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EXECUTIVE SUMMARY

1. This document provides a comprehensive, scientifically based analysis of wildfire related hazards and risks in the Wildland-Urban Interface (WUI) areas of Yuma County, Arizona. The analysis is delivered in the form of a Community Wildfire Protection Plan (CWPP), and strives to follow the standards for CWPPs that have been established by the Healthy Forests Restoration Act (HFRA).

2. Using the results of the analysis, recommendations have been generated that aid stakeholders in preventing and/or reducing the threat of wildfire to values in the study area. These recommendations are included throughout the report, wherever appropriate.

3. This report complements local agreements and existing plans for wildfire protection to aid in implementing a seamless, coordinated effort in determining appropriate fire management actions in the study area.

The Yuma County CWPP is a guiding document that will facilitate the implementation of future mitigation efforts.

This CWPP strives to meet the requirements of HFRA by:

1. Identifying and prioritizing fuels reduction opportunities across the landscape
   See Communities section of the main document
2. Addressing structural ignitability
   See Defensible Space section in *Appendix B*
3. Addressing local preparedness and firefighting capabilities
   See main document and *Appendix B*
4. Collaborating with stakeholders
   See *Appendix C*

The Yuma County CWPP is the result of an area-wide fire protection planning effort that includes extensive field data, a compilation of existing documents, scientific analysis of the fire behavior potential of the study area (based on fuels, topography, and historical weather conditions), and collaboration with homeowners and officials from several agencies including Yuma County Office of Emergency Management, Bureau of Land Management (BLM), Arizona State Forestry Division, U.S. Fish and Wildlife Service (FWS), the City of Yuma Parks and Recreation Department, Martinez Lake Fire District, City of Yuma Fire Department, Somerton/Cocopah Fire Department, and Rural Metro Fire, and various representatives from local communities.

This CWPP provides a comprehensive assessment of the wildfire hazards and risks in the study area. Its goal is to reduce hazards through increased education about wildfires, hazardous fuels reduction, and improved levels of fire suppression response. Detailed recommendations for specific actions are included herein. It is important to note that the Yuma County CWPP is a working document to be updated annually, and/or after a major “event” such as wildfire, flood, insect infestation or even significant new home development.

TAKE HOME MESSAGE

The CWPP and associated appendices provide an overview of the Values at Risk on which a significant wildfire would have an impact. These areas include: life safety, homes and property values, infrastructure, recreation and lifestyle, and especially environmental resources.

Recommendations in the report address five broad categories, including: public education, structural ignitability/defensible space, water supply, access/evacuation, and street and home addressing. While many of the recommendations are general in nature, specific recommendations regarding landscape scale fuels treatments Community Descriptions section of the report. As a result of the extensive work that has already been initiated in the county, the fuels reduction recommendations include continuing and maintaining the projects that have already been started. Other recommendations in this CWPP should be brought to the local community for involvement with the project to ensure that the project is valuable and viable for the area. Additional fuels reduction projects are also encouraged, especially as previous recommendations are completed.

HOW TO USE THIS DOCUMENT

The main CWPP document provides much of the pertinent information for communities. A general narrative of the Healthy Forests Restoration Act and the background for CWPPs is discussed first, followed by information more specific to Yuma County. This includes an analysis of fire department capabilities, and specific community write-ups. Each community write-up can be regarded as an individual document. These pages can be delivered to a community independently of the overall document. As a result, you will see specific recommendations for each community listed first, followed by recommendations that apply to all communities, such as defensible space. With this format, each community has all the pertinent information available in three to four pages, separate of the overall document. Combined with Appendix B, an individual community should have the information necessary to begin working.

Because much of the information contained in the report is extensive and/or technical in nature, detailed discussions of certain elements are contained in appendices:

Appendix A: Fire Behavior Potential Analysis Methodology
Appendix A describes the methodology used to evaluate the threat represented by physical hazards such as fuels, weather, and topography to Values at Risk in the study area, by modeling their effects on fire behavior potential. A detailed description of each standardized, nationally recognized fuel model found in the study area is included.

Appendix B: Solutions and Mitigation
Appendix B gives both general and specific recommendations. General defensible space guidelines are described at length, while specific public education needs, water supply issues, and fire department recommendations are outlined.

Appendix C: Project Collaboration
One of the main requirements of HFRA is to assure community participation. Public collaboration was achieved through meetings, an online survey for residents, and an opportunity to comment on the draft report. A summary of the collaborative process undertaken for this project are found here.

While the graphics provide general information regarding the overall hazard and risk rating for specific communities, they are not adequate to describe fully the specific information that went towards forming the rating. At a minimum, it is necessary to review the individual community write-ups and recommendations near the end of the document. The rating alone may not capture the mitigation needs of the community. As an example, some communities may have a low or moderate rating, but may have a few specific areas that require attention. True understanding can only be captured by reading the accompanying text, in addition to looking at the graphics. Additionally, each community write-up can be regarded as an individual document. These pages can be delivered to a community independently of the overall document. As a result, you will see specific recommendations for each community listed first, followed by recommendations that apply to all communities, such as defensible space. With this format, each community has all the pertinent information available in 3 to 4 pages, separate of the overall document.

A CWPP is a living document; it should change based on the needs of the communities as projects are completed or additional projects are added. It is recommended that the core stakeholder group involve the communities to identify projects and implement the CWPP.

INTRODUCTION

The Yuma County CWPP is the result of a community-wide planning effort that included extensive field data gathering, compilation of existing documents and GIS data, and scientifically-based analyses and recommendations designed to reduce the threat of wildfire related damages to Values at Risk. This document incorporates new and existing information relating to wildfire which will be valuable to citizens, policy makers, and public agencies throughout Yuma County, Arizona. Participants in this project include Yuma Office of Emergency Management, BLM, Arizona Department of Forestry, FWS, City of Yuma Parks and Recreation, Martinez Lake Fire District, City of Yuma Fire, Somerton/Cocopah Fire Department, Rural/Metro Fire Department.

The assessment portion of this document estimates the hazards and risks associated with wildland fire in proximity to WUI areas. This information, in conjunction with identification of the Values at Risk, defines areas of special interest and allows for prioritization of mitigation efforts. From the analysis of this data, solutions and mitigation recommendations are offered that will aid homeowners, land managers, and other interested parties in developing short-term and long-term planning efforts.

Wildfire hazard data is derived both from the Wildfire Hazard Rating system (WHR) and from the analysis of Fire Behavior Potential, which are extensive and/or technical in nature. Detailed findings and methodologies for these analyses are included in their entirety in appendices rather than the main report text. This approach is designed to make the plan more readable, while establishing a reference source for those interested in the technical elements of the Yuma County wildfire hazard and risk assessment.

For the purposes of this report the following definitions apply:

Risk is considered to be the likelihood of an ignition occurrence. This is primarily determined by the fire history of the area.

Hazard is the combination of the WHR ratings of the WUI neighborhoods and the analysis of Fire Behavior Potential, as modeled from the fuels, weather, and topography of the study area. Hazard attempts to quantify the severity of undesirable fire outcomes to the Values at Risk.

Values at Risk are the intrinsic values identified by citizens as being important to the way of life in the study area (e.g. life safety, property conservation, access to recreation, cultural sites, and wildlife habitat).

This document has the following primary purposes:

- Provide a comprehensive, scientifically-based analysis of wildfire related hazards and risks in the WUI and areas of special interest in Yuma County.
- Using the results of the analysis, generate recommendations designed to prevent and/or reduce the damage associated with wildfire to values in the study area.
- Create a CWPP document which conforms to the standards for CWPPs established by HFRA.

THE NATIONAL FIRE PLAN AND THE HEALTHY FORESTS RESTORATION ACT

In 2000, more than eight million acres burned across the United States, marking one of the most devastating wildfire seasons in American history. One high-profile incident, the Cerro Grande fire at Los Alamos, NM, destroyed more than 235 structures and threatened the Department of Energy's nuclear research facility.

Two reports addressing federal wildland fire management were initiated after the 2000 fire season. The first report, prepared by a federal interagency group, was titled "Review and Update of the 1995 Federal Wildland Fire Management Policy" (2001). This report concluded, among other points, that the condition of America's forests had continued to deteriorate.

The second report, titled "Managing the Impacts of Wildfire on Communities and the Environment: A Report to the President in Response to the Wildfires of 2000," was issued by the Bureau of Land Management (BLM) and the United States Department of Agriculture Forest Service (USFS). It became known as the National Fire Plan (NFP). This report, and the ensuing Congressional appropriations, ultimately required actions to:

- Respond to severe fires
- Reduce the impacts of fire on rural communities and the environment
- Ensure sufficient firefighting resources

Congress increased its specific appropriations to accomplish these goals. 2002 was another severe season: more than 1,200 homes were destroyed and over seven million acres burned. In response to public pressure, Congress and the Bush administration continued to designate funds specifically for actionable items such as preparedness and suppression. That same year, the Bush administration announced the Healthy Forests Initiative, which enhanced measures to restore forest and rangeland health and reduce the risk of catastrophic wildfires. In 2003, the Healthy Forests Restoration Act was signed into law.

Through this piece of legislation, Congress continues to appropriate specific funding to address five main sub-categories through the NFP: preparedness, suppression, reduction of hazardous fuels, burned-area rehabilitation, and state and local assistance to firefighters. The general concepts of the NFP blend well with the established need for community wildfire protection in the study area. The spirit of the HFRA and NFP is reflected in the Yuma County CWPP.

This CWPP strives to meet the requirements of HFRA by:

- Identifying and prioritizing fuels reduction opportunities across the landscape
- Addressing structural ignitability
- Assessing community fire suppression capabilities
- Collaborating with stakeholders

GOALS AND OBJECTIVES

Goals for this project include the following:

- Enhance life safety for residents and responders
- Mitigate undesirable fire outcomes to property and infrastructure
- Identify Communities at Risk and Values at Risk
    - Reduce fuel hazards and prevent fires in these communities
        - Consider fuels treatment prescriptions and locations
        - Continue fuels treatment projects already initiated
- Mitigate undesirable fire outcomes to the environment, watersheds, and quality of life
- Improve the county's position as it competes for grants

To accomplish these goals, the following objectives have been identified:

- Establish an approximate level of risk (the likelihood of a significant wildfire event in the study area)
- Provide a scientific analysis of the fire behavior potential of the study area.
- Group Values at Risk into areas that represent relatively similar hazard factors
- Identify and quantify factors that limit (mitigate) undesirable fire effects on the Values at Risk (hazard levels)
- Recommend specific actions that will reduce hazards to the Values at Risk

Other Desired Outcomes

1. Promote community awareness:

   Quantifying the community's hazards and risk from wildfire will facilitate public awareness and assist in creating public action to mitigate the defined hazards.

2. Improve wildfire prevention through education:

   Community awareness, combined with education, will help to reduce the risk of unplanned human ignitions. This type of education can also limit injury, property loss, and even unnecessary death.

3. Facilitate and prioritize appropriate hazardous fuel reductions:

   Organizing and prioritizing hazard mitigation actions will provide stakeholders with the tools and understanding to bring these projects to ensure that they are valuable and viable for the local community.

4. Promote improved levels of response:

   The identification of specific community planning areas and their associated hazard and risk rating, will improve the focus and accuracy of pre-planning and facilitate the implementation of cross-boundary, multi-jurisdictional projects.

COLLABORATION: COMMUNITY AND AGENCIES

The names of the representatives involved in the development of the Yuma County CWPP are included in the table below, along with their organizations and various roles and responsibilities, both currently and in the future. For more information on the collaborative process, see **Appendix C**, *Yuma County CWPP Collaborative Effort*.

Name	Organization	Roles / Responsibilities
Gretchen Robinson	Yuma County Office of Emergency Management	Initiate stakeholder group, point of contact during the CWPP process
James Stewart Bryan Collins Benjamin Stewart Dave Faires Mike Erfert Gary August Ray Smith Elton Grubach John & Sandra Hogarth	Bureau of Land Management Arizona State Forestry Division U.S. Fish and Wildlife Service City of Yuma Parks and Recreation Department City of Yuma Fire Department Rural Metro Fire Department Somerton/Cocopah Fire Department Wellton-Mohawk Irrigation and Drainage District Martinez Lake Fire Department	Local information and expertise, including community risk and value assessment, development of community protection priorities, and action plan, including establishment of fuels treatment project areas and methods, approval of CWPP minimum standards
Chris White, Urban Interface Specialist Rod Moraga, Managing Member, Fire Behavior Analyst Kerry Malm, WUI Project Specialist Mark McLean, GIS Project Manager	Anchor Point Group	Development of the CWPP, decision-making, Community Risk and Value Assessment, development of community protection priorities, establishment of fuels treatment project areas and methods

Table 1. CWPP Development Team

STUDY AREA OVERVIEW

Yuma County is the most south western county in Arizona. It borders California to the west and Mexico along the entire southern border. The largest city within Yuma County is Yuma, which is situated in the south western corner of the county. Yuma has a population of 135,000 people, which increases by 80,000 during the winter months, bringing the total to 215,000. There are an excess of 80 RV parks in Yuma County to accommodate the increase in winter population. Yuma is approximately a three and a half hour drive southwest of Phoenix, and a four hour drive east of Tucson. There is an International Airport located in Yuma and the air traffic control tower is operated by the Marine Corps Air Station Yuma.

Other towns in the county include San Luis, Somerton, and Wellton. Two sovereign nations are also present, the Quechan Tribal Nation and the Cocopah Tribal Nation. The majority of the development has occurred near the City of Yuma and along the Interstate 8 corridor. Highway 95 and Interstate 8 are the major thoroughfares in the County.

Many military installations are located in Yuma County, including the Yuma Proving Grounds (YPG), 30 miles northeast of Yuma and the Marine Corps Air Station. YPG is used for testing military equipment, including munitions and artillery systems. The air station is a premiere aviation training base, supporting 80 percent of the Corps' air-to-ground aviation training. Land ownership is shown in the table below and in Figure 1.

Jurisdiction	Total Acreage	Total Sq. Miles	% of Total
Barry M. Goldwater Range	958,286	1497.32	27.142
Kofa National Wildlife Refuge and Wilderness Area	526,159	822.12	14.903
Bureau of Land Management	522,104	815.79	14.788
Cabeza Prieta National Wildlife Refuge	455,256	711.34	12.894
U.S. Army Yuma Proving Ground	439,296	686.40	12.442
Private Land	370,204	578.44	10.485
State Land	199,750	312.11	5.658
Bureau of Reclamation	43,581	68.10	1.234
Cocopah Indian Nation	6,727	10.51	0.191
Imperial National Wildlife Refuge	4,089	6.39	0.116
Marine Corp. Air Station	2,808	4.39	0.080
Quechan Indian Tribe	1,318	2.06	0.037
Arizona Game and Fish Department	1,059	1.65	0.029
Total	**3,530,637**	**5,516.62**	**100**

Table 2. Land ownership in Yuma County

Total acreage and land use designations are from the Yuma County 2010 Comprehensive Plan.

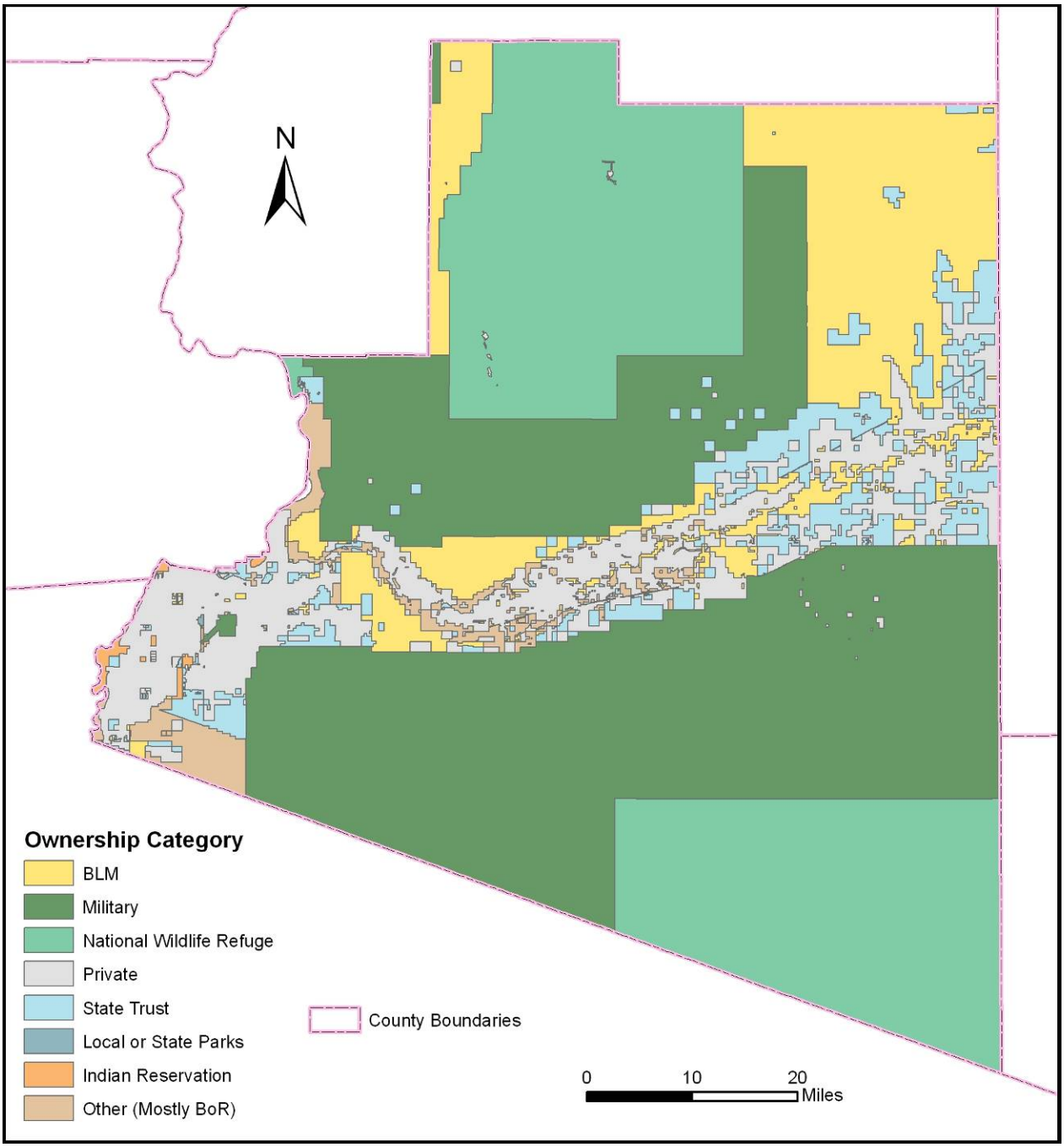

Figure 1. Land ownership in Yuma County

Other attractions include the Kofa National Wildlife Refuge, established in 1939 to protect Desert Bighorn Sheep. It encompasses 665,400 acres and is also home to the only native palm in Arizona, the California palm (*Washingtonia filifera*). The Kofa and Castle Dome Mountains are part of the landscape in this refuge. A second refuge, the Cabeza Prieta National Wildlife Refuge was also established in 1939 as a protection measure for Desert Bighorn Sheep (*Ovis canadensis nelsoni*) and their habitat. It spans both Yuma County and neighboring Pima County to the east. It borders the Barry M. Goldwater Air Force Range. The range is used for bombing practice by both the Air Force and Marines. The third refuge is the Imperial National Wildlife Refuge (INWR), located in Yuma County, La Paz County, and Imperial County, CA. This refuge covers approximately 30 miles of the Colorado River, and it protects habitat for migratory birds and desert wildlife. Species likely to be found in these refuges include: bats, the desert tortoise, collared lizard, white-winged dove, cactus wren, and desert kit fox. The INWR has the most potential impact on a community because of its close proximity to Martinez Lake.

The elevation in Yuma County ranges from approximately 82 feet to 4000 feet. Much of the county is desert, combined with rugged mountains. While the developed areas do not have steep slopes, the mountain ranges have slopes greater than 45%. The areas along the Colorado and Gila Rivers provides riparian habitat for many animal species, including black-tailed jackrabbits, cinnamon teal, and mule deer. More detailed information on vegetation can be found under the “Current Risk Situation” of this report.

For the purposes of this project, 4 Wildland Urban Interface (WUI) communities and 5 areas of special interest were identified, representing the most hazardous areas in the study area. The WUI is defined as the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. Each community exhibited certain dominant hazards from a wildfire perspective. Fuels, topography, structural flammability, availability of water for fire suppression, egress and navigational difficulties, as well as other hazards both natural and manmade, are considered in the overall hazard ranking of these communities.

Construction type, condition, age, fuel loading of the structure/contents, and home position in relation to topography are contributing factors in making homes more susceptible to ignition under even moderate burning conditions. There is also a likelihood of rapid fire growth and spread in these areas due to steep topography, fast-burning or flashy fuel components, and other topographic features that contribute to channeling winds and the promotion of extreme fire behavior.

The community-level assessment has identified two of the four communities in the study area to be at high risk. Because many of the buildings are not permanent, recommendations that call for improvements to the structures are difficult. Therefore, fuel management projects are the most beneficial recommendation. Please refer to the graphics on the following pages for a color-coded hazard ranking reference. Additional general recommendations for RV parks and seasonal communities can be found in Appendix B. Although the places defined as “areas of special interest” may not include residences, they contain critical infrastructure, buildings, and/or other environmental concerns that necessitate serious attention from a fire mitigation standpoint.

The methodology for this assessment uses the WHR system that was developed specifically to evaluate communities within the WUI for their relative wildfire hazard. The WHR model combines physical infrastructure such as structure density and roads, and fire behavior components like fuels and topography, with the field experience and knowledge of wildland fire experts.

DEFINING THE WILDLAND URBAN INTERFACE

The communities identified within the CWPP document are areas of concern from a wildland-urban interface perspective. Because wildfire can spread rapidly, and fuels reduction and other mitigation measures may be located adjacent to communities, a half-mile in all directions of the communities is also considered part of the defined WUI. For areas outside of this designation, the determination of interface areas should be based on the modeled flame length under extreme weather conditions (see figures 21-23 in Appendix A). Critical infrastructure, existing structures, and any future development that is within vegetation areas that could produce flame lengths greater than four feet under extreme weather conditions should follow construction and maintenance practices identified in a WUI code or other fire codes adopted by the authority having jurisdiction.

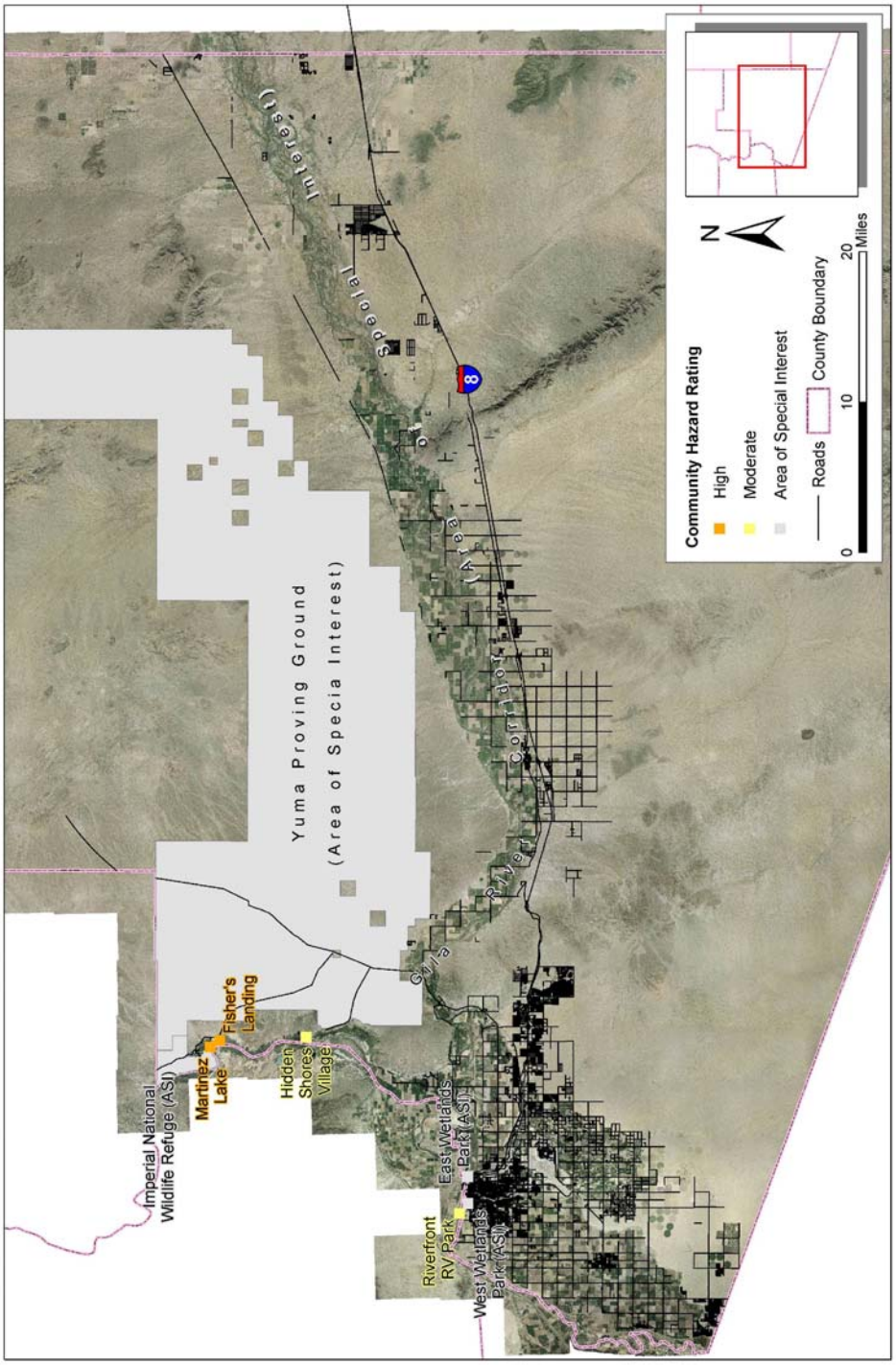

Figure 2. Overview of communities and areas of special interest

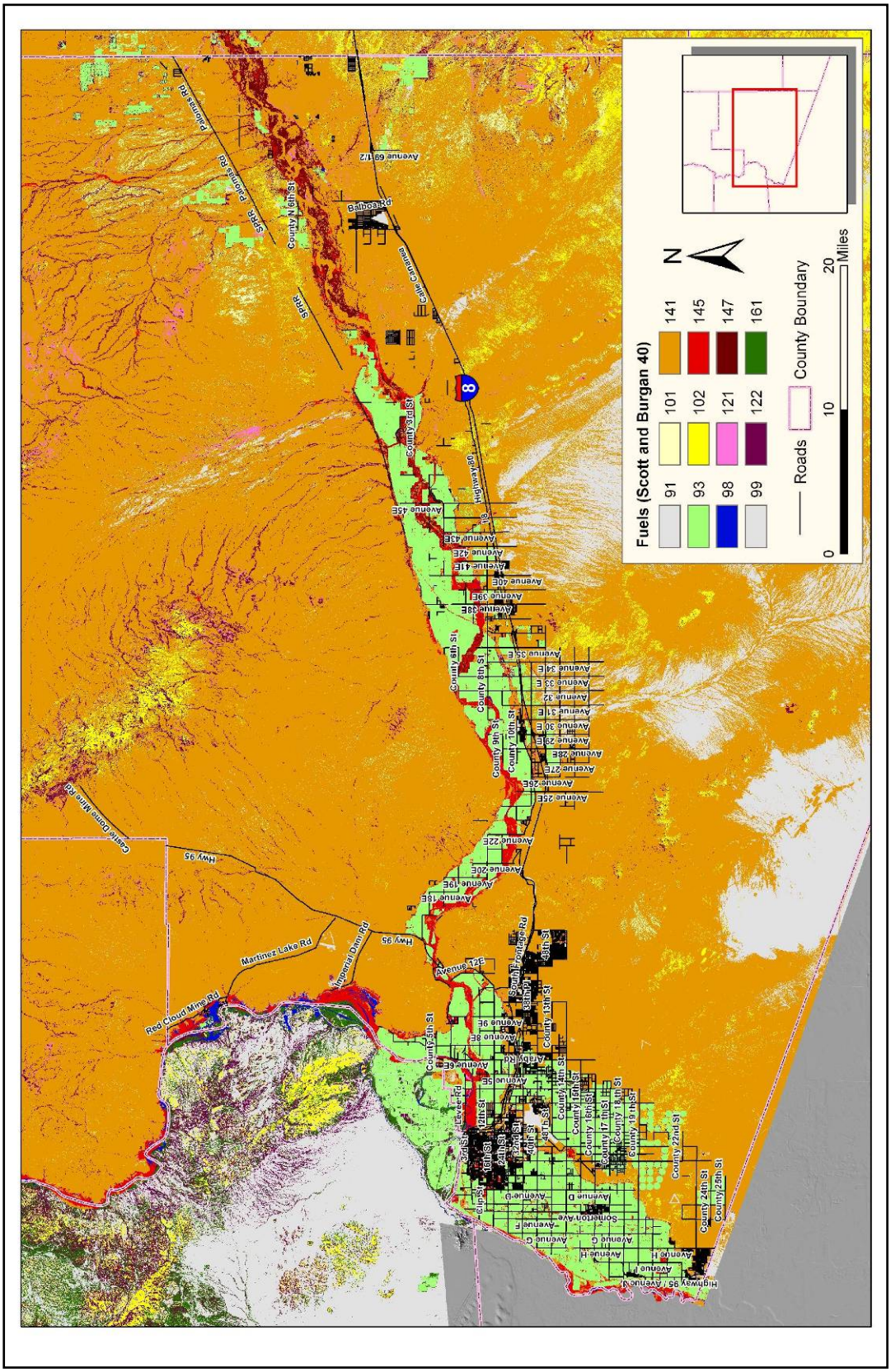

Figure 3. Fuel models found in Yuma County

VALUES AT RISK

LIFE SAFETY AND HOMES

Yuma County is by and large a rural area, with the exception of the cities of Yuma and San Luis. Construction of additional housing units is ongoing throughout the study area, and the number of residents and visitors has increased by almost 10% between 2000 and 2003. Population density is low at 35 people per square mile. The County continues to grow, but there is a strong desire to promote in-growth rather than sprawl.

Although the majority of fires occurring in Yuma County are unlikely to impact structures, under extreme burning conditions, there is a likelihood of rapid increases in fire intensity and spread in some of the communities, due to fast burning or flashy fuel components, large quantities of ember-cast, and other topographic features that contribute to channeling winds and promotion of extreme fire behavior. These areas may also represent a serious threat to life safety, due to difficult access, and the likelihood of heavy smoke, heat, and/or long response times from suppression resources.

Most of Yuma County is vulnerable to some form of natural disturbance, and while wildland fire is not one of the main concerns, it is an issue that officials and residents should be aware of. Recent national disaster events have focused increased attention at both local and state government levels on the need to mitigate such events where possible, and to prepare to cope with them when unavoidable.

COMMERCE AND INFRASTRUCTURE

Economic Values

Agriculture is an important part of Yuma County's economy; 90% of the U.S.'s winter lettuce crop comes from Yuma County. Lettuce grosses 83% of the billion dollar vegetable income in the County. Lemons and other citrus fruits are also major crops. Soils are irrigated by using water from the Colorado and Gila Rivers. Additional crops include cotton, grain, and hay. Along with the crops, livestock is another large part of the economy, grossing $134.5 million. The Yuma Agricultural Center continues to generate biotechnical solutions that increase yields.

Critical Infrastructure

Wellton-Mohawk Irrigation and Drainage District

Wellton-Mohawk Irrigation and Drainage District (WMIDD) is responsible for the area of land from the Gila River, spreading 60 miles to the east to Texas Hill (Figure 4). Created by Arizona State Legislature in 1951, the WMIDD is the franchise for power distribution in the local area, as well as being responsible for irrigation. WMIDD's water comes from the Gila River, where the water is diverted the Arizona abutment of Imperial Dam. From there, the water is fed into the Gila Canal, and then into the Wellton-Mohawk Canal. The District is allowed to use 278,000 acre-feet of water annually. There are 378 miles of canals, laterals, and return flow channels. Three major pumping plants, four minor pump stations, 10 re-lift pumps, and ~300 observation wells also within the WMIDD.

Though wildfire has never impinged upon critical infrastructure such as transmission facilities within the District, there is a history of fire in the area; power poles and surrounding vegetation have burned on occasion. WMIDD has approximately 30 individuals capable of responding to a wildfire incident, but not everyone has actual wildland fire training. Current firefighting

equipment available to WMIDD includes multiple 10,000 gallon water tenders and loaders. In addition, one fire truck is accessible. The Tacna and Wellton Volunteer Fire Departments are also available to assist if there is a fire. To combat the threat of wildfire, WMIDD maintains a fire break and completes 300 acres of fuels reduction work along the Gila River right of way. The WMIDD has recently signed a Cooperative Fire Rate agreement with the State Forester to provide available equipment and personnel. It is also utilized on responses to any Federal fires.

More information about WMIDD can be found at http://www.wellton-mohawk.org/index.html.

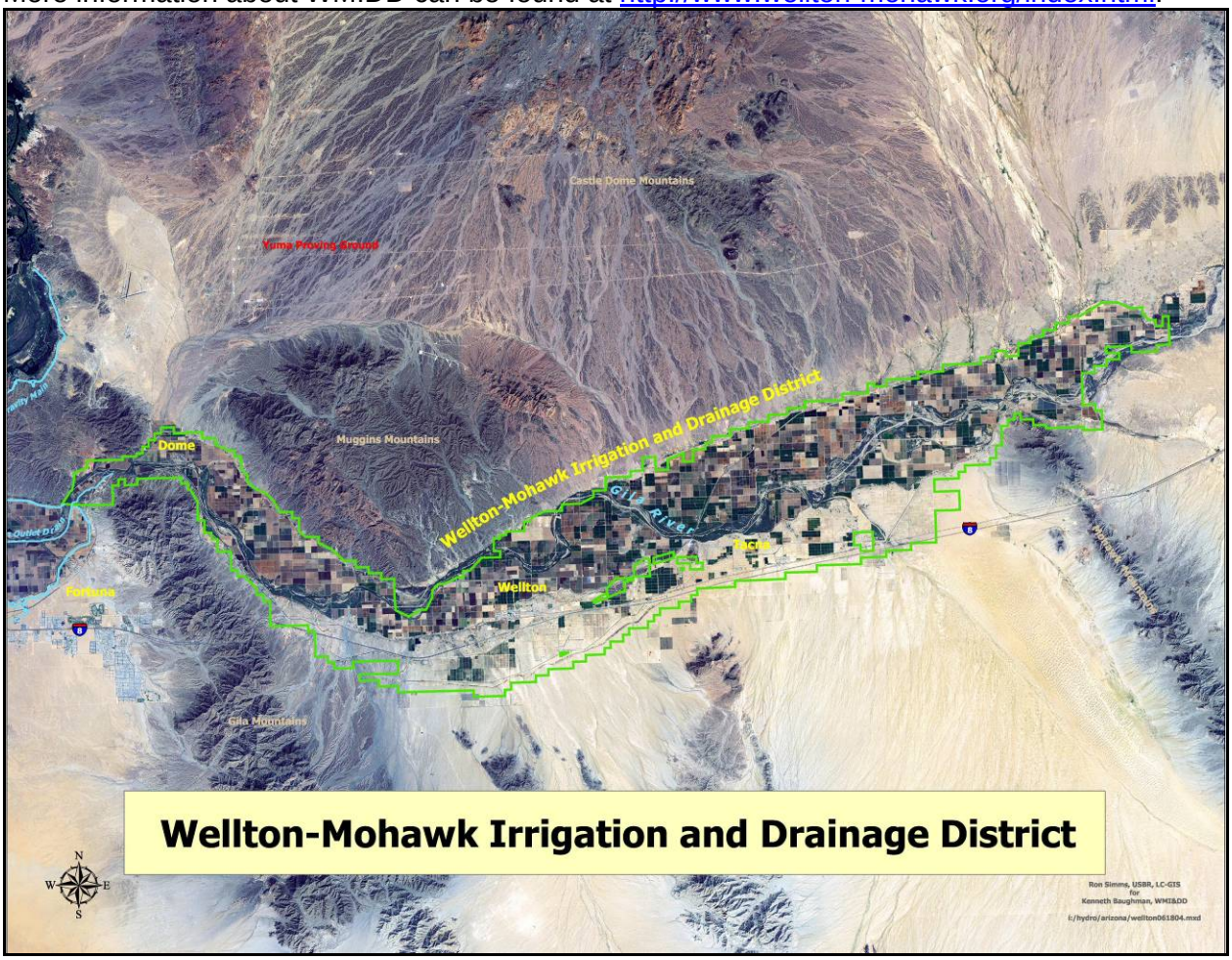

Figure 4. Wellton-Mohawk Irrigation and Drainage District boundary

Kinder Morgan

Kinder Morgan is one of the largest natural gas transporters and storage operators in the United States. The Kinder Morgan West Line is approximately 515 miles of primary pipeline and currently transports products from the Los Angeles Basin to Phoenix. The East Line is approximately 400 miles of pipeline originates in El Paso, Texas transporting products to Tucson and Phoenix. In Yuma County, Kinder Morgan has a 6” transmix pipeline with a terminal at the MCAS and a remote control pump station in the city of Yuma.

Western Area Power Association (WAPA)
The Desert Southwest Region operates and maintains 1,380 miles of high-voltage transmission lines, substations, and a communications system that includes microwave, VHF radio, and state-of-the-art fiber optics. If the lines in Yuma County were compromised by direct flames, smoke, or any other aspect related to wildland fire, it is possible that southern California could lose power. Any fire in the vicinity of these lines should be suppressed as soon as possible. WAPA should be responsible for removing any heavy fuels that could impact the functioning of their lines. Crews should be aware of the dangers associated with working around high voltage power lines.

ENVIRONMENTAL RESOURCES

Watershed and River Concerns

Because Yuma receives three inches of rain a year on average and the economy is highly dependent on agriculture, watershed and river concerns are a high priority. There are five watersheds in Yuma County that provide water for the County: Lower Gila, Parker, Ranegras Plain, Western Mexican Drainage, and Yuma. The State of Arizona currently pumps more groundwater than is replenished through rain and snow melt. As the population continues to grow, the importance and demand for water will also increase. The cities and towns in Yuma County exist outside of the AMA boundaries, making effective water management difficult. The Colorado River is a major contributor to the agricultural productivity in the County. Vegetation associated with riparian areas provides wildlife habitat for multiple species, including muskrats, beaver, fishes, and birds, including the endangered South West Willow Flycatcher. Just because the vegetation is in an area that is wet, does not mean it cannot or will not burn. Taking action to prevent wildfire in these areas is critical for maintaining biodiversity and ecosystem function. This concern is most prevalent in the East and West Wetlands Parks in the City of Yuma, as well as in Martinez Lake.

Several endangered species are also found in Yuma County, many of which are associated with the wetland areas along the Colorado River. The threatened and endangered species include: the bald eagle, brown pelican, lesser long-nosed bat, razor back sucker, Sonoran pronghorn, southwestern willow flycatcher, and the Yuma clapper rail. The recommendations made in this CWPP include protecting and improving habitat for all animals, not only threatened and endangered species.

Colorado River Corridor

The Colorado River is the lifeblood of Yuma County. Most of the land area is vast desert and rugged mountains, but the Colorado River has been used to develop arable land in many river valleys. Silt and mineral deposits from the Colorado and Gila Rivers allow these soils to be some of the most fertile in the world. The main industries in Yuma County like farming, raising cattle, and tourism, are all possible because of the Colorado.

The Colorado River is not just important for human uses, but for a wide variety of animals, some endangered and some not. Beaver, Big horn sheep, bobcats, coyotes, deer, ducks, doves, fox, geese, quail, raccoons, and wild horses all utilize the Colorado. The Imperial National Wildlife Refuge, identified as an area of special interest, fronts on both sides of the river for 35 miles. The refuge is a stop-over for migratory birds, with some 235 species being observed.

CURRENT RISK SITUATION

Within Yuma County, the City of Yuma is the only location listed in the Federal Register as a community in the vicinity of federal lands at risk from wildfire.[1] However, the State of Arizona Wildland Urban Interface Assessment determined the City of Yuma and San Luis to be rated as moderate, where as the rest of the towns in the county to be low.

Prior to 1935, wildfire was not a major cause of disturbance within the lower Colorado River riparian ecosystem. Flood control has allowed the wide-spread establishment of the invasive saltcedar (*Tamarix ramosissima/chinensis*). Suppression of annual floods has reduced the ability of native plant communities to regenerate and has created a system where wildfire has become the major disturbance influencing riparian stand development. Saltcedar is adapted to respond to fire through vigorous sprouting. In some cases, it has been reported to re-sprout within days of burning, and be over 6 feet tall within several months. It also has the ability to produce seeds throughout most of the year so that it is uniquely able to colonize newly burned areas. Native riparian species vary in their ability to respond to fire. Arrowweed (*Pluchea purpurascens*) responds to fire and has the ability to colonize newly burned areas where salinity and water limit other native plant species. Fire behavior in arrowweed is typically minimal and active fire tends to drop to the surface when encountering large areas of arrowweed. Willow (*Salix spp.*) also actively re-sprouts from the base after a burn. Cottonwood (*Populus fremontii*) does not respond to fire and is often lost as a stand component after a fire.

Wildfire and the subsequent progression towards monotypic saltcedar stand composition have been detrimental to many riparian-obligate species. While some species have been able to utilize stands of large “old growth” saltcedar habitat, few species have been found utilizing recently established or burned habitats. The ability of saltcedar to vigorously sprout after fire creates conditions that produce fire intervals as short as five to fifteen years. Phragmities is a large perennial grass found in the riparian areas. As this reed dies, large quantities of downed material are left, which are not only a fire hazard, but can also be a safety issue for firefighters and residents.

Sonoran Desert vegetation is not considered to be fire adapted or dependent. The invasion of non-native species has created areas that are now prone to high intensity fires with high rates of spread. The vegetation in this management unit is dominated by desert shrubs, trees, and cacti. Deep upland sites have overstories of mesquite, palo verde, and ironwood, with understories of perennial and annual grasses and forbs. Grasses are mostly found in more mountainous areas of the County.

According to the Arizona Division of Emergency Management, 11 wildfire events have occurred historically, causing losses of $2,315,000. This is a small number in comparison to the 1,573 fires reported by the Yuma-Lake Havasu BLM zone between 1980 and 2009. The majority of these fires were less than 10 acres, but even a small fire can be a threat to structures and natural resources. In August of 2009, a fire in the Martinez Lake area threatened multiple structures on Swede Hill. As a result of the establishment of partnerships and quick response, no structures were lost.

Land ownership is complicated in Yuma County, and it is one of the largest issues faced by federal land managers, fire departments, and private entities. Boundaries are often changing,

[1] http://www.forestsandrangelands.gov/resources/documents/351-358-en.pdf

and they are not updated frequently to capture these changes in a GIS. Multiple agencies often show up to a fire without knowing who has primary jurisdiction and this impacts funding source. Several departments have mutual aid agreements with the other local departments, like Wellton and City of Yuma. These agreements need to be established with all agencies responding to wildland calls, especially since departments like Wellton are volunteer based; response on a wildland fire can reduce the number of responders for additional calls in the area.

CURRENT AND PLANNED FUELS PROJECTS

In order to mitigate the wildfire problem and combat invasive species, federal and state agencies have multiple fuels projects occurring in the county. The table and graphic below detail the current projects and their locations. For additional information on any of the projects, contact the BLM Yuma Field Office.

Project Name	Agency	Last Treatment Year	Approximate Acres	Type of Treatment	General Location
Betty's Kitchen	BLM	2010	1	Mechanical	See Map
Confluence FB	BLM	2010	10	Mechanical, chemical	See Map
Confluence RX	BLM	2010	300	Prescribed fire (RX)	See Map
Fortuna Pond	BLM	2009	5	Mechanical	See Map
Laguna BAR	BLM	2010	140	Mechanical, chemical	See Map
Laguna Division	Bureau of Reclamation	In planning	1000	RX, Mechanical	See Map
Limitrophe FB	BLM	2010	10	Mechanical, chemical	See Map
Little Laguna BAR	BLM	2010	5	Mechanical, chemical	See Map
Mittry BAR	BLM	2008	2000	Mechanical, chemical	See Map
Mittry FB	BLM	In planning	50	Mechanical, chemical	See Map
Mittry South	BLM	2008	80	RX, Mechanical	See Map
Paradise	BLM	2010	80	Mechanical, chemical	See Map
Quail BAR	BLM, State	2010	20	Mechanical, chemical	See Map
Quigley Pond	AZGF	In planning	50	RX, Mechanical	See Map
San Luis BAR	BLM	2010	70	Mechanical, chemical	See Map
Yuma Face	BLM, State	2009	20	Mechanical, chemical	See Map
Yuma Lakes	BLM	2009	10	Mechanical, chemical	See Map

Table 3. Fuels treatment projects in Yuma County

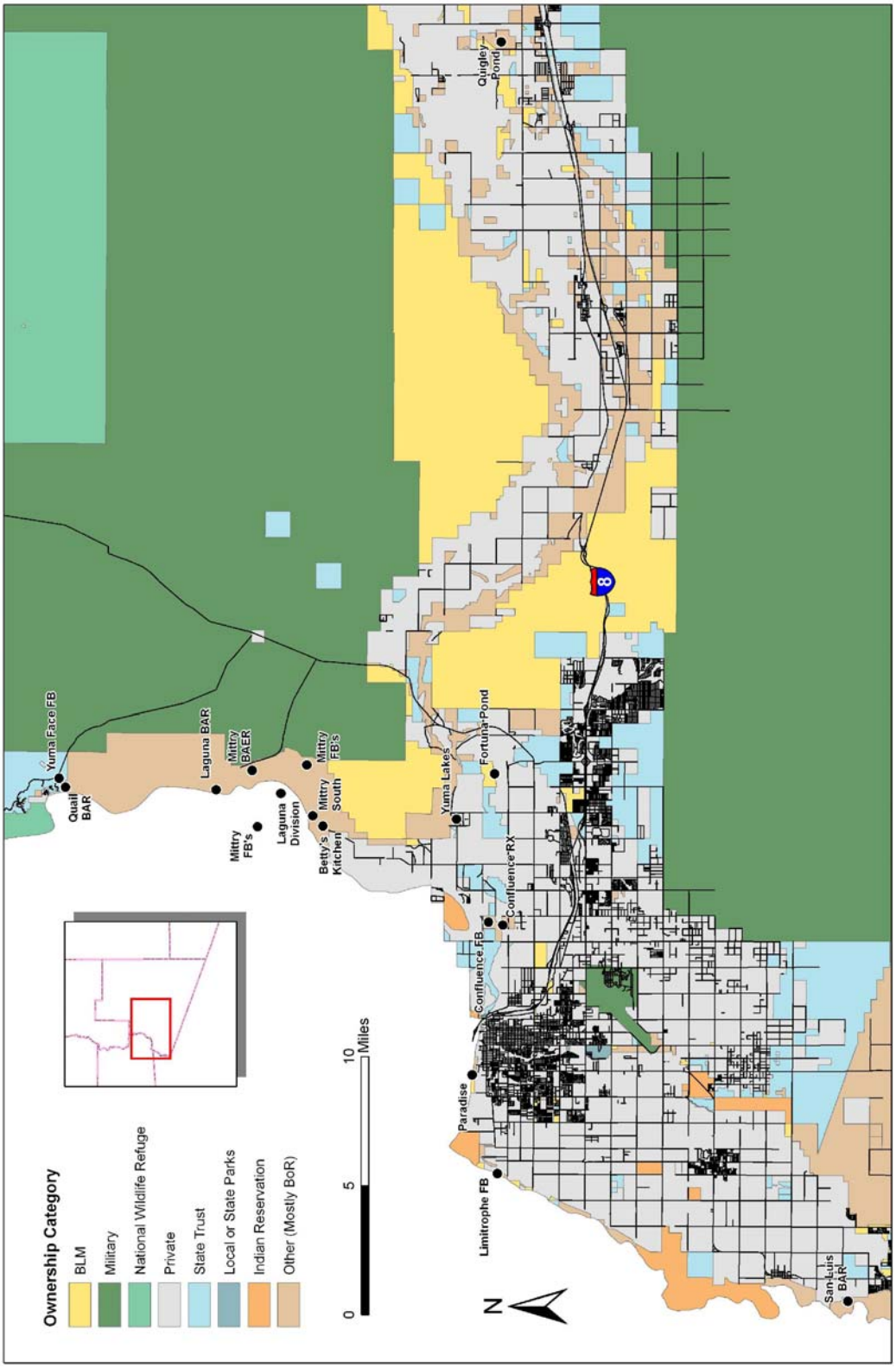

Figure 5. Fuels treatment projects

FIRE BEHAVIOR DISCUSSION

Overall, the study area has a low to moderate risk from wildfire. However, under the right conditions, it can exhibit very high to extreme fire behavior in some locations. As a result, the probability of this area having a large fire is low, but given extreme heat, low relative humidity, especially following a wet spring, the potential for a fast moving intense fire is high.

Fire risk and fire behavior characteristics are defined by three major variables: fuels, weather and topography. For a more complete discussion of the fire behavior potential methodology, please see Appendix A.

Fuels

Any vegetation that can burn is considered a fuel. Fuels are categorized into 'fuel models', each of which has a unique set of characteristics when burned. This area is typical of the Sonoran desert ecosystem. It has sparse grass and shrubs in most areas with heavier concentrations along the riparian corridors. There are few trees and they are mostly found along the riverbanks. Most native species are fire resistant and not a major concern.

Generally grass is the most likely fuel to burn, as it is very susceptible to drying from wind and solar radiation. Even under moderate weather conditions, it can burn readily and spread quickly, as it is unsheltered from the wind by taller vegetation. While grass fires can spread quickly, they are fairly easy to extinguish. Grass is very sparse in the study area, mainly being a concern after a wet spring season.

There are numerous species of shrubs in the study area, such as salt cedar, arrowweed, mesquite, and quailbush. All are good carriers of fire. The biggest concern is the salt cedar, which grows in large dense clumps along the riverbanks. This exotic plant is one of the most fire prone fuels in the study area. It can burn very hot and under various conditions. A severe fire can seemingly destroy the plant, but new growth is usually visible within a few weeks. The plant is capable of burning again within a matter of months. While more flammable during the summer months, salt cedar can burn at any point during the year.

The other major concern is phragmites - a reed grass that also grows along the rivers and in conjunction with salt cedar. It is a light flashy fuel, which means it can ignite quickly and burn rapidly. Another issue with this plant is that it can generate large embers that help to spread the fire into other receptive vegetation. Many of the plants along the river corridors thrive on disturbance, including fire, and continue to spread and return, unless removed effectively.

Weather

The study area is one of the driest places in the country. Temperatures are very high and precipitation is minimal. The lack of moisture doesn't allow for much plant growth on the landscape, except along the riparian river corridors. Temperatures are warm year-round and the majority of rain falls between December-March, and August. Maximum temperatures, reached in July, can be above 100 degrees. Because fuel moistures are not a result of precipitation, there is the potential for fire most of the year.

Predominant winds change through the year. North winds are most common during the winter months and then a west or southwest wind is prevalent during the summer. Generally the wind

is directly south at sunrise and tends to be more westerly at night. Although relative humidity rises at night, it is not typically high enough to decrease fire behavior; active fire behavior is often observed even in the middle of the night.

Topography

While the study area incorporates two mountain ranges, the communities lie in the valley and are primarily flat. However, the arroyos and riverbanks have small scale influences on fire behavior. Steeper slopes will increase the rate of spread and the flame lengths, as a result of preheating the uphill fuels. The biggest concern would be a fire starting along the riverbank and spreading quickly up into the communities.

Recommendations

Most fires in the study area are human caused. Education is the best way to mitigate the threat from wildfire in this area. Posting fire danger signs at the wildlife refuge, RV parks, and city parks will inform visitors of the risk. Fire danger ratings are available from numerous websites, and it is updated daily during the fire season. A more detailed fire danger rating can be calculated for the area as well. The State of Arizona imposes fire restrictions during times of potential extreme fire danger, and the BLM and FWS also have their own sets of restrictions. Examples of restrictions include but are not limited to: only allowing campfires and charcoal grills in developed recreation sites, not allowing smoking except in buildings, in cars, and on paved roads, or using any incendiary devices. These kinds of restrictions should be in place for non-federal and state places, especially when fire danger is high or extreme.

Fire mitigation projects, such as thinning stands of trees adjacent to trailhead parking lots, along trails, and within wooded areas, are a vital component of wildfire management and highly recommended.

LOCAL PREPAREDNESS AND FIRE DEPARTMENT CAPABILITIES

YUMA FIRE DEPARTMENT

Figure 6. Yuma Fire Station #6

The City of Yuma has six fire stations; five are staffed and dispersed located throughout the city. The most recent station opened in July 2008 (Figure 6). These stations house high-tech apparatus with onboard computers, capable of mobile data computing and GIS mapping. Apparatus is available for structure fire, water rescue, and hazardous materials response. There is station-wide coverage 24 hours a day, seven days a week by three rotating shifts. Not every member of the department has wildland fire training, but all have structural firefighting certifications. Water Tender 5 (WT-5) is the only piece of apparatus that could be technically considered wildland apparatus, but overall the department is extremely well equipped. All the ladder trucks and engines are NIMS Type I. In addition, the department has multiple ambulances, medical trailer, hazardous materials trailer, and a zodiac for water response. This list is not all inclusive, but shows the versatility of the City of Yuma Fire Department. Yuma Fire has recently signed a Cooperative Fire Rate agreement with the State Forester to show available equipment and personnel. It is also utilized if the department responds to any Federal fires.

Station Locations

Station 1 - 298 West 4th Street
Station 2 - 3284 South Avenue A
Station 3 - 508 East 25th Street
Station 4 - 2850 West 16th Street
Station 5 - 6490 East 26th Street
Station 6 - 3151 Pinto Way

SAN LUIS FIRE DEPARTMENT

Figure 7. San Luis Fire Department

San Luis Fire Department is responsible for protecting the 25,000 people living in San Luis and the surrounding area. The San Luis Fire Department is comprised of 21 full-time and four part-time firefighters (Figure 7). The city is covered at all times by a three shift rotation. All of the personnel have structure fire training, and approximately 50-75% also have S-130/190, which they receive during fire academy. A total of six emergency apparatus are located at the fire station, including a Type 1 pumper, 61' Tele-Squirt, haz-mat truck, and rescue pick-up. The department is in the process of purchasing a flatbed truck that would have a skid-mount unit, with the thought of making it a haz-mat response vehicle. A truck like this would also be able to serve as a wildland response vehicle, since it is more maneuverable in tight spaces and off-road. The area protected by the San Luis Fire department includes approximately two miles of river bottom with vegetation; the majority is unimproved desert and agricultural land. Within the developed portion of the city, hydrants are located every 300' to 500' and provide adequate water supply. Since much of the area under fire department jurisdiction is rural, there is not adequate access to water, especially if a piece of machinery were to catch fire in one of the numerous agricultural fields surrounding San Luis.

Station Location
1165 North McCain Avenue
San Luis, Arizona 85349-0445

SOMERTON/COCOPAH FIRE DEPARTMENT

Figure 8. Somerton/Cocopah Fire Department

The Somerton/Cocopah Fire Department is primarily a structural fire department (Figure 8). They currently have one wildland vehicle, but it is out of service in need of repairs. At this time, there is no money available to fix this vehicle. There is limited wildland fire equipment, and funds are limited for additional equipment. Some fire fighters have their red cards, meaning they have passed the NWCG pack test and are nationally certified to respond on wildland fires. Refresher courses, vital to maintaining and updating wildland fire fighting expertise, are not consistently available to all fire fighters.

Station Location
445 E Main Street
Somerton, Arizona 85350

WELLTON FIRE DEPARTMENT

Figure 9. Wellton Fire Department

The Wellton Fire Department is a volunteer department, comprised of 15 volunteers (Figure 9). Volunteers are monetarily compensated each time they respond to a call. For response apparatus, the department has a ladder truck and two pumpers. Currently there are no specific wildland vehicles. All the members of the department go through in-house training, which includes approximately 220 hours a year. Bi-annually they are required to go through physical fitness testing, along the lines of the Candidate Physical Ability Test (CPAT). No wildland training is required, nor does the department have any wildland gear. However, the Wellton Fire Department does respond to brush fires. Wellton Fire has mutual aid agreements with most of the local agencies, including City of Yuma, Rural/Metro, and Wellton-Mohawk Irrigation and Drainage District, the largest land owning entity within the district. Within town, water is available from hydrants. Outside of the town, the department has the ability to use water from the Gila River canals. WMIDD is responsible for the maintenance and water in the canals, but allow the fire department to use it if necessary. In addition, Wellton Fire relies upon the 8,000 gallon water tenders owned and maintained by WMIDD since Wellton Fire does not own such equipment.

Station Location
29118 Los Angeles Ave
Wellton, AZ 85356
http://www.town.wellton.az.us/

TACNA FIRE DEPARTMENT

Figure 10. Tacna Fire Department

The Tacna Fire Department is a rural department that sits within the area of land operated by the Wellton-Mohawk Irrigation and Drainage District (Figure 10). Tacna often runs mutual aid on calls with responders from WMIDD.

RURAL/METRO FIRE DEPARTMENT

Rural/Metro Fire Department is a private company that employs approximately 2,000 people in Maricopa, Pinal, Pima and Yuma Counties. Homeowners and communities pay Rural/Metro for a variety of services, including:

- Fire fighting services (urban and wildland)
- Emergency medical services
- Specialized rescue (swift water, high angle, vehicle extrication)
- Poisonous reptile removal
- Water utility assistance (emergency shut-off & excess water removal)
- Home and vehicle lockout assistance
- Home safety reviews

All of the firefighters with Rural/Metro attend 12-week fire academy training. Additionally, all firefighters are required to take the introduction to wildland fire courses, S-130 and S-190. As part of the wildland fire course work, each member is also required to complete the "pack test" to obtain their Red Card. The pack test entails walking three miles with a 45 pound pack within a 45 minute time limit.

Station Locations

#1 660 E. 18th Place Yuma, AZ	#4 4931 E. 30th Place Yuma, AZ	#7 679 N. 1st Ave, Suite B & C San Luis, AZ	#10 13157 E. 44th Street Yuma, AZ
#2 10820 S. Hensley Blvd Yuma, AZ	#5 3620 W. 8th Street Yuma, AZ	#8 15865 S. Ave. A Somerton, AZ	#11 18669 S. Colorado Street Gadsden, AZ
#3 3007 S. Ave. B Yuma, AZ	#6 10845 E. Martinez Lake Road Martinez Lake, AZ	#9 1275 S. Pacific Ave. Yuma, AZ	#13 840 S. 5th Ave. Yuma, AZ

IMPERIAL NATIONAL WILDLIFE REFUGE

The Imperial National Wildlife Refuge (INWR) is one of the main firefighting entities in the County. While only responsible for the Refuge, the FWS will often assist local agencies and other federal resources if a fire occurs in the area. The INWR has a trained wildland fire crew on staff year-round, working on fuel reduction projects and other maintenance needed throughout the Refuge.

Type of Equipment	Year	Make	Inclusions
Type 6 Wildland Engine	2004	Ford F450	90 GPM @ 50 psi; 294 gal, Foam Pro
Dodge Crew Cab w/Flat Bed	2008	Dodge 3500	Transports 6 People & Tows
Ford F-250 Extended Cab	2004	Ford F250	Transports 5 People & Tows
Boston Whaler & Trailer	2007	Boston Whaler	Darley (Honda 20.0V) Pump; Transports 5
Clark Boat & Trailer	1998	Clark Boat	Briggs & Stratton 18.0V Pump; Transports 6
16' x 6.5' Flat Bed Trailer	2005	Top Hat	Utility Box for Tools and Equipment
4x4 4-Wheeler	2001	Honda	4 x 4
6x6 Polaris Ranger	2008	Polaris	4 x 4 with Pump Package; 75 gal. Tank
Enclosed 30’ Trailer	2008	Wells Cargo	Command Office and 40 Person Cache

ARIZONA STATE FORESTRY

Currently the BLM office in the City of Yuma houses the Arizona State Forestry representative for the area. The State Forestry has a 24 person Type 2 hand crew that is responsible for the majority of the fuels reduction work that happens within the County. In addition to the crew, State Forestry has two crew buggies, a Type 4 engine, a Type 6 engine, two supervisory trucks, and a trailer that has five portable pumps and all the necessary equipment to run these pumps. The crew is highly utilized in the area and generally available for most wildland fires in the County.

BUREAU OF LAND MANAGEMENT

Within the Colorado River District, the Yuma Office is the BLM field office for the area. The BLM plans and funds the majority of the fuels projects in Yuma County. The BLM responds to most of the wildland fire calls within Yuma County and works closely with Arizona State Forestry. In addition to the State's resources, BLM resources include:

- Type 6 engine (2)
- Fire boat (1)
- Non-tactical fire boat (3)
- 6x6 UTVs (2)
- 4x4 ATVs (3)
- Logistic cargo trailer (2)
- Command/Communication trailer (1)
- Command vehicles (3)
- Local supply cache (resources for 20 people)
- Resource Advisors (10)
- Fire Information Officer (1)
- Incident Commander Type 3 (3)
- Incident Commander Type 4 (3)

COMMUNITY IGNITABILITY ANALYSIS AND SPECIFIC COMMUNITY RECOMMENDATIONS

PURPOSE

The purpose of this section is to examine the communities in greater detail. Of the four WUI communities defined in the Yuma County study area, none were found to represent an extreme hazard. Two were rated as high hazard, and two were rated as moderate hazard (Figure 11 and Table 4). It is important to remember these communities are rated relative to what is customary for this specific type of interface. While adhering to proven methodology, an attempt is made to approach each community as a unique entity with its own characteristics, so that the most accurate, safe, and useful assessments possible are provided.

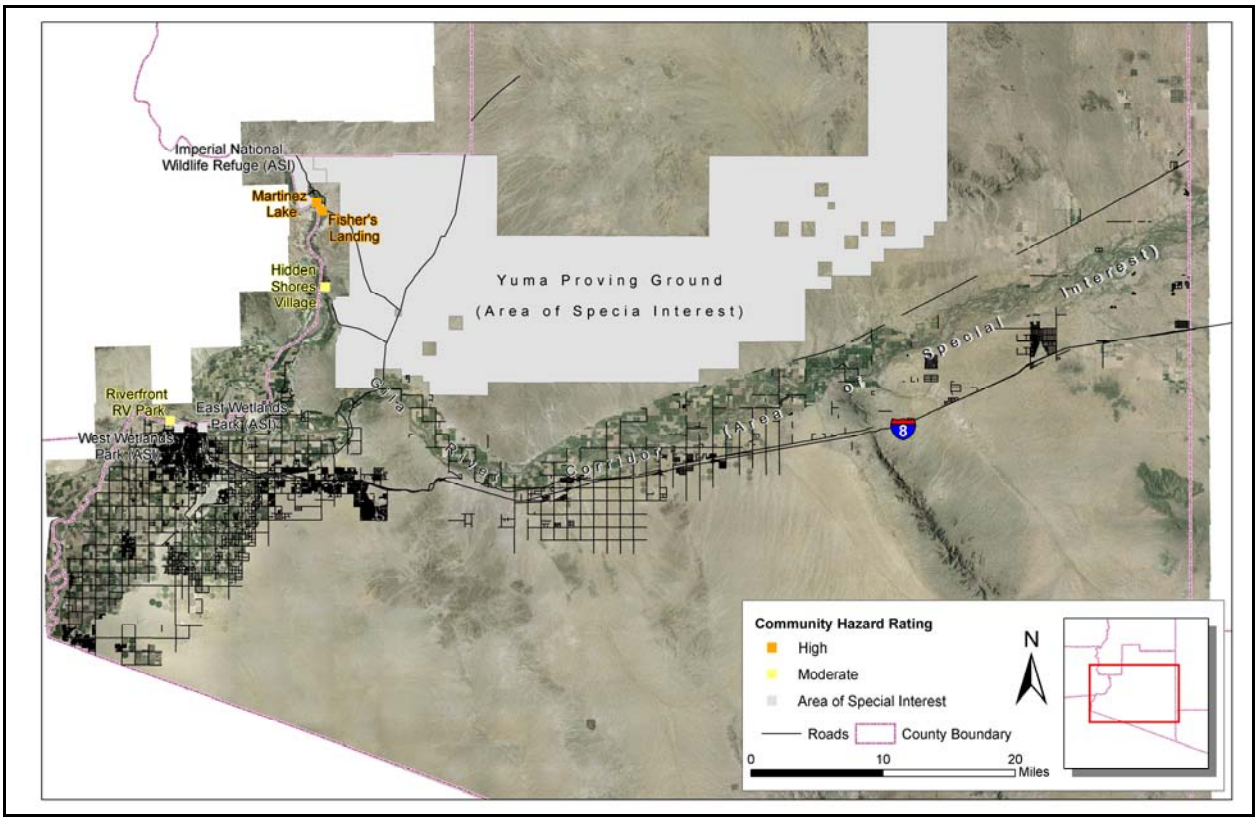

Figure 11. Communities and areas of special interest

Community	Rating
Martinez Lake	High
Fisher's Landing	High
Hidden Shores Village	Moderate
Riverfront RV Park	Moderate

Table 4. Community hazard ratings

COMMUNITY ASSESSMENT METHODOLOGY

The community level methodology for this assessment uses a Wildfire Hazard Rating (WHR) that was developed specifically to evaluate communities within the Wildland Urban Interface (WUI) for their relative wildfire hazard.[2] The WHR model combines physical infrastructure such as structure density and roads, and fire behavior components like fuels and topography, with the field experience and knowledge of wildland fire experts. It has been proven and refined by use in rating thousands of neighborhoods throughout the United States. Much of NFPA 1144 has been integrated into this methodology to ensure compatibility with National standards. Additionally, aspects of NFPA 1142 regarding water supply for rural and suburban firefighting are included in the assessments by looking at proximity and capacity of the water supply.

Many knowledgeable and experienced fire management professionals were queried about specific environmental and infrastructure factors, and wildfire behavior and hazards. Weightings within the model were established through these queries. The model was designed to be applicable throughout the western United States.

The model was developed from the perspective of performing structural triage, also known as prioritizing, on a threatened community in the path of an advancing wildfire with moderate fire behavior. The WHR survey and fuel model ground truthing are accomplished by field surveyors with WUI fire experience.

The rating system assigns a hazard rating based on five categories: topographic position, fuels and fire behavior, construction and infrastructure, suppression factors, and other factors, including frequent lightning, railroads, campfires, etc.

It is important to note that every hazard rating does not necessarily occur in every geographic region. There are some areas with no low hazard communities, just as there are some areas with no extreme communities. The rankings are also related to what is customary for the area. For example, a high hazard area on the plains of Kansas may not look like a high hazard area in the Sierra Nevada. The system creates a relative ranking of community hazards in relation to the other communities in the study area. It is designed to be used by experienced wildland firefighters who have a familiarity with structural triage operations and fire behavior in the interface.

Each community write-up can be regarded as an individual document. These pages can be delivered to a community independently of the overall document. As a result, you will see specific recommendations for each community listed first, followed by recommendations that apply to all communities, such as defensible space. With this format, each community has all the pertinent information available in three to four pages, separate of the overall document.

[2] White, C. "Community Wildfire Hazard Rating From" *Wildfire Hazard Mitigation and Response Plan*, Colorado State Forest Service, 1986. Ft. Collins, CO.

WUI COMMUNITIES IN YUMA COUNTY

1. Martinez Lake – Hazard Rating **High**

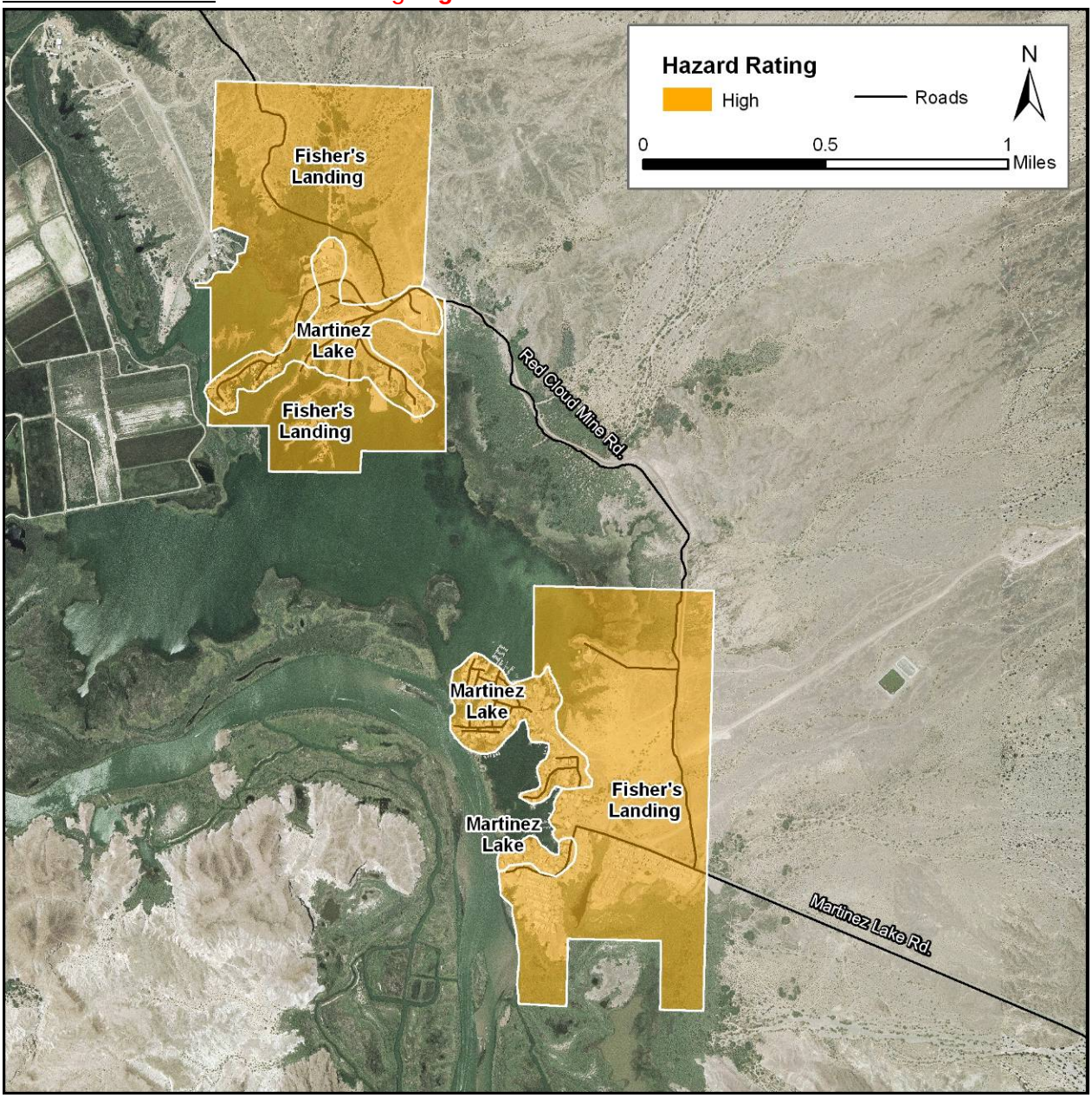

Figure 12. Martinez Lake and Fisher's Landing communities

Figure 13. Overview of the Martinez Lake community

Although the Martinez Lake community is intermixed with the Fisher's Landing community, the construction type and land ownership of the homes is distinct, hence it was determined to be its own community (Figure 12 and 13). Houses that directly surround the lake are on privately owned parcels, different than Fisher's Landing, which is leased through a State Land Trust.

Martinez Lake is composed of one fire district with five separately identified areas: Martinez Lake Resort, North Shore, Martinez Lake Private, Martinez Lake South, and Arizona State Land, referred to as Fisher's Landing for the purpose of this report. Local fire fighters prefer to consider this as a two part area – Fisher's Landing and Martinez Lake.

Martinez Lake Resort, obtained by a Mexican land grant, has a hydrant network which makes it distinct from the other four areas identified above. The North Shore incorporates the US Marine Corps (USMC) recreation area. Meer's Point, under the jurisdiction of the US Fish and Wildlife, is a combination of private and USMC property. Martinez Lake Private includes the lagoon area.

There is a large range of diversity in terms of construction type, home size, and the amount of fuels mitigation work that has been completed. All of the lot sizes are under an acre, so housing density is high. Older homes are typically smaller than new ones and are built using combustible materials for siding and roofs. Newer homes around the lake are built of non-combustible siding such as stucco and tile and asphalt roofing materials are in the majority. Riparian vegetation is often thick, and ornamental vegetation directly abuts the structures. The majority of the properties have various equipment (i.e. boats, jet skis, golf carts, RVs, etc.) stored on the property. When not in an enclosed garage, this allows for a place for debris to accumulate, further increasing the chance of home ignitability. In some places the power lines are underground, but that is not consistent throughout. High winds in the area have caused transformers or power lines to come down, acting as an ignition source. The home and road addressing is inconsistent and not reflective.

Figure 14. Non-reflective, flammable addressing

The road network throughout the community is a mix of both dirt and paved roads. The majority of these roads are too narrow to accommodate large firefighting apparatus and equipment. A Type 6 brush truck (the size of a large pick-up truck) would be able to get through. Fire hydrants are available, but the municipal water lines are not large enough to produce the necessary pressure needed to effectively fight fire except in Martinez Lake Resort. A 15,000 gallon water tank is located in the vicinity but is not sufficient for large-scale fire suppression activities. The final potential water source is the lake itself, and in a true emergency situation, the water can be used. Unfortunately, there are concerns regarding the Quagga mussel, an invasive species that has not been found in Martinez Lake, but is present in other places in Arizona. Any equipment that is used to draft from the lake must either be disinfected or replaced if it is to be used anywhere else. An additional issue with using the lake as a water source revolves around the equipment and personnel resources available. The fire station in Martinez Lake is not staffed, and the equipment does not include a portable pump or personnel capable of using the engine to draft. If assistance from the INWR fire crew is required, and their response times may be limited depending on time of day and what other fires may be occurring in the area. The issue with response time being upward of 40 minutes was observed during the fire in August 2009 (Figure 20).

Martinez Lake residents do not, by and large, reside in the community full-time. Many use their homes as weekend retreats or ski destinations. It is during these periods that the threat of fire damage is at its greatest. One of the largest local fires in recent memory, was the August 2009, wildfire in which 70 acres were lost and many structures threatened. That fire was started, not by lightning strikes – a relatively rare occurrence in this community – but by individuals lighting off fireworks.

Predominant south winds, most common during the summer months, helped to preserve the fire- threatened structures. The combination of low relative humidity, little precipitation, dry fuels, steep topography along the banks, and high winds are common in Martinez Lake. Winds are regularly upwards of 40 mph, and can cause extreme fire behavior. The abundance of easily burnable fuels in the riparian areas lends itself to fast rates of spread and flame lengths greater than 11 feet, making direct suppression by hand crews impossible. With extreme weather conditions, which imply higher wind speeds and drier fuel moistures, rates of spread greater than 1 mi/hr are expected. And according to witnesses, during the fire in August, flame lengths were greater than 200 feet at times.

Recommendations

- Thin overly dense vegetation along riparian ecosystems, particularly when within 30 feet of buildings or structures. (Figure 15). “Wildlife Protected Areas” should be noted and treated according to federal statutes. (See the Conclusions and Next Steps for additional information regarding federal land management.)
- Martinez Lake is considered to be a statutorily compliant Fire District. As a result, they have the ability to tax the residents. Raise revenue to purchase needed items such as personal protective equipment (PPE), portable pumps, hoses, nozzles, and associated appliances. Since this equipment will be specific to Martinez Lake, there should be no issue with the Quagga mussel when drafting from the river/lake.
- Establish regulations that require residents to clear their property of debris and store recreational equipment in a safe manner.
- Increase public awareness regarding fires and fire management.
- Encourage the Fire District to create and implement a Firewise Community plan.
- Discourage the use of combustible materials for stoops and decks.

- Fully enclose the area under porch stoops and decks to keep hot embers out.
- Use fine mesh metal screen (1/4" or less) to cover eaves, roof, and foundation vents, in order to prevent embers from blowing in.
- Remove all flammable materials from a 10 foot area in all directions around propane tanks.
- Add reflective addressing to all driveways or homes, using only non-combustible materials. A good guideline for this practice is to place the markers five feet above ground level on the right side of the driveway. These could be used in conjunction with mailbox markings.
- Fire hydrants must be visible at all times and tested annually.

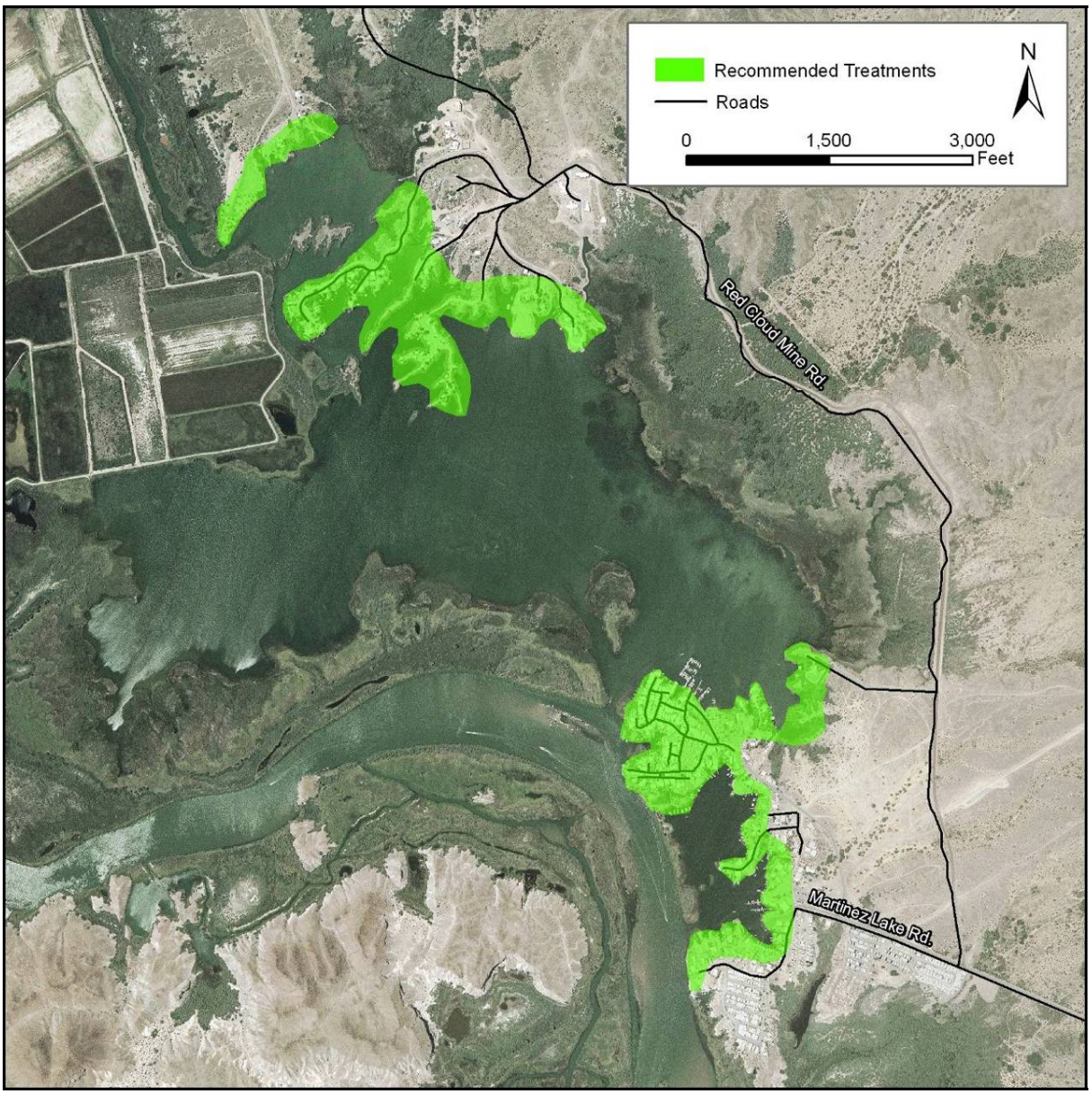

Figure 15. Vegetation thinning along the banks of Martinez Lake and inlets

2. Fisher's Landing – Hazard Rating **High**

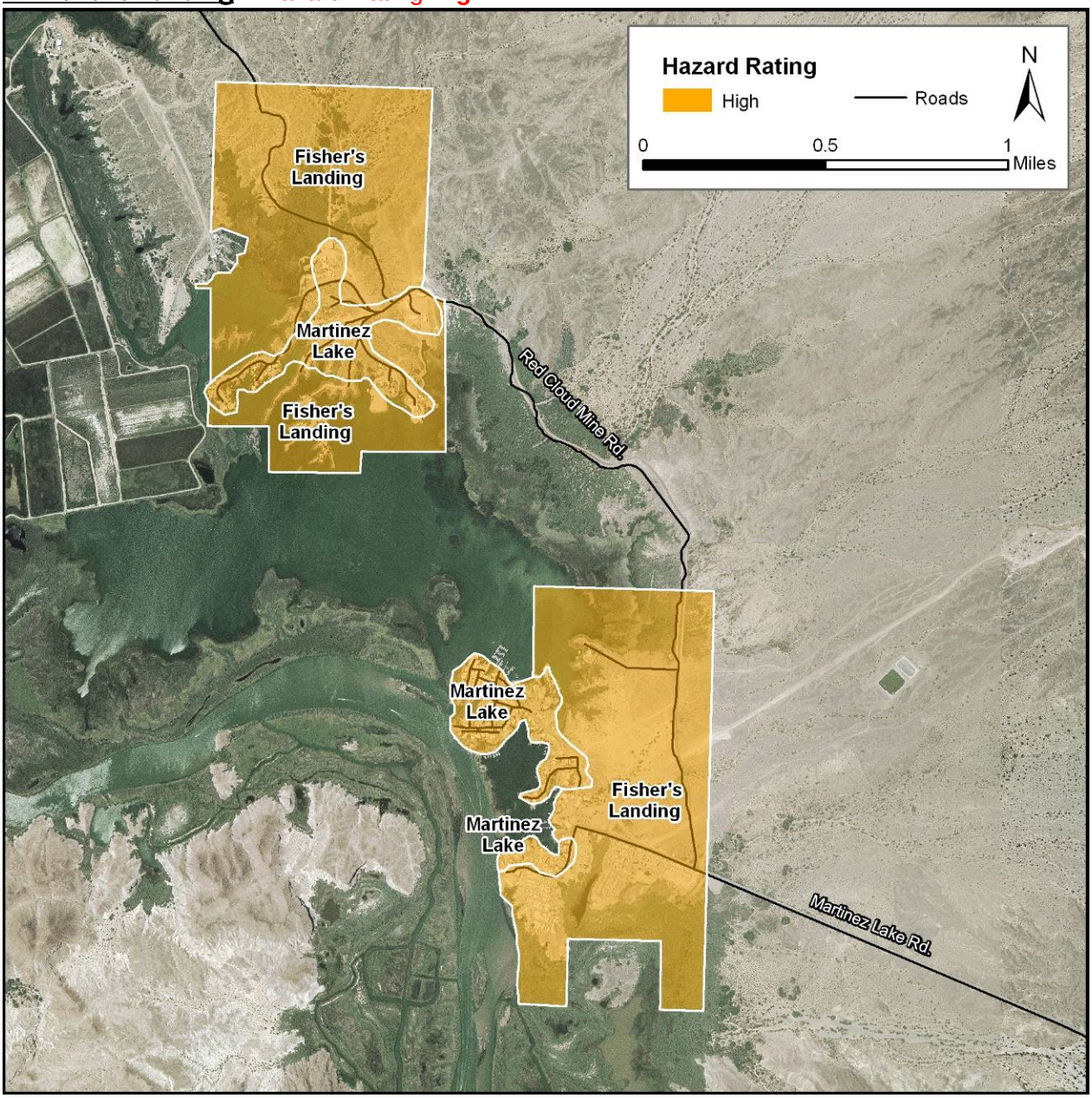

Figure 16. Fisher's Landing and Martinez Lake communities

Figure 17. Fisher's Landing area and Pruitt City

The area known as Fisher's Landing contains two trailer parks (Swede's Hill and Pruitt City) and two camp grounds (Fisher's Camp and Fisher's Landing North Camp). Swede's Hill provides long-term housing, where an individual owns the trailer but rents the property from Fisher's Landing, which is actually Arizona State Land (Figure 17). These trailers were the ones most impacted by the Quail Fire on August 14, 2009 fire (Figure 20). Pruitt City is similar in structure but has short-term/seasonal space for RVs and 5th wheels in addition to the trailers. Fisher's Camp is set-up with RV hook-ups, laundry facility, and showers. The Fisher's Landing North Camp does not have as many amenities as Fisher's Camp, and generally does not have people staying for as long of a time. The construction type of all these structures is similar, in that there is non-combustible roofing and siding. Although the RVs/trailers may not be flammable, the more permanent structures have additions that are flammable (shade structures, patio furniture, boats, etc.). These items increase the flammability of the structure. Propane tanks are of particular concern because once on fire, they could easily allow fire to spread from trailer to trailer (Figure 18).

Figure 18. Additions to a trailer that increase flammability

In addition, these structures are not capable of being moved in a short amount of time, which may be necessary if a wildfire were to ignite in nearby riparian vegetation. Utilities are underground in some areas and above in others. Road widths are narrow, generally less than 20' wide and are dirt. Many residents use golf carts to access the area, and evacuation is complicated by this fact. The fire department response and water situation is the same in Fisher's Landing as it is in Martinez Lake.

There are hydrants located within Martinez Lake, but often the municipal water lines are not large enough to support any kind of pressure that would be effective to fight fire. A 15,000 gallon water tank is located in the vicinity but is not sufficient for fire suppression activities. The final potential water source is the lake itself, and in a true emergency situation, the water can be used. Unfortunately, there are concerns regarding the Quagga mussel, an invasive species that has not been found in Martinez Lake, but is present in other places in Arizona. Any equipment

that is used to draft from the lake must either be disinfected or replaced if it is to be used anywhere else. An additional issue with using the lake as a water source revolves around the equipment and personnel resources available. The Martinez Lake fire station is not staffed, and the equipment does not include a portable pump or personnel capable of using the engine to draft. Assistance from the INWR fire crew is required, and their response times may be limited depending on time of day and what other fires may be occurring in the area.

Because of the high number of people recreating in the area, human caused fires are likely. Fisher's landing does not typically support year-round living. Visitors increase during the summer and especially on weekends. Fires are most likely during these visits, as seen in August 2009, when individuals lighting fireworks started the approximately 70 acre wildfire that destroyed several boats and threatened multiple structures. The weather and expected fire behavior is the same for Fisher's Landing as it is for Martinez Lake. The biggest difference between the two stems from the type of structures and density. The predominant wind during the summer months is from the south, which was a contributing factor to why no structures were lost. The combination of low relative humidity, little precipitation, dry fuels, and high winds are common in Fisher's Landing. Winds can reach upwards of 40 mph, and can cause extreme fire behavior. The abundance of easily burnable fuels in the riparian areas lends itself to fast rates of spread and flame lengths greater than 11 feet, making direct suppression by hand crews impossible. With extreme weather conditions, which imply higher wind speeds and drier fuel moistures, rates of spread greater than 1 mi/hr are expected. And according to witnesses, during the fire in August, flame lengths were greater than 200 feet at times.

Recommendations

- There is a 200 foot wide fuel break behind Pruitt City. However, RV and equipment storage now occupies much of the area, thus decreasing the effectiveness of the fuel break. Equipment should not be stored in the area, as it is a fuel break.
- Thin overly dense vegetation along riparian ecosystems, particularly when within 30 feet of buildings or structures. (Figure 16). (See the Conclusions and Next Steps for additional information regarding federal land management.)
- Consider increasing fees for camping spots, renting trailers, and day users. The increased revenue from this can be used to purchase fire danger warning signs that will keep visitors aware of the current risk in the area.
- Establish stricter regulations on equipment storage are recommended. Jet skis, boats, golf carts, etc. should be stored in a safe manner, preferably not under added shade structures attached to RVs.
- Increase public awareness regarding fires and fire management.
- Implement a Firewise Community plan.
- Discourage the use of combustible materials for stoops and decks.
- Fully enclose the area under porch stoops and decks to keep hot embers out.
- Use fine mesh metal screen (1/4" or less) to cover eaves, roof, and foundation vents, in order to prevent embers from blowing in.
- Remove all flammable materials from a 10 foot area in all directions around propane tanks.
- Add reflective addressing to all driveways or homes, using only non-combustible materials. A good guideline for this practice is to place the markers five feet above ground level on the right side of the driveway. These could be used in conjunction with mailbox markings.
- Fire hydrants must be visible at all times and tested annually.

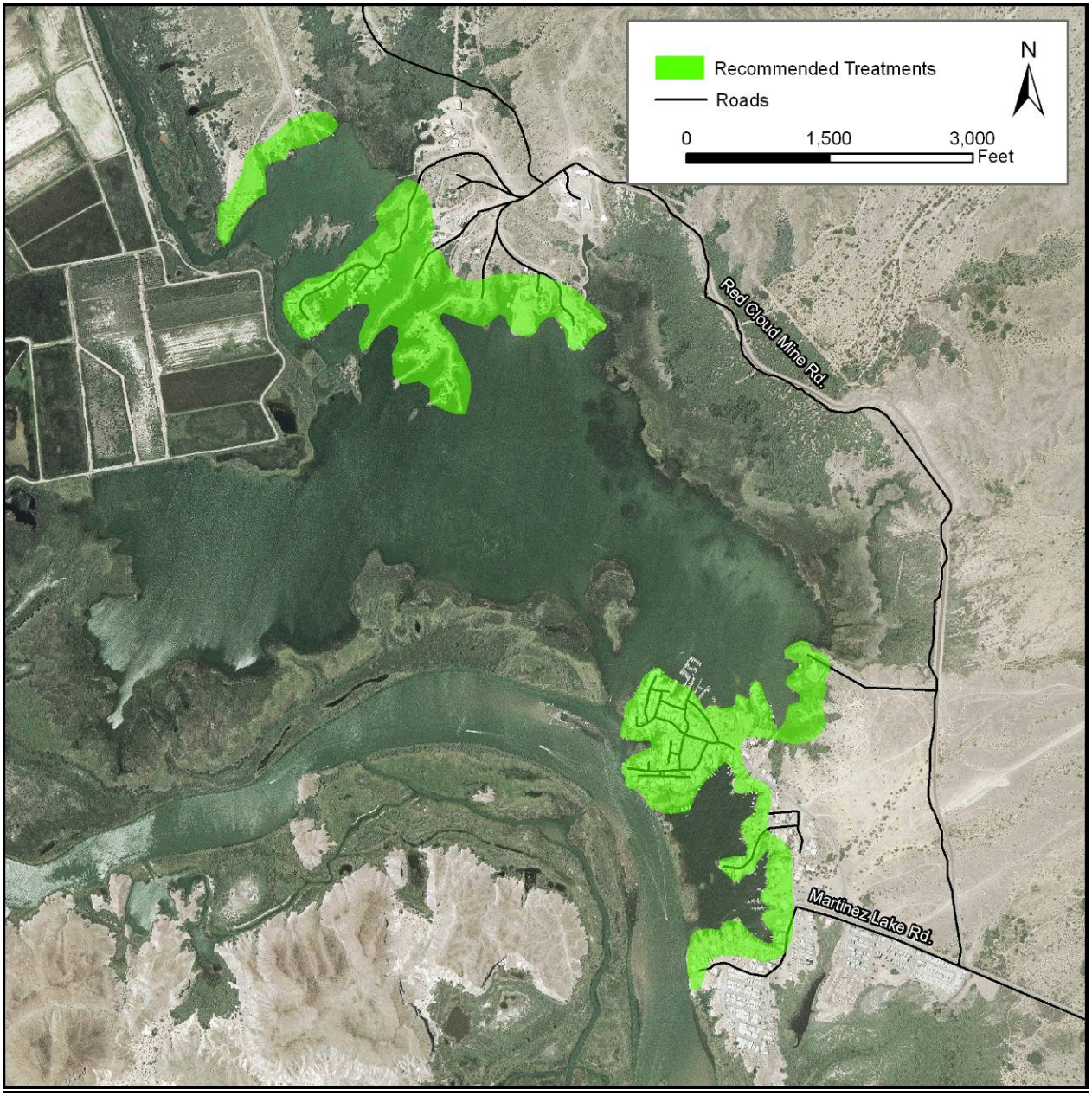

Figure 19. Martinez Lake and Fisher's Landing communities

Figure 20. Quail Fire occurring August 14, 2009

3. Hidden Shores Village – Hazard Rating **Moderate**

Figure 21. Boats and homes at Hidden Shores Village

The Hidden Shores Village is located on BLM land and operates through a concession. There are two types of structures, some of which are permanent homes and buildings, and others that are mobile RVs and 5th wheelers (Figure 21). The grounds are well-maintained and include a golf course. Vegetation has been cleared all the way around the park, as well as between the permanent structures (Figure 22). There are no flammable items stored under the decks, and the properties are kept clear of debris. All utilities are underground and there are individual hook-ups for RVs. The roads are paved, but are less than 24 feet across. There are two ways of ingress and egress in Hidden Shores, but evacuation may still be difficult due to congestion, especially when the Village is heavily utilized. While the vegetation has been cleared around the Village, there are house boats and fishing boats docked that are close to the riparian vegetation. A fire spreading from the riparian vegetation to the boats, and as a result, into the community, poses the largest threat to Hidden Shores. Fire department response is limited in the area because the Martinez Lake station is not staffed, and the BLM and FWS offices are at least 30 minutes away. Depending on the season, these resources may be unavailable because they are not on duty or already committed to another incident.

There is a history of fires in the area, as seen on the west side of Highway 95 (Figure 23). The fire did not threaten the community, it highlights the fact that the riparian vegetation does burn. Under even moderate weather conditions, rate of spread in the vegetation to the south and north can be expected to be fast. Higher wind speeds during extreme weather will cause the rate of spread to increase. This reduces the amount of time for evacuation and the need for quick response from fire crews. The patchy vegetation to the east is unlikely to carry fire as

quickly. The riparian vegetation to the south and north are predicted to produce flame lengths greater than 11 feet under moderate and extreme conditions. Extreme flame lengths limit the ability of ground crews to control the fire, resulting in the potential to need aircraft to fight the fire.

Figure 22. Example of vegetation being cleared from around homes

Figure 23. Post-fire photo of area burned near Hidden Shores Village

Recommendations

- Since the property is leased from the BLM, it is important that all aspects of the contract are being followed, including county planning and zoning regulations. This includes having fire protection established for the resort and making sure structures are mobile. The details of the lease are available from the BLM Yuma Field Office.
- Begin and maintain a public education program on wildfire, as outlined in Appendix B. Education is one of the most effective methods for mitigating risk and keeping people safe if a wildfire were to occur in the area.
- Establishing a fire cache on the premises is recommended. Items to be purchased include personal protective equipment (PPE), portable pumps, hoses, nozzles, and associated appliances. Since this equipment will be specific to Hidden Shores, there should be no issue with the Quagga mussel when drafting from the river/lake.
- Increase public education on wildfire management and working towards creating a Firewise community, outlined in Appendix B.
- Discourage the use of combustible materials for stoops and decks.
- Fully enclose the area under porch stoops and decks to keep hot embers out.
- Use fine mesh metal screen (1/4" or less) to cover eaves, roof, and foundation vents, in order to prevent embers from blowing in.
- Propane tanks: remove all flammable materials from a 10 foot area in all directions around the tank.
- Add reflective addressing to all driveways or homes, using only non-combustible materials. A good guideline for this practice is to place the markers five feet above ground level on the right side of the driveway. These could be used in conjunction with the mailbox markings.
- Make certain all fire hydrants are visible and tested annually.

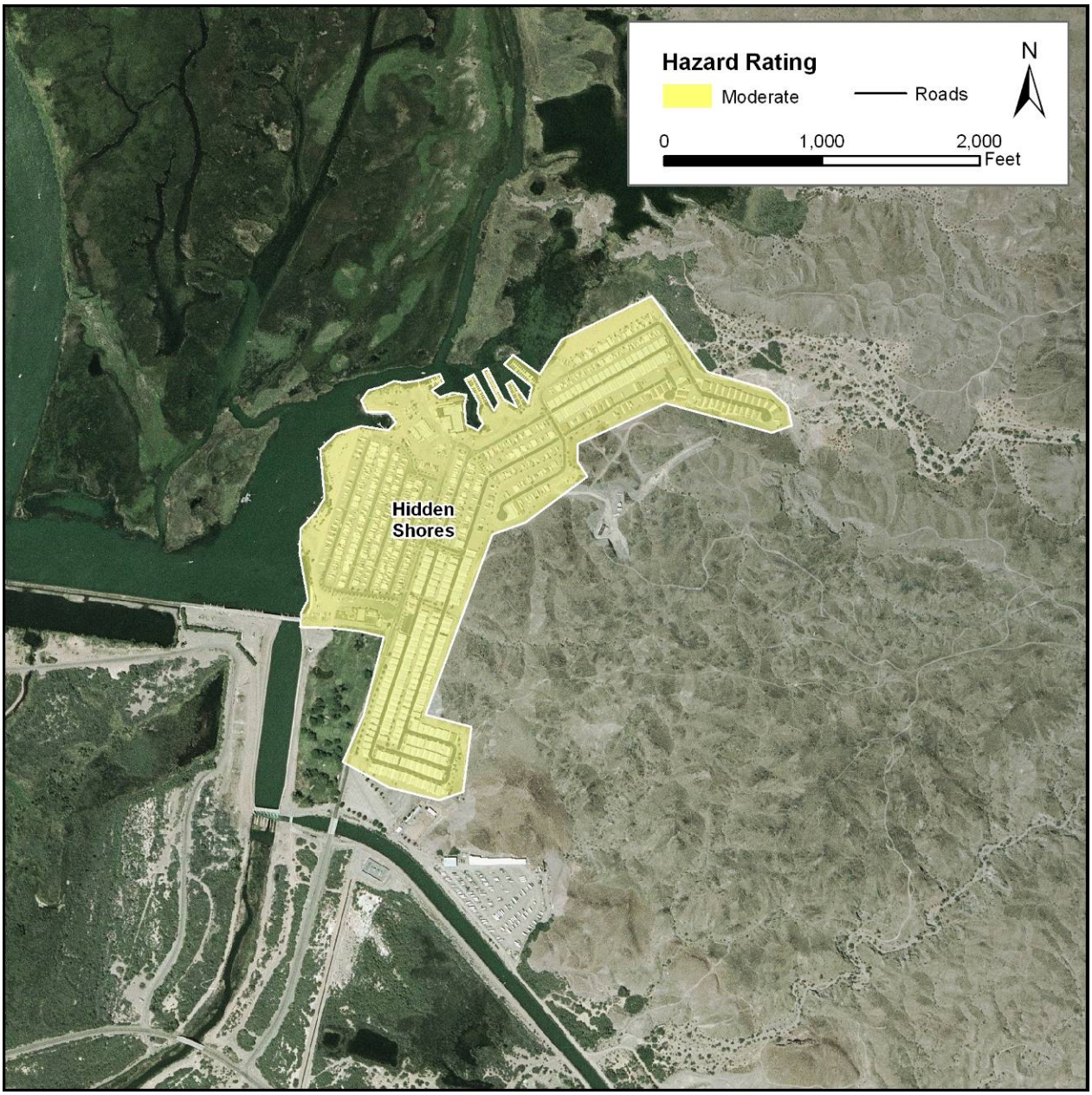

Figure 24. Detailed view of the Hidden Shores community

4. Riverfront RV Park – Hazard Rating **Moderate**

Figure 25. Mobile homes and vegetation at Riverfront RV Park

Like the majority of the RV parks in Yuma County, there are a high number of non-year-round residents. Seeking warmer temperatures, individuals travel to Yuma during the winter months, staying in this RV park which abuts the California/Arizona border (Figure 25). The property is situated along the Colorado River, allowing for great views of the water, surrounding vegetation, and access to local parks and paths. The RVs are made out of non-combustible materials, but often have additional shade structures and 5th wheel skirts, which are more prone to ignition than the RV itself. If a wildland fire were to ignite a single unit, the heat generated could potentially cause the propane tank to rupture, and the close proximity of all the units could lead to fire spreading from RV to RV. All of the utilities in the park are underground and there are individual hookups included. While each space has a unique designation, the numbering is not reflective, which would be difficult to see in heavy smoke. There are no hydrants within Riverfront, but there are hydrants easily accessible within a quarter of a mile.

Roads within the park are gravel, and are fairly narrow. While a large apparatus could access the area, multiple pieces of equipment would have difficulty maneuvering the park. Additional difficulties exist when trying to access the area outside of the park. Soft soil and dense vegetation impedes the ability of apparatus to operate outside of the park. Evacuation is the largest issue for Riverfront. Many of the residents have separate cars that they use to access the city, while others have golf carts. In an emergency situation, like a wildfire, unpredictable behavior is common. The fear of losing one's home and possessions can limit judgment, and make for unsafe situations as everyone is trying to leave at the same time, or go back to try to save their possessions.

There is little vegetation within the Riverfront RV Park, but the riparian vegetation surrounding the park is dense and prone to burning. Under a moderate weather scenario, much of the area around the Riverfront community would experience a surface fire, with flame lengths less than four feet. This would allow for direct attack by hand crews. To the north west, where the vegetation is more continuous, flame lengths in excess of 11 feet are predicted even under moderate conditions, making control by hand crews impossible. Extreme conditions, which consist of higher wind speeds and drier fuels, are predicted increase flame lengths and rates of spread. As with the moderate scenario, the area to the north west of Riverfront is of most concern. Flame lengths are likely to limit ability of hand crews and rates of spread will be

greater than 1 mi/hr. Because of the dense vegetation, high rates of spread, and long flame lengths, there is a high amount of risk associated with fighting fire in these conditions.

Recommendations

- Create a fuel break around the park on all sides to prevent wildfire from spreading into the park or from spreading out of the park (Figure 26).
- Determine an evacuation plan and accountability for residents in case of a wildfire. The community park is a viable option as a safety zone or collection point.
- Begin and maintain a public education program on wildfire, as outlined in Appendix B. Education is one of the most effective methods for mitigating risk and keeping people safe if a wildfire were to occur in the area.
- Outline regulations for storage of personal belongings in the park, including propane tanks, patio furniture, and recreational equipment.
- Continue to work in West Wetlands Park, as this will greatly reduce the risk to the RV park.
- Work on public education and working towards creating a Firewise community, outlined in Appendix B.
- Discourage the use of combustible materials for stoops and decks.
- Fully enclose the area under porch stoops and decks to keep hot embers out.
- Use fine mesh metal screen (1/4” or less) to cover eaves, roof, and foundation vents, in order to prevent embers from blowing in.
- Remove all flammable materials from a 10 foot area in all directions around propane tanks.
- Add reflective addressing to all driveways or homes, using only non-combustible materials. A good guideline for this practice is to place the markers five feet above ground level on the right side of the driveway. These could be used in conjunction with mailbox markings.
- Fire hydrants must be visible at all times and tested annually.

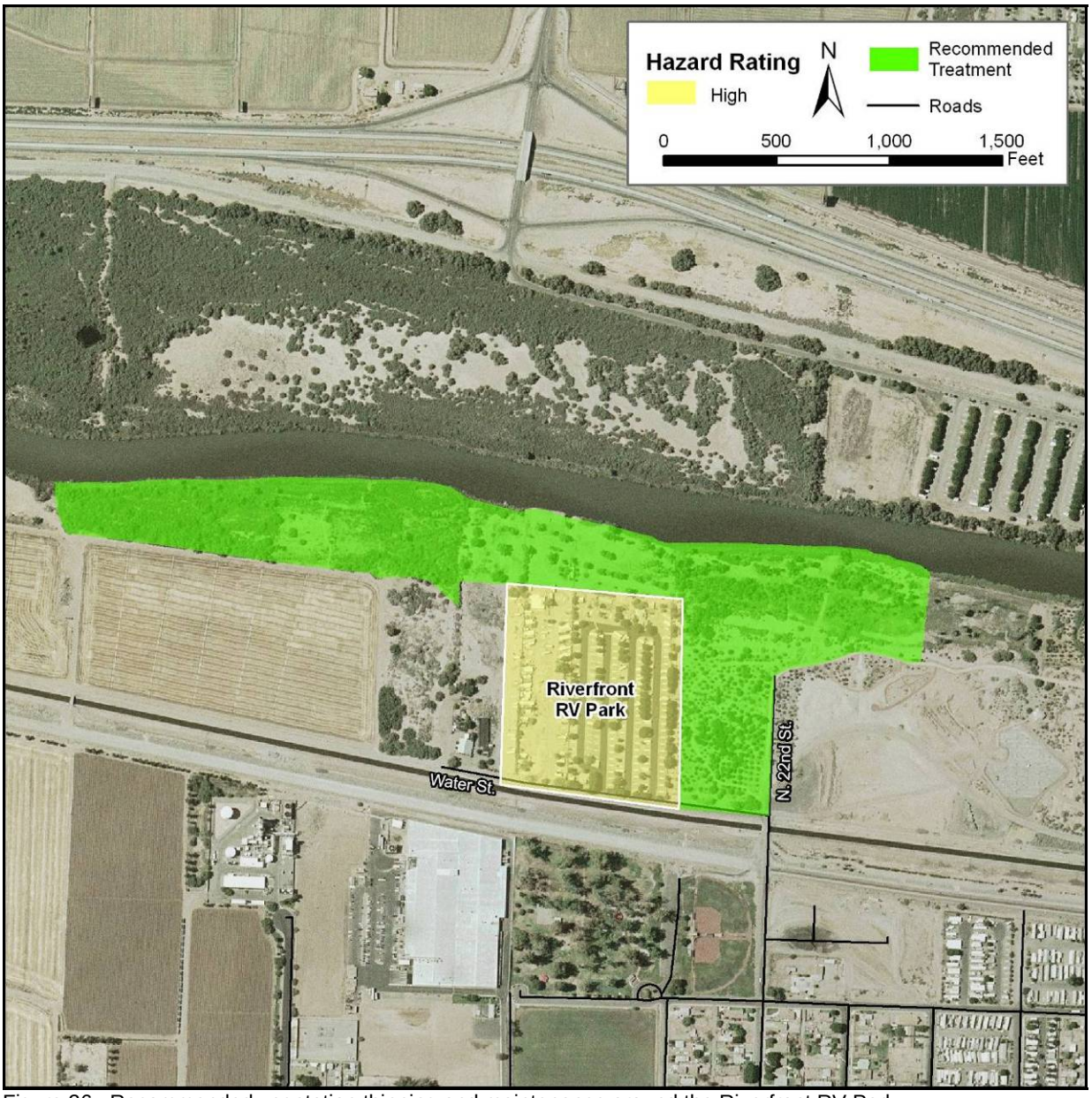

Figure 26. Recommended vegetation thinning and maintenance around the Riverfront RV Park

Figure 27. Cocopah Bend RV and Golf Course

Cocopah Bend RV & Golf Resort

The Cocopah Bend RV and Golf Course consists of 300 acres situated along the Colorado River near Yuma, Arizona. There are approximately 449 sites directly on the golf course and 356 additional sites at the resort. The Resort provides a variety of activities, including golf, a tennis court, shuffleboard, horseshoes, and a pool, to name a few. Close proximity to flammable riparian vegetation may pose a threat to the Resort. Resulting evacuations may be difficult if residents are panicked. Fire behavior potential should be used as a guideline for any fuels reduction projects in the area. The same recommendations that apply to other RV parks in the study area also apply to the Cocopah Resort.

The Arizona Island - River Ranch RV Park

Figure 28. River Ranch RV Park

The River Ranch RV Park is located outside of the City of Yuma, 4.5 miles down Levee Road and Quechan Drive (Figure 28). Approximately 250 people live here during the winter, but numbers lessen during the summer. 20-25 transient campers live in the brush surrounding the RV park. There is power and water available on-site. Vegetation has been cleared around the park and the RVs sit on concrete slabs. Heavier riparian vegetation borders the park to the south east and north. Because of the high number of transients camping in the brush there is additional risk of wildfire in the area from camp fires. The recommendations for RV parks found in Appendix B are applicable for River Ranch, as well.

AREAS OF SPECIAL INTEREST

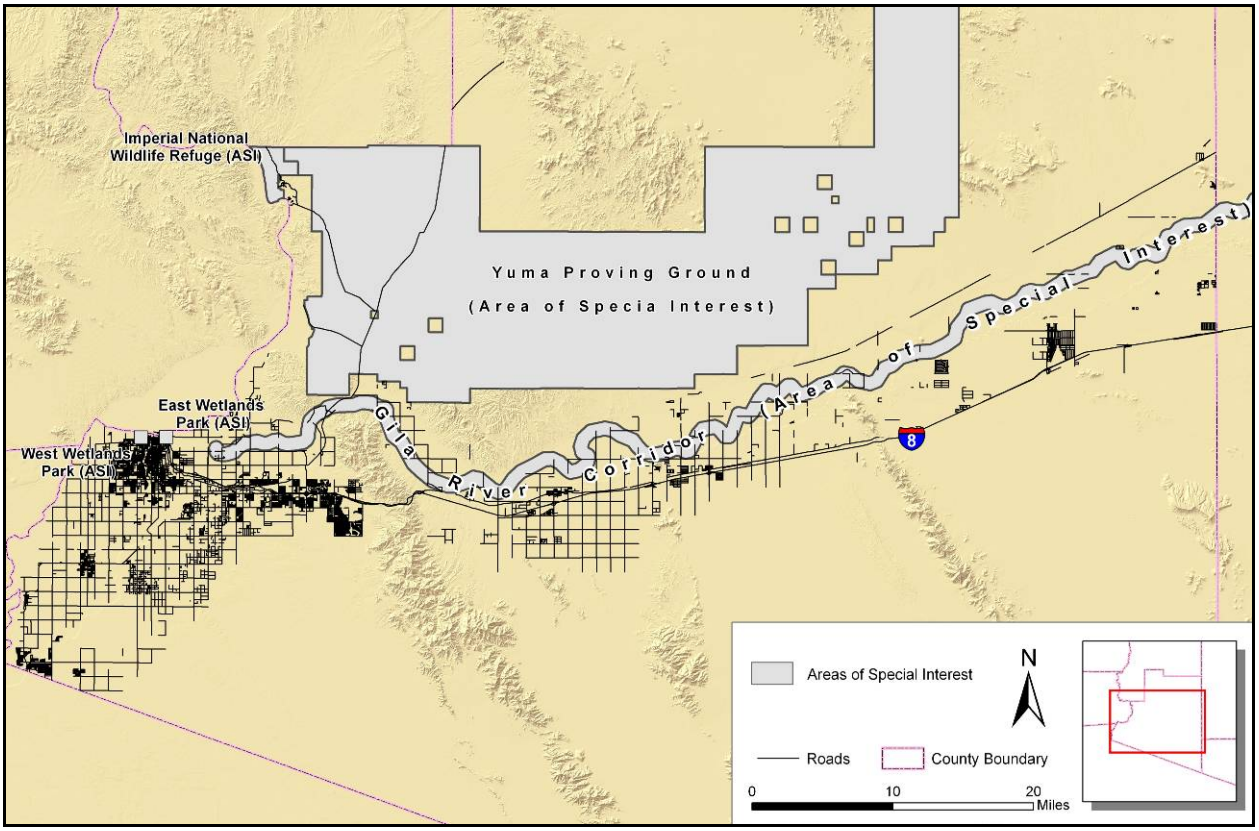

Figure 29. Overview of the areas of special interest

EAST AND WEST WETLANDS PARKS

Figure 30. East Wetlands Park

Figure 31. West Wetlands Park

Wetland rehabilitation projects have been instrumental in returning the East and West Wetland Parks to their natural state. Non-native salt cedar has been removed and native species such as mesquite, cottonwoods, and willows have been planted. The return of native vegetation has also encouraged native animal species to return, including the endangered Yuma clapper rail. The Yuma East Wetlands consists of 1,400 acres (Figure 30). In a joint effort between the City of Yuma, the Quechan Indian Tribe, Arizona State Land Department, Army Corps of Engineers, Yuma County, Bureau of Indian Affairs, Audubon Society, Bureau of Reclamation, Bureau of Land Management, and Yuma Crossing National Heritage area, approximately 350 acres of the Yuma East Westland has been restored, known as the East Wetlands; the goal is to treat all 1,400 acres. The initial project scope runs between River Mile 30.8 to 34.2 which is a 2-1/2 mile walking trail that starts below the Yuma Territorial Prison has recently been opened to the public. The trail provides the opportunity to see natural vegetation and wildlife, such as quail, egrets, beavers, and raccoons to name a few. Details can be found at http://www.fredphillipsconsulting.com/projects_yuma.htm.

The West Wetlands were once city landfill property, but through removal of invasive species and planting, the area is beginning to be restored (Figure 31). Salt cedar has been replanted with mesquite, acacia, and palo verde. A large playground and three ponds were added to the area,

along with restrooms, boat ramps, and hummingbird garden. The BLM and State Forestry played critical roles in this project, providing not only much of the labor, but engraved stone signage for a Tree Walk Trail.

Because of the volume of people using these parks, the risk of a human-caused wildfire is greater. Although extensive thinning and replanting work has been done, there are still vast areas of dense vegetation that pose a threat to human life and the riparian ecosystem if a fire were to start. Continuing to clear the salt cedar and replanting native species is recommended. Clearing the dense and extremely flammable vegetation improves ecosystem functioning and decreases the risk to firefighters involved in fighting a wildfire. Most important to reducing the chance of a human-caused fire is education. Providing people with information on the dangers to life and property and impacts associated with a fire is the most effective way to reduce the chance of a fire being started.

Recommendations

- Continue previous efforts within the area. Restoring native vegetation in the area protects several RV parks in the area, creates species habitat, and is a valuable asset of for the county. There is no reason to alter the existing prescription, just continue the work into areas that have not yet been rehabilitated. Funding should be secured to maintain the work in future years.

IMPERIAL NATIONAL WILDLIFE REFUGE

Figure 32. Imperial National Wildlife Refuge

Established in 1941, the Imperial National Wildlife Refuge is responsible for the protection of habitat along 30 miles of the lower Colorado River and in Arizona and California (Figure 32). Of the 25,768 acres encompassed by the INWR, more than 15,000 acres are federally designated wilderness. The Refuge is known for its plethora of wildlife species, especially those whose habitat is the wetland/riparian areas along the Colorado River and backwater lakes. Before the Colorado River was dammed, periodic flooding allowed for cottonwood and willow forests to grow along the banks. The combination of extensive woodcutting, agricultural clearing, and

exotic species has deteriorated these stands along the lower Colorado River. As a result, many of the wildlife species that used these tree species have become endangered. A significant amount of work has been put into maintaining the cottonwoods and willows; removal of salt cedar and clearing of the brush is allowing the native species to thrive (Figure 33).

Figure 33. Cottonwoods in the INWR

In terms of wildland fire, the greatest concerns fire starting on the Refuge and traveling through the continuous fuels into the community of Martinez Lake, or a fire beginning within Martinez Lake and spreading into the Refuge. Several large fire and fuelbreaks have already been established within the INWR to limit the spread of fire (Figure 34). One such fuelbreak extends three miles up the river, and while it is not wide enough to act as a complete fire break, it creates a place from which to fight the fire by providing a place to begin a burn operation or for aerial resources. The fire breaks are also about 3 miles long and from South to North, the breaks begin from Imperial Ponds to Mesquite Point. On average the breaks are 100' wide, in some areas it is greater than 100'.

Less known but historically significant to Yuma County, four single-room Miner's Cabins, built in the late 1800s or early 1900s are found on the refuge. Two of the cabins are built with rock walls and roofed with cottonwood timbers, arrowweed and mud. Rock walls are all that remain of the other two. Petroglyphs are scattered all along the river corridor.

Figure 34. Fuelbreak in the INWR

Recommendations

- Maintain fuel and fire breaks.
- Continue to work on removing/trimming salt cedar to promote native vegetation.
- If necessary, clear vegetation around historic cabins to decrease possible loss due to fire.

GILA RIVER CORRIDOR

There are large quantities of riparian vegetation along the Gila River Corridor which are prone to wildland fires. There are several "urban-interface" concerns along the river as a result of individuals who are known to establish camps in the areas. In addition, there are some cooperatively managed recreation sites along this corridor, specifically Yuma Lakes Resort, Fortuna Pond, the North Gila Trailer Park and the very popular area at the Colorado-Gila River Confluence.

The vegetation in the corridors has a large component of salt cedar, which is out-competing native species. The invasive species also change the fire behavior and fire effects. What used to burn rarely, now may burn more frequently and at higher intensities. The increased intensities may not deleteriously impact the salt cedar and other invasives, but may be too intense for the native vegetation.

Recommendations

- Work with federal, state, and local agencies to clear vegetation and provide fuel breaks or thinning projects within ½ mile along the river corridor.
- Continue previous efforts within the area. Restoring native vegetation in the area protects several RV parks in the area, creates species habitat, and is a valuable asset of for the county. There is no reason to alter the existing prescription, just continue the work into areas that have not yet been rehabilitated. Funding should be secured to maintain the work in future years.

YUMA PROVING GROUND

Figure 35. Weapons testing at the YPG

The Yuma Proving Ground (YPG) encompasses an area of 1,300 square miles, making it one of the largest military installations in the world. The large area and sparse vegetation within the YPG allows Army weapon systems to be tested without endangering the public or starting a large wildfire (Figure 35). The low elevation also provides an excellent place to test helicopters as well. Extreme weather, especially heat, tests both the soldiers and the equipment. According to the YPG website,"YPG is Yuma County's largest single employer of civilians and is one of the largest consumers of local goods and services of all the government organizations in the county. Federal impact funds are provided to the local community to help defray educational costs for dependents of civilian and military employees."

The YPG has their own fire response team that handles any fires on the grounds. Again, because of the sparse vegetation, wildfire is not a major concern on the Proving Ground, but since the grounds have a significant economic value to the County, the YPG has been determined to be an area of special interest.

Barry M. Goldwater Range

Although the Yuma Proving Ground was identified as an "area of special interest" in the main report, it should be noted that no wildfire mitigation work or wildfire suppression activities occur at YPG. The sparse fuels at YPG are what make it an ideal area for weapons trials, and if artillery causes a fire, it goes out because of the lack of continuous vegetation. YPG has its own fire resources. Non-military resources are not allowed on the range for any suppression activities.

The Barry M. Goldwater Range is operated by the 56th Fighter Wing Range Management Office, Airspace and Range Operations office. The U.S. Air Force and U.S. Marine Corps use it as a training area for aerial gunnery, rocketry, electronic warfare, and tactical maneuvering and air support. Unlike YPG, the Range was not originally identified as an ASI. The proximity to communities results in a lower probability of an impact from a fire in the range on any values at risk.

CONCLUSIONS AND NEXT STEPS

The Yuma County Community Wildfire Protection Plan (CWPP) is a comprehensive, scientifically based analysis of wildfire related hazards and risks in the Wildland-Urban Interface (WUI) areas in Yuma County, AZ. This document follows the standards for CWPPs that have been established by the Healthy Forest Restoration Act, which was established in 2003.

The results of the analysis were used to determine a variety of fuel reduction projects throughout the study area. While these are recommendations made by Anchor Point Group, LLC, the stakeholders can also use these results to guide in decision making for additional fuel reduction projects. Recommendations focus on reducing the threat of wildfire to values within the study area. Additional recommendations are presented throughout the document, and include public education, home and street addressing, as well as water source availability. Since much of the report is technical, detailed discussions of certain elements are contained in appendices, which are included after the main CWPP document.

In terms of vegetation management for the Martinez Lake and Fisher's Landing communities, there has been some confusion regarding what residents can and cannot do. According to the Army Corps of Engineers, every action taken revolves around the 'high water line'. Above this line, landowners can do any type of vegetation removal necessary to mitigate their fire risk. Landowners can riprap, clear-cut, put in walls, etc. However, if any material is removed, it must be taken out, not pushed into the river; heavy equipment is fine to do this. The banks are outside of the Army Corps' jurisdiction. Any work that is done below the high water line must be done with a Nationwide Permit, which is easily obtained. With this permit, for every linear foot along the bank, 1 cubic yard of material can be added for bank stabilization. Vegetation removal *below* the high water line is required to be done by hand and carried out, not dragged, as it could allow for debris to enter the water. The Army Corps wants to avoid or minimize impacts to the waterways. If the community has a plan they want to pursue and are not sure if they are allowed to do so, the Army Corps will work with them to adjust the plans and work within the Nationwide Permit to get the work completed in a manner that is acceptable to all parties. Mr. Bill Miller, an Army Corp representative, said he is available to meet with and educate the residents in the area. His contact information is as follows:

Bill Miller
3636 N Central Ave # 740
Phoenix, AZ 85012-1977
(602) 640-5385 ext. 221

Local agreements and existing plans were examined, in order to create a coordinated fire management effort between all parties involved. Public land management, private landowners and resident concerns and comments were used to generate this document. The Yuma County CWPP is a multi-year, guiding document that will facilitate the implementation of future mitigation efforts. The CWPP is a living document, meaning it changes and evolves through time, use and events. Consequently, it should be revisited at least annually to assess the relevance and progress on the given recommendations. Amendment or changes to a CWPP should be collaborative and include stakeholder notification.

GLOSSARY

The following definitions apply to terms used in the Yuma County Community Wildfire Protection Plan.

1-hour time lag fuels: Grasses, litter and duff; <1/4 inch in diameter

10-hour time lag fuels: Twigs and small stems; 1/4 inch to 1 inch in diameter

100-hour time lag fuels: Branches; 1 to 3 inches in diameter

1000-hour time lag fuels: Large stems and branches; >3 inches in diameter

Active Crown Fire: This is a crown fire in which the entire fuel complex – all fuel strata – become involved, but the crowning phase remains dependent on heat released from the surface fuel strata for continued spread (also called a Running Crown Fire or Continuous Crown Fire).

ArcGIS 9.x: This is Geographic Information System (GIS) software that is designed to handle mapping data in a way that can be analyzed, queried, and displayed. ArcGIS is in its ninth major revision and is published by the Environmental Systems Research Institute (ESRI).

Citizen Safety Zone: An area that can be used for protection by residents in the event that the main evacuation route is compromised. The area should be cleared of fuels and otherwise well maintained. It should be large enough for all residents of the area to survive an advancing wildfire without special equipment or training.

Crown Fire (Crowning): The movement of fire through the crowns of trees or shrubs; may or may not be independent of the surface fire.

Defensible Space: An area around a structure where fuels and vegetation are modified cleared or reduced to slow the spread of wildfire toward or from the structure. The design and distance of the defensible space is based on fuels, topography, and the design/materials used in the construction of the structure.

Energy Release Component: An index of how hot a fire could burn. ERC is directly related to the 24-hour, potential worst case, total available energy within the flaming front at the head of a fire.

Extended Defensible Space (also known as Zone 3): This is a defensible space area where treatment is continued beyond the minimum boundary. This zone focuses on forest management with fuels reduction being a secondary consideration.

Fine Fuels: Fuels that are less than 1/4-inch in diameter, such as grass, leaves, draped pine needles, fern, tree moss, and some kinds of slash which, when dry, ignite readily and are consumed rapidly.

Fire Behavior Fuel Model: A complete set of [fuel] inputs for the mathematical fire spread model.

Fire Behavior Potential: The expected severity of a wildland fire expressed as the rate of spread, the level of crown fire activity, and flame length. This is derived from fire behavior modeling programs using the following inputs: fuels, canopy cover, historical weather averages, elevation, slope, and aspect.

Fire Danger: In this document we do not use this as a technical term, due to various and nebulous meanings that have been historically applied.

Fire Hazard: Given an ignition, the likelihood and severity of Fire Outcomes (Fire Effects) that result in damage to people, property, and/or the environment. The hazard rating is derived from the Community Assessment and the Fire Behavior Potential.

Fire Mitigation: Any action designed to decrease the likelihood of an ignition, reduce Fire Behavior Potential, or to protect property from the impact of undesirable Fire Outcomes.

Fire Outcomes, AKA Fire Effects: This is a description of the expected effects of a wildfire on people, property and/or the environment, based on the Fire Behavior Potential and physical presence of Values at Risk. Outcomes can be desirable as well as undesirable.

Fire Risk: The probability that an ignition will occur in an area with potential for damaging effects to people, property, and/or the environment. Risk is based primarily on historical ignitions data.

Flagged Addressing: A term describing the placement of multiple addresses on a single sign, servicing multiple structures located on a common access.

FlamMap: A software package created by the Joint Fire Sciences Program, Rocky Mountain Research Station. The software uses mapped environmental data such as Elevation, Aspect, Slope, and Fuel Model, along with fuel moisture and wind information, to generate predicted fire behavior characteristics such as Flame Length, Crown Fire Activity, and Spread Rate.

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.

Fuelbreak: A natural or constructed discontinuity in a fuel profile that is used to isolate, stop, or reduce the spread of fire. Fuelbreaks may also make retardant lines more effective and serve as control lines for fire suppression actions. Fuelbreaks in the WUI are designed to limit the spread and intensity of crown fire activity.

ICP (Incident Command Post): The base camp and command center from which fire suppression operations are directed.

ISO (Insurance Standards Office): A leading source of risk (as defined by the insurance industry) information to insurance companies. ISO provides fire risk information in the form of ratings used by insurance companies to price fire insurance products to property owners.

Jackpot Fuels: A large concentration of fuels in a given area such as a slash pile.

Passive Crown Fire: A crown fire in which individual or small groups of trees torch out (candle), but solid flaming in the canopy fuels cannot be maintained except for short periods.

Shaded Fuelbreak: An easily accessible strip of land of varying width (depending on fuel and terrain), in which fuel density is reduced, thus improving fire control opportunities. The stand is thinned, and remaining trees are pruned to remove ladder fuels. Brush, heavy ground fuels, snags, and dead trees are disposed of and an open, park-like appearance is established.

Shelter-in-Place Areas: A method of protecting the public from an advancing wildfire that involves instructing people to remain inside their homes or public buildings until the danger passes. This concept is new to wildfire in the United States, but not to hazardous materials incident response, where time, hazards, and sheer logistics often make evacuation impossible. This concept is the dominant modality for public protection from wildfires in Australia, where fast-moving, short-duration fires in light fuels make evacuation impractical. The success of this tactic depends on a detailed preplan that takes into account the construction type and materials of the building used, topography, depth and type of the fuel profile, as well as current and expected weather and fire behavior.

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

Spotting: Refers to the 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.

Structural Triage: The process of identifying, sorting, and committing resources to a specific structure.

Surface Fire: A fire that burns the surface litter, debris, and small vegetation on the ground.

Time lag: Time needed under specified conditions for a fuel particle to lose about 60% of the difference between its initial moisture content and its equilibrium moisture content.

Values at Risk: People, property, ecological elements, and other human and intrinsic values within the project area. Values at Risk are identified by inhabitants as important to the way of life in the study area, and are particularly susceptible to damage from undesirable fire outcomes.

WHR (Community Wildfire Hazard Rating, AKA Community Assessment): A 140-point scale analysis designed to identify factors that increase the potential for and/or severity of undesirable fire outcomes in WUI communities.

WUI (Wildland Urban Interface): The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. This is sometimes referred to as Urban Wildland Interface, or UWI.

RECOMMENDED READING

Anderson, H. E., *Aids to Determining Fuel Models for Estimating Fire Behavior*, National Wildfire Coordinating Group, NFES 1574, April 1982.

At Home in the Woods – Lessons Learned in the Wildland/Urban Interface, FEMA, 2004.
Bachmann, A., and Allgower, B., *A Consistent Wildland Fire Risk Terminology is Needed!,* Fire Management Today (61, 4), USDA Forest Services, Washington, DC, Fall 2001.

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Developing a Cooperative Approach to Wildfire Protection, National Wildland-Urban Interface Fire Protection Program.

Development Strategies in the Wildland/Urban Interface, International Association of Fire Chiefs and Western Fire Chiefs Association, Billings, Montana, July 1991.

Firefighter Safety in the Wildland/Urban Interface – A Video Series (VHS Video - 60 Minutes.), National Wildland/Urban Interface Fire Program, 2003.

Fires that Changed the Fire Service – Wildlands (VHS Video – 84 Minutes.), American Heat, March 2000.

FireSmart – Protecting Your Community from Wildfire, Partners in Protection, Edmonton, Alberta, Canada, May 1999.

Hirsch, K.G., Pinedo, M.M., and Greelee, J.M., *An International Collection of Wildland-Urban Interface Resource Materials*, Information Report NOR-X-344, Canadian Forest Service – Northwest Region – Northern Forestry Centre, 1996.

Home Improvement: A Firewise Approach (VHS Video – 15 Minutes.), 2003.

Introducing Firewise Communities Workshops (VHS Video– 6 Minutes.), Firewise Communities, Quincy, MA.

Mangan, R. J., *Improving Firefighter Safety in the Wildland-Urban Intermix*, FE02P16 – USDA Forest Service Technology and Development Program, Missoula, Montana, Feb. 2000.
National Wildland/Urban Interface Fire Protection Program Building a Fire wise Home (VHS Video – 20 Minutes.), Hearst-Argyle Television Productions, Needham, MA, Nov. 1997.
Langowski, P., Fire and Fuels Analysis to Support Project Planning, Nov. 2003.

Preparing a Community Wildfire Protection Plan – a Handbook for Wildland-Urban Interface Communities, Sponsored by: Communities Committee, National Association of Counties, National Association of State Foresters, Society of American Foresters, Western Governors' Association, March 2004.

Queen, Phillip L., *Fighting Fire in the Wildland/Urban Interface*, Fire Publications, Inc., Bellflower, California, 1993.

Quincy, M.A., *Wildfire! Preventing Home Ignitions!* (VHS Video – 19 Mins.), Firewise Communities

Slaughter, R. (ed.), California's I-ZONE – Urban/Wildland Fire Prevention & Mitigation, Sacramento, California, Jan. 1996.
Standard for Protection of Life and Property from Wildfire, NFPA 1144(02) (Formerly *NFPA 299*) National Fire Protection Association, Quincy, MA, 2002.

Southwest Community Wildfire Protection Plan Guide, Southwest Strategy, 2004.

Urban-Wildland Interface Code™, International Fire Code Institute, Whittier, California, Jan. 2000.

White, C., Dry Hydrant Manual – A Guide for Developing Alternative Water Sources for Rural Fire Protection, Developed for Summit County, Colorado.

Wildland/Urban Interface Fire Hazard Assessment Methodology, Developed by National Wildland/Urban Interface Fire Protection Program. Wildland/Urban Interface Fire Policy Action Report, Western Governors' Association, Feb. 1996.

WEBSITE RESOURCES INCLUDING GRANT RESOURCES

Firewise, multi-agency organization designed to increase homeowner, community leader, developer, and others education on wildland urban interface and the actions they can take to reduce fire risk to protect lives, property, and ecosystems.
http://firewise.org/

Fire Regime Condition Class
http://www.frcc.gov/

FRAMES -- Fire Research and Management Exchange System,
http://www.frames.gov/tools/

Department of Homeland Security Web site for granting opportunities for Staffing for Adequate Fire and Emergency Services (SAFER) grants and provides other useful information.
http://www.firegrantsupport.com

Environmental Protection Agency.
http://cfpub.epa.gov/fedfund

ESRI Grant Assistance program for GIS users.
http://www.esri.com/grants

The Fire Safe Council.
http://www.FireSafeCouncil.org

Grant opportunities search website.
www.grants.gov

NFPA 1710 summary.
http://www.iaff.org/academy/content/online/modules/1710/summary.htm

National Association of State Foresters Listing of Grant Sources and Appropriations.
http://www/stateforesters.org/S&PF/FY_2002.html

National Database of State and Local Wildfire Hazard Mitigation Programs,
http://www.wildfireprograms.com, January 2005.

Pre-disaster Mitigation Program.
http://www/cfda/gov/public/viewprog.asp?progid=1606

RAMS - (Risk Assessment and Mitigation Strategies), U.S. Department of Interior, Bureau of Land Management, National Interagency Fire Center, Wildland Fire Management Information.
http://www.nifc.blm.gov/nsdu/fire_planning/rams

Rural Fire Assistance and other State Forestry Grants.
www.azsf.az.gov/grant_information

Southwest Area Forest, Fire, and Community Assistance Grants. This Web site lists grants that are available to communities to reduce the risk of wildfires in the urban interface.
http://www.SouthwestAreaGrants.org

Standard for Protection of Life and Property from Wildfire, NFPA 1144.
http://www.normas.com/NFPA/PAGES/NFPA-1144(02).html

Standard for Protection of Life and Property from Wildfire, NFPA 299.
http://webstore.ansi.org/ansidocstore/product.asp?sku=29997PDF

Stewardship and Landowner Assistance—Financial Assistance Programs.
http://www.na.fs.fed.us/spfo/stewardship/financial.htm

US Fire Administration—Assistance to Firefighters Grant Program.
http://www.usfa.fema.gove/dhtml/inside-usfa/grants.