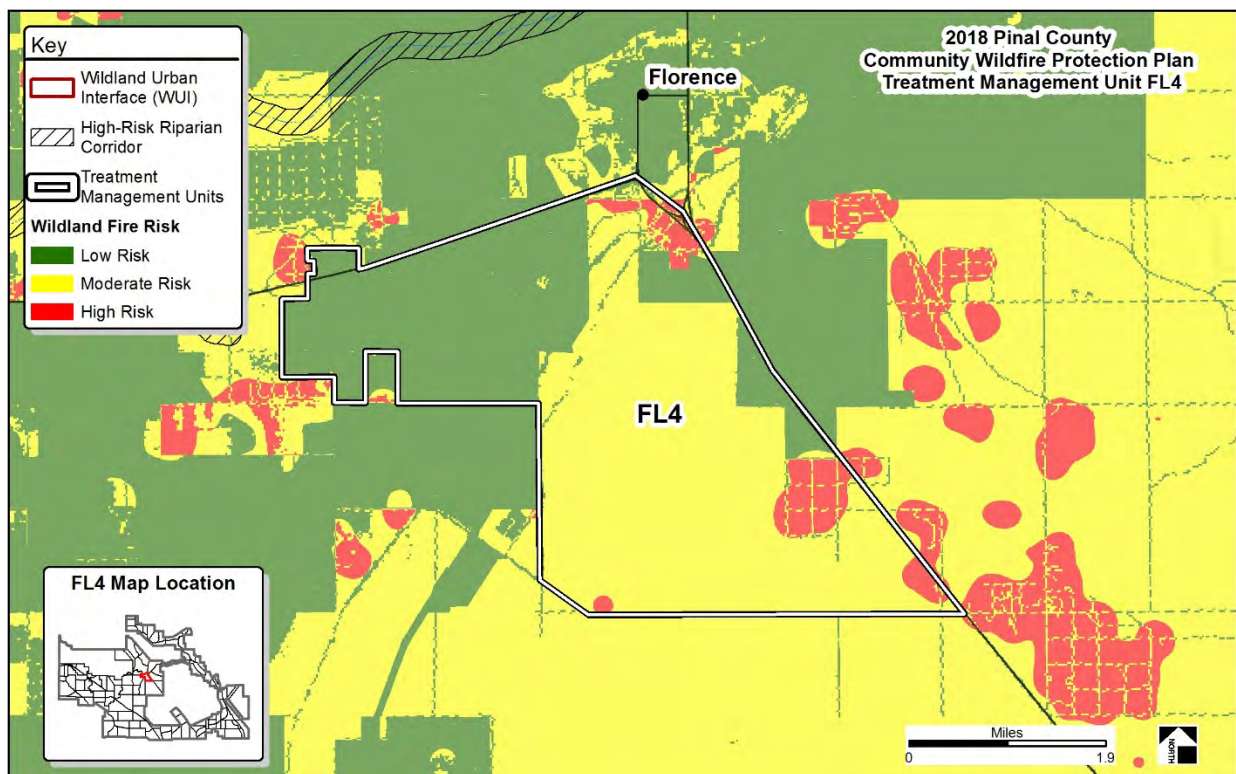
TMU FL1



TMU FL2

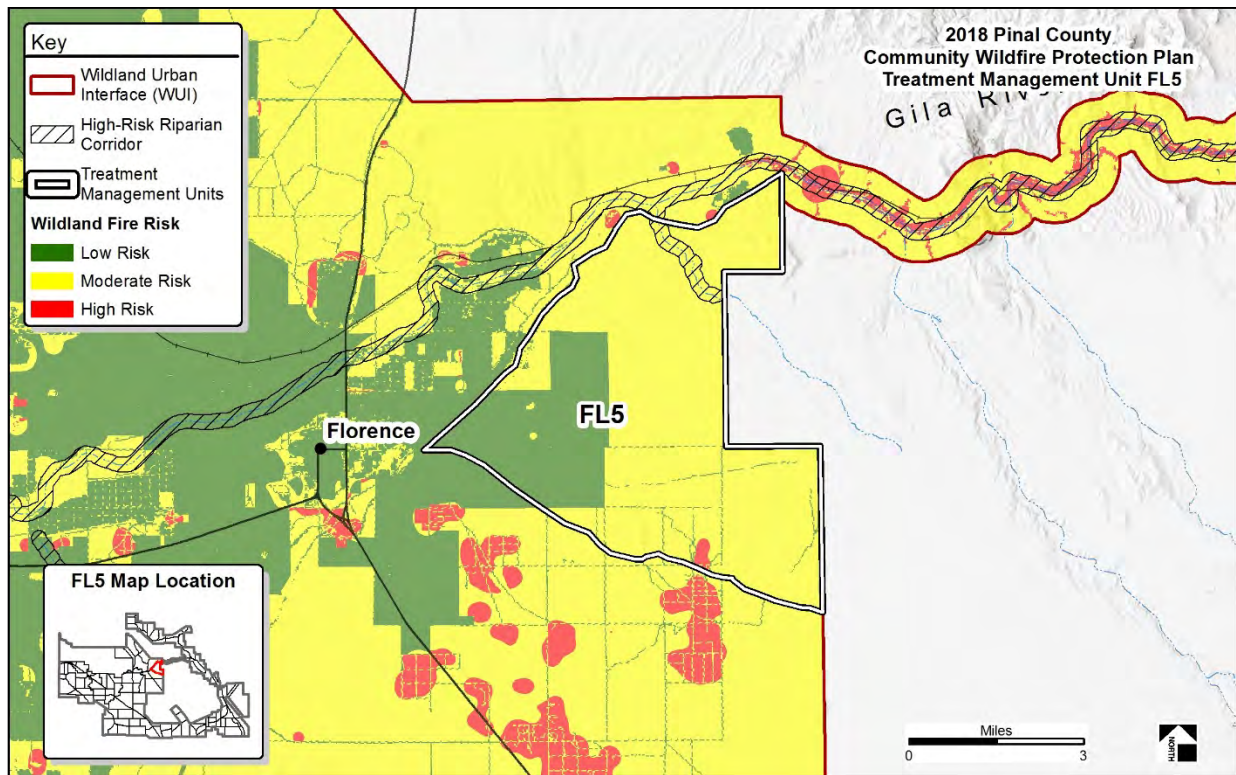


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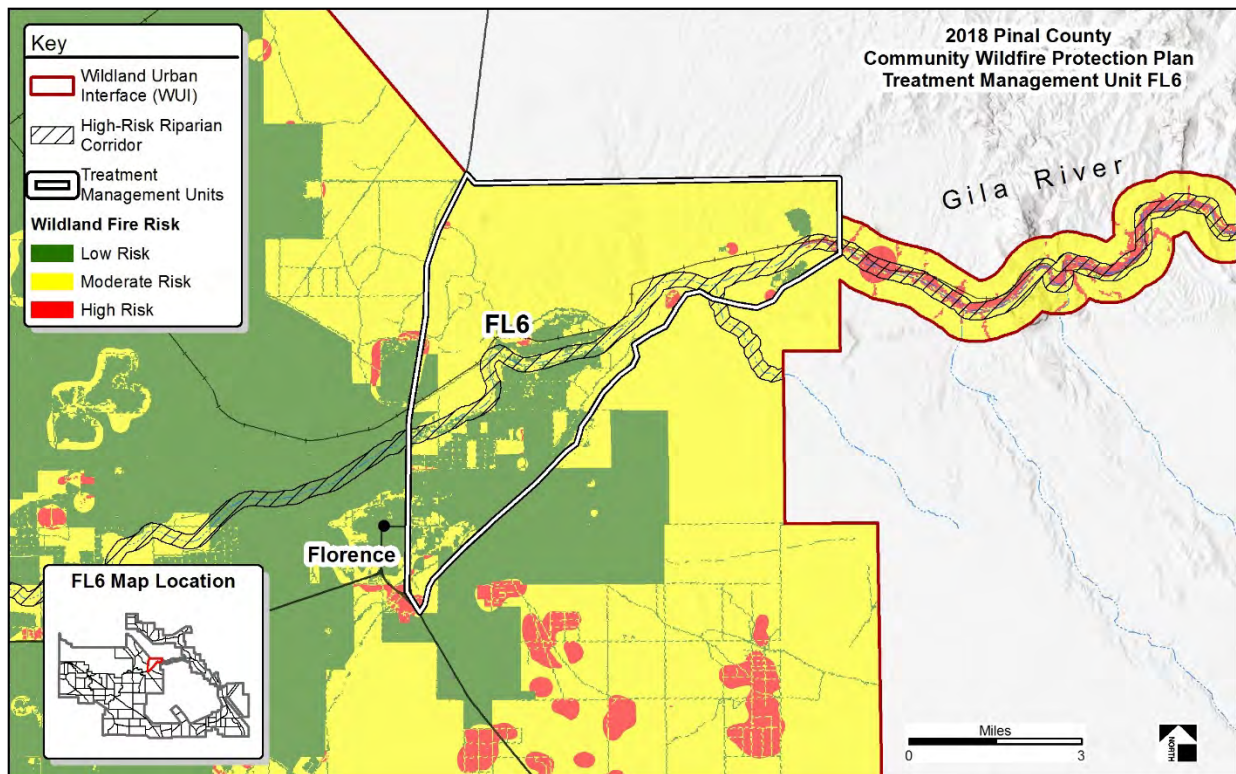


TMU FL4



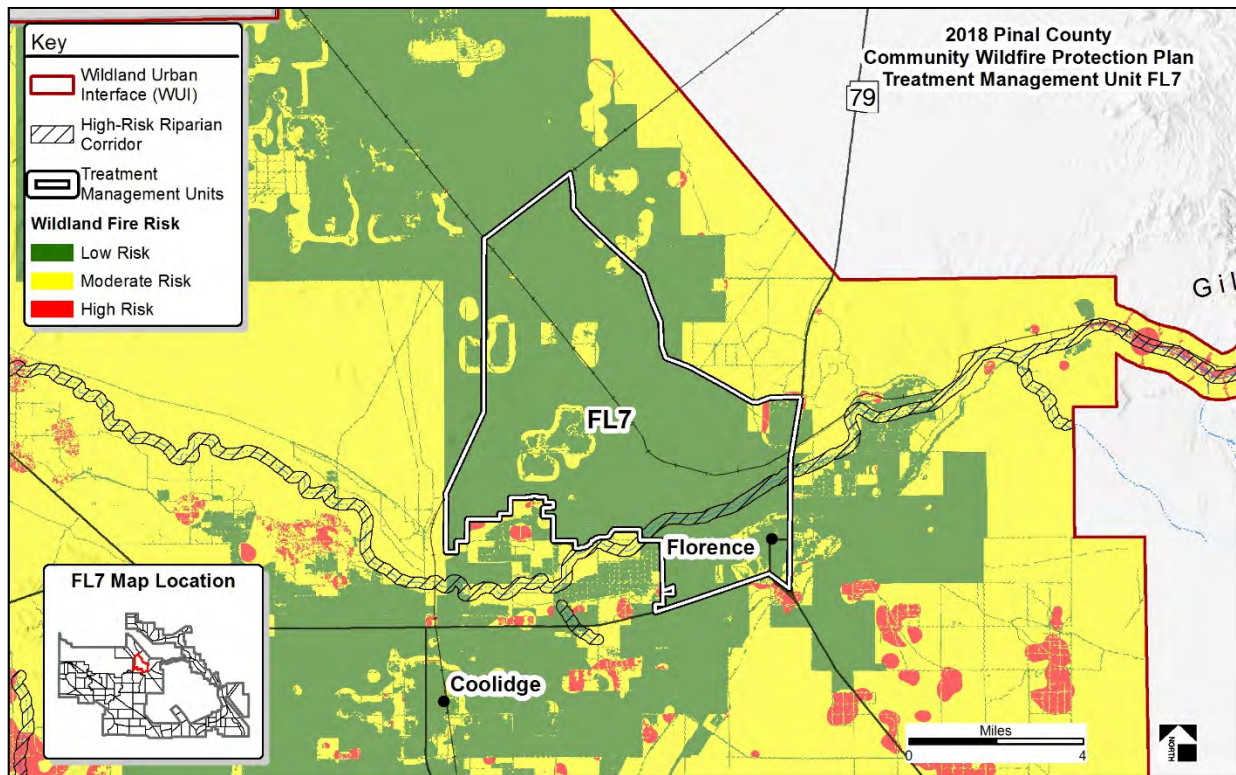


TMU FL5

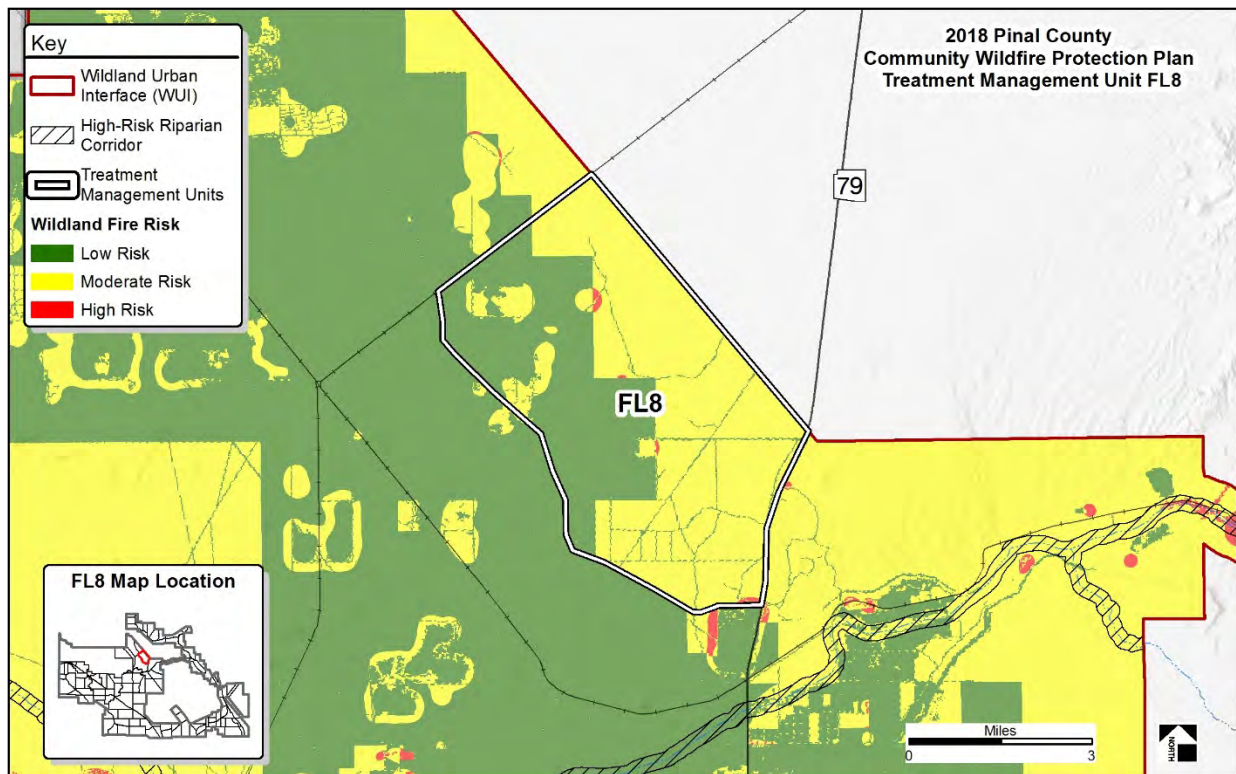


TMU FL6





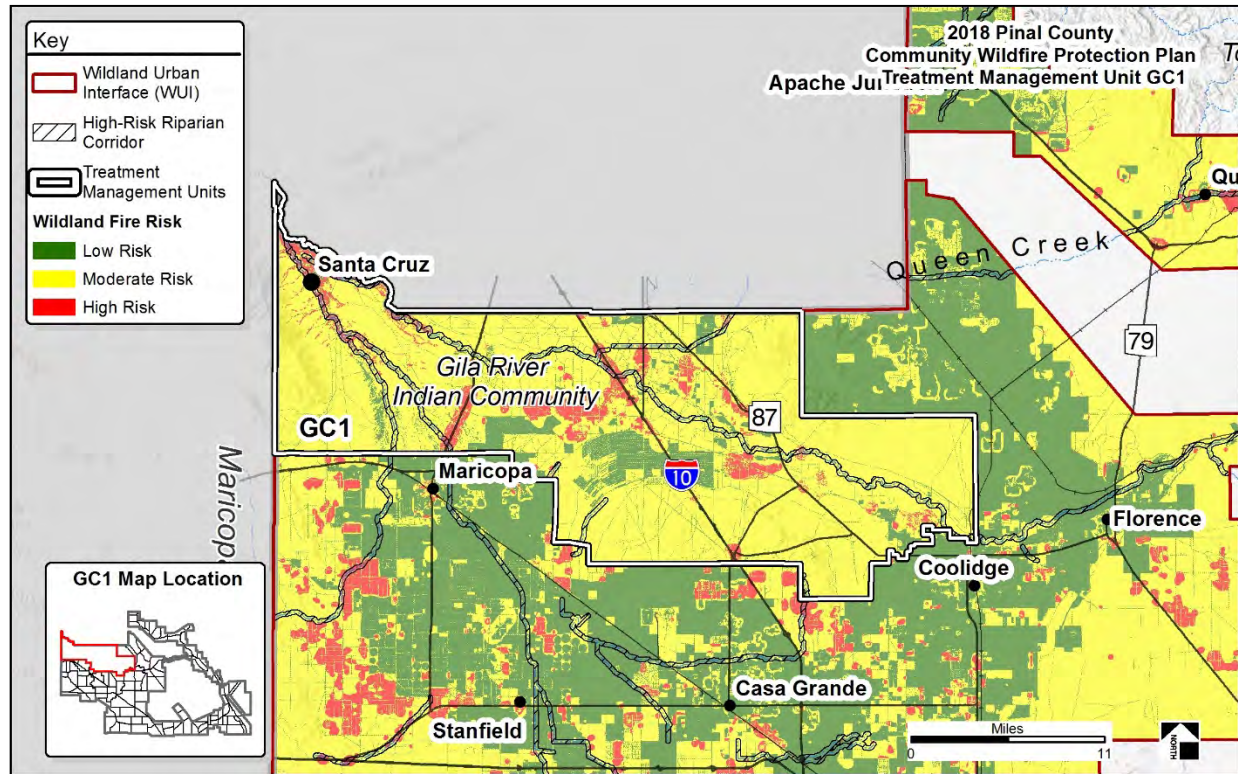
TMU FL7



TMU FL8



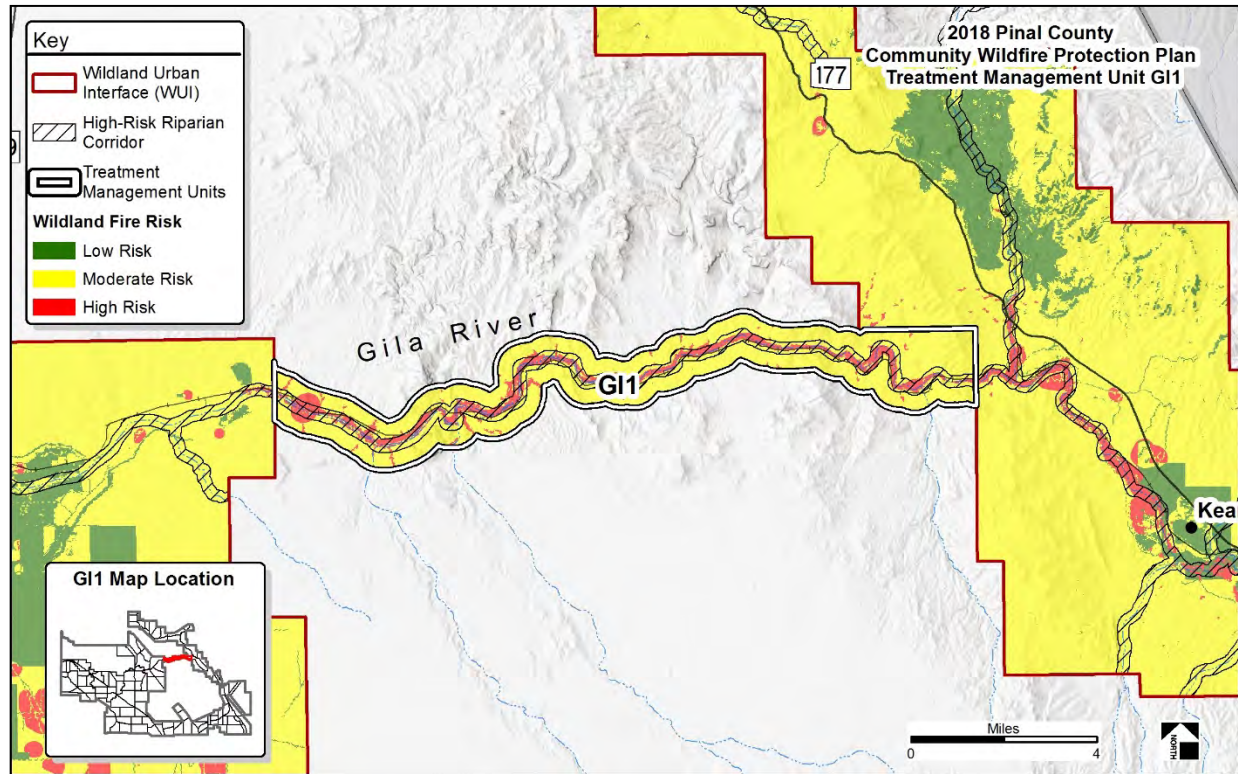
## GILA RIVER INDIAN COMMUNITY WUI



TMU GC1

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## GILA RIVER RIPARIAN CORRIDOR WUI

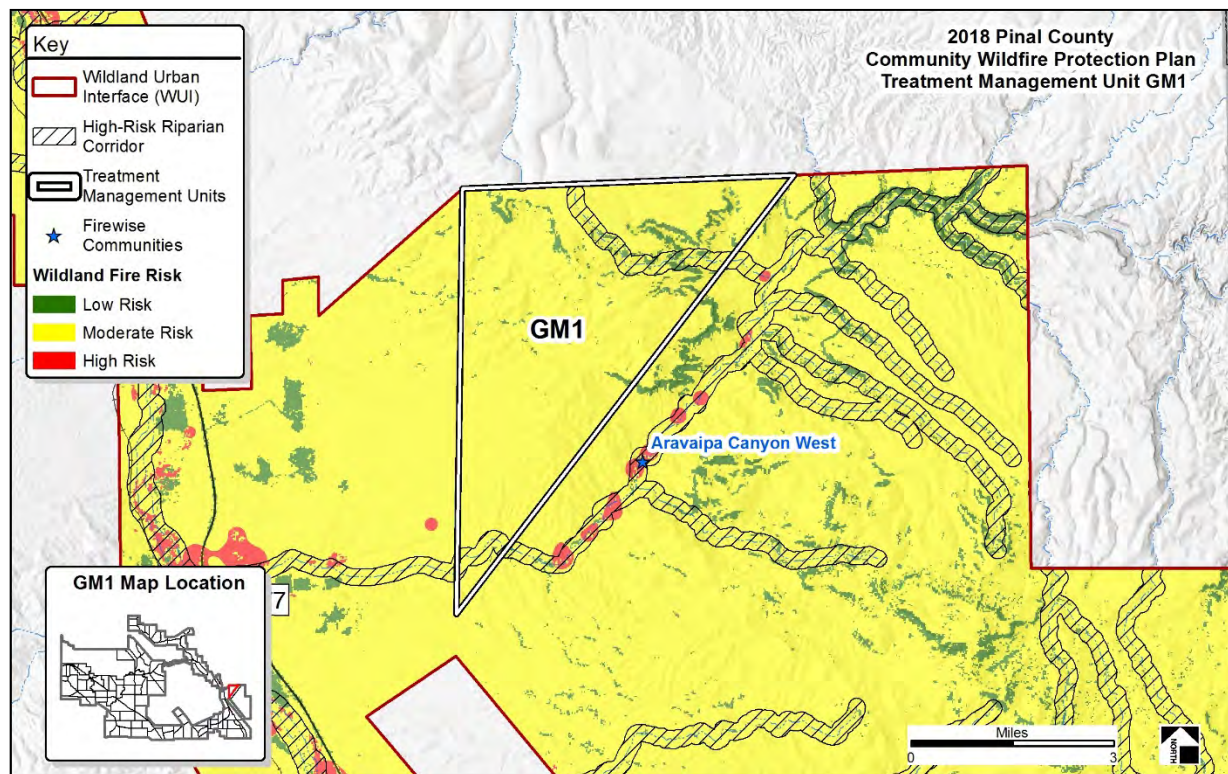


TMU GI1

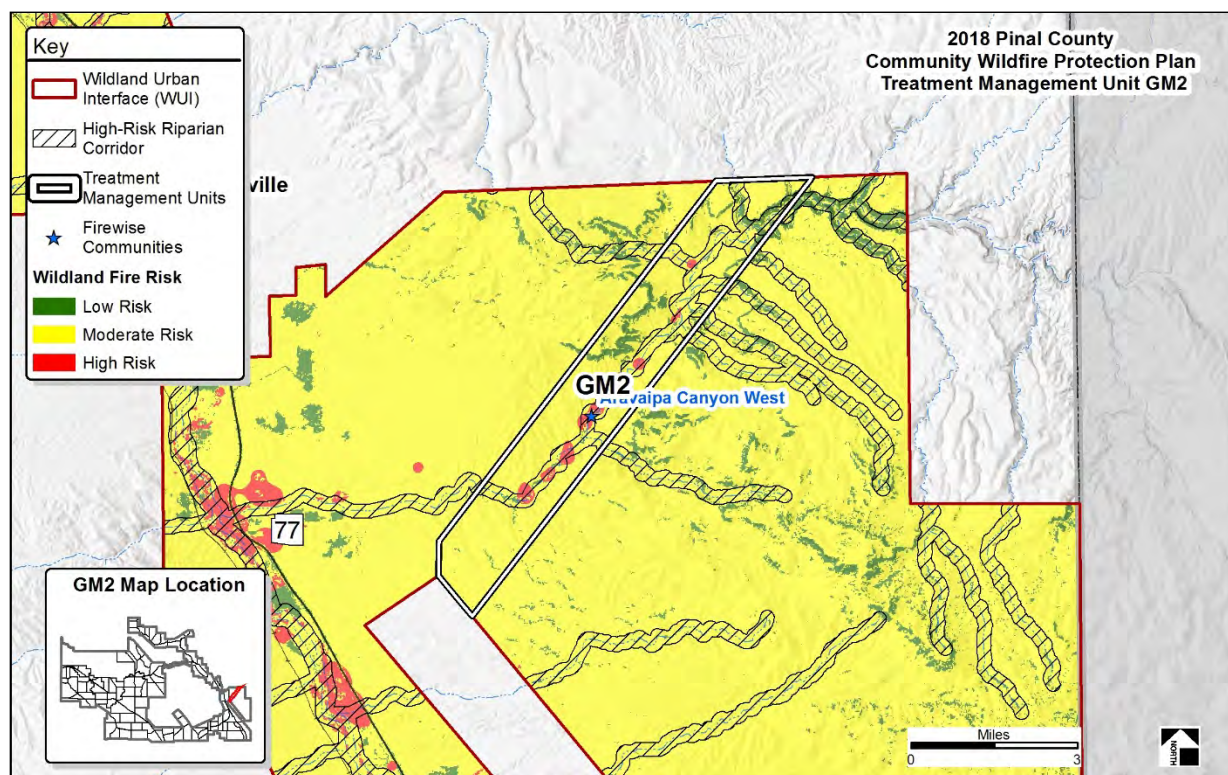
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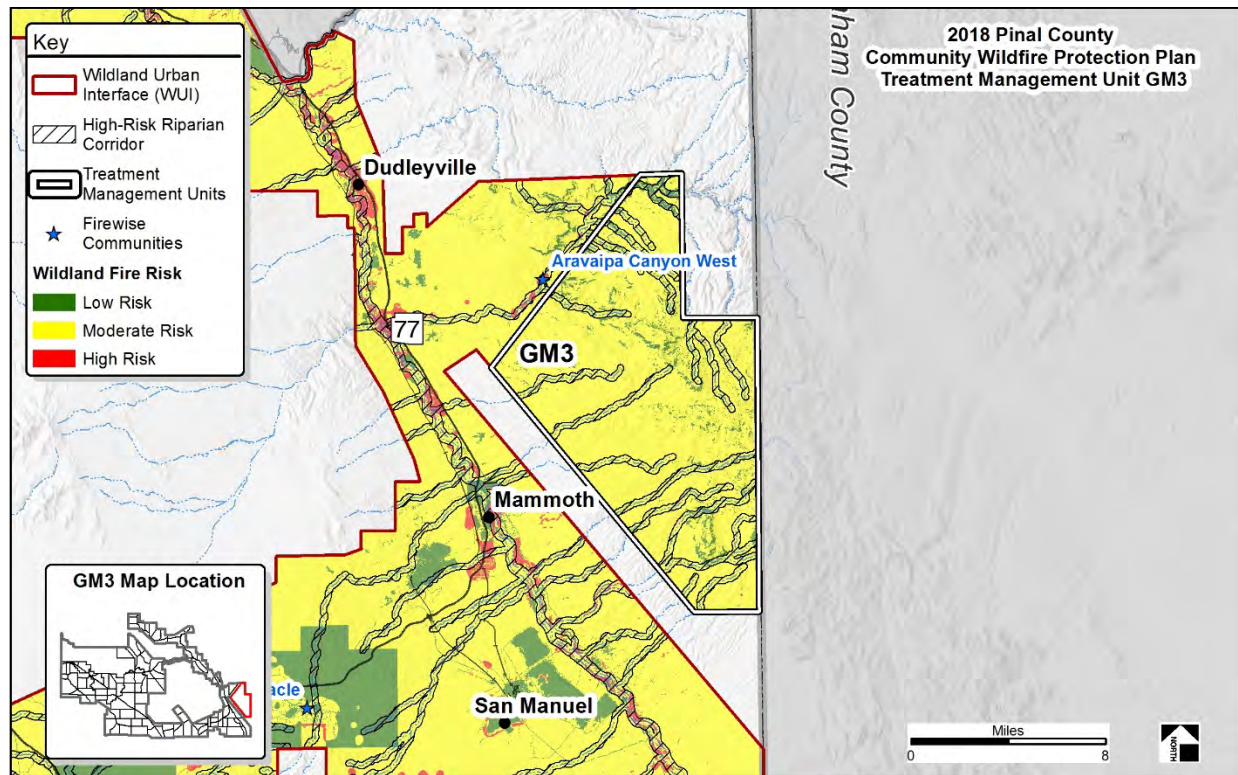
## GALIURO MOUNTAINS WUI



TMU GM1



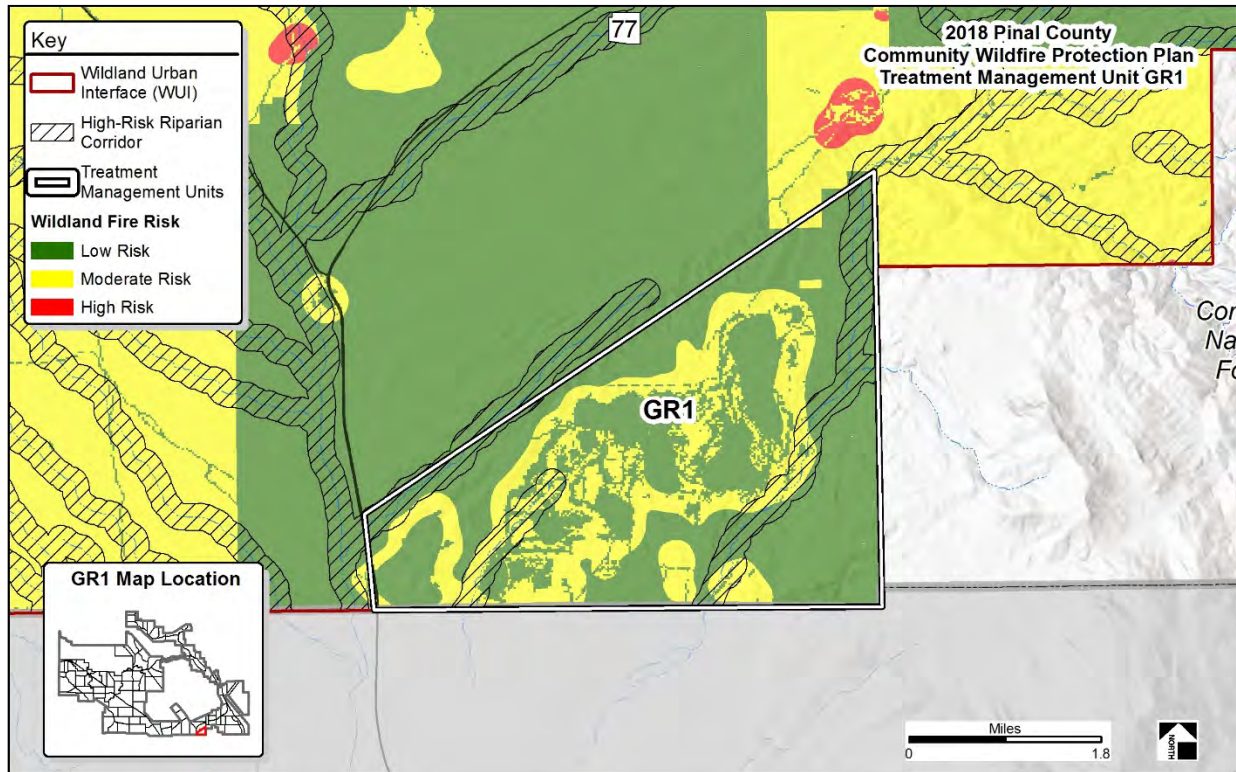
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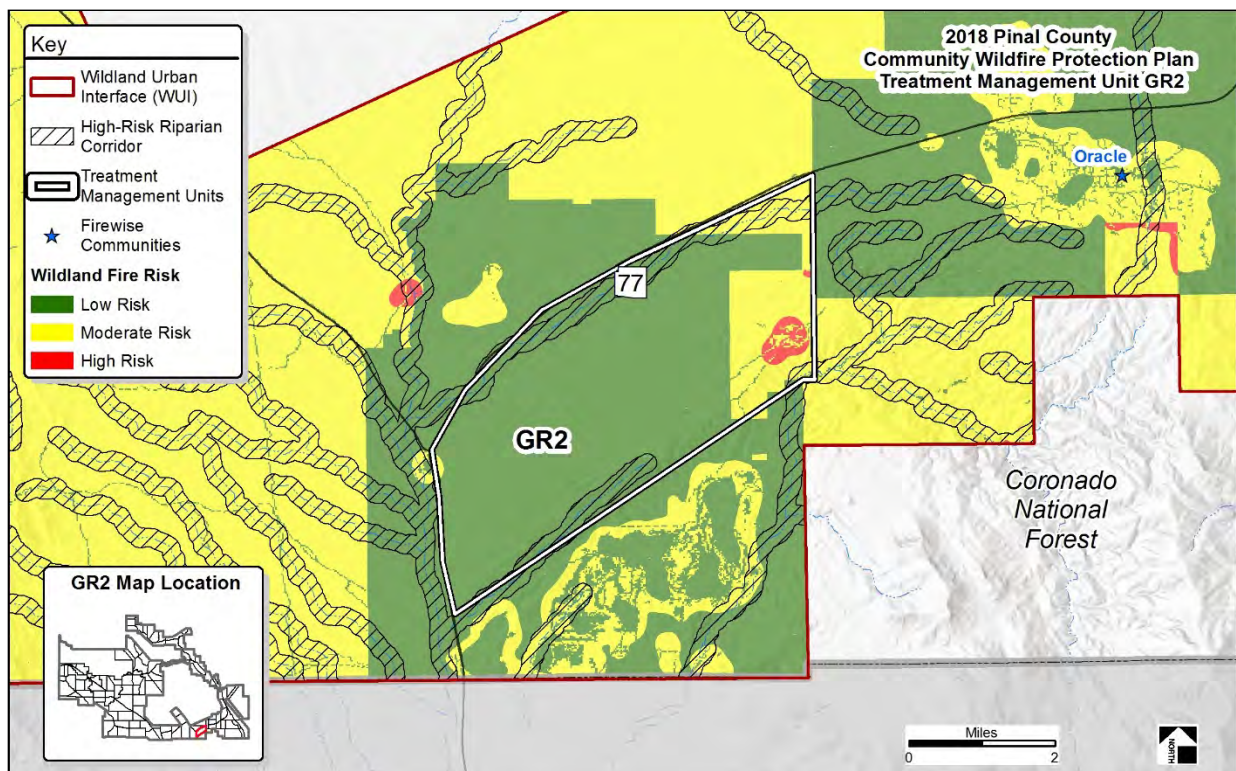
TMU GM3



## GOLDER RANCH WUI

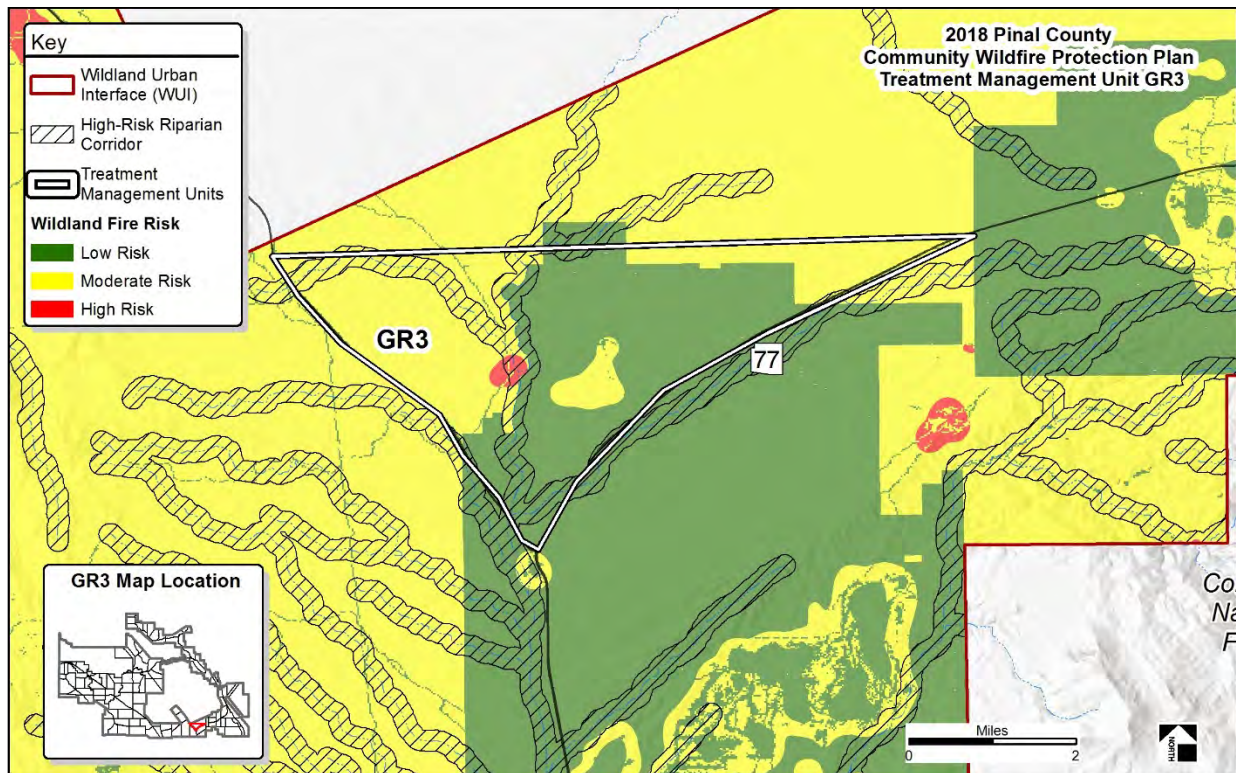


TMU GR1

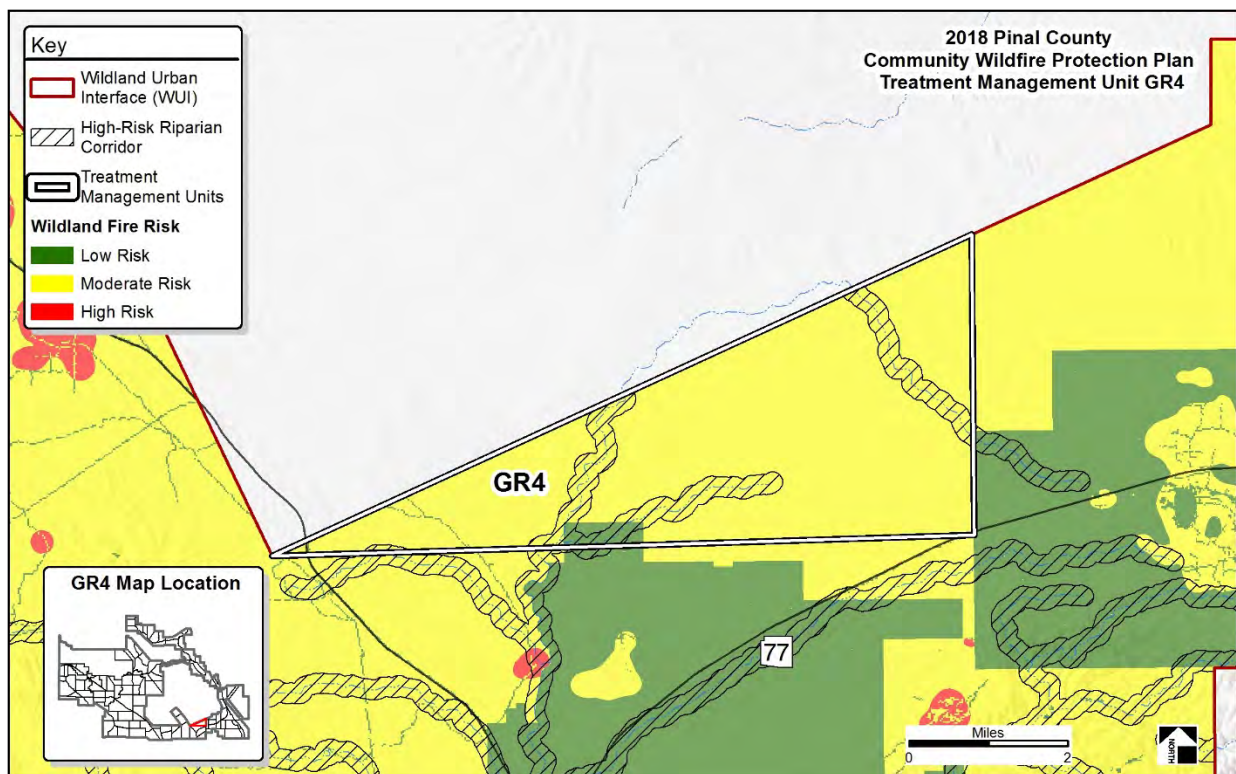


TMU GR2



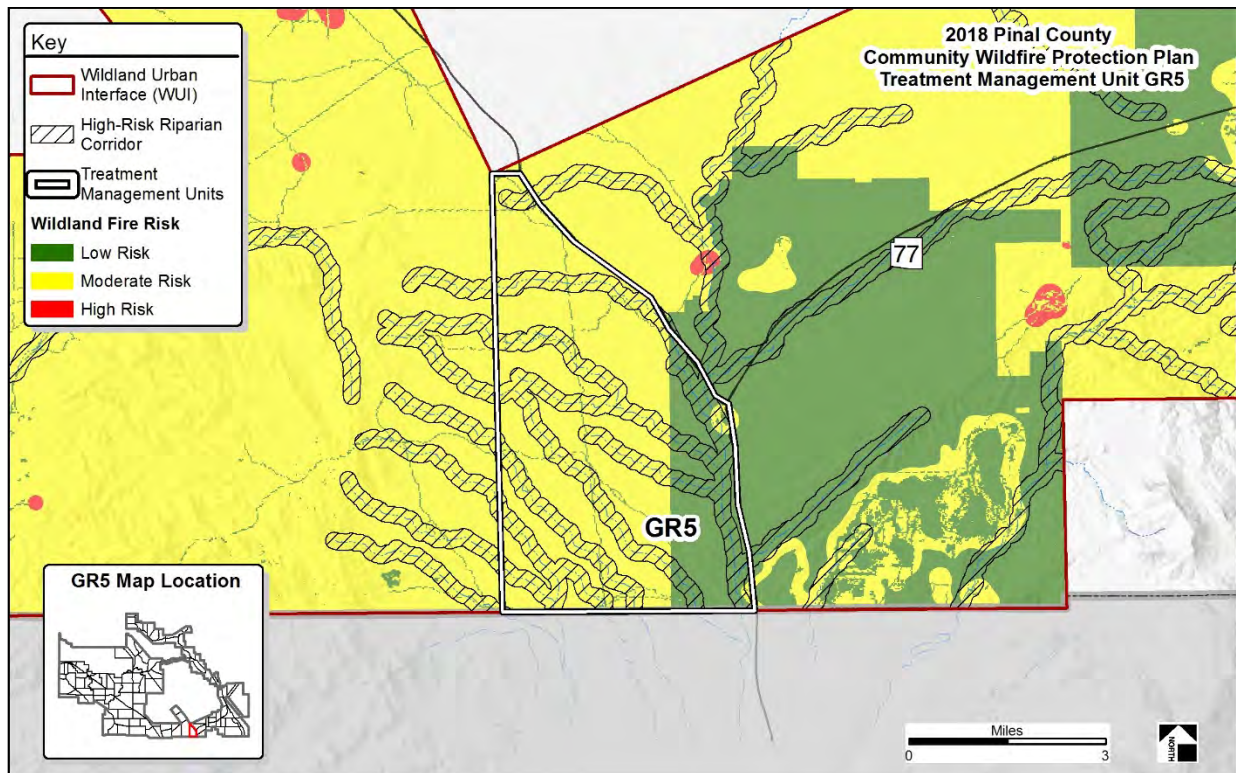


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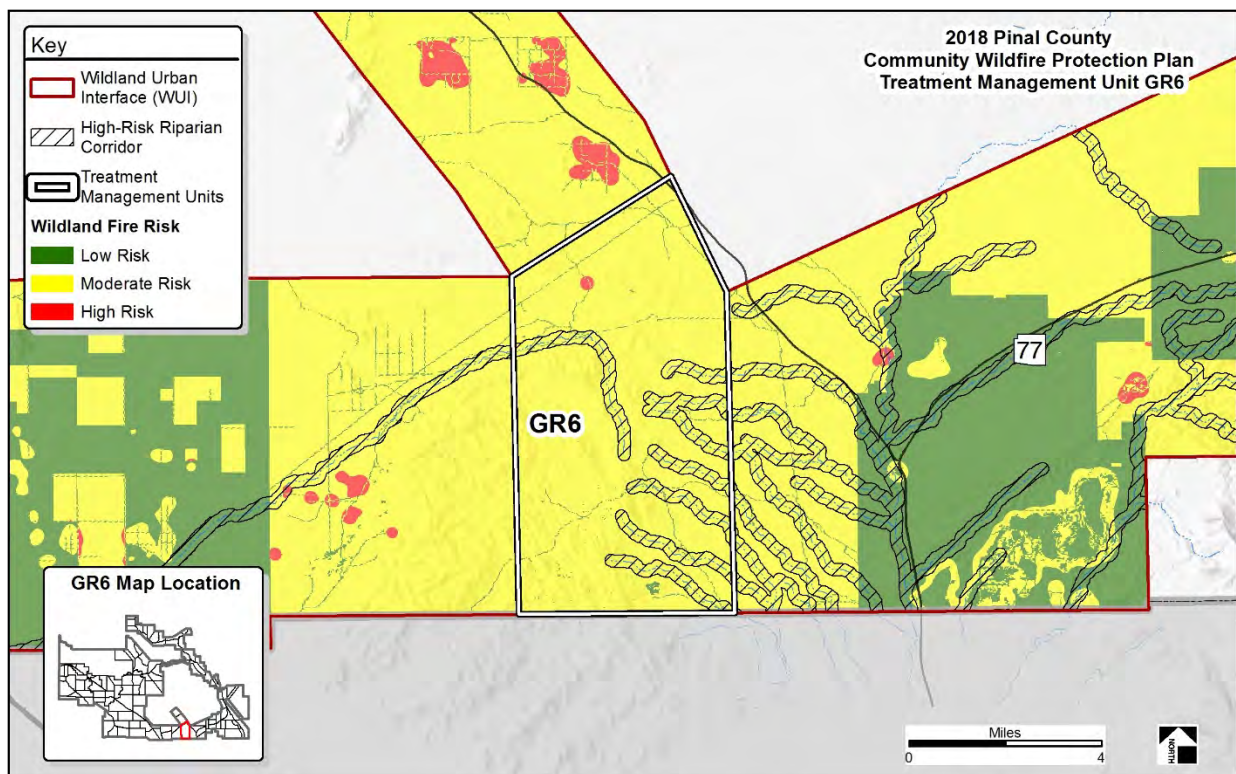


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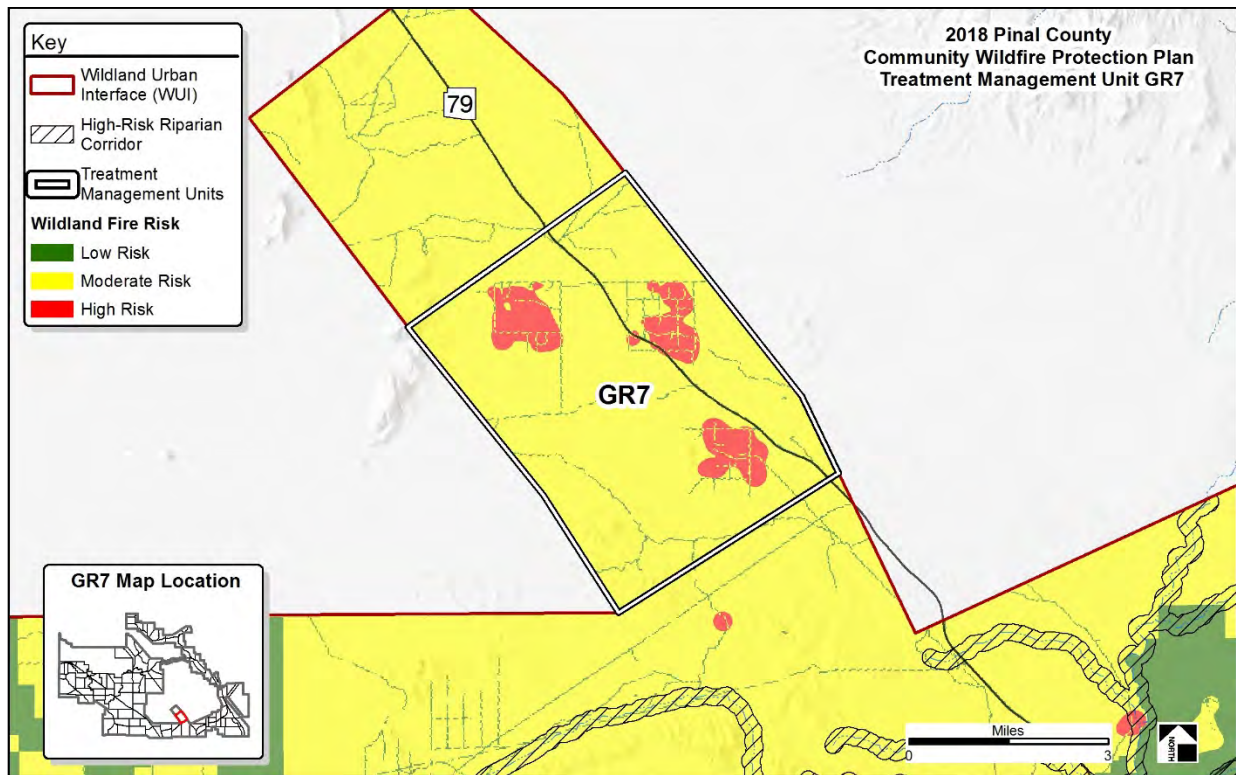




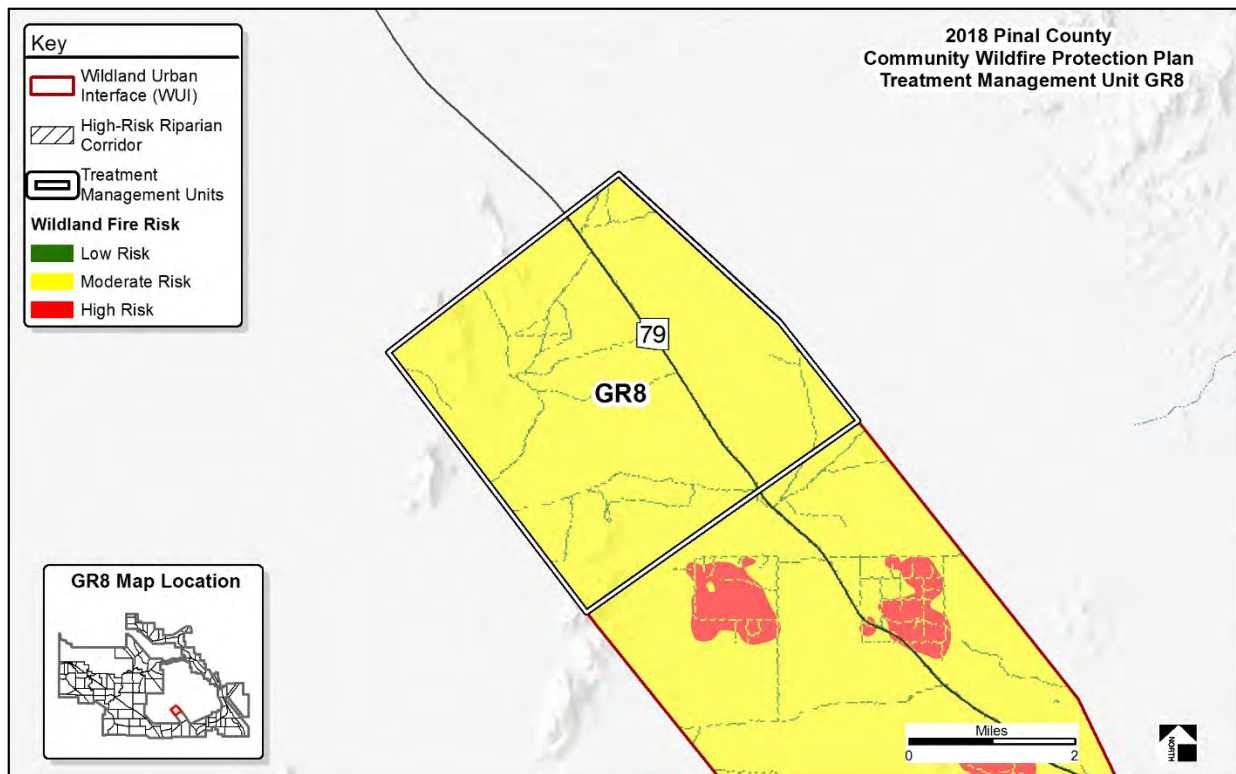
TMU GR5



TMU GR6

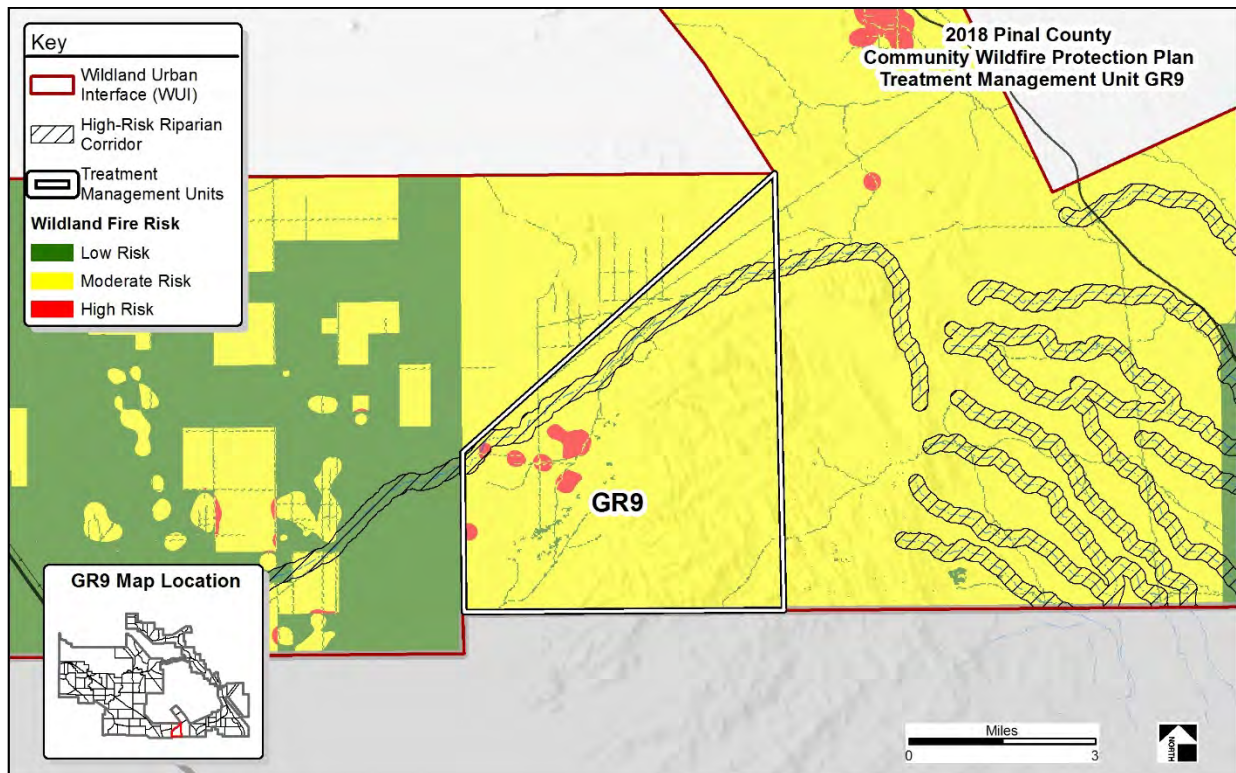


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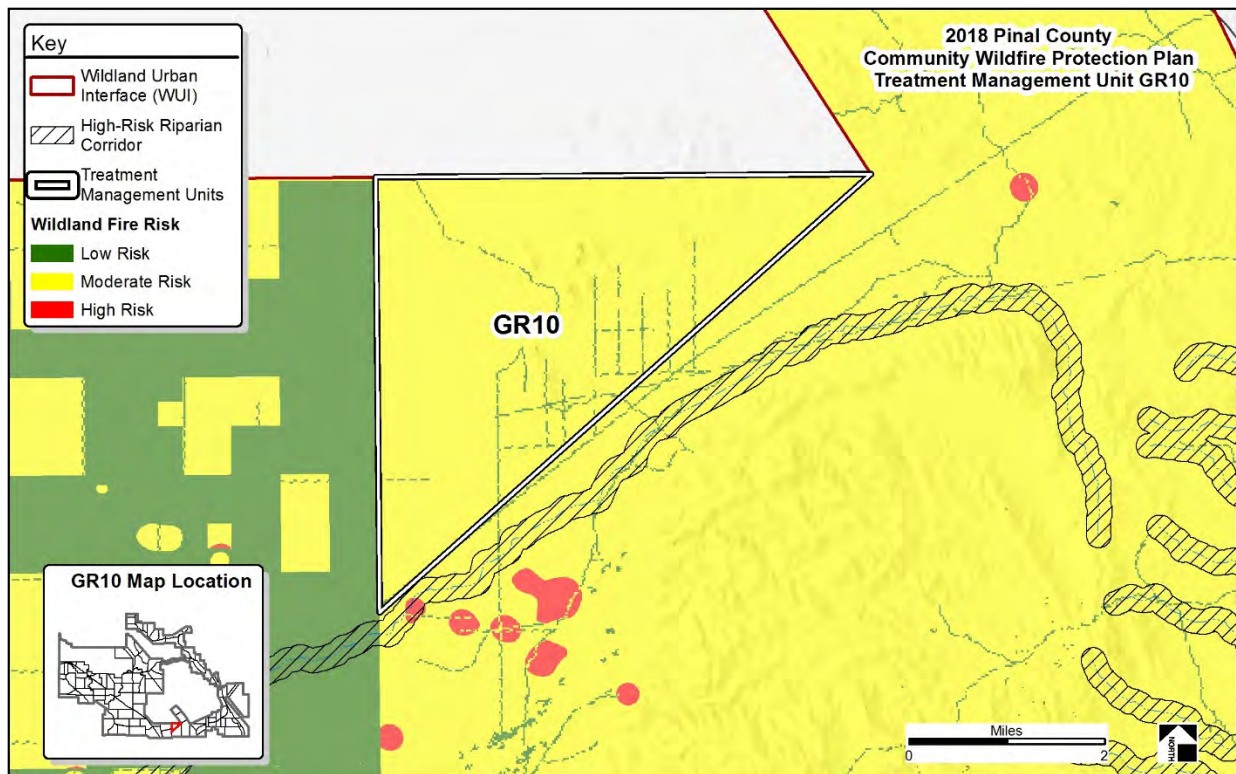


TMU GR8





TMU GR9

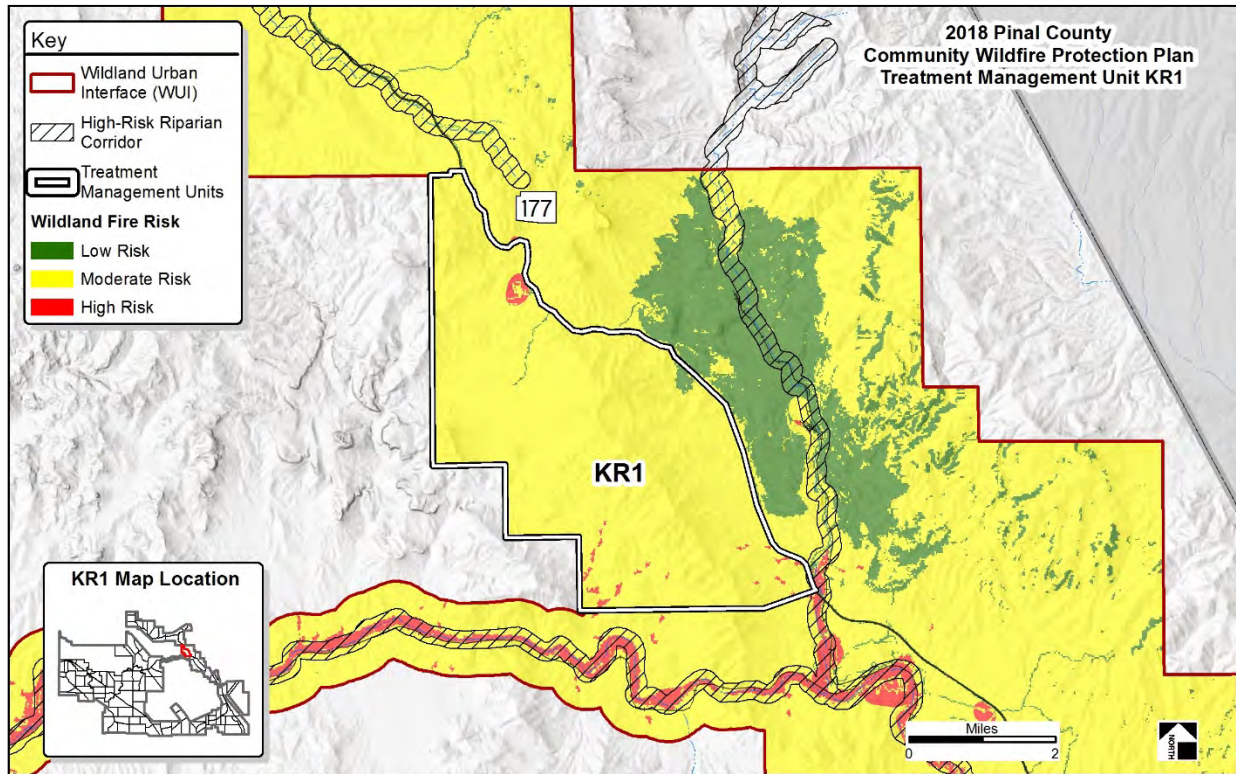


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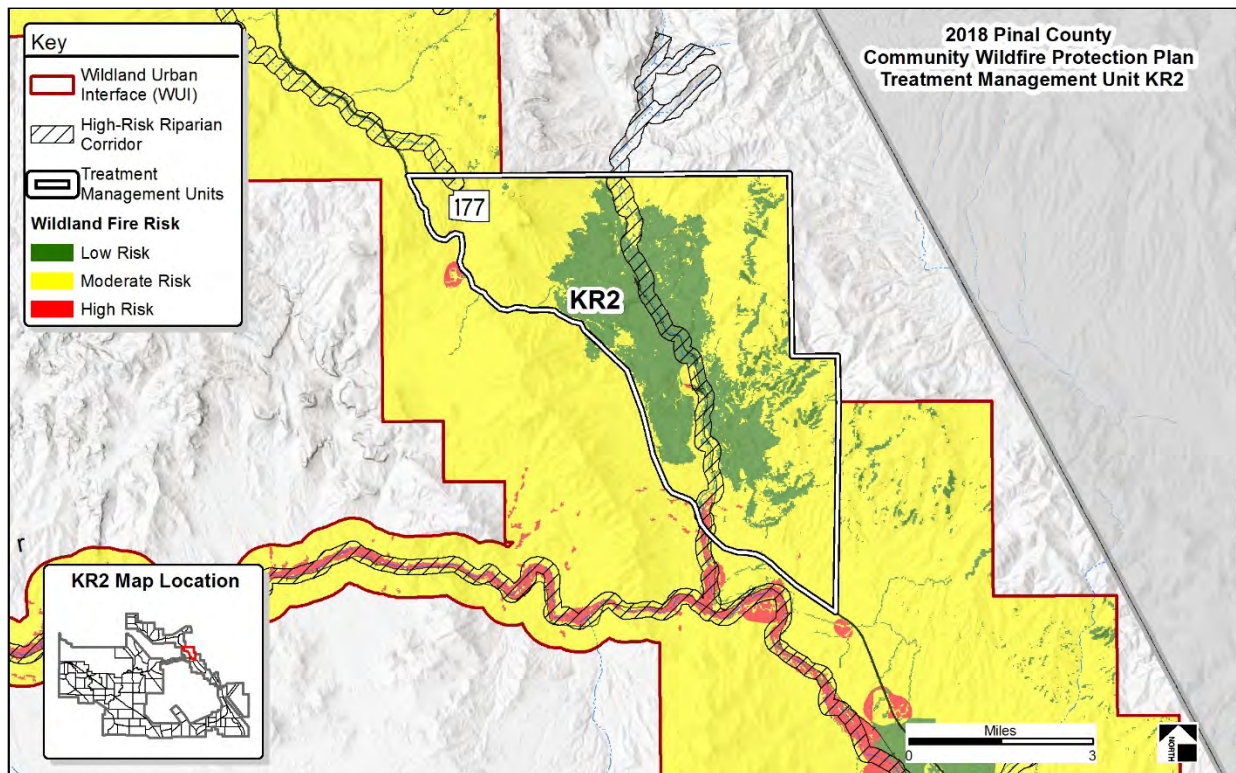
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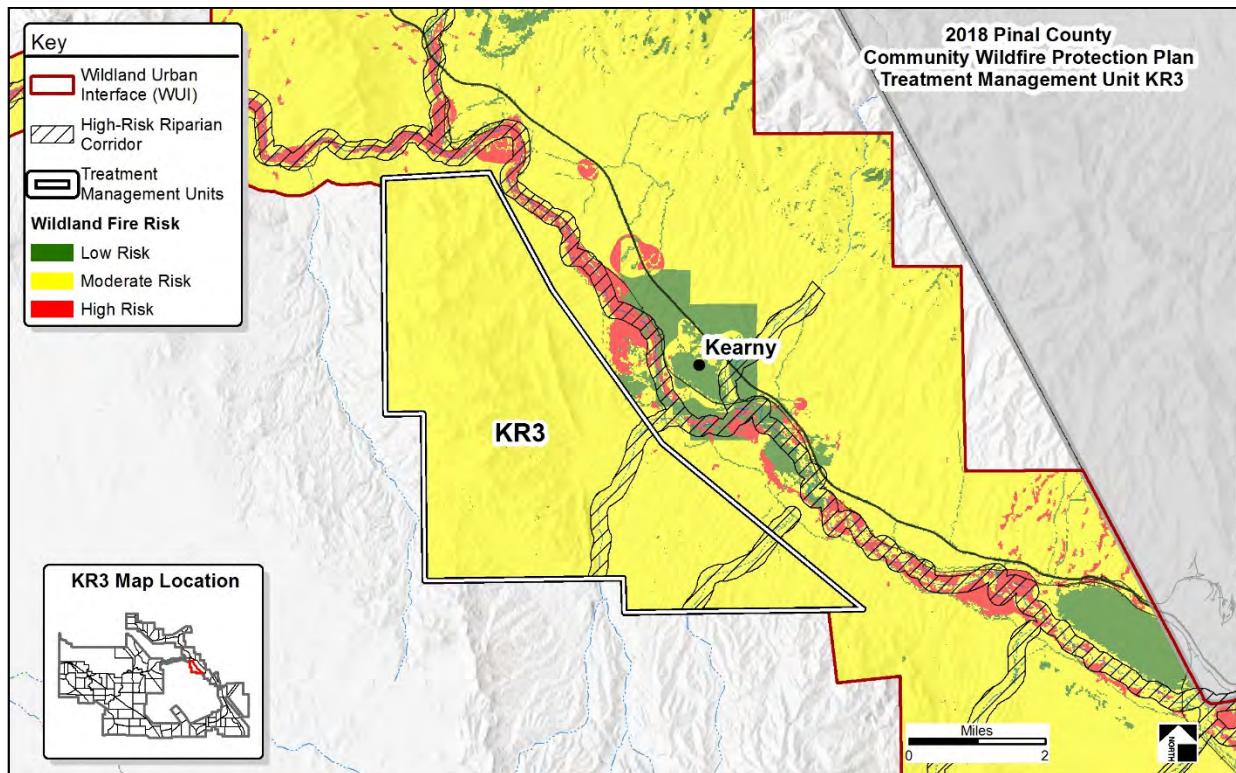


**TMU KR1**

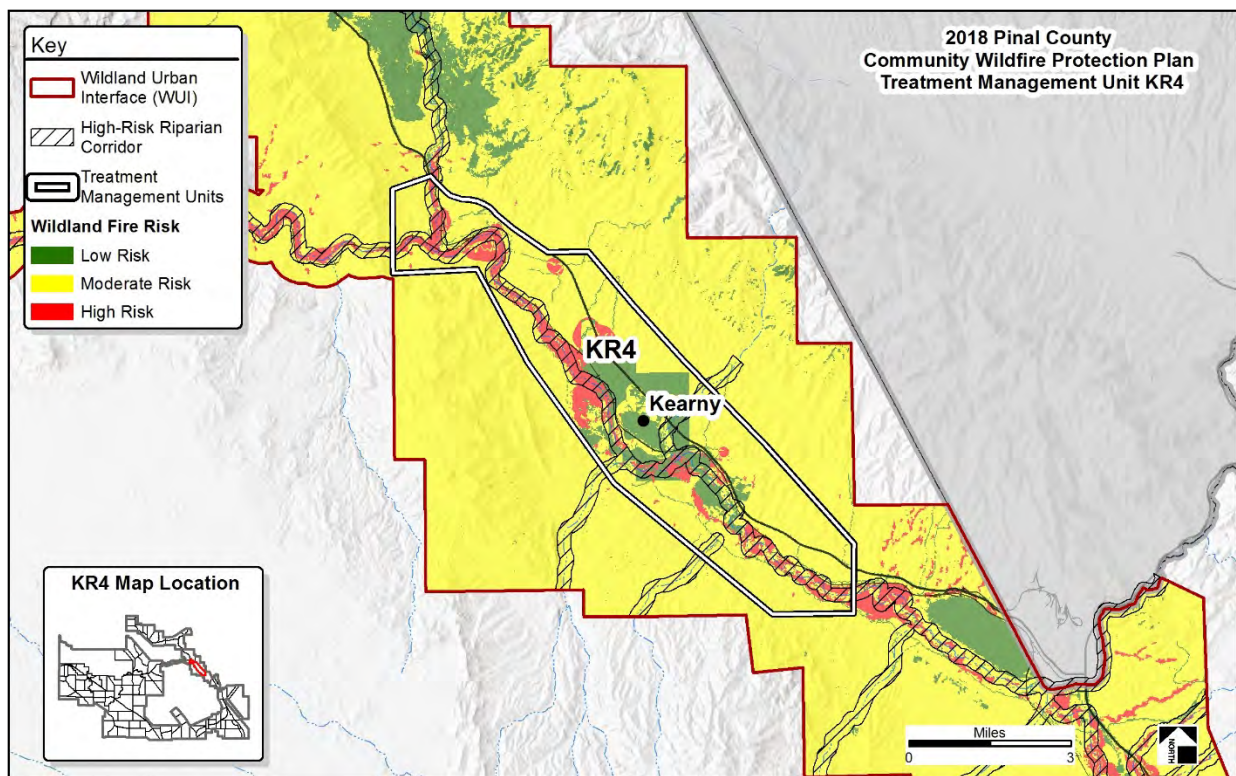


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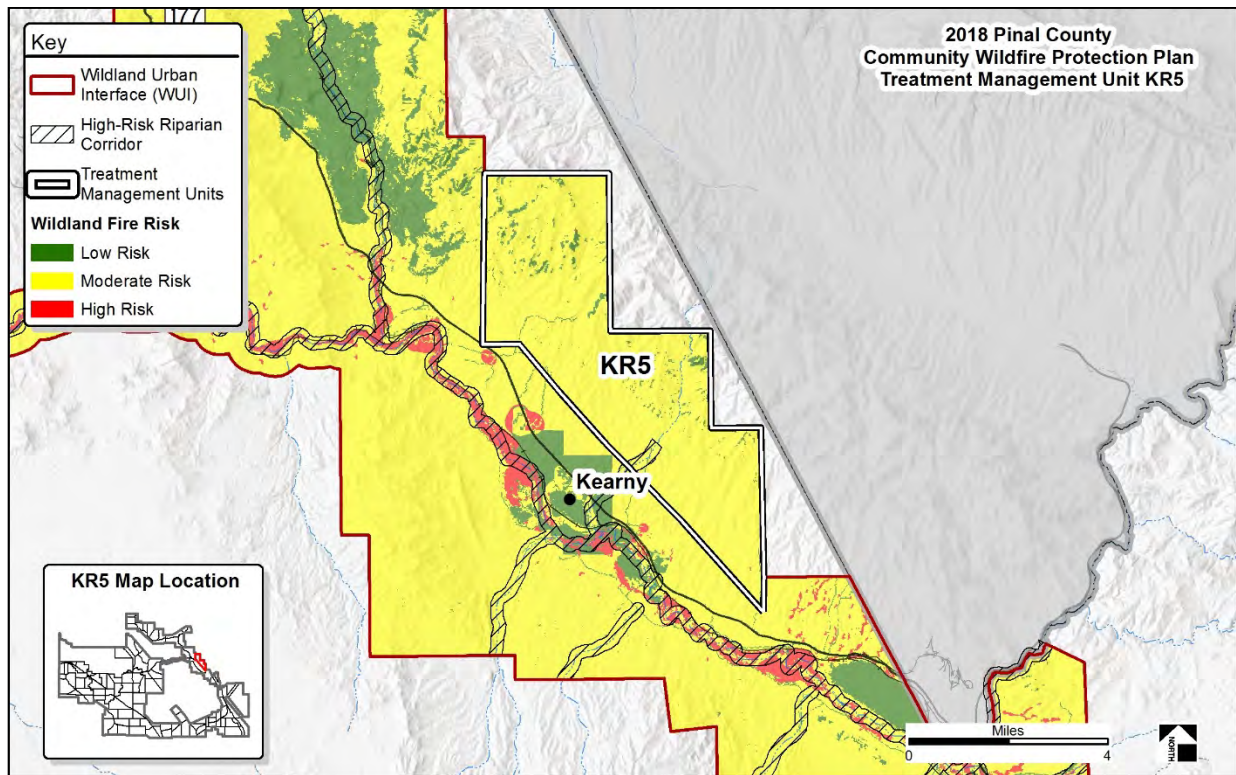




TMU KR3



TMU KR4

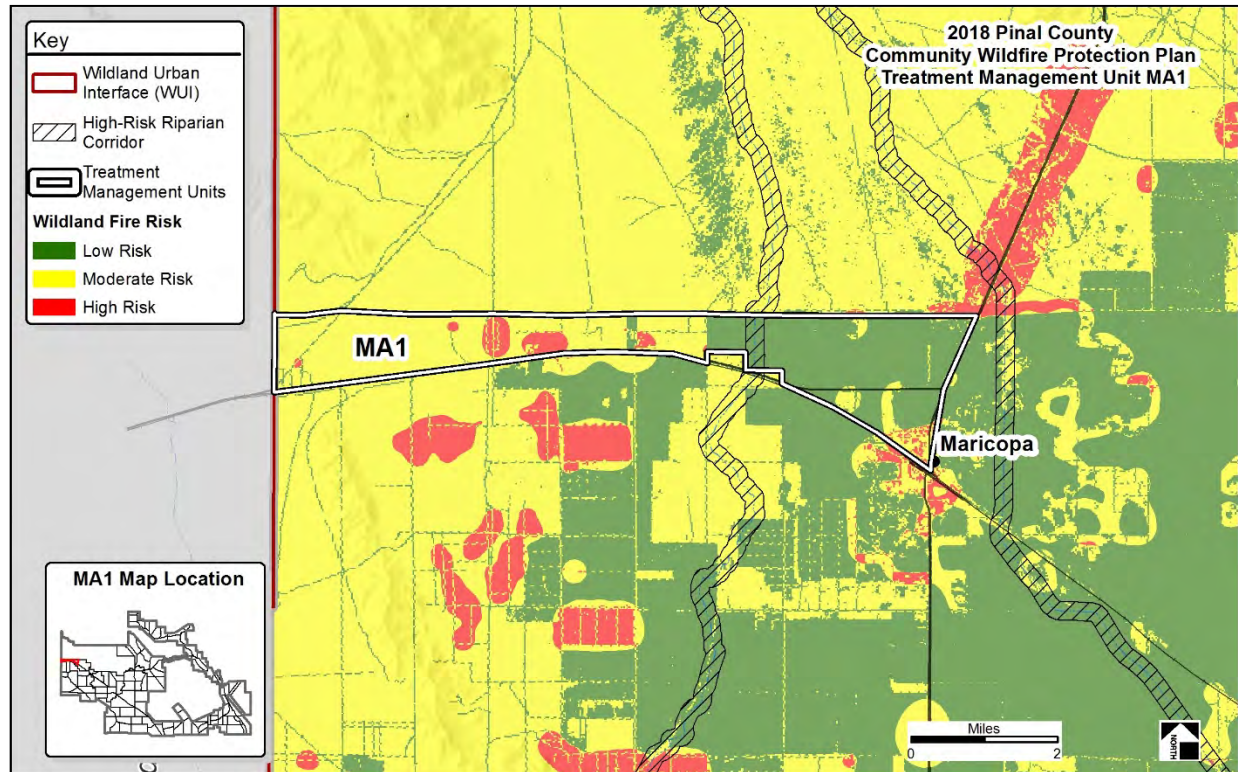


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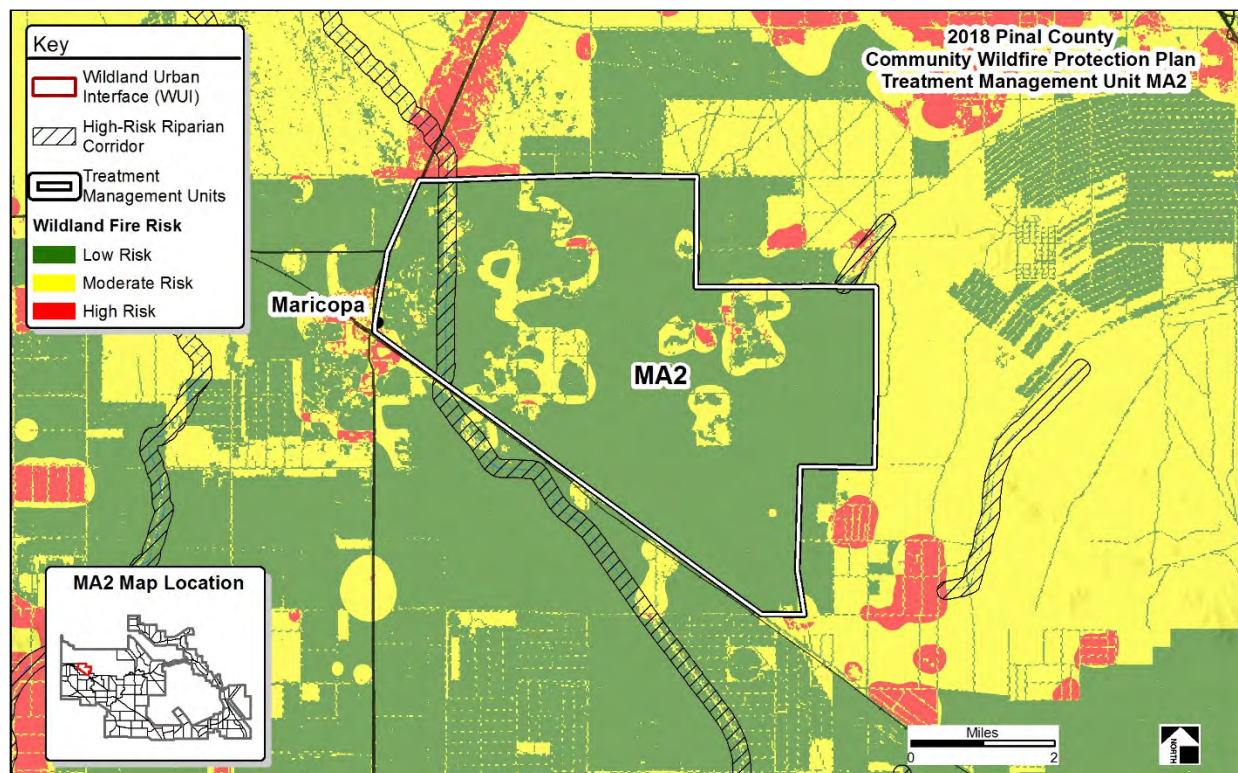
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## MARICOPA WUI

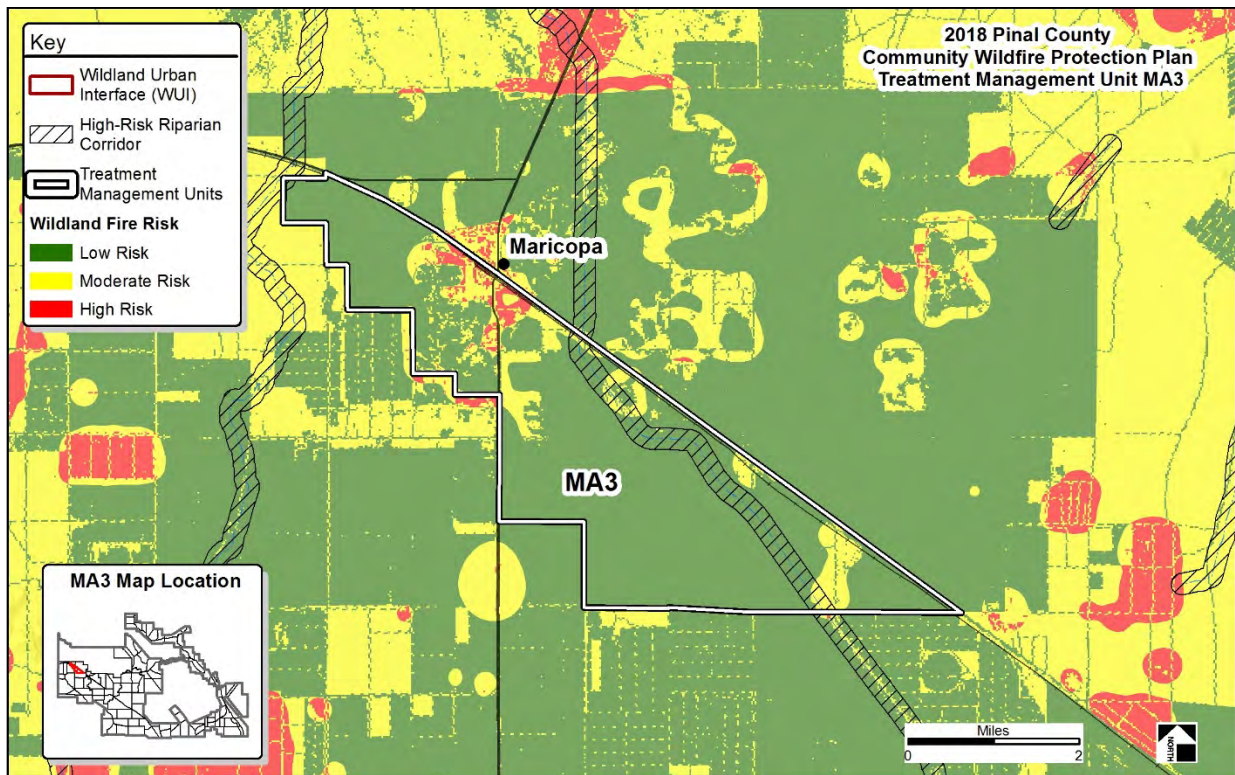


TMU MA1

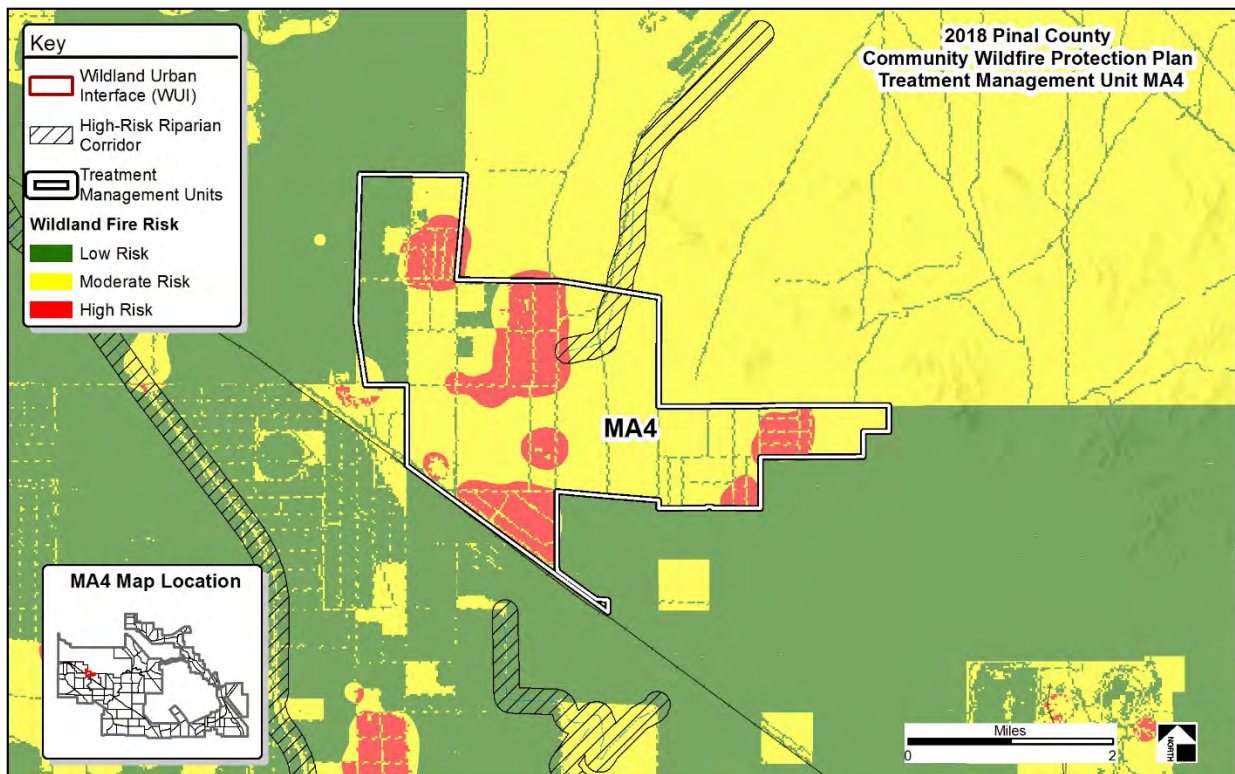


TMU MA2



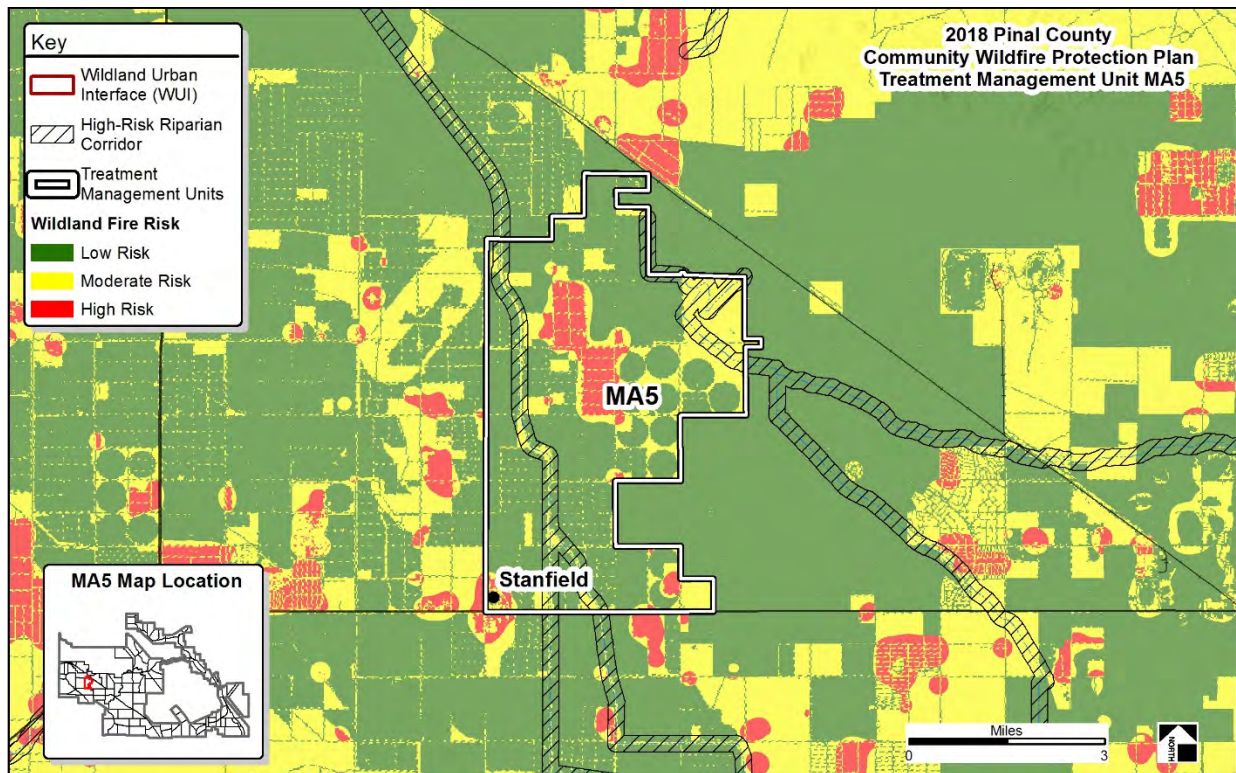


TMU MA3

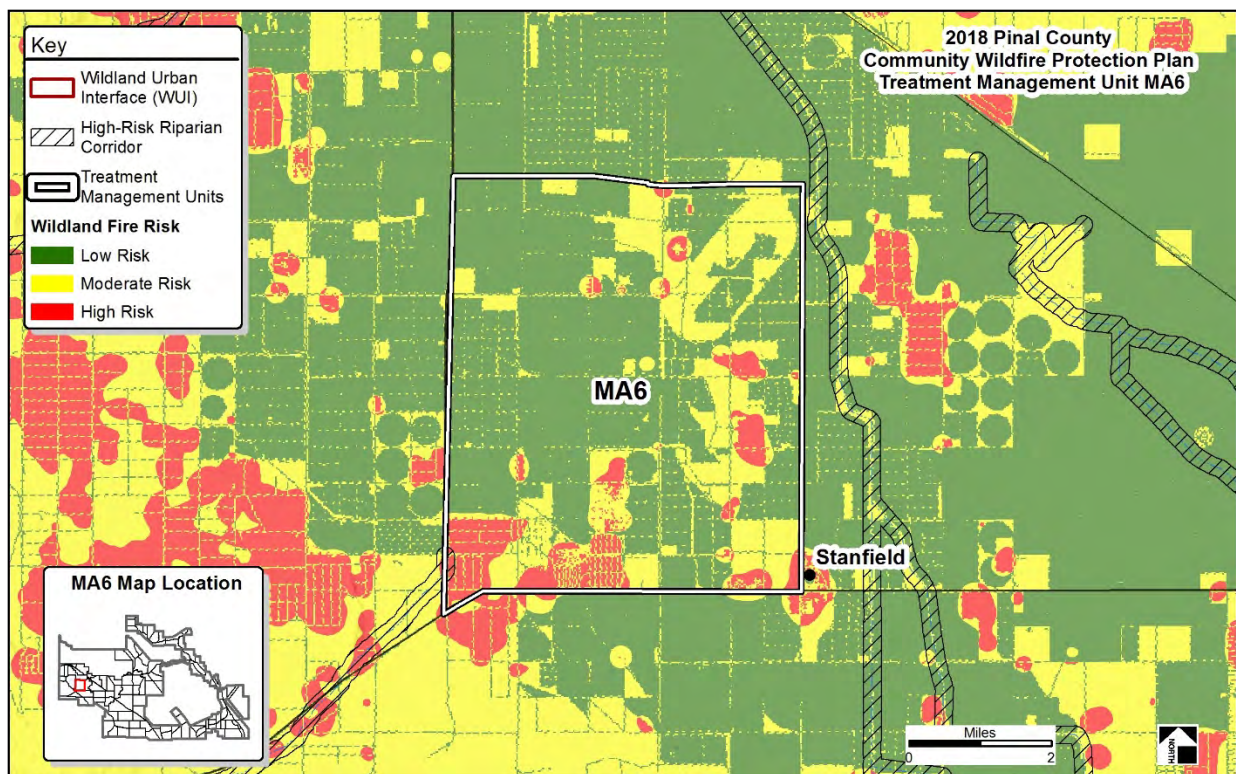


TMU MA4



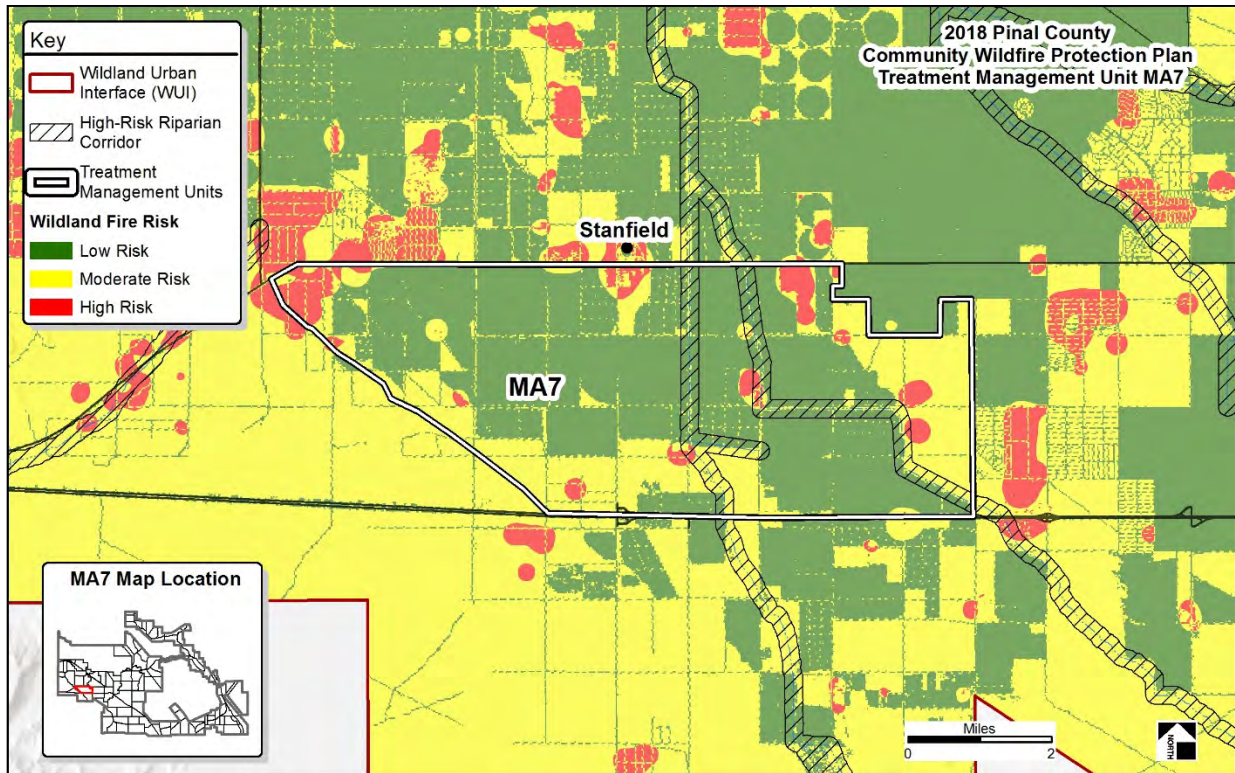


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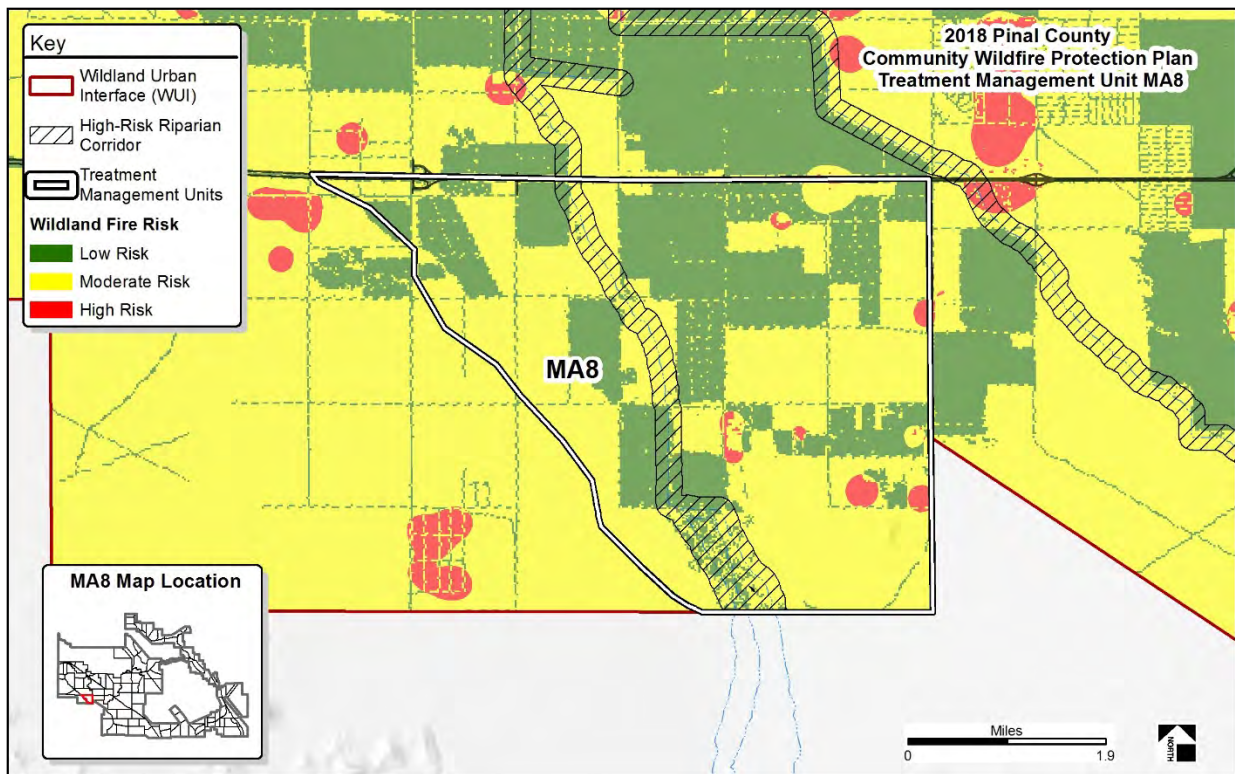


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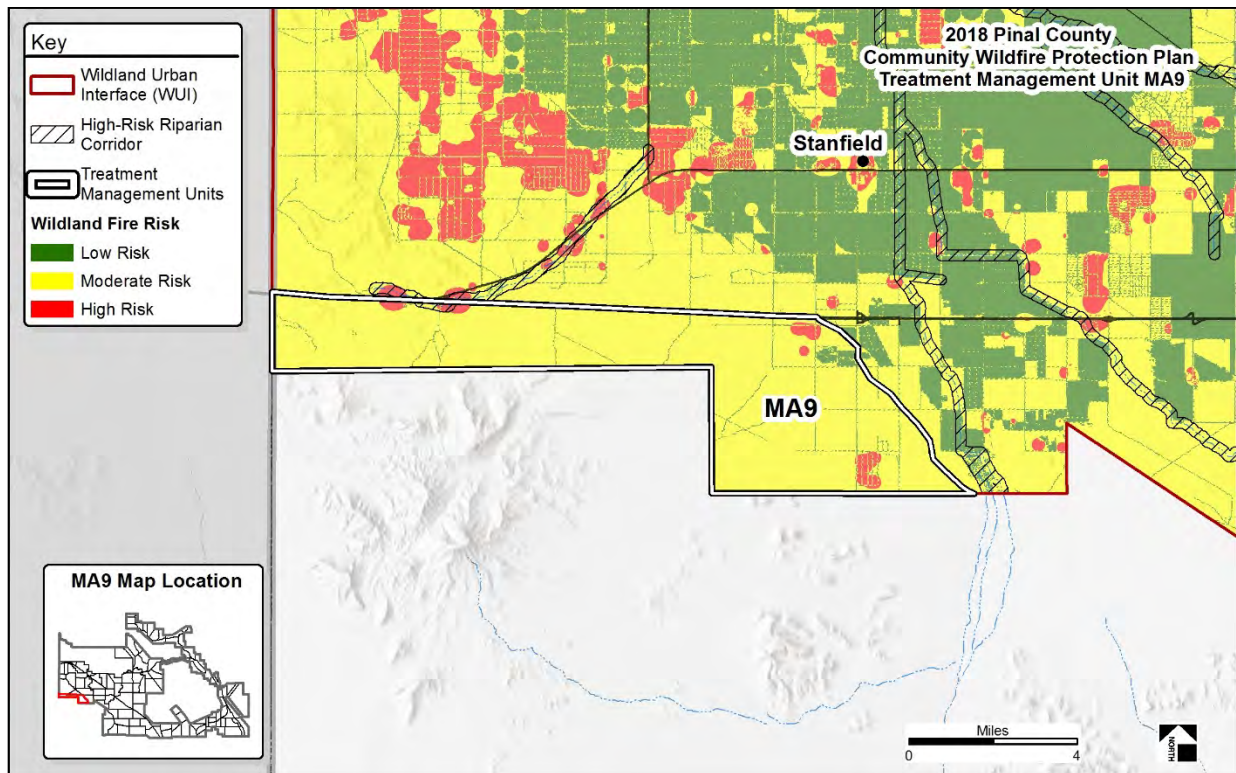


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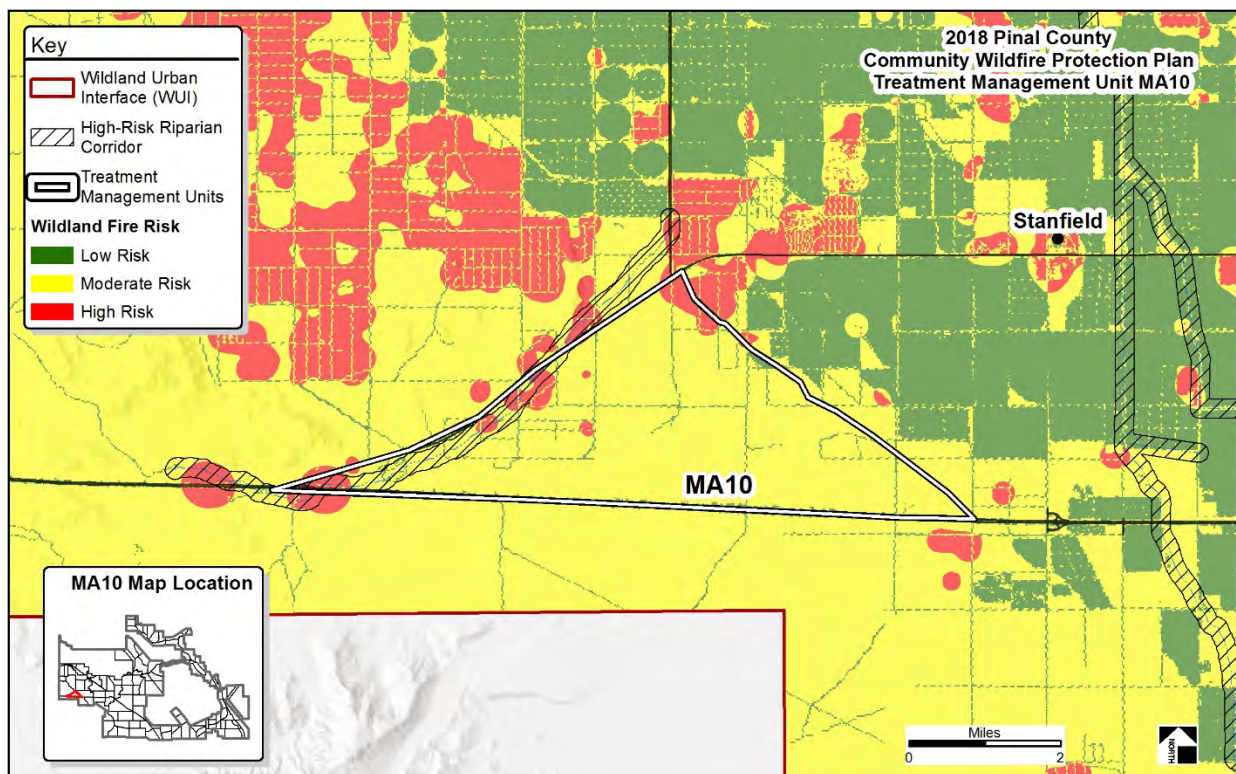


TMU MA8



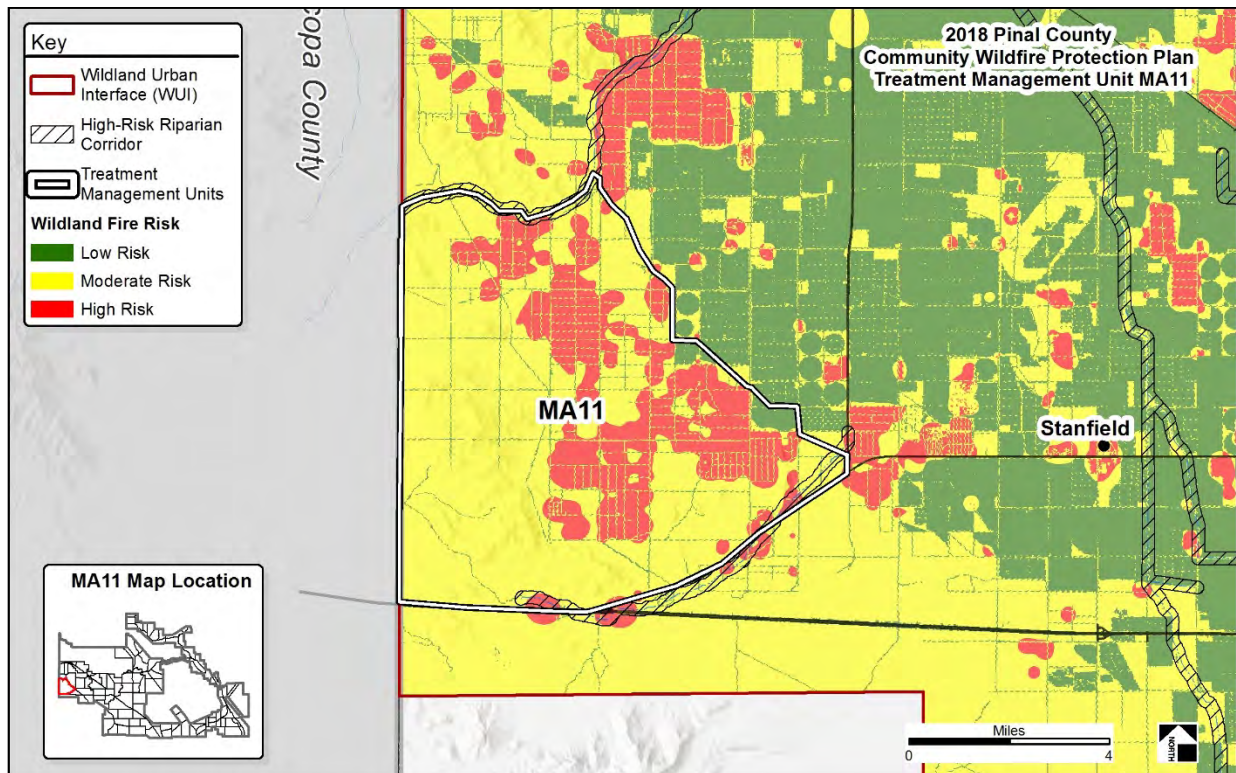


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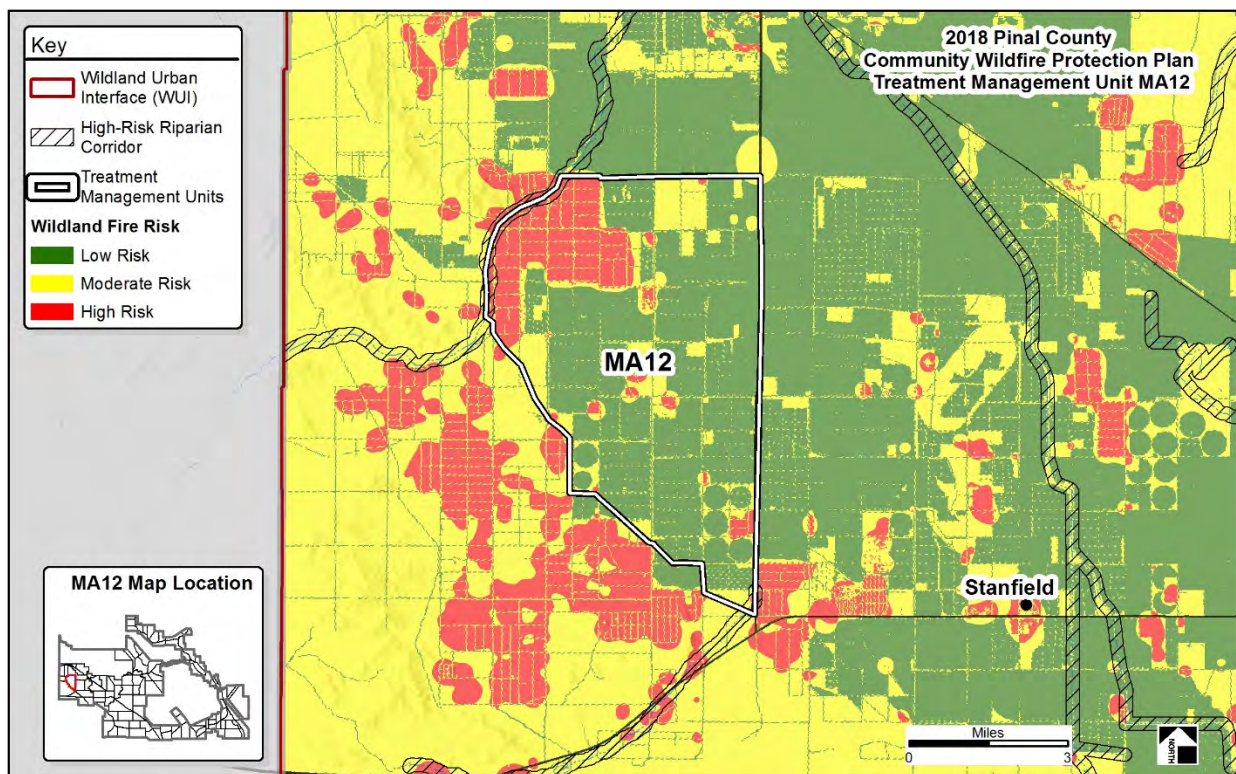


TMU MA10



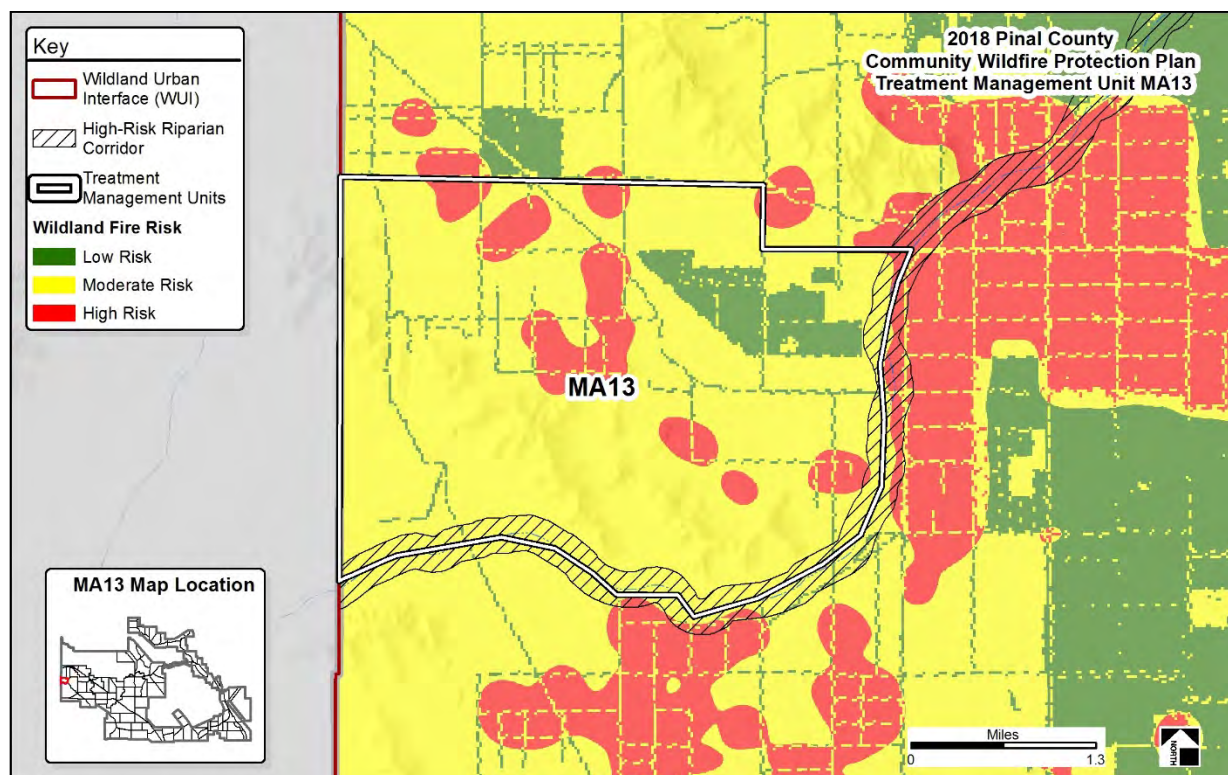


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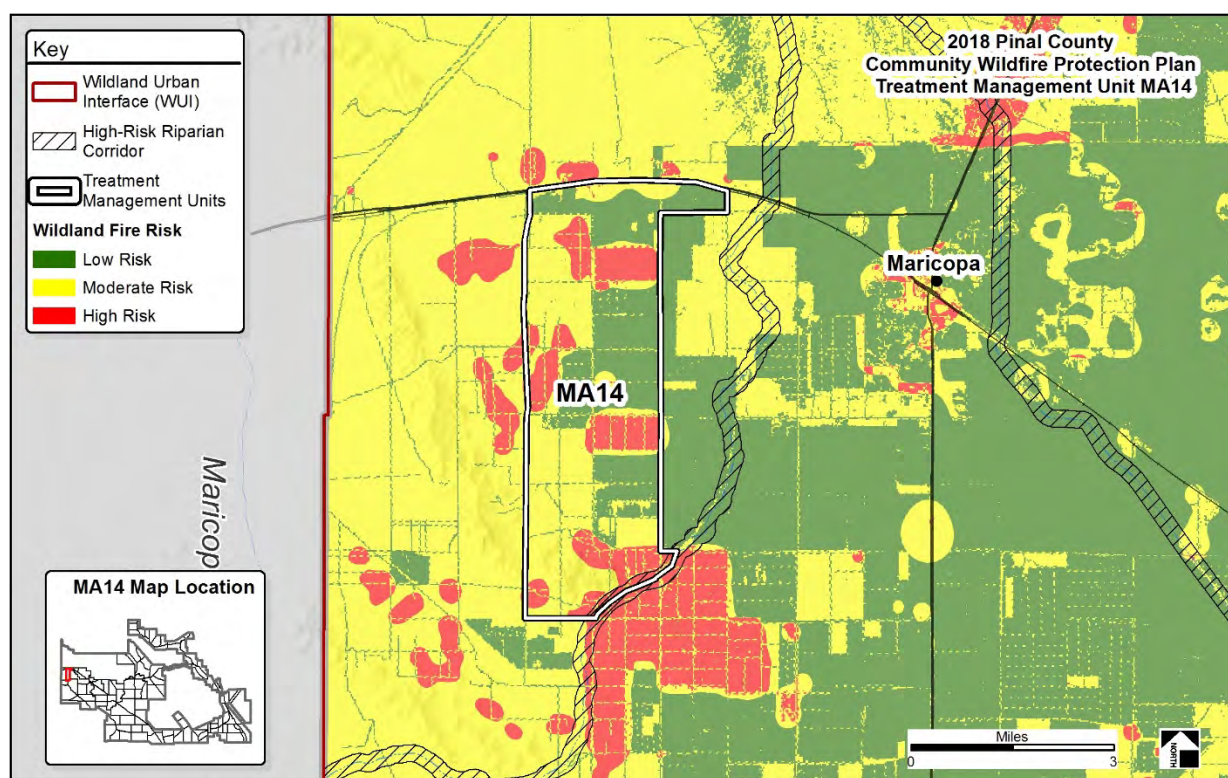


TMU MA12

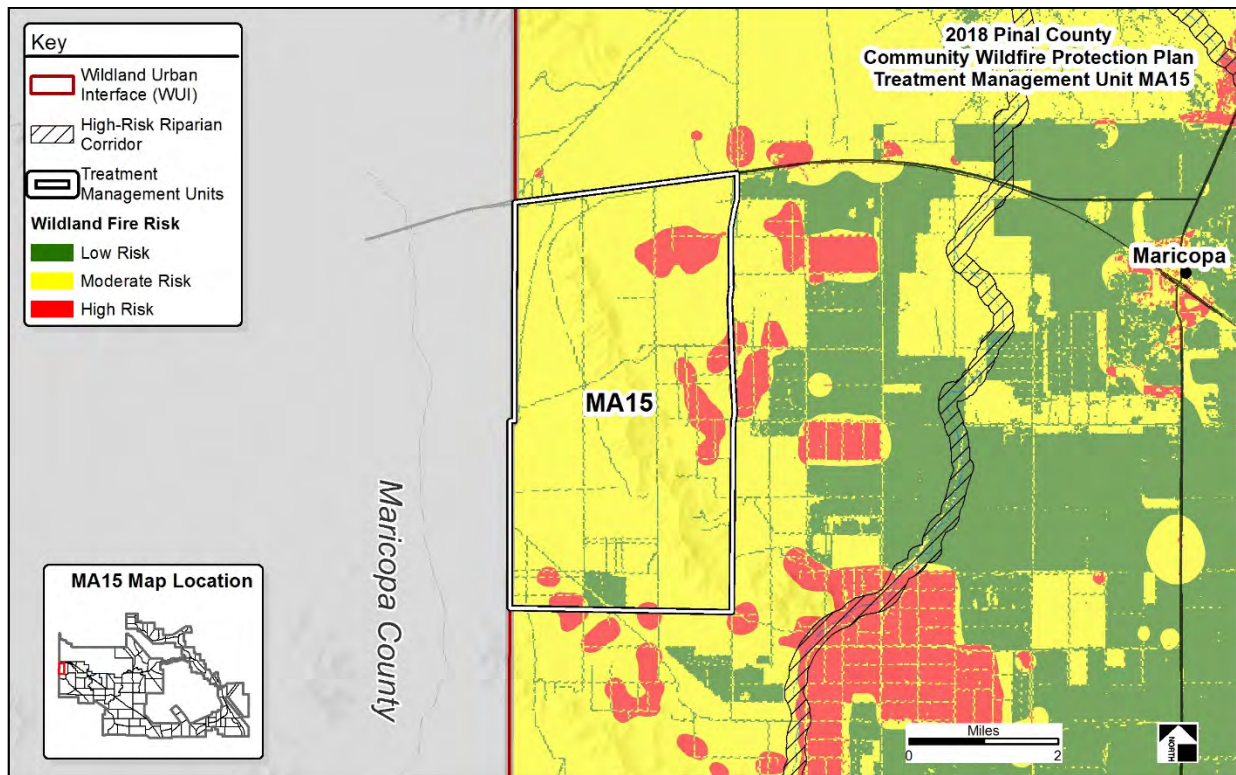




TMU MA13



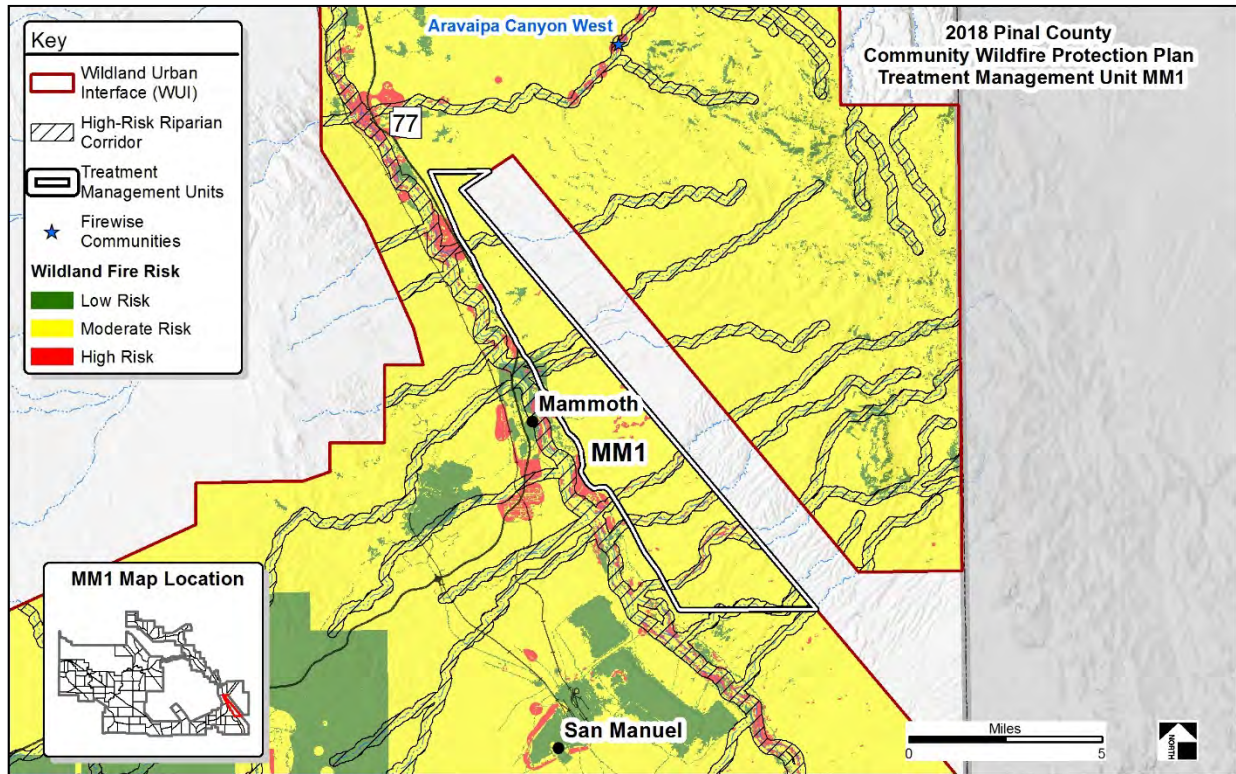
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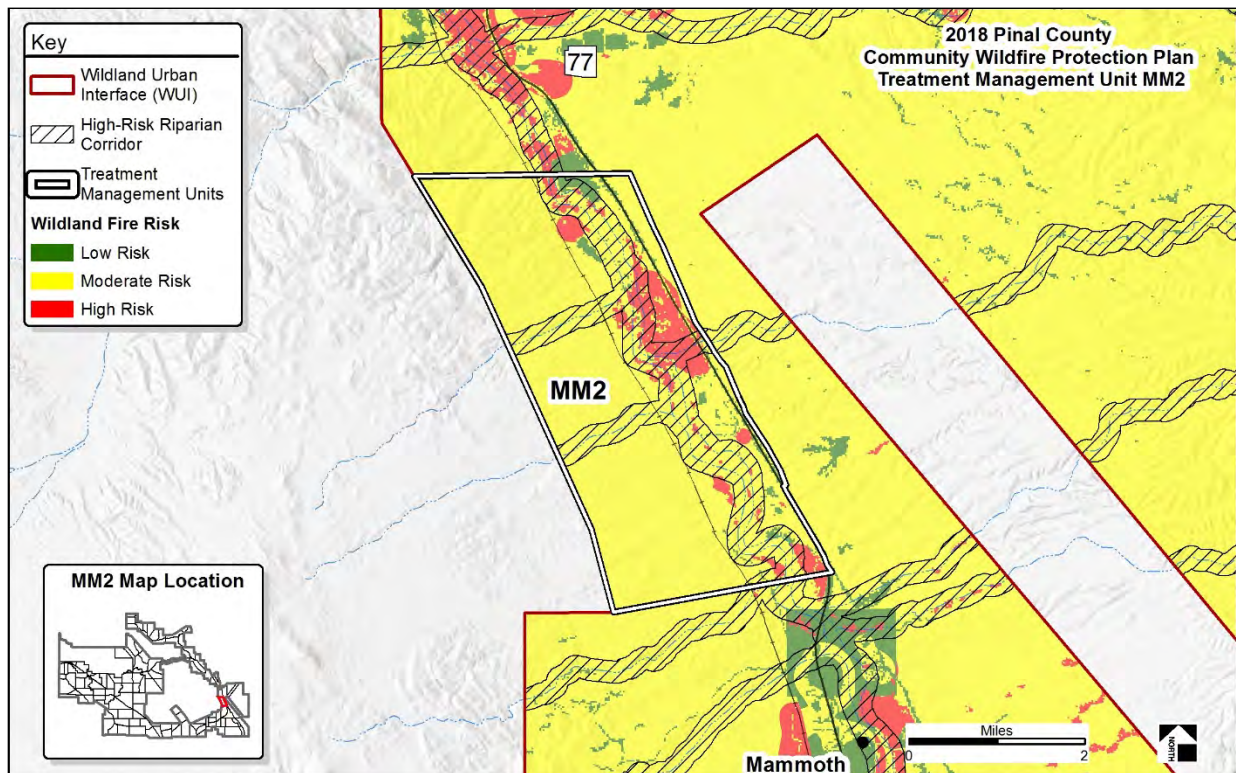
**TMU MA15**



## MAMMOTH WUI

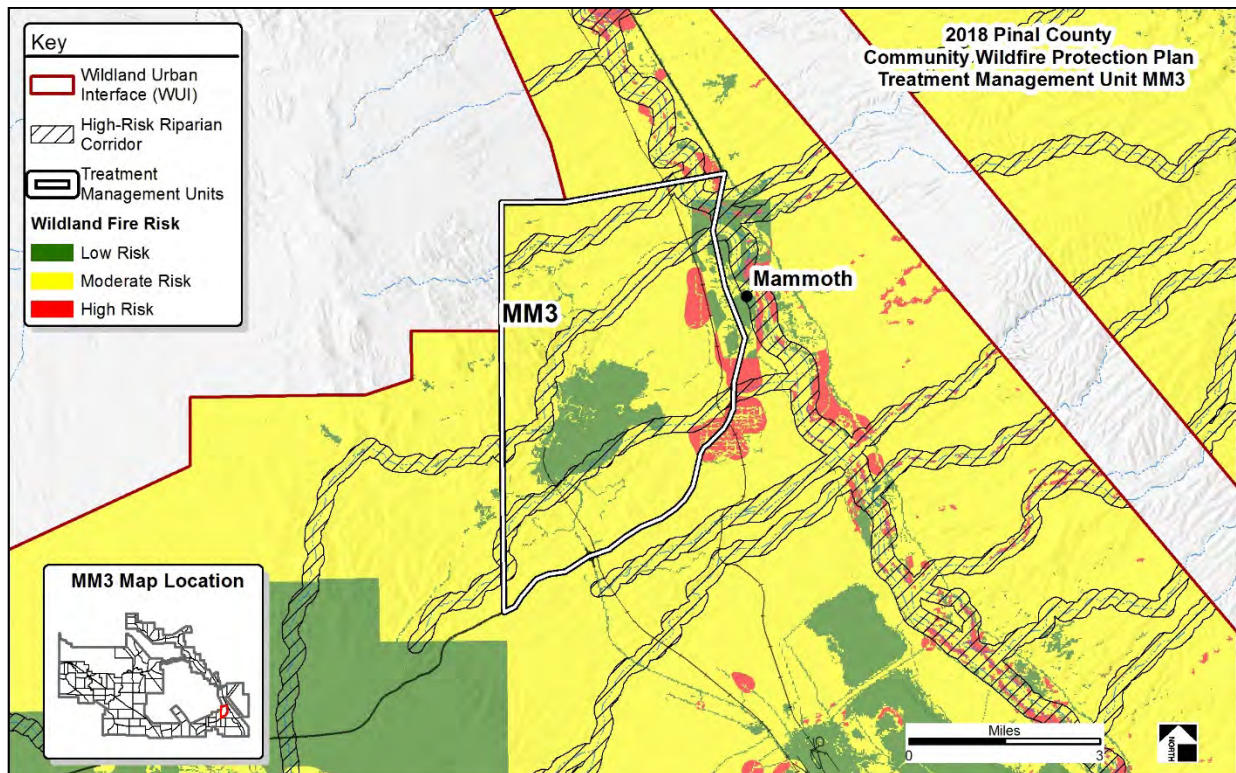


TMU MM1

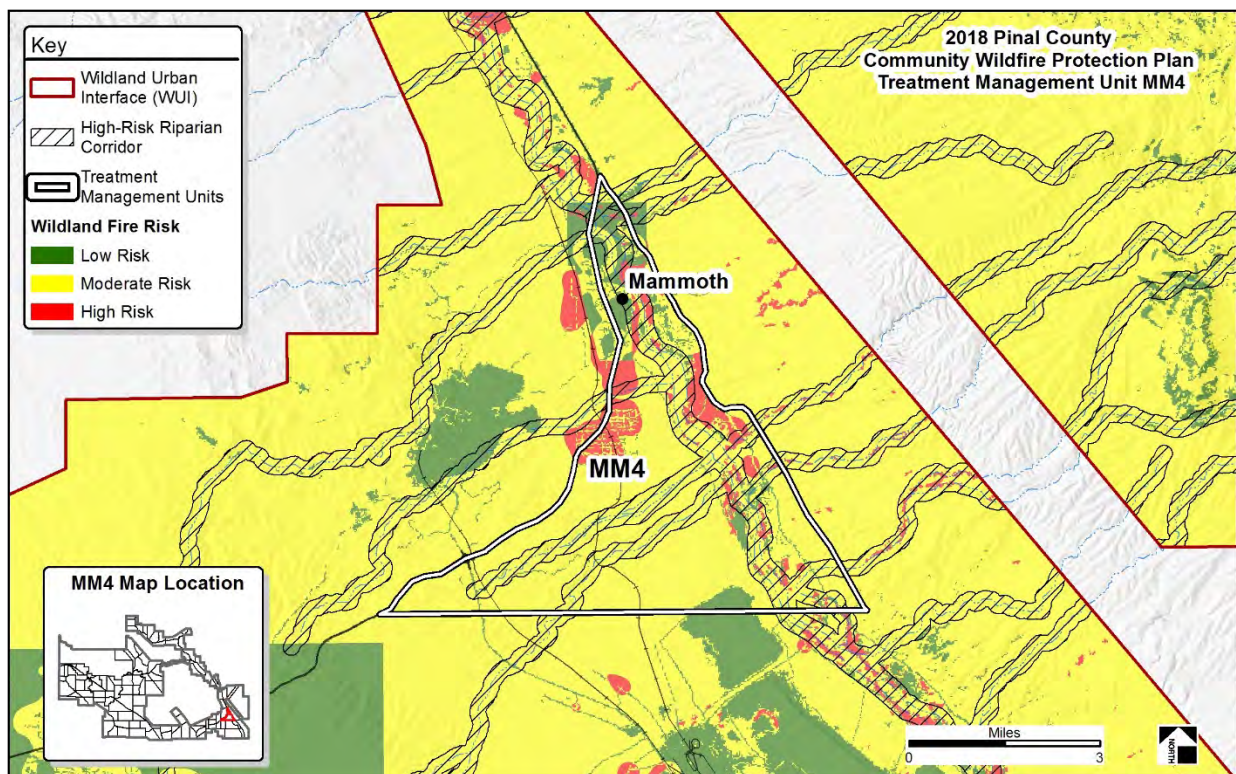


TMU MM2





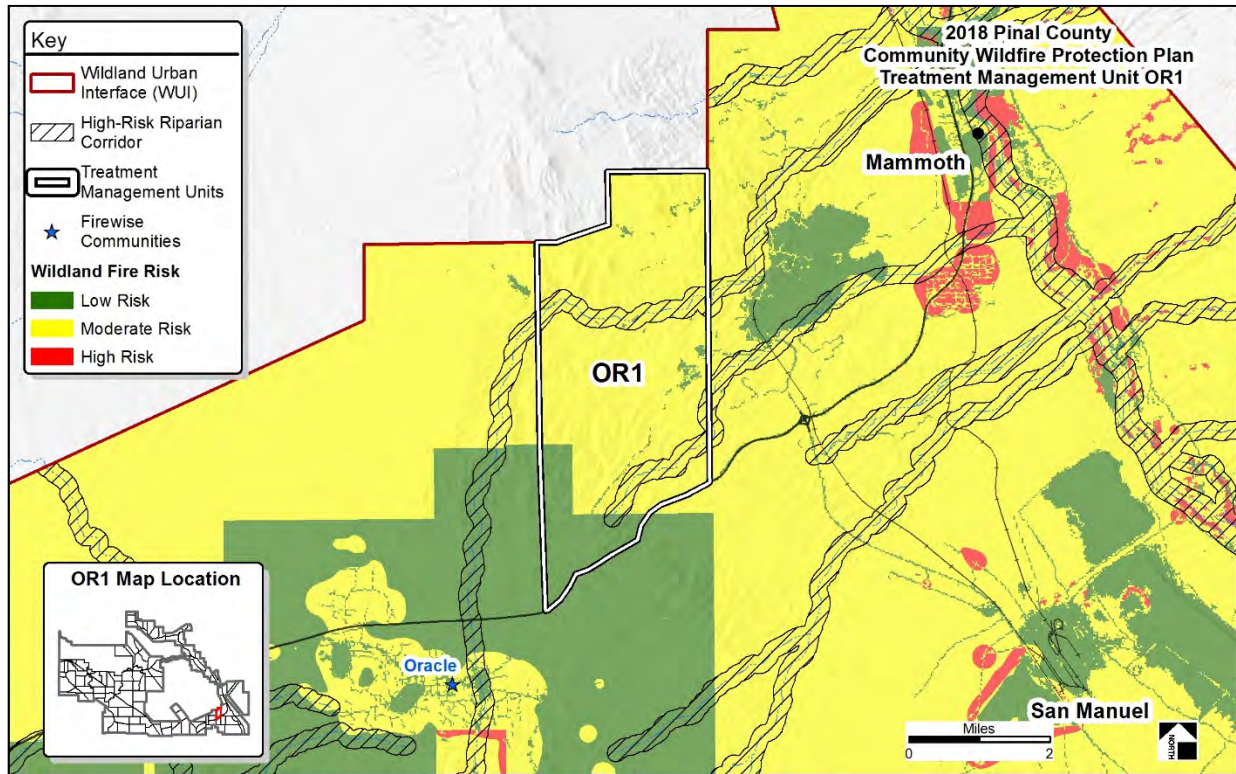
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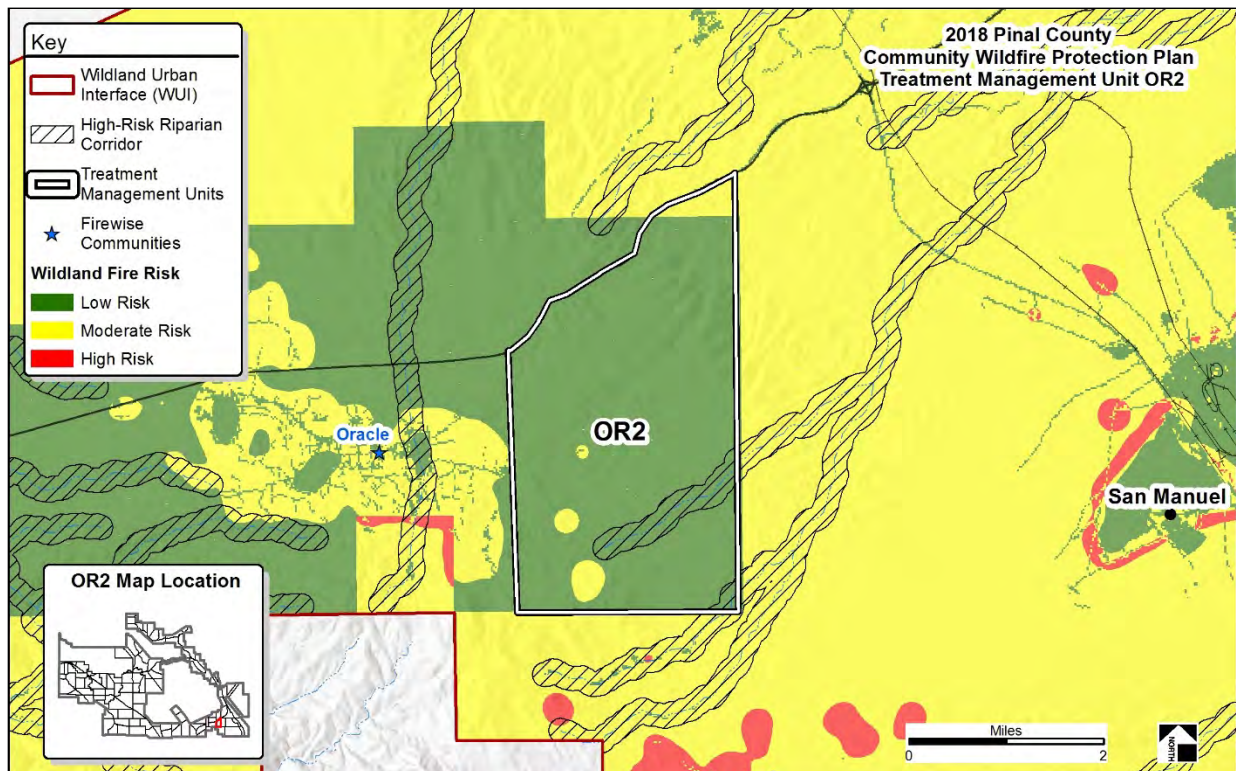
TMU MM4



## ORACLE WUI

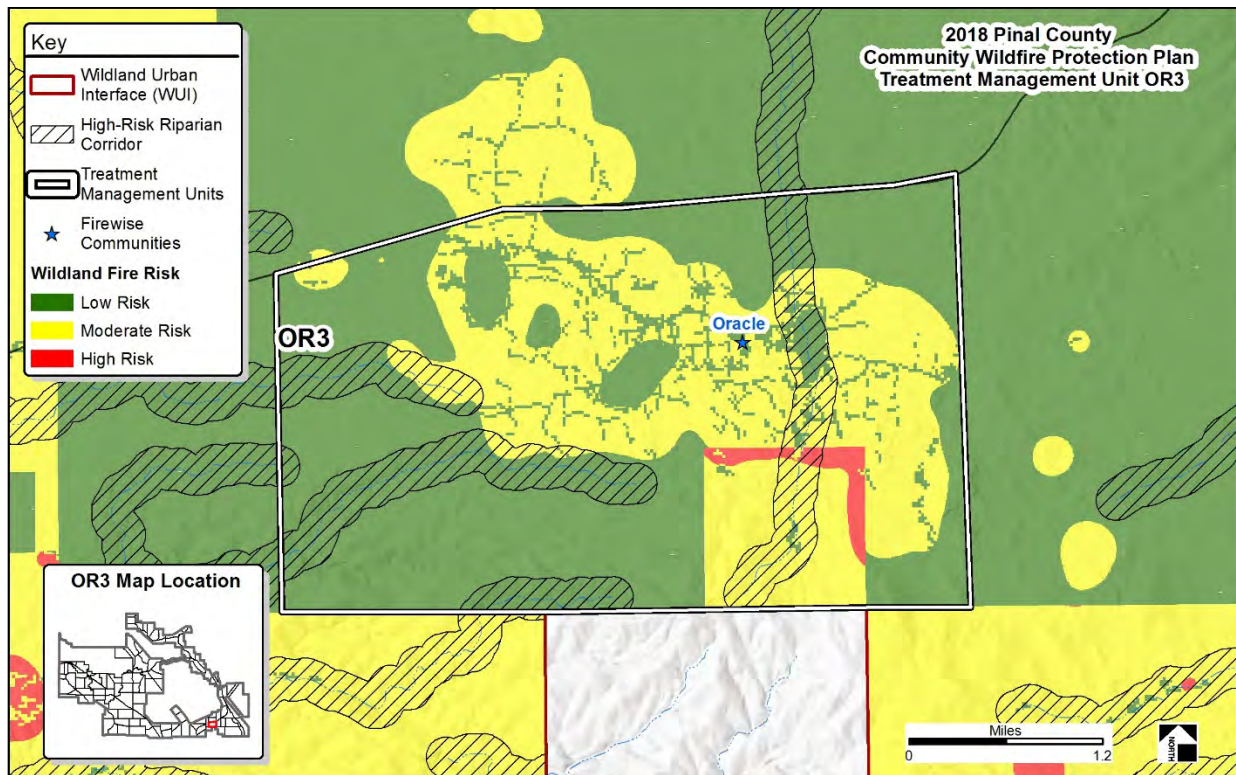


TMU OR1

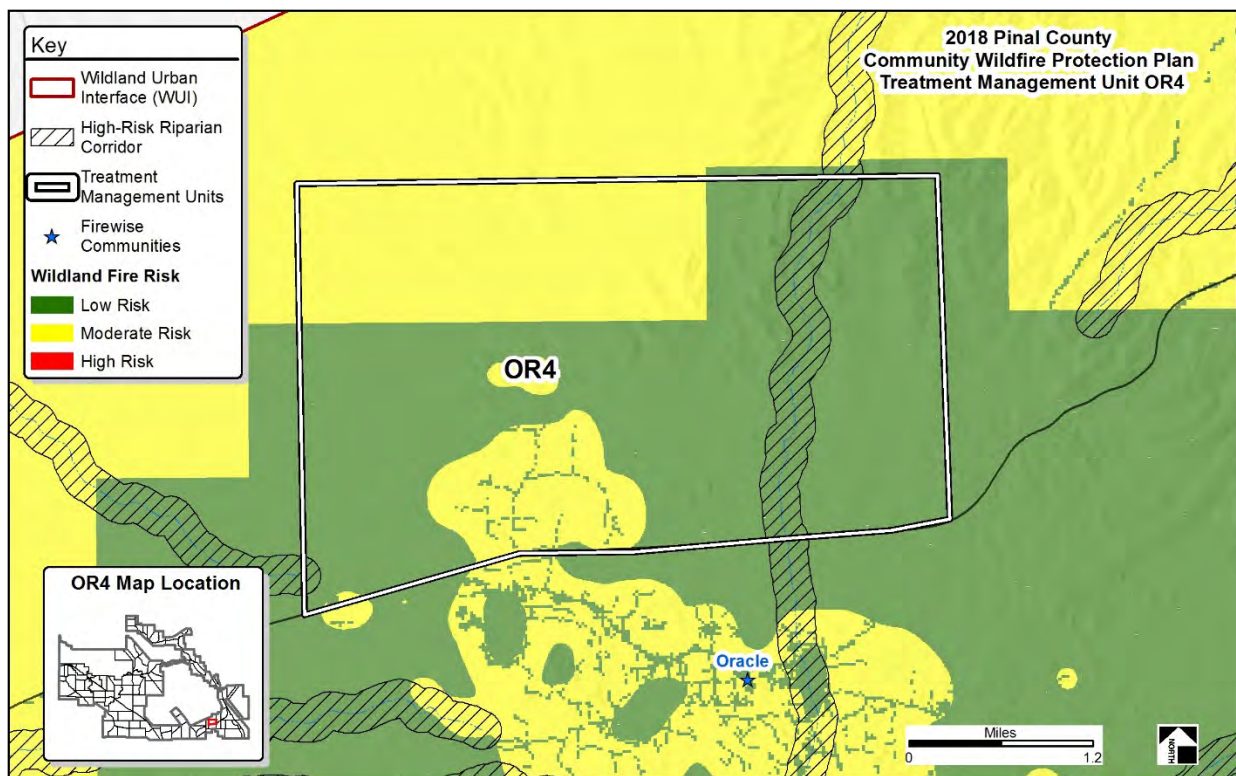


TMU OR2



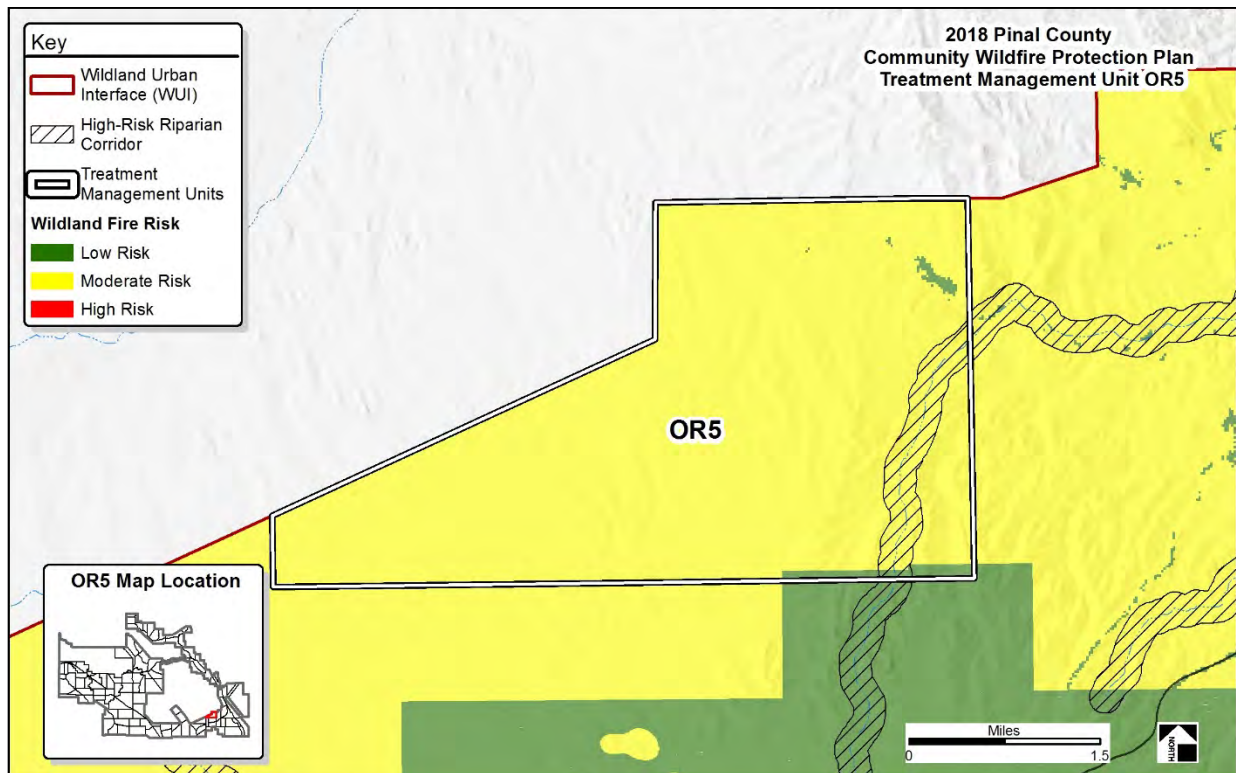


TMU OR3

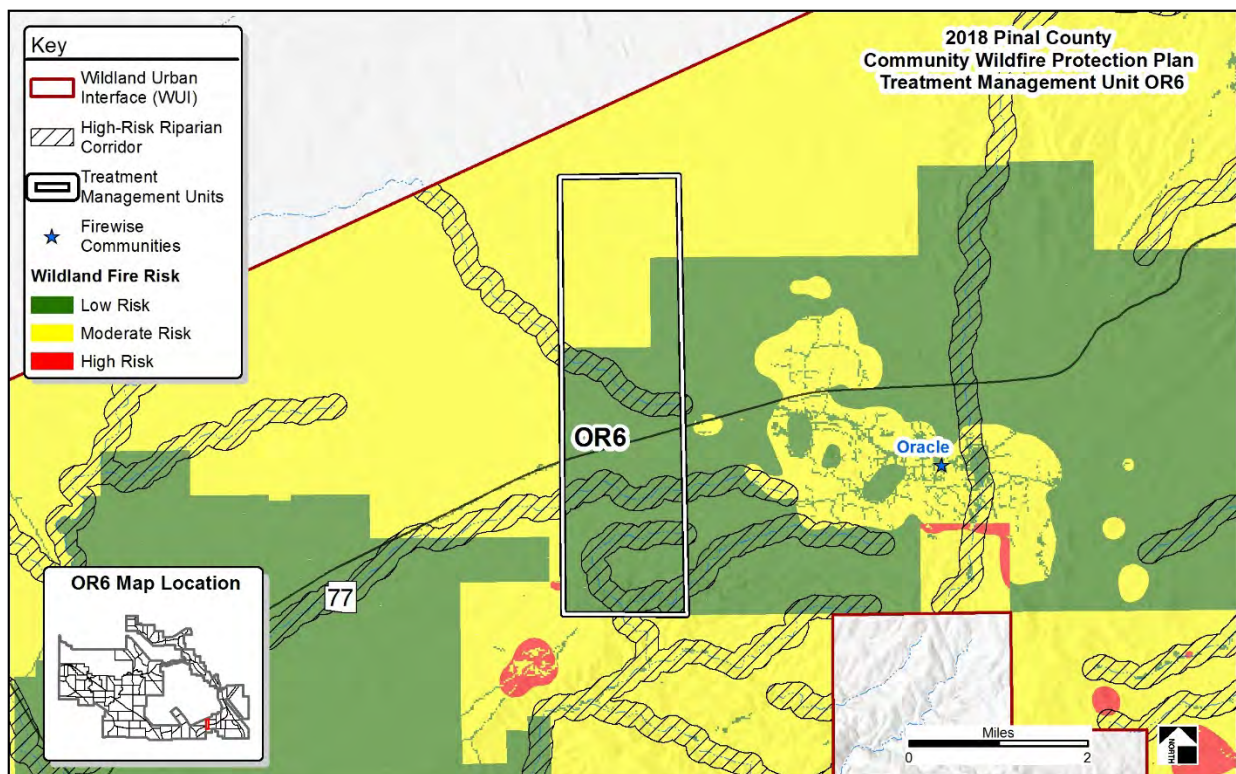


TMU OR4

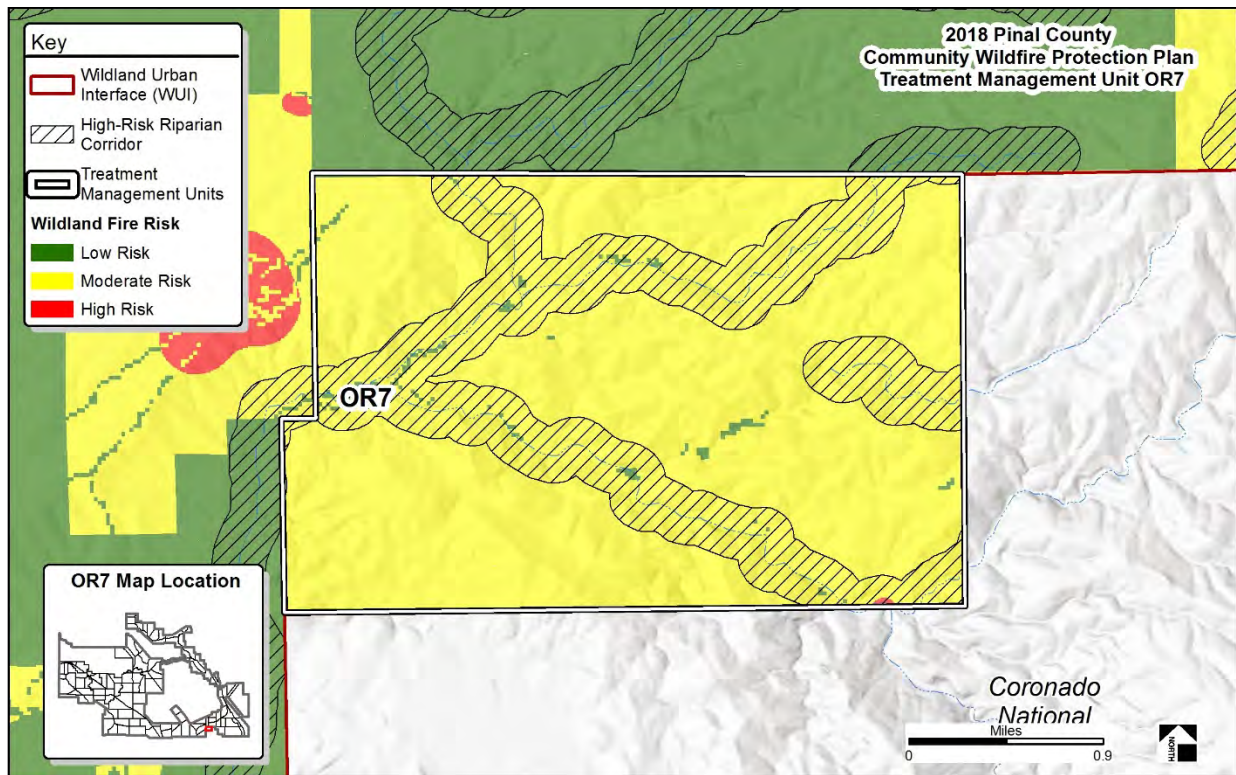




TMU OR5



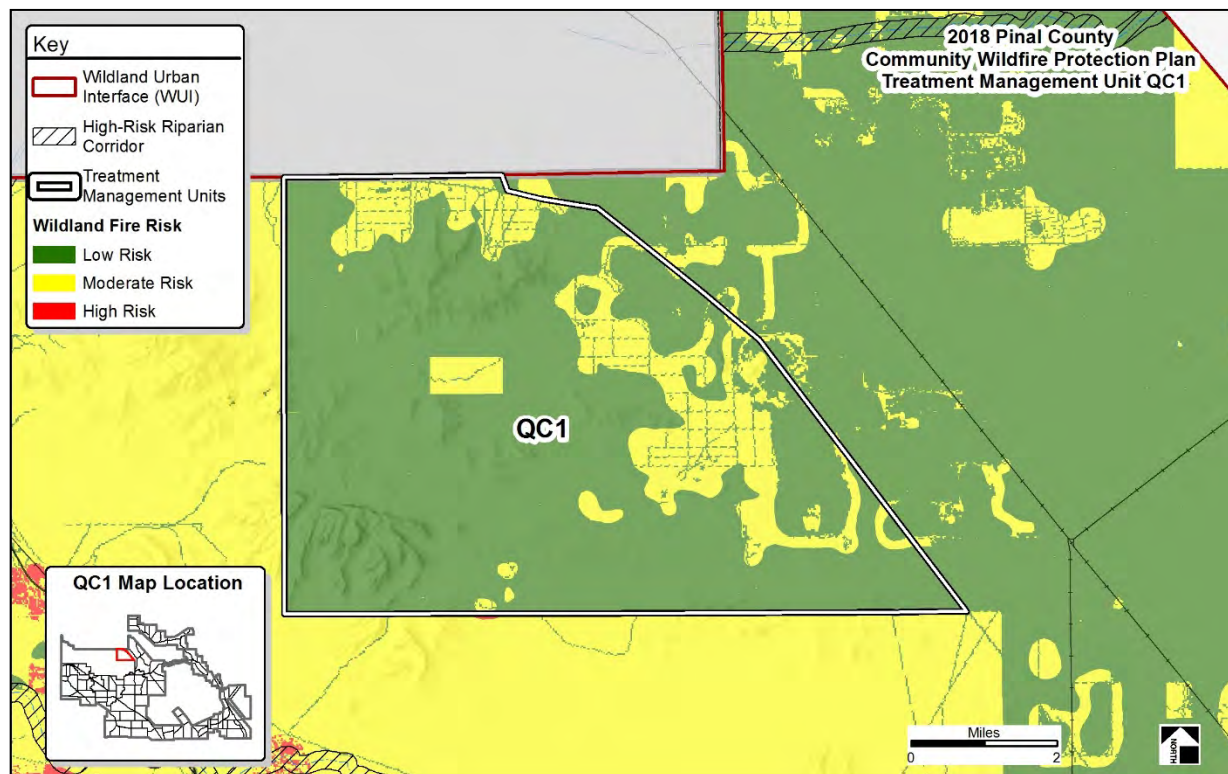
TMU OR6



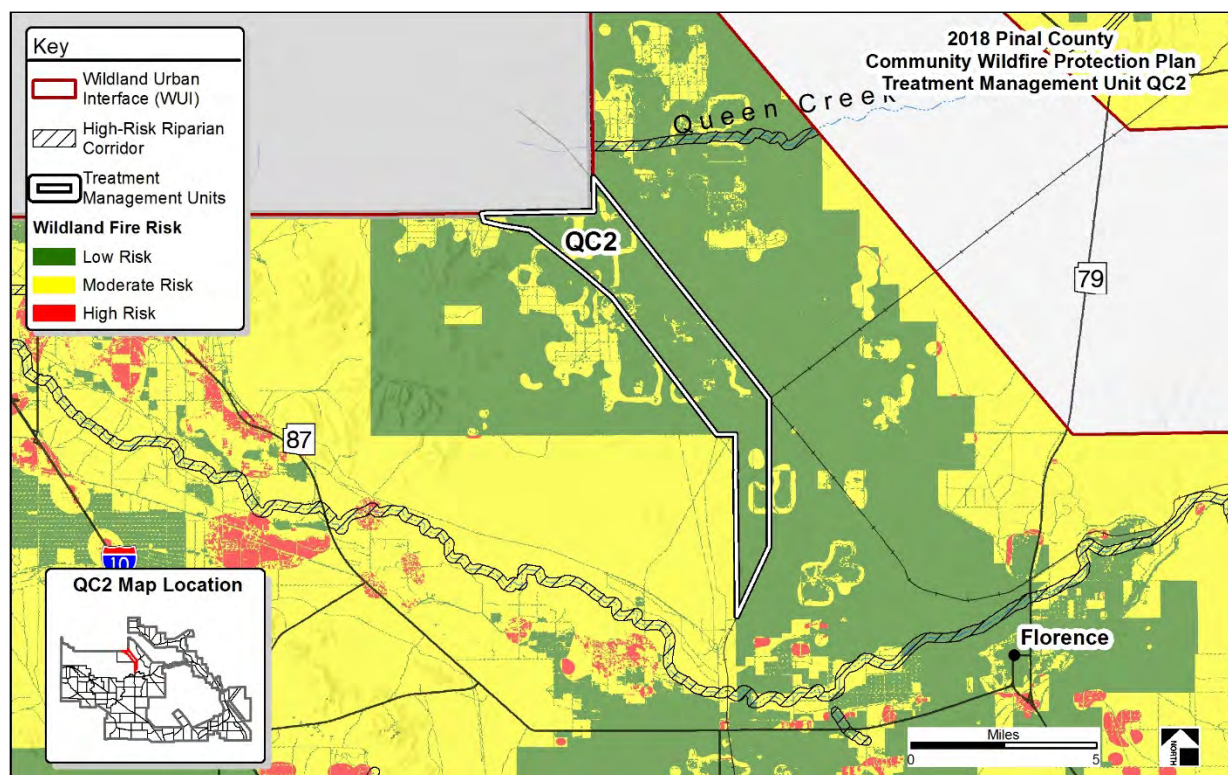
TMU OR7



## QUEEN CREEK WUI

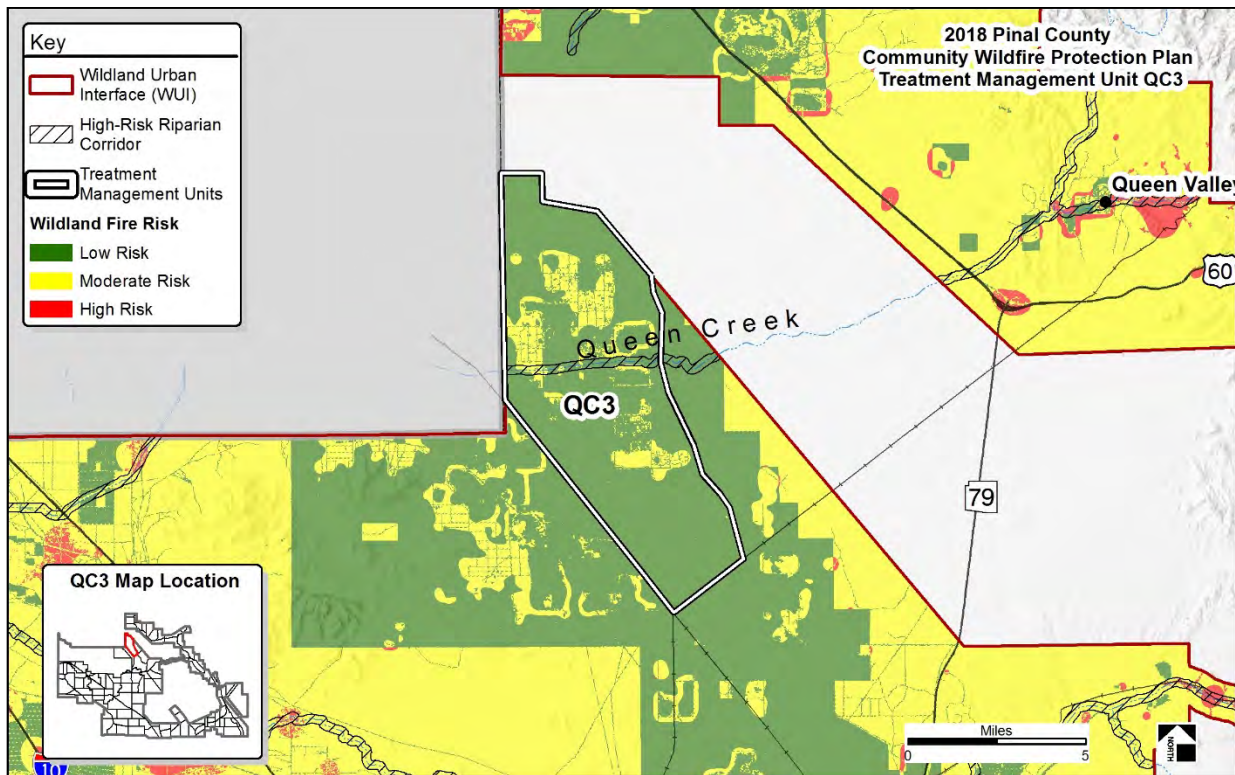


TMU QC1

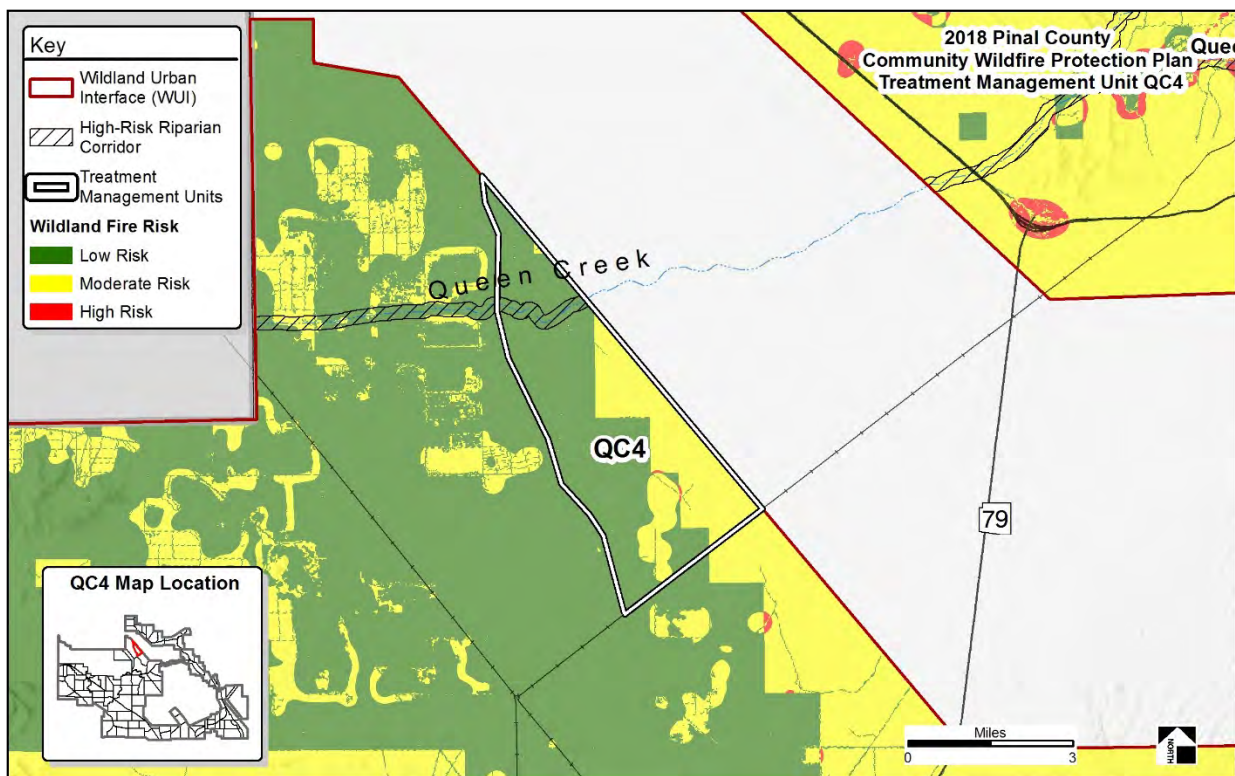


TMU QC2





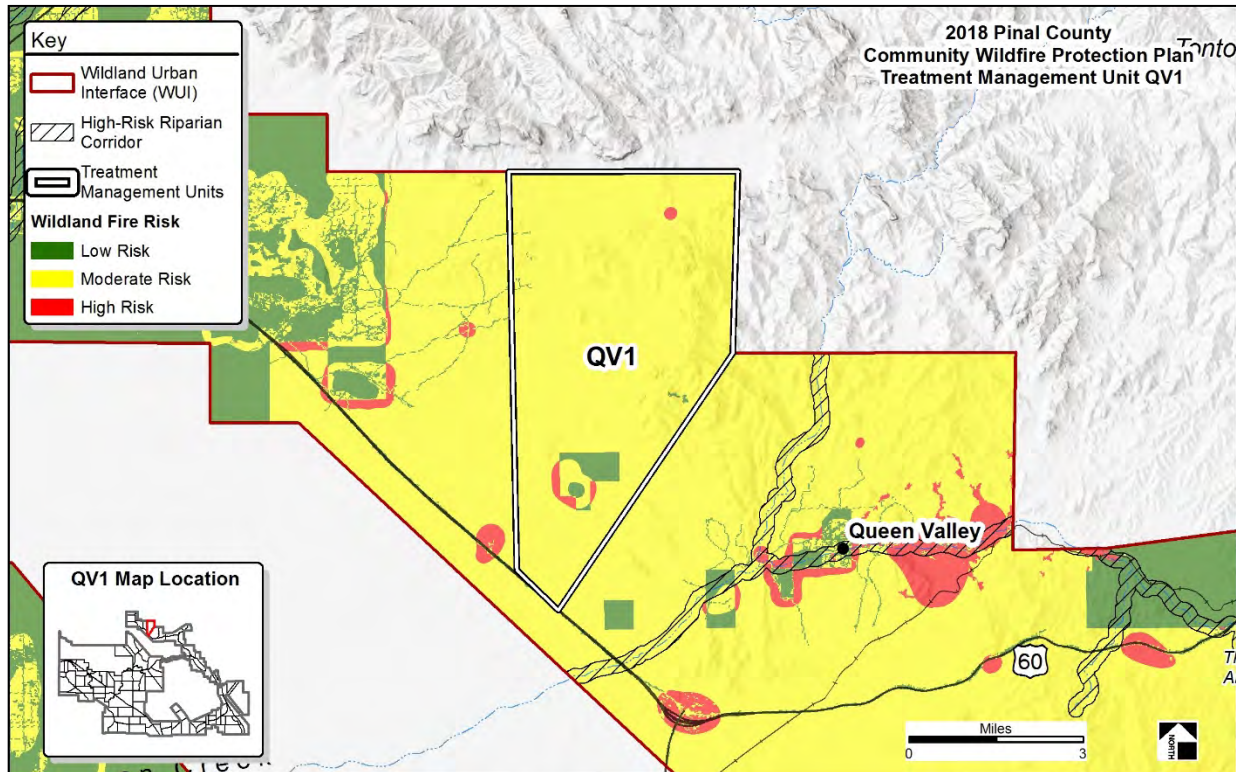
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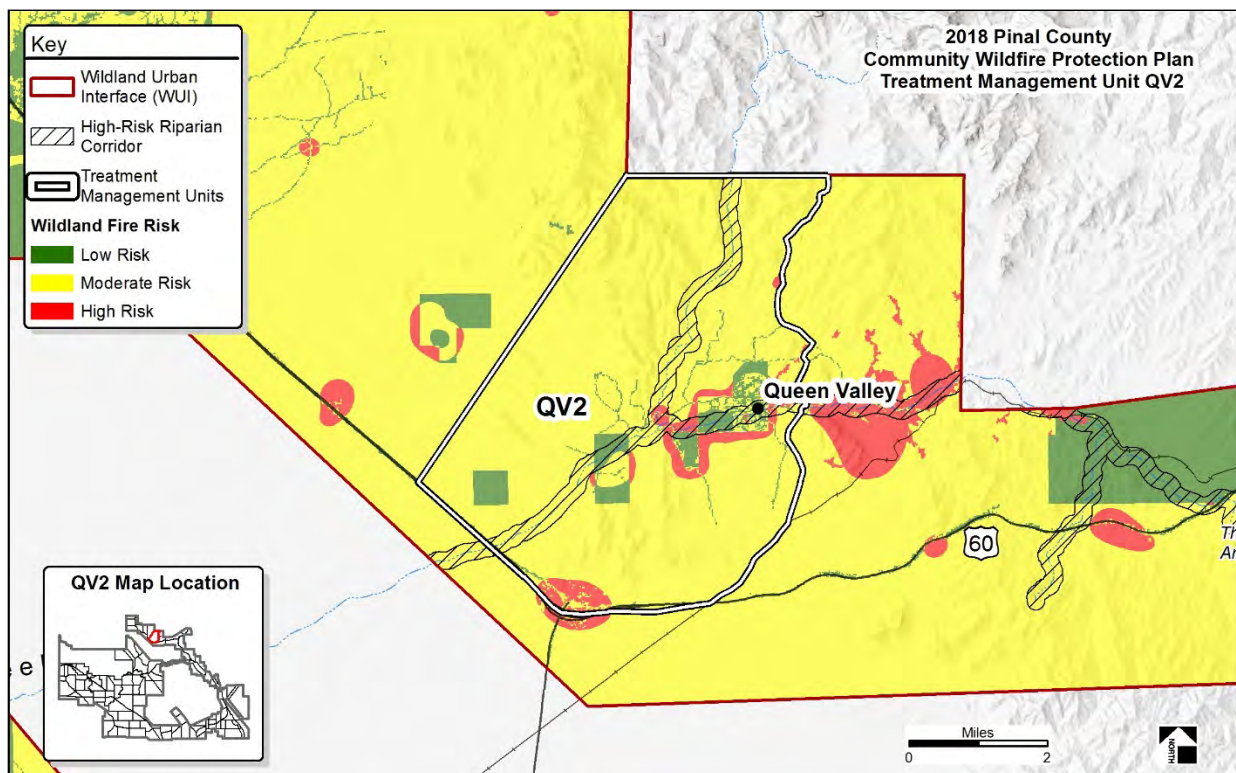
TMU QC4



## QUEEN VALLEY WUI

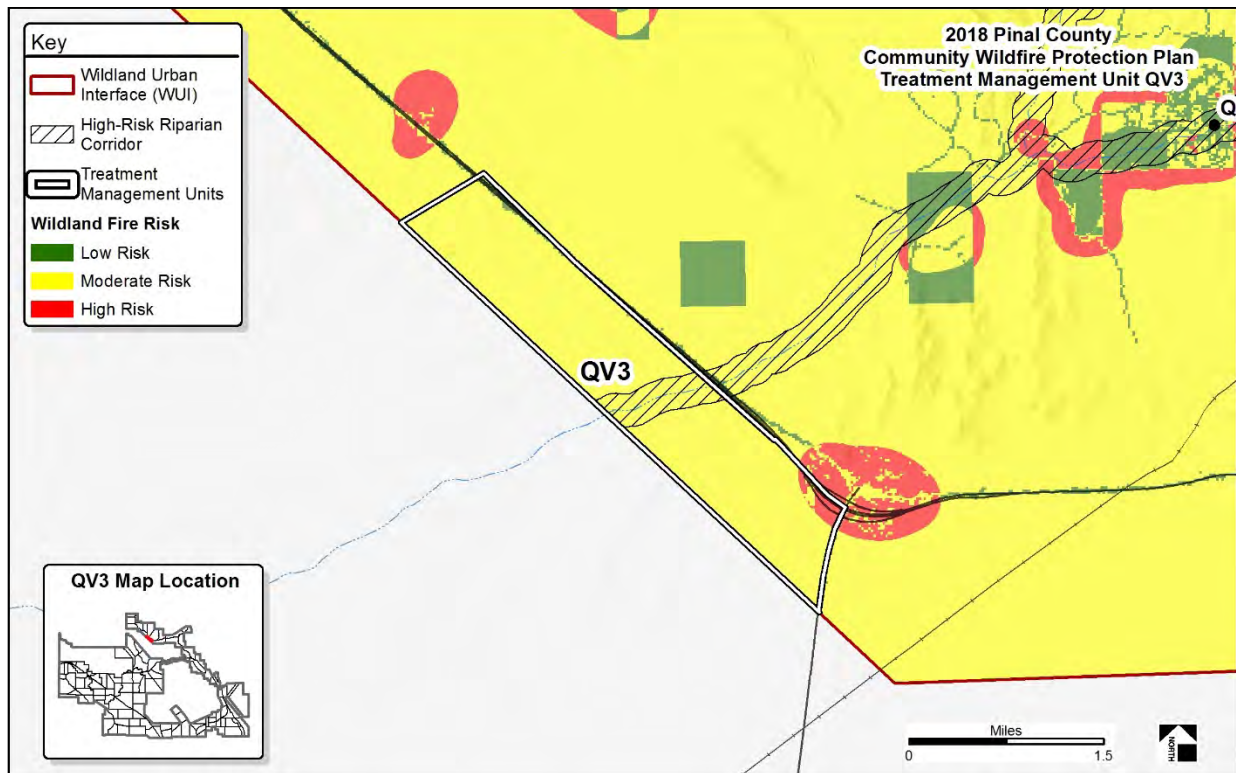


TMU QV1

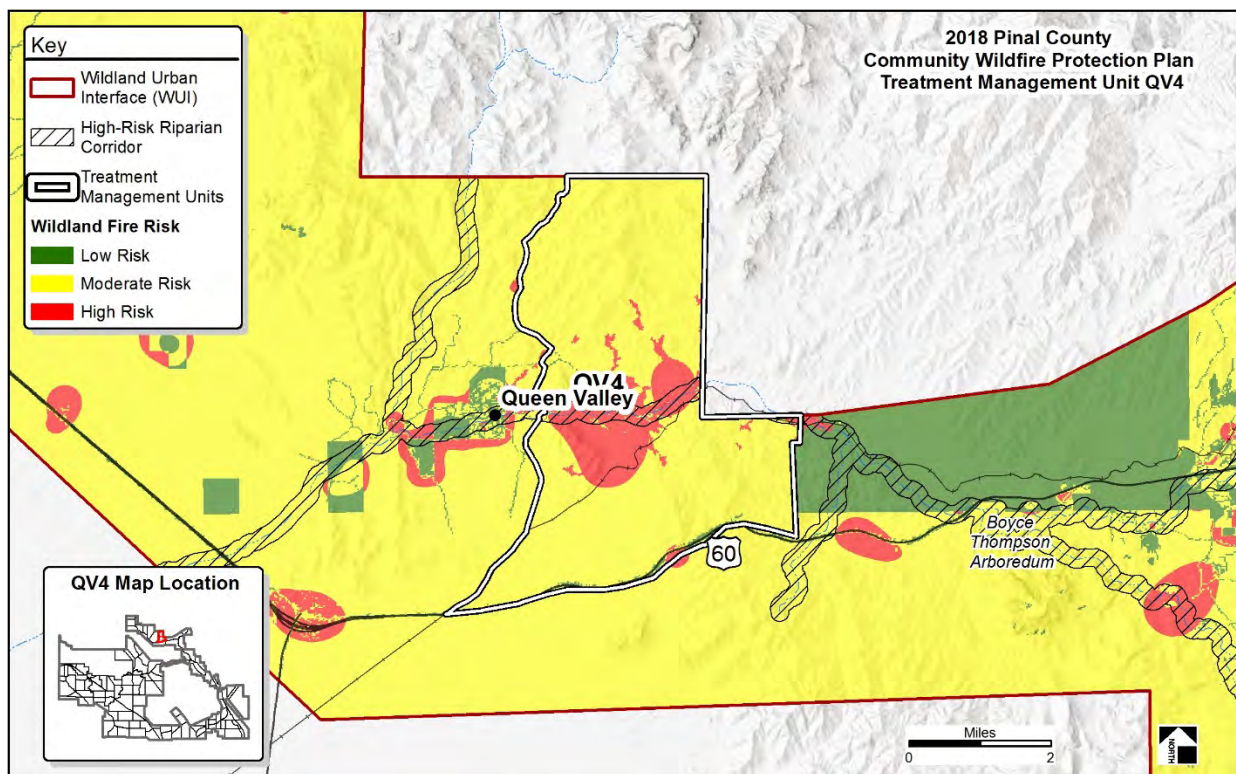


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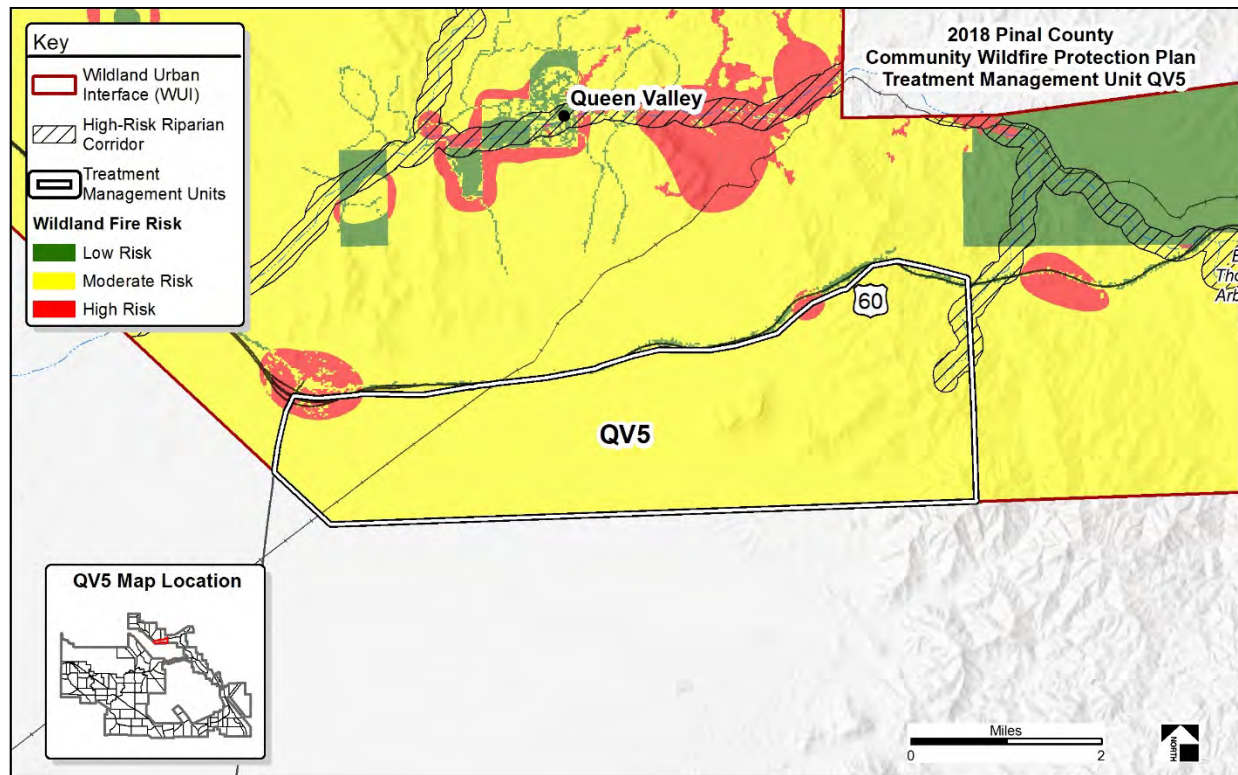


TMU QV3



TMU QV4

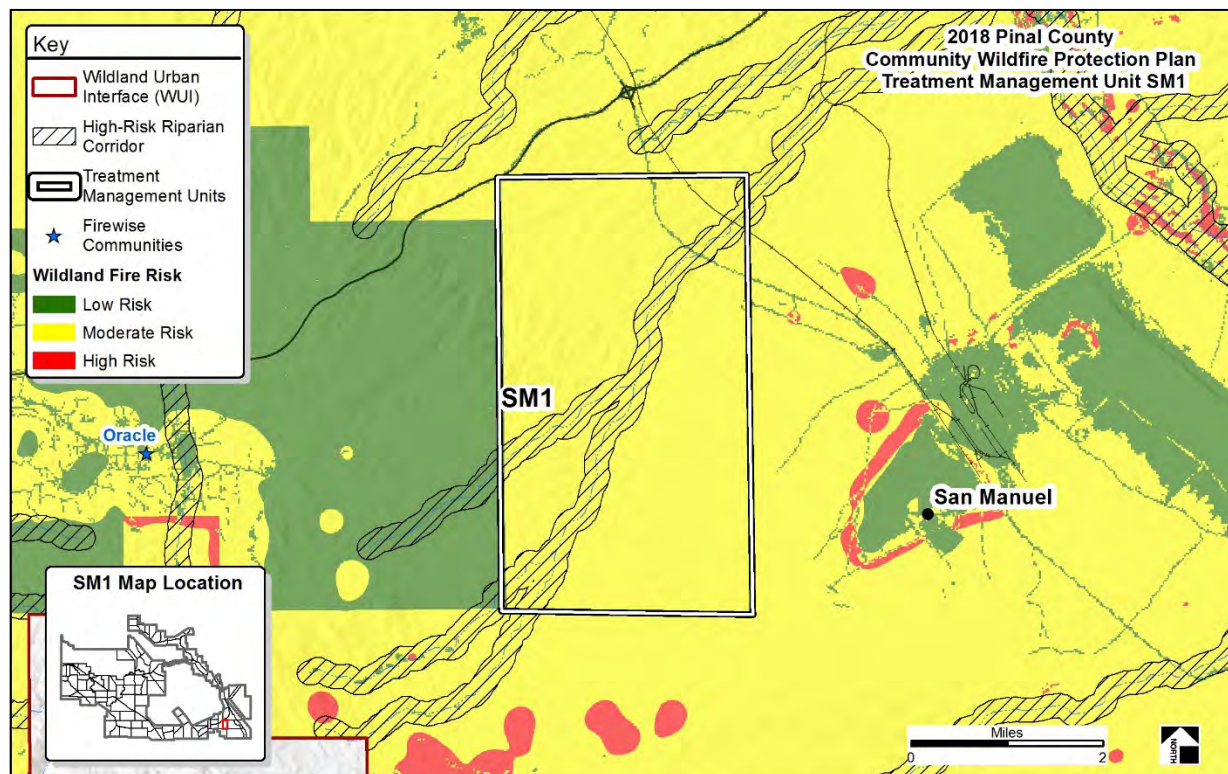




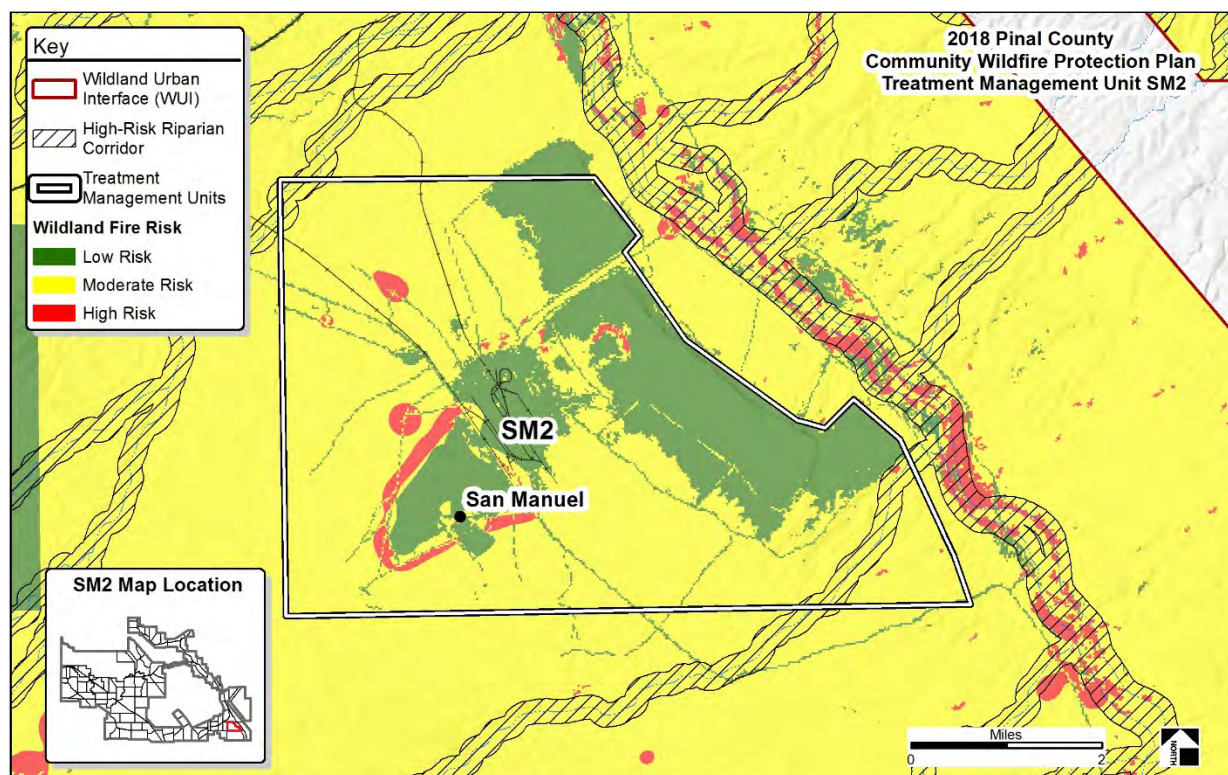
TMU QV5

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## SAN MANUEL WUI

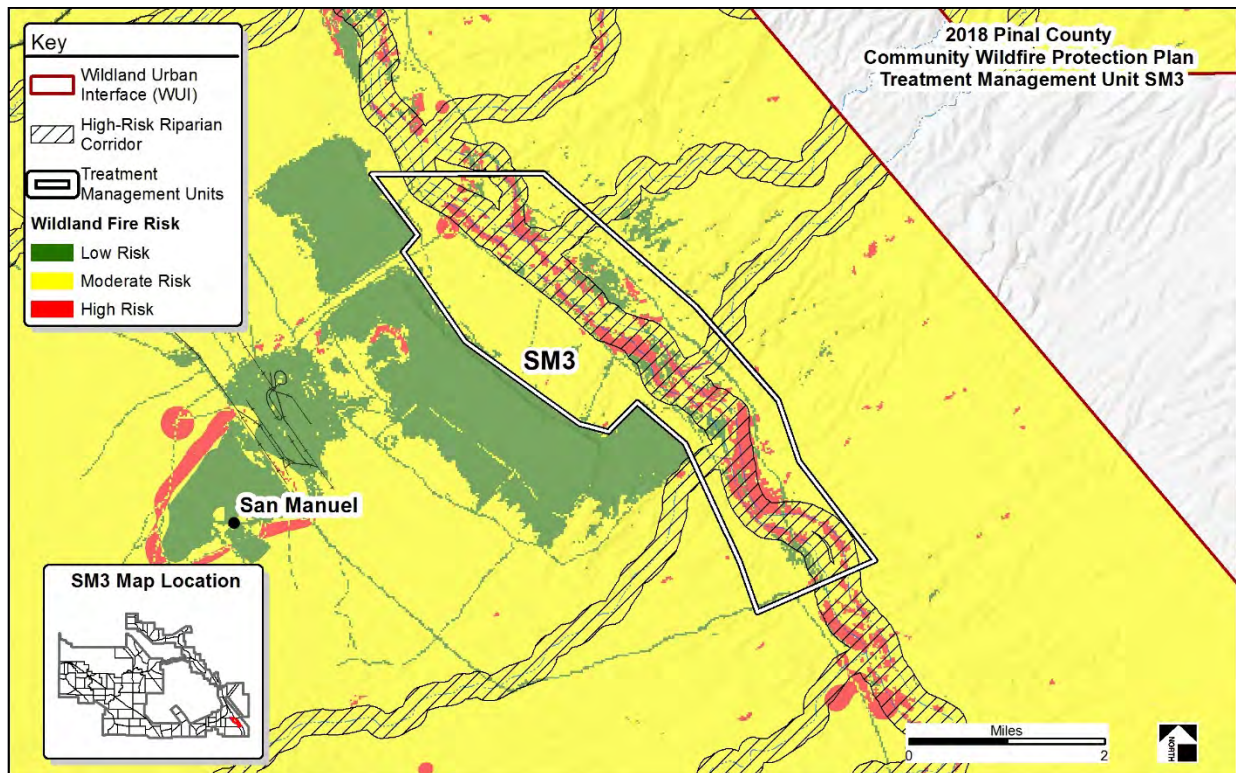


TMU SM1

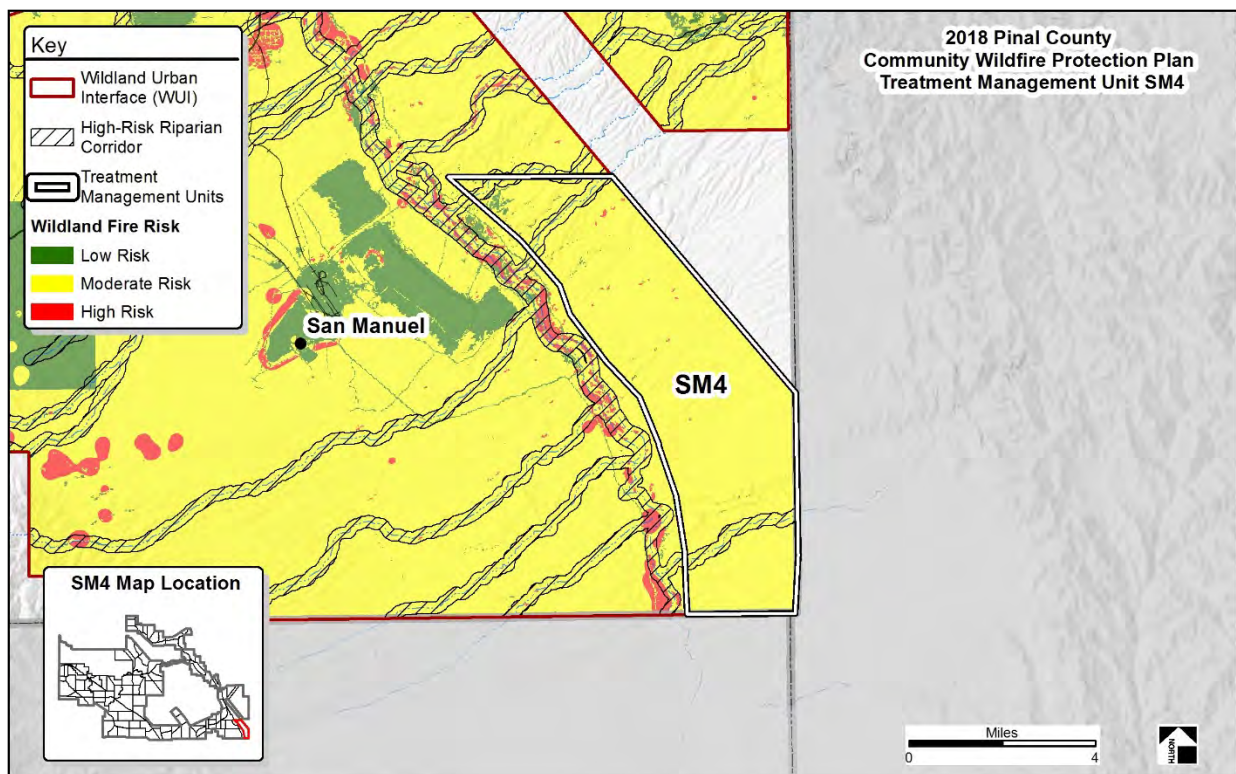


TMU SM2



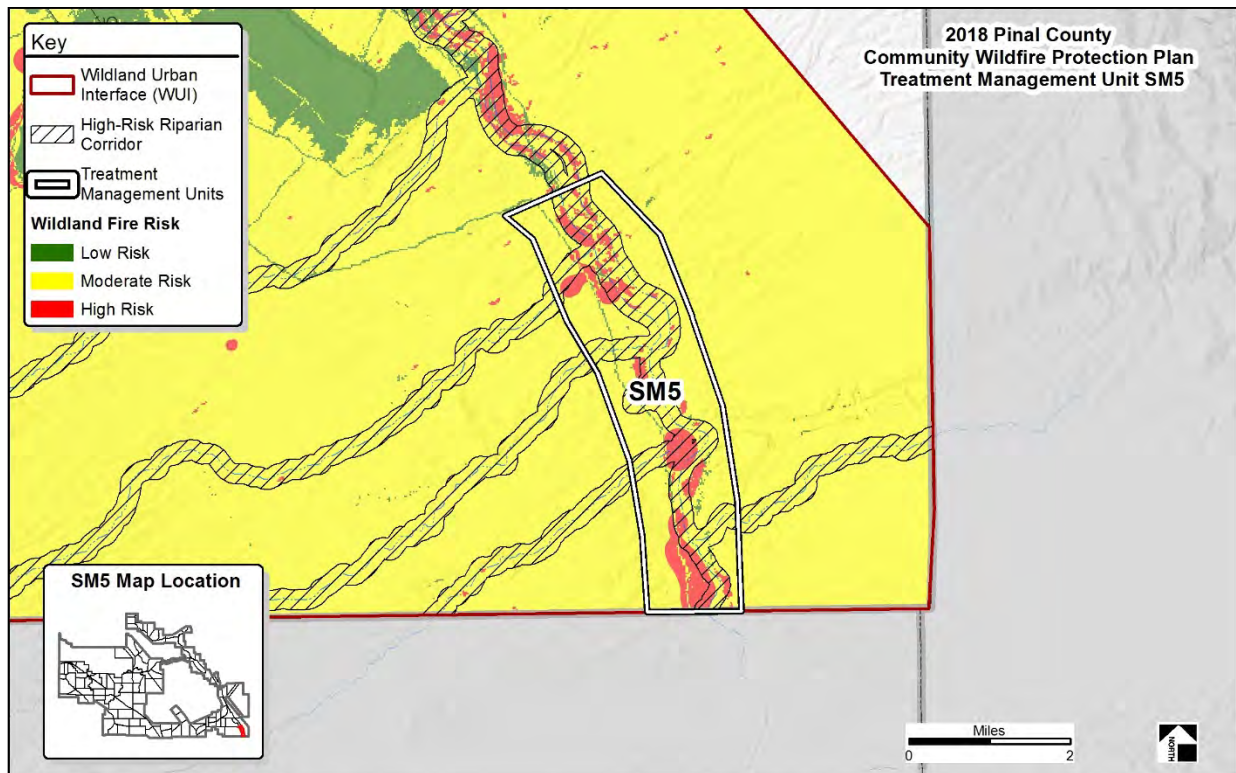


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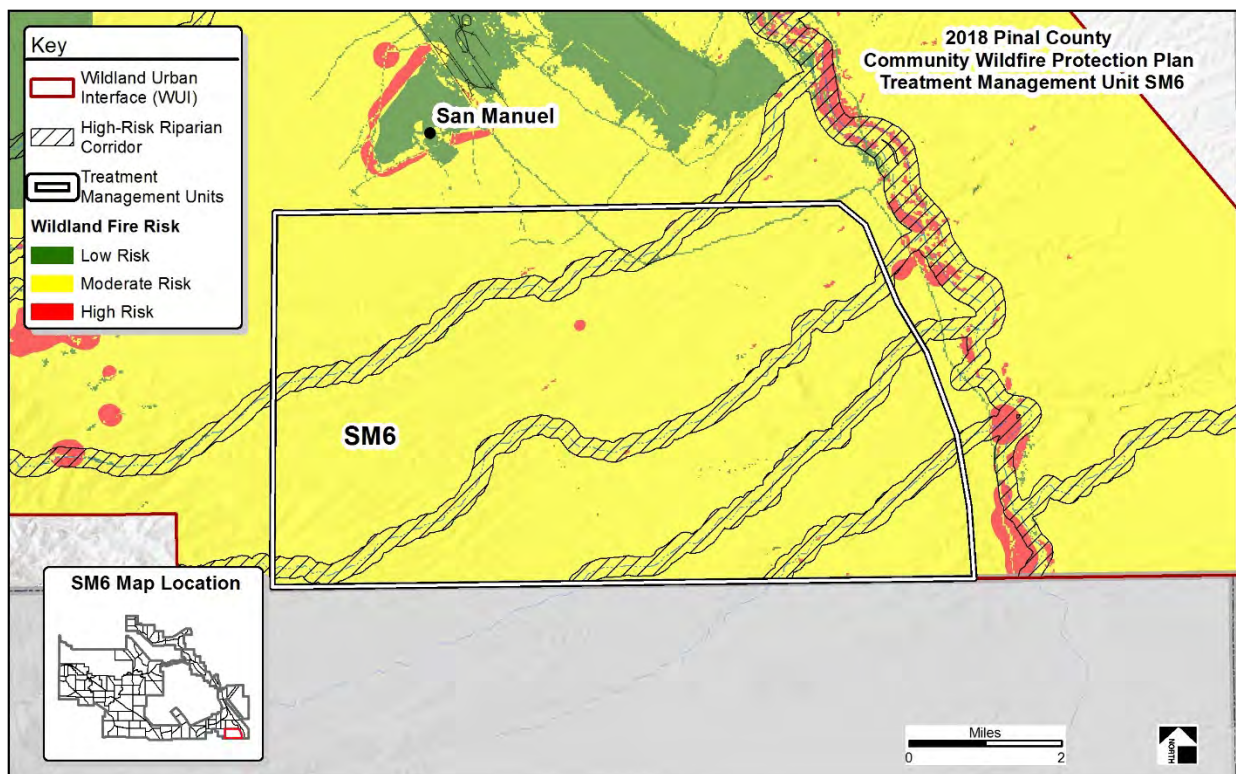


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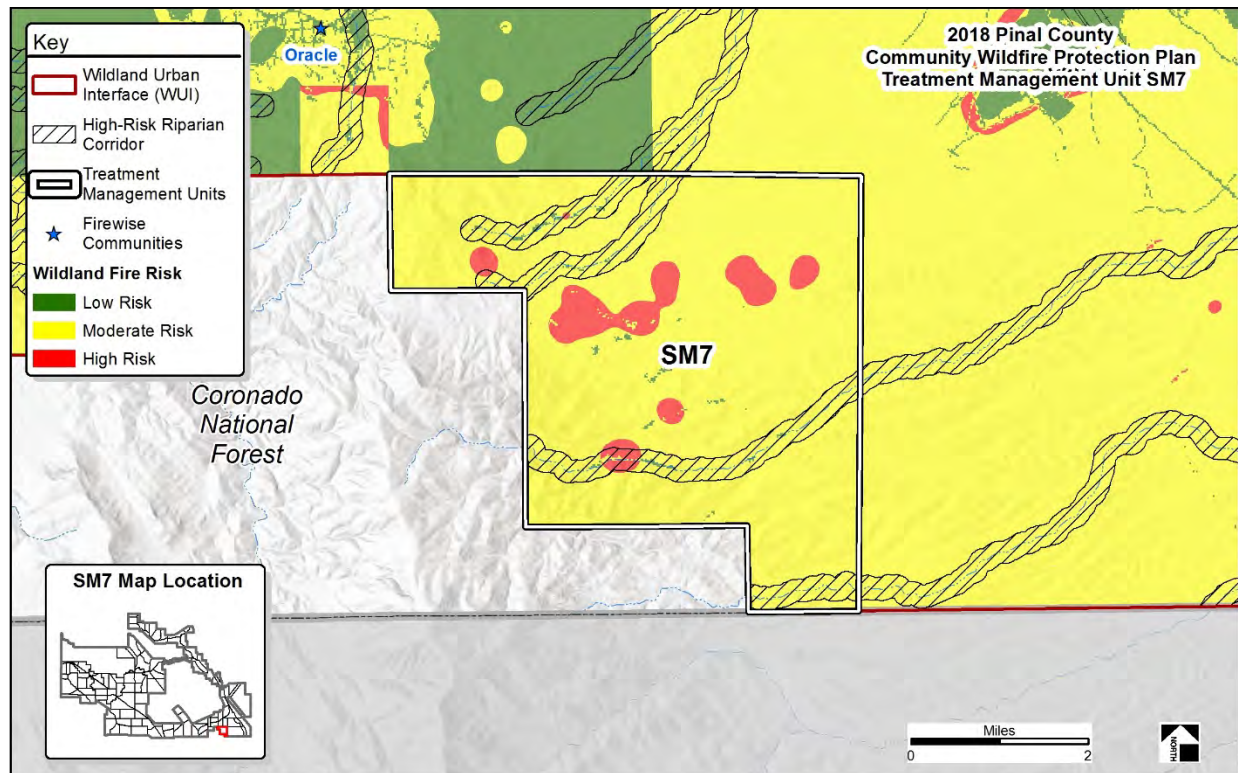




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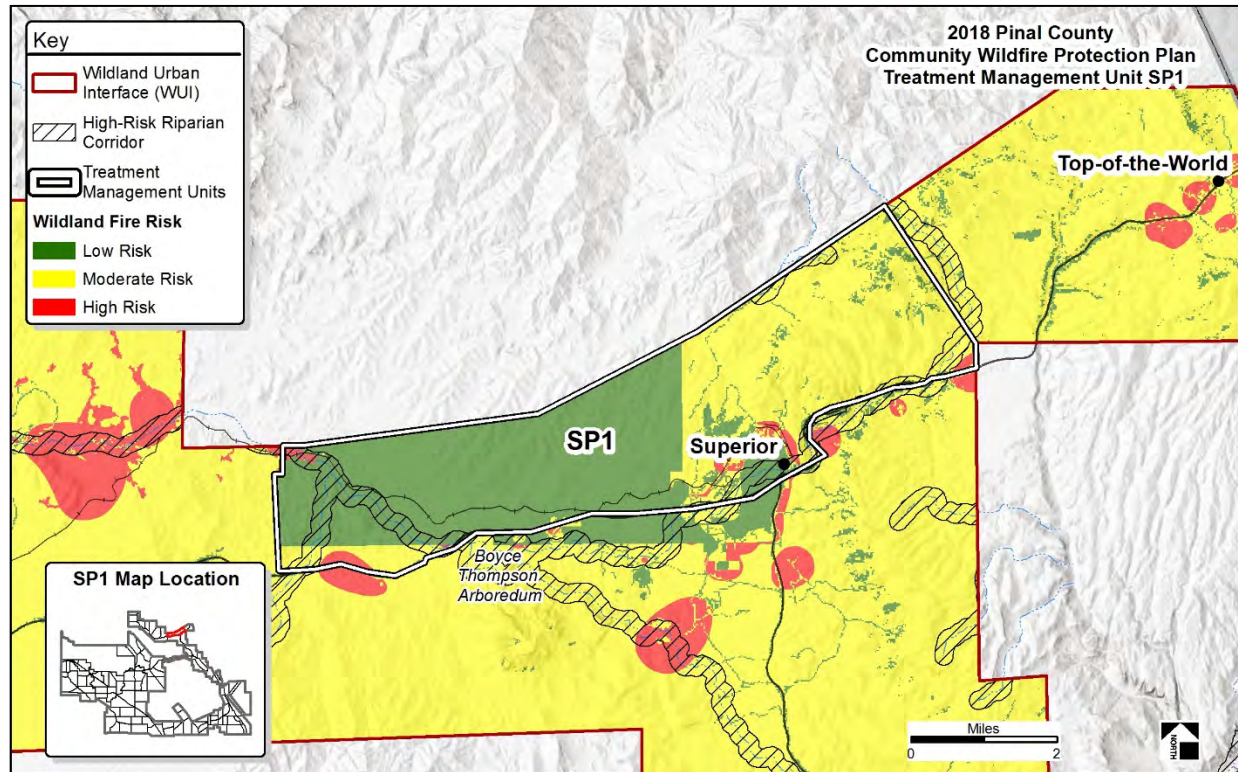
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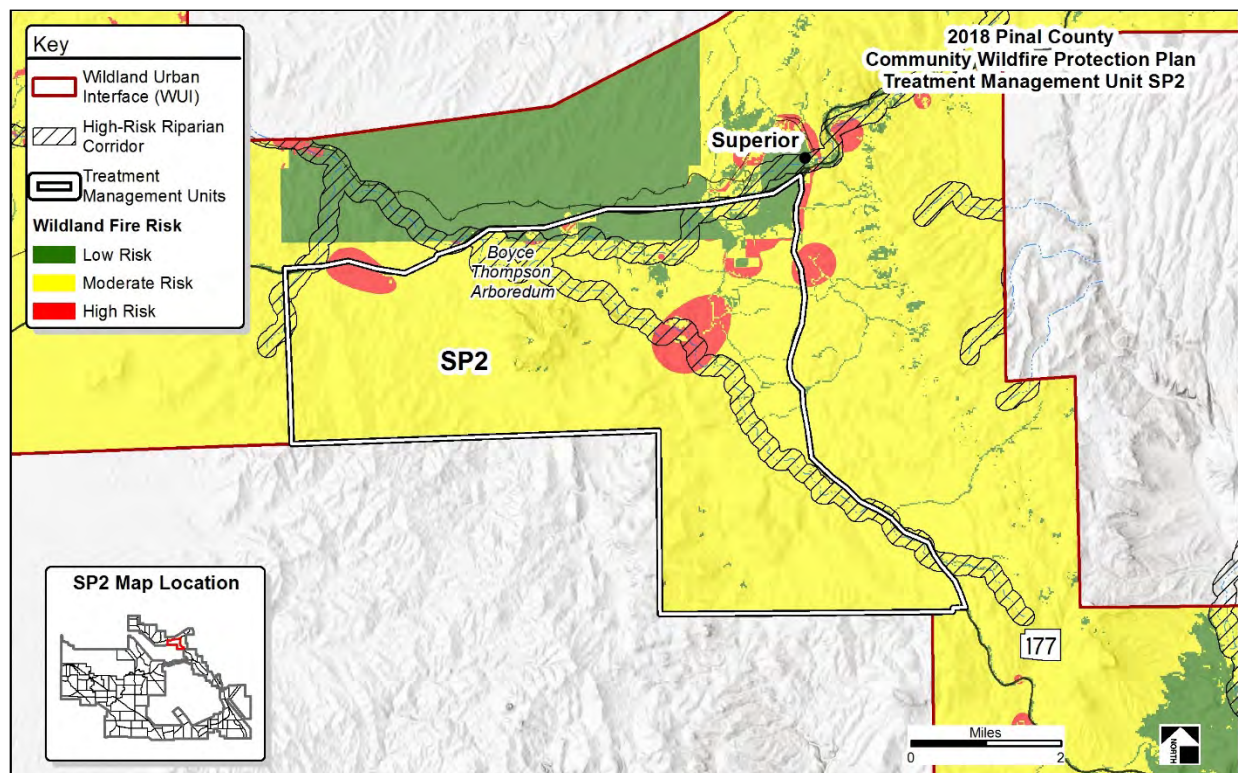
**TMU SM7**



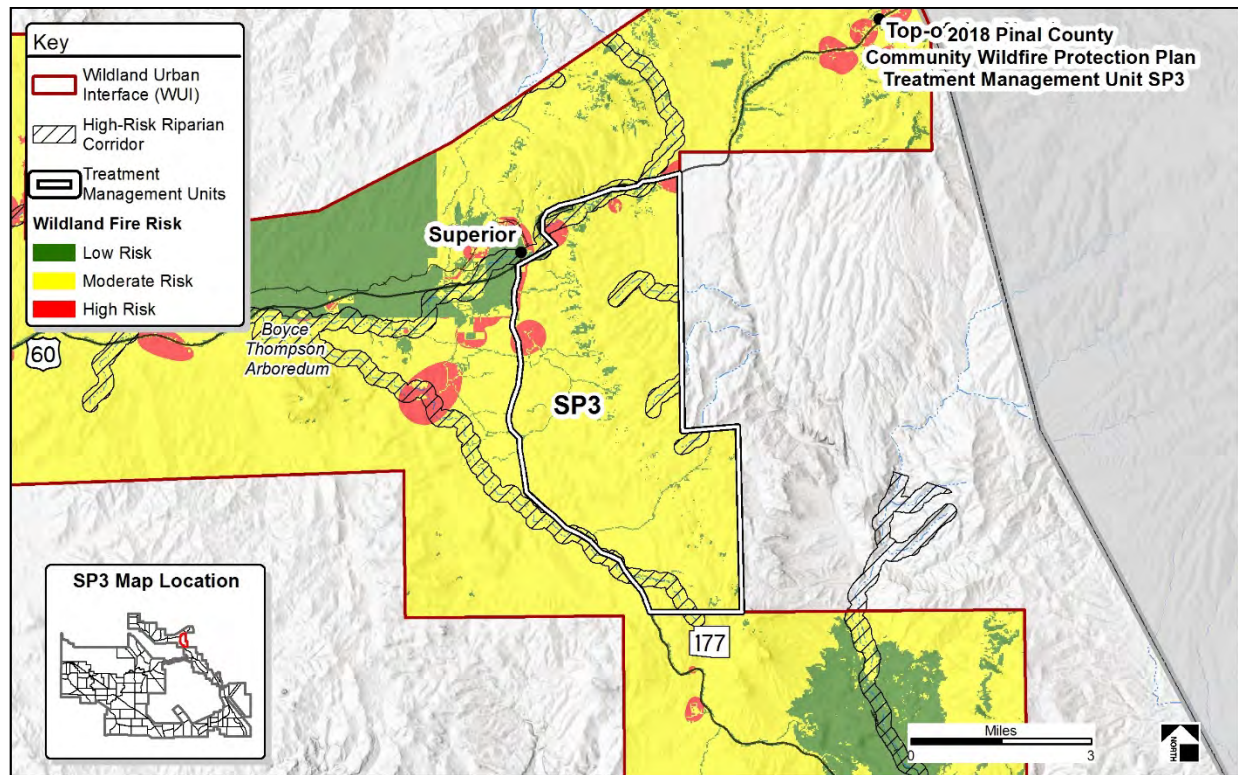
## SUPERIOR WUI



TMU SP1



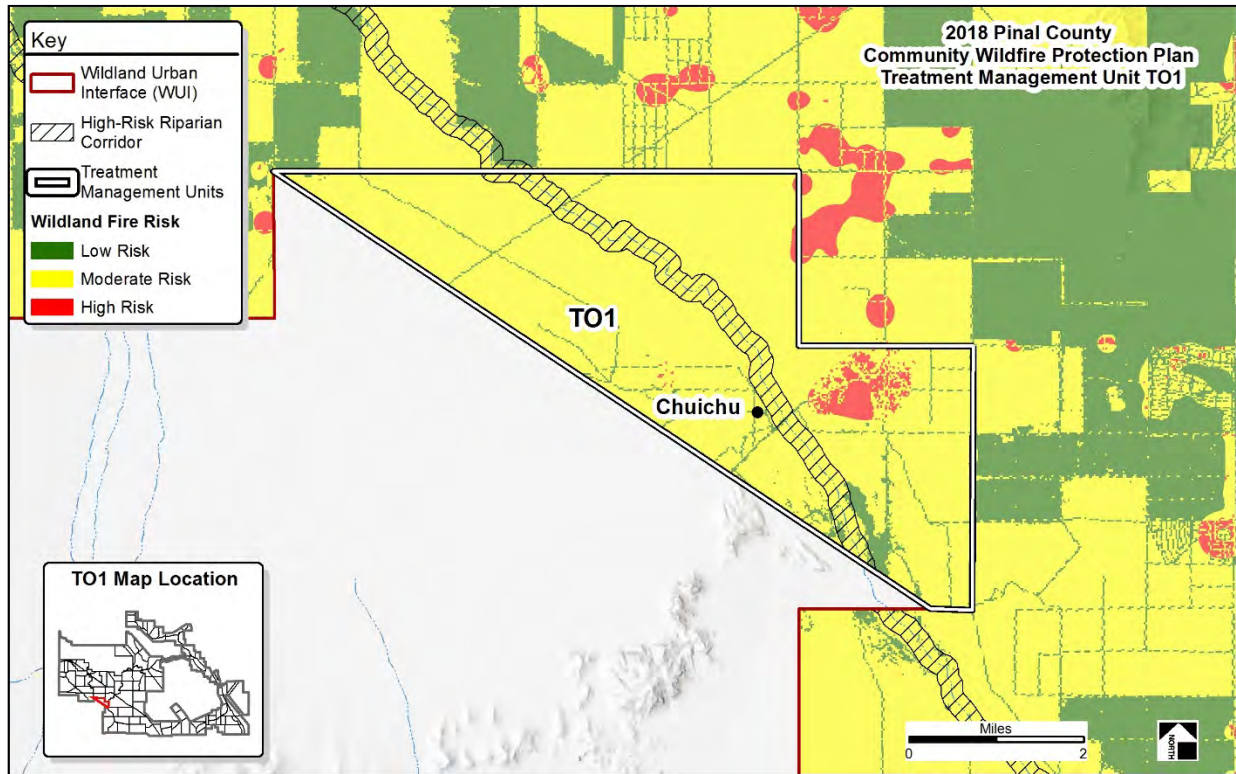
TMU SP2



TMU SP3



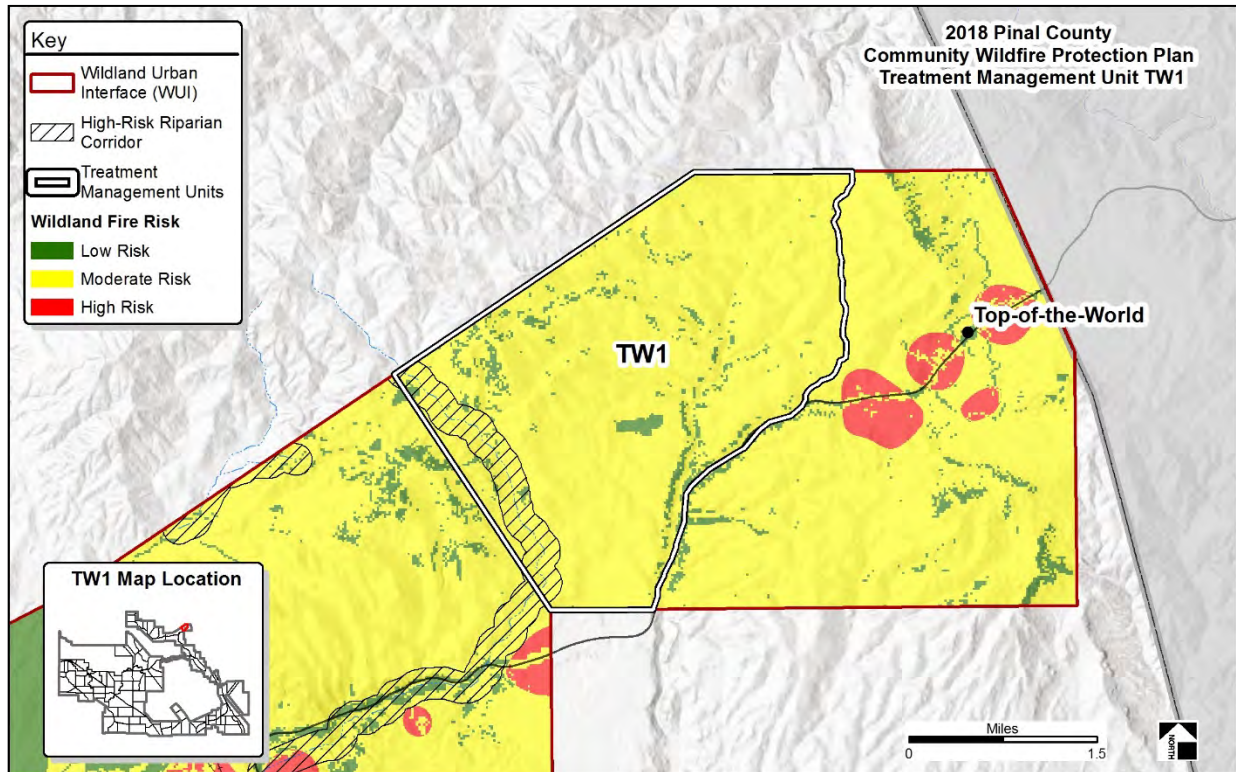
# TOHONO O'ODHAM NATION WUI



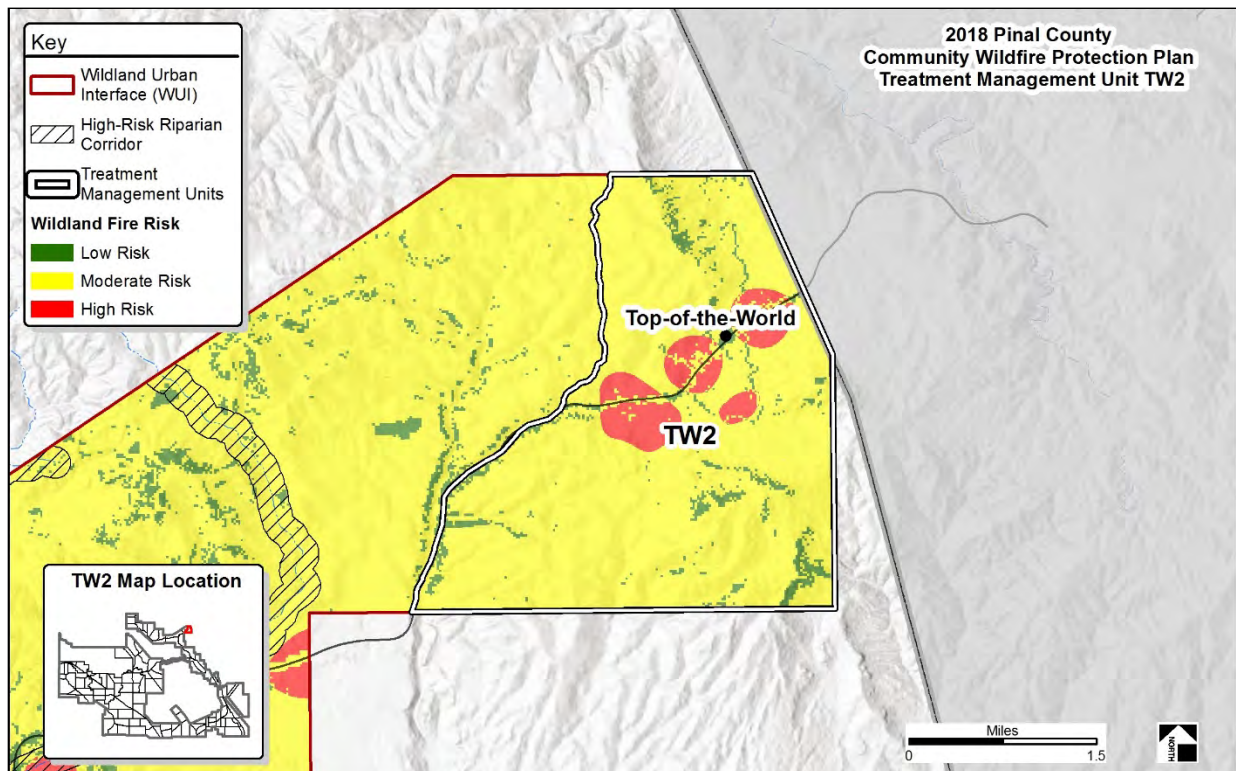


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## TOP-OF-THE-WORLD WUI



TMU TW1



TMU TW2

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