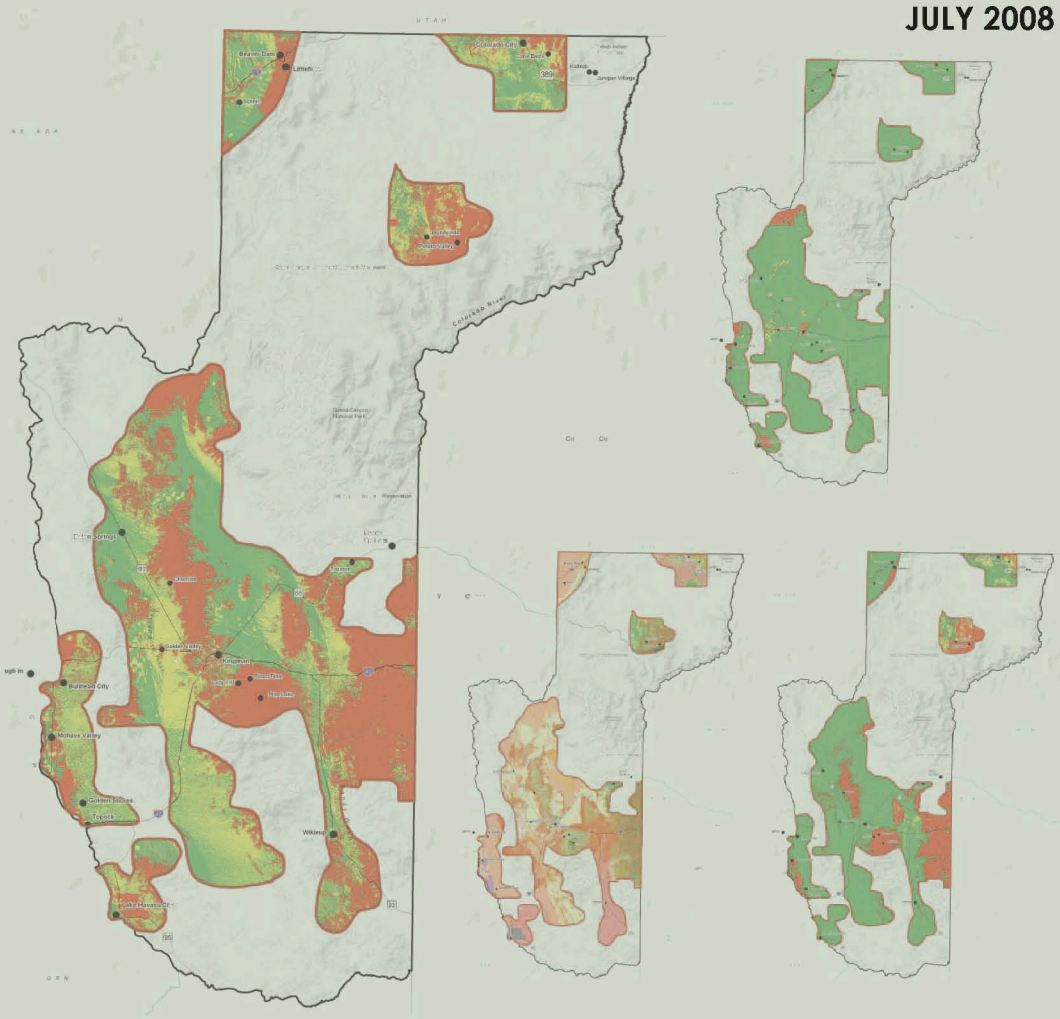
Mohave County
Community Wildfire Protection Plan

Kingman ▪ Lazy Y-U ▪ Pinion Pine ▪ Potato Valley ▪ Pine Lake
Beaver Dam ▪ Bullhead City ▪ Bundyville ▪ Cane Beds
Colorado City ▪ Dolan Springs ▪ Golden Shores ▪ Golden Valley
Littlefield ▪ Truxton ▪ Chloride ▪ Mohave Valley ▪ Scenic ▪ Wikieup

JULY 2008



Mohave County Board of Supervisors
Mohave County Division of Emergency Management
City of Kingman
Lake Havasu City
Bullhead City
Colorado City
Kingman Fire Department
Grapevine Mesa Fire Department
Lake Mohave Ranchos Fire Department
Mohave Valley Fire Department
Colorado City Fire Department
Beaver Dam/Littlefield Fire Department
Pine Lake Fire Department
Pinion Pine Fire Department
Golden Valley Fire Department
Bullhead City Fire department
Ft. Mohave Fire Department
Hualapai Valley Fire Department
Truxton Fire Department
Chloride Fire Department
Oatman Fire Department
Yucca Fire Department
Arizona State Forestry Division
Arizona State Parks Department; Lake Havasu and Cattail Cove State Parks
Arizona Strip District Office, Bureau of Land Management
Colorado River District Office, Bureau of Land Management
National Park Service, Lake Mead National Recreation Area
USFWS Havasu National Wildlife Refuge

Mohave County
Community Wildfire Protection Plan

July 2008

Prepared by:
Logan Simpson Design Inc.
33 North Stone Avenue
Suite 1460
Tucson, AZ 85701

(520) 884-5500
www.logansimpsondesign.com

LOGAN SIMPSON
DESIGN INC.

TABLE OF CONTENTS

APPENDIXES

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOS

ACRONYMS AND ABBREVIATIONS

ASLD	Arizona State Land Department
ASFD	Arizona State Forestry Division
ASP	Arizona State Parks Department
BA	basal area
BAER	burned area emergency response
BLM	Bureau of Land Management
CWPP	community wildfire protection plan
dbh	diameter at breast height
drc	diameter at root collar
FD	fire district
FO	Field Office
FRCC	fire regime condition class
FS	Forest Service
FWS	United States Fish and Wildlife Service
GIS	geographic information system
GPS	Global Positioning System
HFRA	Healthy Forests Restoration Act of 2003
HNWR	Havasu National Wildlife Refuge
IGA	intergovernmental agreement
ISO	Insurance Services Office
LMNRA	Lake Mead National Recreation Area
MCCWPP	Mohave County Community Wildfire Protection Plan
MCDEM	Mohave County Division of Emergency Management
NFPORS	National Fire Plan Operations and Reporting System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
PNVG	potential natural vegetation group
R_x	prescribed fire
SR	state route
SWReGAP	Southwest Regional Gap Analysis Project
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
WUI	wildland-urban interface

EXECUTIVE SUMMARY:
MOHAVE COUNTY COMMUNITY WILDFIRE PROTECTION PLAN

The Mohave County Community Wildfire Protection Plan (MCCWPP) was developed in response to the Healthy Forests Restoration Act of 2003 (HFRA) for the at-risk communities and unincorporated areas located in and around public lands administered by the US Department of the Interior (USDI) Bureau of Land Management (BLM), Arizona Strip District Office; Grand Canyon-Parashant National Monument (including National Park Service portion); Arizona Strip Field Office; Vermillion Cliffs National Monument; and Kingman and Lake Havasu Field Offices in Mohave County, Arizona. HFRA established unprecedented incentives for communities to develop comprehensive wildfire protection plans in a collaborative, inclusive process. Furthermore, this legislation gives direction to the BLM to address local community priorities in fuel reduction treatments, even on nonfederal lands. For a community to take full advantage of the opportunities provided in HFRA, it must first prepare a community wildfire protection plan (CWPP). A CWPP developed in accordance with HFRA is the most effective way to acquire federal funding for fire preparedness and planning. Mohave County and the participating communities wish to adopt a CWPP to better protect their communities from wildfire risk, to better prepare citizens, and to become eligible to apply for and receive federal and other grant monies to implement projects.

To ensure that all residents of Mohave County were represented in this planning process, two Core Teams were formed to implement the agency and public collaboration necessary to develop a CWPP compliant with HFRA: the Northern Core Team includes all identified at-risk communities in Mohave County located north of the Colorado River, and the Southern Core Team includes all identified at-risk communities south of the Colorado River. The Core Teams agreed to and established an efficient process to be followed throughout the MCCWPP development. The Core Team identified 19 communities at risk from catastrophic wildland fire within Mohave County.

Section I. Introduction

A primary objective of a CWPP is to help local governments, fire departments, and residents identify at-risk public and private lands to better protect those lands from severe wildfire threat. Additional functions of a CWPP are to improve fire prevention and suppression activities, as well as to identify funding needs and opportunities to reduce the risk of wildland fire and enhance public and firefighter safety. Identifying at-risk areas and improving fire protection capabilities helps the communities to prioritize high-risk projects and expedites overall project planning. Mohave County's CWPP was created to meet these objectives at a local level while integrating with overall federal- and state-level fire planning.

The Core Teams identified natural values at risk, such as watersheds, as well as community values at risk. The Core Teams also identified strategies that would improve watershed, rangeland, and community health through fuels reduction projects. Economic development and stability, as well as protection of the riparian and rangeland ecosystems, were encouraged. Additional fuels reduction projects that support local industry and economies while improving public and firefighter safety were identified.

Section II. Community Assessment

Section II covers the methods used in community assessments and identification of the wildland-urban interface (WUI) and hazard area maps. Environmental elements used by the Core Teams to identify the WUI include wildland vegetative fuel hazards, consideration of local topography, historical fire occurrence, and ignition potential. These environmental factors were coupled with community-based characteristics and values, such as local fire resource preparedness, infrastructure, evacuation routes, and desired municipal watershed protection. An external element, the Fire Insurance Service Organization ratings, was also used in creating the WUI boundary. These elements were all identified and combined using spatial analysis within a geographic information system (GIS). As a result of the GIS analysis, a WUI boundary map and a hazard area map were created. Hazard areas were divided into groups according to high, moderate, and low fuel hazard. Several components, including slope, aspect, vegetation type, vegetation density, ground fuel loads, and treated areas, were used to make fuel hazard determinations. The MCCWPP analysis consisted of 3,044,059 acres of federal, state and private lands. Cumulative risk levels across the MCCWPP analysis area include 1,142,093 acres (38%) of high risk, 773,372 acres (25%) of moderate risk and 1,128,594 acres (37%) of low wildland fire risk.

Section III. Community Mitigation Plan

Section III prioritizes the areas in need of wildland fuel mitigation and recommends the types and methods of treatment and management necessary to mitigate the potential for catastrophic wildland fire in the WUI. Also presented in this section are the MCCWPP communities' recommendations for enhanced wildland fire protection capabilities; public education, information, and outreach; and support for local wood product, woody biomass, and wildland vegetative fuel management businesses and industries. Recommendations were also made to encourage activities that will promote watershed and rangeland health.

As part of the community mitigation plan, the Core Teams identified the MCCWPP administrators—the Mohave County Fire Officers Association, Mohave County Office of Emergency Management, and BLM—who will be mutually responsible for implementing and monitoring MCCWPP action recommendations in coordination with a future established countywide community Working Group. MCCWPP administrators are responsible for ensuring implementation of the MCCWPP, preparing reports and work plans, and developing community bulletins and public service announcements that inform residents of wildfire dangers and preventive measures. Additional tasks include assisting federal and state agencies and private landowners to identify appropriate funding sources to implement action recommendations of the MCCWPP, as well as continued coordination with communities outside the analysis area. MCCWPP administrators are also responsible for coordinating monitoring and reporting of implementation actions that will allow for enhanced coordination of management programs and that will reduce inconsistencies among local, state, and federal agencies.

To prioritize treatments, the Core Teams identified 101 wildland fuel treatment areas within the WUI. These treatment areas were analyzed and categorized according to potential risk for wildfire. Each area was also ranked and described along with a recommendation for its preferred treatment type and method. Preferred treatments were recommended for treatment management areas that were found to be high risk. These treatments are designed to meet the fuel reduction and modification objectives of the MCCWPP.

Section IV. MCCWPP Priorities: Action Recommendations and Implementation

During the development of the MCCWPP, the Core Teams identified action recommendations necessary to achieve the goals outlined in the plan. The first action recommendation was to identify priority treatment areas for fuel reduction projects. Treatment areas were identified within the WUI to create defensible space through treatments within the home ignition zone, the use of strategically placed fuelbreaks, and the modification of hazardous wildland fuels. The objective of a fuels reduction project is to create an acceptable vegetation condition class for community and infrastructure protection. Completion of these projects will result in safer evacuation routes, which provide for firefighter and public safety. Priority treatment management areas were designated in areas identified as high risk. Table 4.1 lists the action recommendations for the reduction of hazardous fuels within the MCCWPP area. The second action recommendation identified by the Core Teams was to reduce structural ignitability. Reduction of structural ignitability is achieved through evaluation; maintenance; and, at times, upgrades to community response facilities, capabilities, and equipment. The third action recommendation described is the promotion of community involvement; action items include community education, information, and outreach.

Section V. Monitoring Plan

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

The MCCWPP administrators will provide an annual report of successful grant awards and projects implemented as a result of those awards. The administrators will also update work plans based on projects completed in the previous years.

Acknowledgments

The following communities and agencies were involved in the preparation of the MCCWPP:

Arizona State Forestry Division

Arizona State Parks–Lake Havasu and Cattail Cove State Parks

Local fire districts

Municipalities of Kingman, Colorado City, Bullhead City, and Lake Havasu City

Mohave County Division of Emergency Management

Mohave County Public Works Department

Arizona Department of Transportation

US Fish and Wildlife Service, Havasu National Wildlife Refuge

National Park Service, Lake Mead National Recreation Area

USDI Bureau of Land Management

I. INTRODUCTION

The Mohave County Community Wildfire Protection Plan (MCCWPP) was developed in response to the Healthy Forests Restoration Act of 2003 (HFRA) for the at-risk cities and unincorporated areas located in and around public lands administered by the US Department of the Interior (USDI) Bureau of Land Management (BLM) Arizona Strip District Office; Grand Canyon-Parashant National Monument (including National Park Service [NPS] portion); Arizona Strip Field Office (FO); Vermillion Cliffs National Monument; and Kingman and Lake Havasu FOs in Mohave County, Arizona (see Figure 1.1). HFRA established unprecedented incentives for communities to develop comprehensive wildfire protection plans in a collaborative, inclusive process. Furthermore, this legislation gives direction to BLM to address local community priorities in fuel reduction treatments, even on nonfederal lands.

Congress passed HFRA in November 2003, and the President signed it into law that December. When certain conditions are met, Title I of HFRA authorizes the Secretaries of Agriculture and the Interior to expedite the development and implementation of hazardous fuel reduction projects on lands managed by BLM.

HFRA emphasizes the need for federal agencies to collaborate with communities in developing hazardous fuel reduction projects and places priority on treatment areas identified by communities themselves through development of a community wildfire protection plan (CWPP). Priority areas include the wildland-urban interface (WUI), municipal watersheds, areas affected by windthrow or insect or disease epidemics, and critical wildlife habitat that would be negatively affected by a catastrophic wildfire.

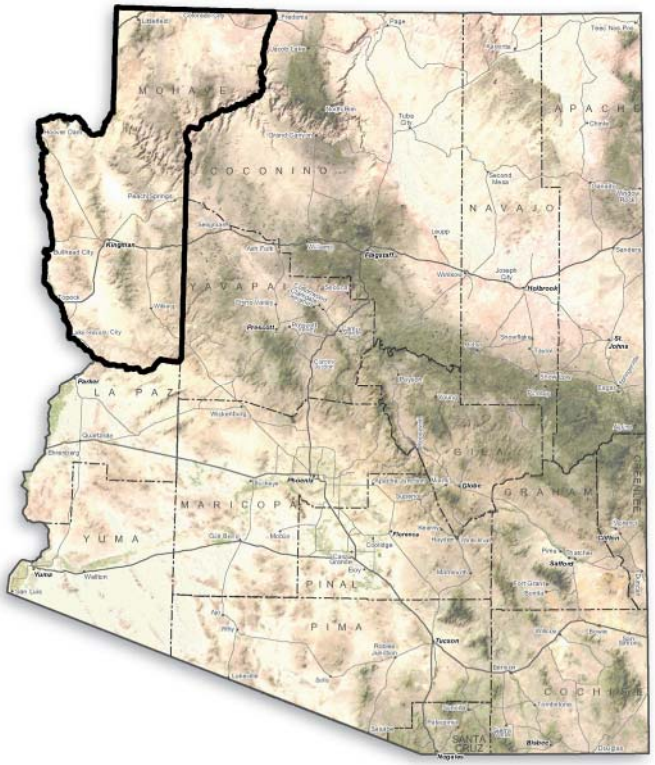


Figure 1.1. Analysis area

In compliance with Title 1 of HFRA, the CWPP requires agreement among local governments, local fire departments, and the state agency responsible for forest management. For the MCCWPP, this agency is the Arizona State Forestry Division (ASFD). The CWPP must also be developed in consultation with interested parties and the applicable federal agency managing the land surrounding the at-risk communities. The majority of lands surrounding the at-risk communities and unincorporated intermixed community zones within Mohave County are located adjacent to “public lands,” as defined in HFRA Section 3.1.A and B; Indian tribal lands, as defined in HFRA Section 3.2; and Arizona state lands.

The MCCWPP has been developed to assist local governments, fire departments, and residents to identify lands—including federal lands—at risk from severe wildfire threat and to identify strategies for reducing hazardous vegetative fuels within the WUI, while improving watershed and rangeland health, supporting local industry and local economies, and improving public and firefighter safety and response capabilities.

The MCCWPP is based on the *Approved Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management and Decision Record (*USDI BLM 2004a); the *Arizona Strip Fire Management Zone Fire Management Plan* (USDI BLM 2007a); the *Proposed Resource Management Plan/Final EIS for the Arizona Strip Field Office, the Vermilion Cliffs National Monument, and the BLM Portion of the Grand Canyon-Parashant National Monument, and a Proposed General Management Plan/Final EIS for the NPS Portion of the Grand Canyon-Parashant National Monument* (USDI BLM 2007b); and the *Statewide Strategy for Restoring Arizona's Forests* (Governor's Forest Health Councils 2007). This CWPP has been developed in consultation with the BLM FOs to help Mohave County and the State of Arizona implement the recommendations of Mohave County; Arizona State Land Department (ASLD); ASFD; Arizona Sate Parks Department (ASP); 16 local participating fire departments; the municipalities of Bullhead City, Kingman, Colorado City, and Lake Havasu City; and community residents and to identify lands at risk from severe wildfire threat. It also allows those entities to identify strategies for reducing vegetative fuels within the WUI while improving riparian and rangeland health, supporting local industry, making recommendations for reducing structural ignitability, developing public education and outreach, and improving public and firefighter safety and response capabilities. General guidance for development of the MCCWPP is based on *Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities* (Communities Committee et al. 2004). In addition, two Core Teams were formed to ensure that local, state, and federal management recommendations for wildland fire protection, watershed, and riparian health were addressed in the MCCWPP. The Northern Core Team includes all identified at-risk communities in Mohave County located north of the Colorado River. The Southern Core Team includes all identified at-risk communities south of the Colorado River. As additional guidance documents become available, changes or amendments will be incorporated into the MCCWPP as necessary.

The following sections detail the background and process used to develop the MCCWPP. The MCCWPP includes a defined WUI in context of the MCCWPP. In addition, the desired future condition of lands covered by the plan are described; current fire policies and programs are identified; and current projects and future needs are discussed. Finally, the goals of the MCCWPP are presented along with an outline of planning methods to achieve those goals.

A. Background

The process for developing this CWPP included evaluation of Mohave County, excluding Tribal Trust lands, to identify communities and remote private lands at risk from catastrophic wildland fire. During this analysis the County solicited federal, state, and local governments; fire chiefs; and interested individuals to participate in either the Northern or the Southern Core Team. The Core Teams were created to define and locate interface and intermix communities in which significant community values and infrastructure are at risk because of the potential of wildland fire.[1] The Mohave County Division of Emergency Management (MCDEM) requested local governments; fire departments; BLM; US Fish and Wildlife Service (FWS); Arizona Fire District; Havasu National Wildlife Refuge (HNWR); NPS, Lake Mead National Recreation Area (LMNRA); ASFD, Flagstaff District; ASP, Lake Havasu and Cattail Cove State Parks; and interested

[1]Interface communities exist where structures directly abut wildland fuels; intermix communities exist where structures are scattered throughout a wildland area (USDA and USDI 2001a).

individuals throughout Mohave County to participate in the Northern and Southern Core Teams to develop the draft CWPP. Mohave County is the local government authority for the unincorporated communities identified as at risk, while the city councils of Bullhead City, Colorado City, Kingman, and Lake Havasu City are the appropriate local governments for agreement with the MCCWPP for these municipalities. Mohave County and the Core Teams recognize the value of conveying information developed from the MCCWPP process to local citizens. Therefore, the Core Teams provided updates of the MCCWPP development process at regular public meetings that were held within the northern and southern portion of the county, which were conducted immediately after each Core Team meeting. These regular public informational meetings are the foundation for general public involvement and information dissemination. This process established by the Core Teams ensures an open public process, with the goal of all community interests being represented during the development of the MCCWPP. The Core Teams, in association with planned public involvement, meet all collaborative guidance criteria established by the Wildland Fire Leadership Council (2002).

The Core Teams and collaborators developed this CWPP to increase preparedness, to reduce hazardous wildland fuels, to reduce impacts from catastrophic wildfire, and to prepare recommendations for reducing structural ignitability. In addition, the Core Teams developed this CWPP to increase communication with local, county, state, and federal emergency response personnel by determining areas of high risk from catastrophic wildland fire, by developing mitigation measures to reduce hazardous wildland fuels (see Photo 1.1), by improving emergency response to unplanned wildfire, and by preventing wildfire ignitions within the WUI from spreading to adjacent state and public lands and from spreading into the communities and becoming major conflagrations.

Photo 1.1. The White Hills fire of 2006

During initial analysis for the proposed wildland fuel mitigation recommendations, as well as the development of the overall plan, the Core Teams reviewed the following documents:

- "Urban Wildland Interface communities within the vicinity of Federal lands that are at high risk from wildfire," *Federal Register* Vol. 66, Nos. 3 and 160 (US Department of Agriculture [USDA] and USDI 2001a, 2001b)
- *Field Guidance: Identifying and Prioritizing Communities at Risk* (National Association of State Foresters 2003)
- *Arizona Wildland Urban Interface Assessment* (Arizona State Forester 2004)
- *Arizona-Identified Communities at Risk.* (Arizona State Forester 2007a)
- *Statewide Strategy for Restoring Arizona's Forests* (Governor's Forest Health Councils 2007)
- *2006 Status Report and Recommendations* (Governor's Arizona Forest Health Oversight Council 2006)
- *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan* (USDA Forest Service [FS] and USDI BLM 2002)
- *Mohave County Multi-Jurisdictional Hazard Mitigation Plan* (MCDEM and Homeland Security 2004)
- *Mohave County Emergency Response and Recovery Plan* (MCDEM and Homeland Security 2008)
- *Approved Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management and Decision Record*(USDI BLM 2004a)
- *Fire Plan, Lake Havasu State Park* (Arizona State Parks Department 2005)
- *Proposed Resource Management Plan/Final EIS for the Arizona Strip Field Office, the Vermilion Cliffs National Monument, and the BLM Portion of the Grand Canyon-Parashant National Monument, and a Proposed General Management Plan/Final EIS for the NPS Portion of the Grand Canyon-Parashant National Monument* (USDI BLM 2007b)

The Core Teams also reviewed Section 101.16.B.iii of HFRA to determine the area adjacent to an evacuation route for hazardous fuel reduction measures to provide safer evacuation from an at-risk community. Since 2005, nine wildfires have occurred within the WUI, burning over 32,000 acres of wildland habitat within the MCCWPP WUI. The 2006 White Hills Complex fire comprised three separate ignitions that grew to approximately 2,400 acres and was successfully contained near Dolan Springs and Chloride. Large wildfires have become increasingly common in the desert vegetation zones due to the presence of nonnative annual grasses. Unwanted wildland fires have burned over 17,000 acres since 2005 within the southern WUI adjacent to the communities of Golden Valley, Dolan Springs, Chloride, and Mohave Valley. The Mount Bangs Complex fire occurred in 2005 and burned 12,200 acres southeast of the communities of Scenic, Beaver Dam, and Littlefield. The Jarvis fire occurred in 2006 and burned over 2,600 acres northeast of the communities of Beaver Dam and Littlefield. The fire departments within the county have responded to and suppressed numerous wildland fires within the WUI during the last 15 years. The Core Teams have determined that the majority of wildfire starts within the county have occurred along the

Colorado River corridor; along State Route (SR) 95 from Lake Havasu City north to Bullhead City; in the Hualapai Mountains south of the communities of Pine Lake, Pinion Pine and Lazy Y-U; along the ridgeline of the Cerbat Mountains east of the communities of Golden Valley, Dolan Springs, and Chloride; within the Virgin River, along the Interstate Highway 15 (I-15) corridor of the Beaver Dam/Littlefield sub-WUI; and in the Mount Trumbull area. These fires have occurred within saltcedar-invaded riparian communities and higher-elevation chaparral and conifer vegetation associations that threaten the at-risk communities of Mohave County with the potential of catastrophic wildland fire. Continued extreme weather conditions, dry fuels, increased nonnative invasive vegetation, and increased fuel loading on federal and nonfederal lands contribute to the potential for catastrophic wildland fires within Mohave County. As a result, the local fire departments and governmental agencies have initiated fire preparedness and land-treatment planning efforts to deal with the types and densities of wildland fuels that significantly threaten communities with potential catastrophic wildfire (see Photo 1.2).

Photo 1.2. The Secret fire

In 2003, Governor Janet Napolitano created the Forest Health Advisory Council and the Forest Health Oversight Council in response to the increasing number, frequency, and intensity of unwanted wildfires threatening Arizona communities and forests (Executive Order 2003-16). The councils were directed to develop scientific information and policy recommendations to advise the Governor's administration on matters of forest health, unnaturally severe forest fires, and community protection. In 2005, the councils established a subcommittee to begin work on a 20-year strategy to restore forest health, protect communities from fire, and encourage forest-based economic activity. Governor Napolitano approved and signed the *Statewide Strategy for Restoring Arizona's Forests* in June 2007. The Core Teams have reviewed the strategy, specifically the Arizona Strip and Basin and Range landscapes, to ensure that the recommendations adopted by the Core Teams and presented within the MCCWPP are compliant with, and

complementary to, the *Statewide Strategy for Restoring Arizona's Forests*. Using the information gathered from these supporting documents, the Core Teams and collaborators agree that the Mohave County communities listed within *Arizona-Identified Communities at Risk* (Arizona State Forester 2007a), as well as other developed areas identified as at risk within the MCCWPP WUI, constitute an interface or intermix community (see USDA and USDI 2001a; Arizona State Forester 2007b) at risk from wildland fire. The Core Teams and collaborators concur with the listing of at-risk communities within *Arizona-Identified Communities at Risk* (Arizona State Forester 2007a) as maintained by the Arizona State Forester. The Core Teams and collaborators recommend maintaining the original 19 nontribal communities based on the results of the wildland fire analysis conducted within the MCCWPP and further recommend that the "WUI Risk Rating" as listed in the *Arizona-Identified Communities at Risk* (Arizona State Forester 2007a) for the community of Mohave Valley be amended to "high." The MCCWPP will analyze risk and make recommendations to reduce the risk of unwanted wildland fire to the 19 at-risk communities of Mohave County occurring outside Tribal Trust lands. The MCCWPP analysis further refines components of wildland fire risk and prioritizes community recommendations for reducing wildland fire potential through vegetative fuel management and public outreach/education and for reducing structural ignitability. Figure 1.2 summarizes the process the Core Teams followed to produce the MCCWPP. At the far right of each tier is the "product" resulting from the activities in that tier. These tiers correspond to the sections in the MCCWPP and serve as a guide for the rest of this document.

B. WUI and Delineation Process

In 2007, 22 communities were included in *Arizona-Identified Communities at Risk* (Arizona State Forester 2007a) and given a WUI risk rating for catastrophic wildland fire. In 2007, the following ratings were given to Mohave County communities identified as at risk from wildland fire by the ASFD as reported in *Arizona-Identified Communities at Risk* (Arizona State Forester 2007a):

Community	WUI Risk	Fire District	Community	WUI Risk	Fire District
Kingman	High	Kingman	Dolan Springs	Moderate	Lake Mohave Ranchos
Lazy Y-U	High	None	Golden Shores	Moderate	None
Pinion Pine	High	Pinion Pine	Golden Valley	Moderate	Golden Valley
Peach Springs[a]	High	Tribal Authority	Kaibab[b]	Moderate	Tribal Authority
Potato Valley	High	None	Littlefield	Moderate	Beaver Dam/Littlefield
Pine Lake	High	Pine Lake	Truxton	Moderate	Truxton
Beaver Dam	Moderate	Beaver Dam/Littlefield	Chloride	Low	Chloride
Bullhead City	Moderate	Bullhead City	Juniper Village[b]	Low	Tribal Authority
Bundyville	Moderate	None	Mohave Valley[c]	Low	Mohave Valley
Cane Beds	Moderate	Colorado City	Scenic	Low	Beaver Dam/Littlefield
Colorado City	Moderate	Colorado City	Wikieup	Low	None

[a]Hualapai Indian Reservation—outside analysis area. [b]Kaibab Indian Reservation—outside analysis area. [c]Core Teams recommend amending WUI risk rating to "high."

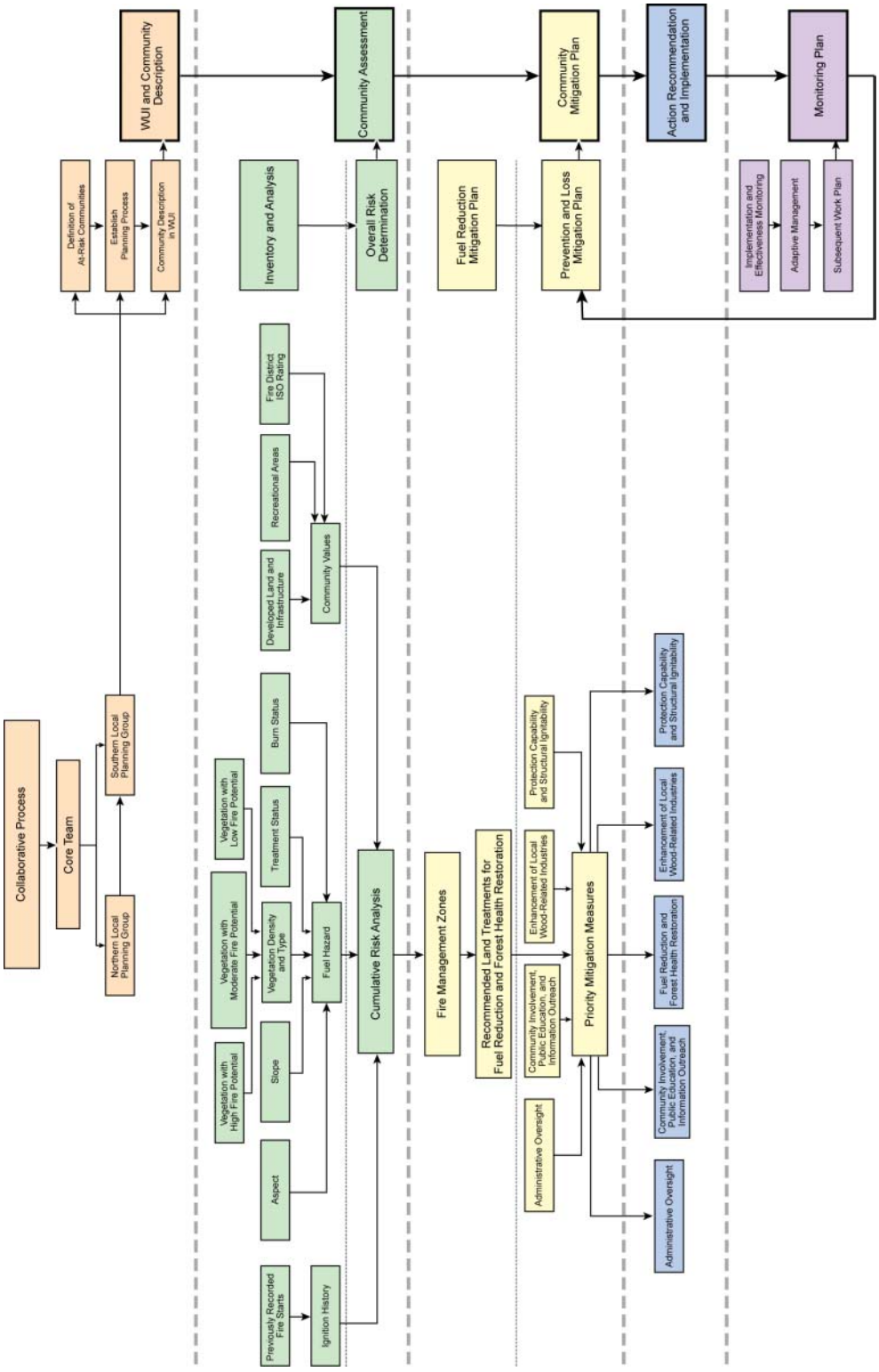


Figure 1.2. MCCWPP process

According to HFRA, an "(1) At-risk community . . . means an area – (A) that is comprised of – (i) an interface community . . . or (ii) a group of homes and other structures with basic infrastructure and services . . . within or adjacent to Federal land; (B) in which conditions are conducive to a large-scale wildland fire disturbance event; and (C) for which a significant threat to human life or property exists as a result of a wildland fire disturbance event" (Secs. 101.1.A.i–ii, 101.1.B, and 101.1.C).

The at-risk communities within Mohave County are adjacent to federal lands, including public lands administered by BLM, and are consistent with the Arizona State Forester's (2007b:1) definition of an *intermix* or *interface community*:

> The Intermix Community exists where structures are scattered throughout a wildland area. There is no clear line of demarcation; wildland fuels are continuous outside of and within the developed area. The developed density in the intermix community, ranges from structures very close together to one structure per forty acres. Local fire departments and/or districts normally provide life and property fire protection and may also have wildland fire protection responsibilities.
>
> The Interface Community exists where structures directly abut wildland fuels. There is a clear line of demarcation between wildland fuels and residential, business, and public structures. Wildland fuels do not generally continue into the developed area. The development density for an interface community is usually three or more structures per acre, with shared municipal services. Fire protection is generally provided by a local fire department with the responsibility to protect the structure from both an interior fire and an advancing wildland fire.

In addition to a community's listing status, the current condition of the wildland fuels within and adjacent to at-risk communities significantly contributes to the possibility of a catastrophic wildfire that has the potential to damage or destroy community values, such as houses, infrastructure, recreational sites, businesses, and wildlife habitats. Establishing a CWPP to enhance the protection of community values, and to minimize the potential loss of property while ensuring public and firefighter safety during a catastrophic wildfire, remains the overriding priority recommendation of the MCCWPP.

The WUI is commonly described as the zone where structures and other features of human development meet and intermingle with undeveloped wildland or vegetative fuels. Communities in the WUI face substantial risk to life, property, and infrastructure. Wildland fire in the WUI is one of the most dangerous and complicated situations firefighters face. Both the *National Fire Plan* (USDA FS and USDI BLM 2004b), which is a response to catastrophic wildfires, and *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan* (USDA FS and USDI BLM 2002), which is a plan for reducing wildland fire risk, place a priority on working collaboratively with communities in the WUI to reduce their risk from large-scale wildfire. HFRA builds on existing efforts to restore healthy wildland conditions in the WUI by empowering local communities to determine the extent of the WUI; by determining appropriate wildland fuel mitigation measures; by enhancing public education for the prevention of wildland fire; and by authorizing expedited environmental assessments, administrative appeals, and legal review for qualifying projects on federal land.

The MCCWPP process of delineating WUI boundaries for at-risk communities involved collaboration among local, state, and federal government representatives as well as interested individuals within the communities. The MCCWPP WUI is the minimum area needed to provide protection to each community

and its surrounding community values. The identified WUI includes a total of 3,044,059 acres composed of a mix of private, county, state, and federal lands. The WUI lands that surround the communities are in a condition conducive to a large-scale wildland fire, and such a wildfire could threaten human life and property.

General elements used in creating the WUI for Mohave County at-risk communities include the following:

- Fuel hazards, consideration of local topography, vegetative fuels, and natural firebreaks
- Historical fire occurrence
- Community development characteristics
- Local firefighting preparedness
- Infrastructure and evacuation routes
- Recreation and wildlife values

C. Desired Future Condition and Wildfire Mitigation in the WUI

The desired future condition of MCCWPP lands includes the maintenance of, or return to, wildland fire resiliency status and the maintenance of, or return to, the vegetation component of the historical plant potential community across Mohave County. This historical plant potential community is composed of desert scrublands, shrublands (pinyon-juniper/Mogollon chaparral/sagebrush), riparian corridors, ponderosa pine forests, and semidesert grasslands habitats, all with an associated shrub community and some composed of invasive grasses and woody species (NatureServe 2004). The Core Teams intend the MCCWPP to complement objectives of the *Fire Plan, Lake Havasu State Park* (Arizona State Parks Department 2005), the *Community Wildfire Protection Plan Equivelent for Communities Adjacent to the Havasu National Wildlife Refuge* (USFWS HNWR 2006), the *Lake Mead National Recreation Area Fire Management Plan* (NPS 2004a) and *Fire Prevention Plan* (NPS 2004b), the *Approved Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management and Decision Record* (USDI BLM 2004a), and the *Arizona Strip Fire Management Zone Fire Management Plan* (USDI BLM 2007a). The desired future condition of public lands is consistent with community wildfire protection, watershed and rangeland restoration, and protection of community values described by the Core Teams, including returning the native vegetation to historical wildfire return intervals. Vegetative types that are maintained in this historical condition allow natural processes such as fire to be incorporated into long-term management practices to sustain habitat health, and also meet management goals of the MCCWPP while providing for community protection from unwanted wildland fire. Public education and land treatment projects in the MCCWPP area, coupled with current efforts of local fire departments, local governments, and BLM, will create a better-informed constituency with a myriad of tools at its disposal for protection of at-risk communities through restoration and vegetative fuels mitigation efforts within the WUI. Federal wildfire reduction policy on public lands is planned and administered primarily by BLM, which is the federal governing agency for the public lands associated with the MCCWPP planning area. BLM manages wildland fire to help reduce unnaturally high wildland fuel loads that contribute to catastrophic wildland fire and to help encourage the return of fire to a more natural role in fire-adapted ecosystems, to achieve ecosystem benefits, to reduce economic impacts, and to enhance public and firefighter safety.

The desired future condition of federal land includes improving public and firefighter safety from wildland fire on public lands, using wildland fire as a management tool to achieve resource objectives, managing hazardous wildland fuels within and adjacent to the WUI, providing adaptive wildland fire response and suppression, and returning public lands to Condition Class I status. Federal lands in this condition class can carry wildfire without significant impacts on habitat components. Once in this condition class, natural processes such as fire can be incorporated into long-term management practices to sustain habitat health. Current federal fire policy requires all wildland fires from unplanned ignitions to be managed for either protection objectives (wildfire) or resource benefit (wildland fire use). Under the current policy a single wildfire cannot be managed for both objectives concurrently (National Fire and Aviation Executive Board 2007). The Kingman, Arizona Strip, and Lake Havasu FOs will adhere to federal policy when managing all unplanned wildfire ignitions. Federal wildfire reduction policy on public lands (i.e., BLM lands) is planned and administered locally through the BLM FOs. Under the Proposed Action described in the *Approved Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality and Decision Record* (USDI BLM 2004a), BLM-administered public lands are assigned one of two land use allocations for fire management: Allocation 1 includes areas suitable for wildland fire use for resource-management benefit, and Allocation 2 includes areas not suitable for wildland fire use for resource benefit. With the exception of a small amount of desert shrub vegetation associations within the WUI, most of the WUI is classified as Allocation 1 BLM lands.

The desired future condition of private lands in the WUI is to have landowners comply with Firewise standards recommended by the Core Teams or to meet Firewise-recommended home ignition zone landscaping or fire-safe landscaping as recommended by the MCCWPP fire departments. Firewise (www.Firewise.org) is a national program that helps communities reduce the risk of wildfires and provides them with information about organizing to protect themselves against catastrophic wildfires and mitigating losses from such fires. Within Arizona, the Arizona State Forester administers the Firewise certification program. Local fire departments and governments would like to build on previous efforts to make this information available to their citizens and encourage its application. Residential and other structures that comply with these standards significantly reduce the risk of fire ignition in a community and from spreading to surrounding habitat. Additionally, structures that comply with Firewise recommendations are more likely to survive wildland fires that spread into the community.

The Core Teams are aware that the synergy of wildland fuel accumulations primarily associated with the invasion of woody species and nonnative grasses, together with community growth in the WUI, has produced areas that are at high risk from catastrophic wildfire. The community aspires to achieve restored, self-sustaining, biologically diverse habitats of mixed open space and developed areas that contribute to a quality of life demanded by Mohave County citizens. The Core Teams recognize that protection from catastrophic wildland fire requires collaboration and implementation through all levels of government and through an informed and motivated public. The Core Teams considered ecosystem restoration to the historical potential natural plant community, community protection, and public and firefighter safety while developing this CWPP.

Financial commitments required to reduce the risk of catastrophic wildfire can be extensive for municipal, county, state, and federal governments, as well as for the small rural communities surrounded by public lands. Mohave County and BLM have implemented wildland fuel mitigation projects within, or in proximity

to, the WUI. Local fire departments have improved wildland fire suppression response and continue public education and outreach programs concerning wildland fire threat and home ignition zone recommendations. As part of their education and outreach efforts, some of the local fire departments conduct site visits when requested by homeowners and help elderly and disabled residents cut and remove fuels. One local fire department sponsors a fuel reduction program in which it maintains a burn site for the disposal of fuels adjacent to its station. However, encroaching commercial developments next to this station may jeopardize this program. Local fire departments maintain wildland fire response teams supported by various engines (types 1 and 2 for structure engines, some equipped with wildland hoses and equipment; types 4, 5, 6, and 7 for wildland engines), water tenders (types 1, 2, and 3), aerial ladder trucks, and various other specialized response vehicles to assist in suppression activities. Response teams are composed of personnel with various levels of wildland firefighting training, including red-card firefighters. The response teams are coordinating radio frequencies to improve communications between initial attack and responding firefighting agencies and departments. Specially trained wildland-fire response teams not only provide suppression response to brush fires but also provide community awareness programs and structural-fire risk assessments. The Core Teams, BLM, and collaborators are proposing additional wildland fuel treatments and wildland fire suppression enhancements and have been proactive in pursuing funding for wildland-fire public outreach programs and fire-suppression training and equipment.

D. Goals for the MCCWPP

To reduce the risks to life and property from catastrophic wildland fire, the Core Teams have agreed on the following primary goals of the MCCWPP:

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

E. Planning Process

During initial analysis, and to aid the overall development of this plan, the Core Teams reviewed the following documents and studies:

- "Urban Wildland Interface communities within the vicinity of Federal lands that are at high risk from wildfire," *Federal Register* Vol. 66, Nos. 3 and 160 (USDA and USDI 2001a, 2001b)
- *National Fire Plan* (USDA FS and USDI BLM 2004b)
- *Healthy Forests: An Initiative for Wildfire Prevention and Stronger Communities* (Presidential Policy 2002)

- HFRA
- *The Healthy Forests Initiative and Healthy Forests Restoration Act: Interim Field Guide* (USDA FS and USDI BLM 2004a)
- *Preparing a Community Wildfire Protection Plan: A Handbook for Wildland-Urban Interface Communities* (Communities Committee et al. 2004)
- *Field Guidance: Identifying and Prioritizing Communities at Risk* (National Association of State Foresters 2003)
- *Arizona Wildland Urban Interface Assessment* (Arizona State Forester 2004)
- *Arizona-Identified Communities at Risk.* (Arizona State Forester 2007a)
- *Identifying Arizona's Wildland/Urban Interface Communities at Risk: A Guide for State and Federal Land Managers* (Arizona State Forester 2007b)
- *Statewide Strategy for Restoring Arizona's Forests* (Governor's Forest Health Councils 2007)
- *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan* (USDA FS and USDI BLM 2002)
- *Approved Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management Decision Record* (USDI BLM 2004a)
- *Mohave County Comprehensive Plan* (Mohave County 2001)
- *BLM Arizona Strip Resource Management Plan* (USDI BLM 2005)
- *Kingman Resource Area Management Plan* (USDI BLM 1995)
- *Proposed Resource Management Plan/Final EIS for the Arizona Strip Field Office, the Vermilion Cliffs National Monument, and the BLM Portion of the Grand Canyon-Parashant National Monument, and a Proposed General Management Plan/Final EIS for the NPS Portion of the Grand Canyon-Parashant National Monument* (USDI BLM 2007b)
- *Wildland Fire Use Implementation Procedures Reference Guide* (USDI and USDA 2005)
- Mohave County Multi-Jurisdictional Hazard Mitigation Plan (MCDEM and Homeland Security 2004)
- *Mohave County Emergency Response and Recovery Plan* (MCDEM and Homeland Security 2008)
- *Fire Plan, Lake Havasu State Park* (Arizona State Parks Department 2005)

Action recommendations for at-risk areas within the MCCWPP WUI boundaries have been developed as part of this planning process. Treatments for wildland vegetative fuels and additional wildland fire mitigation measures are recommended to be implemented in specific time frames and with associated monitoring to determine and document measurable outcomes. Successful implementation of the MCCWPP will require collaboration by local fire departments, governments, resource-management agencies, and the private sector. The cooperating agencies must develop processes and systems that ensure recommended actions of the MCCWPP comply with applicable local, state and federal environmental regulations.

The dedication of the Core Teams and collaborators in implementing the MCCWPP is an assurance that all agencies, groups, and individuals involved will develop any additional formal agreements necessary to ensure the MCCWPP's timely implementation, monitoring, and reporting. The Core Teams were formed not only to meet collaborative requirements of HFRA but also to represent all of the different interests of the Mohave County communities, with all parties being involved and being committed to the development and implementation of the MCCWPP.

II. MCCWPP COMMUNITY ASSESSMENT AND ANALYSIS

The community risk assessment is an analysis of the potential for catastrophic wildland fire to Mohave County communities and lands within the WUI identified by the Core Teams. This risk analysis incorporates the current condition class, wildfire fuel hazards, risk of ignition, wildfire occurrence, and at-risk community values. Local preparedness and protection capabilities are also factors that contribute to the delineation of areas of concern. The Core Teams have reviewed the Arizona State Forester's *Identifying Arizona's Wildland/Urban Interface Communities at Risk: A Guide for State and Federal Land Managers* (2007b) to ensure that the MCCWPP is compatible with and complementary to statewide CWPP planning efforts. The Core Teams have included all risk factors required by the Arizona State Forester in the analysis of this CWPP. The areas of concern for wildland fuel hazards, risk of ignition and wildfire occurrence, and loss of community values are evaluated to determine areas of highest wildland fire risk.

The MCCWPP planning area includes all of Mohave County, except Tribal Trust lands, divided into two analysis areas, one north and one south of the Colorado River. Although some Tribal Trust lands (Fort Mohave Indian Reservation and Hualapai Indian Reservation) are included in the total acreage of the WUI, these lands are not subject to the action recommendations or agreements set forth in this document. The MCCWPP comprises 3,044,059 acres of land. The CWPP planning area includes BLM (1,275,080 acres), Arizona State Parks (ASP) (2,468 acres), FWS (16,670 acres), ASLD (374,686 acres), and private land (1,297,697 acres).

Primary land ownership in the MCCWPP planning area is a mosaic of privately owned lands and lands administered by BLM (see Table 2.1 and Figure 2.1). Much of the land within the MCCWPP planning area is considered rural with minimal development.

Table 2.1. Land management within the WUI

Ownership type	Total acres	% of total
Private	1,297,697	43
ASLD	374,686	12
BLM	1,275,080	42
FWS	16,670	1
NPS	53,668	2
ASP	2,468	<1
AGFD	1,185	<1
Fort-Mohave Indian Res.	21,075	1
Indian Allotments	638	<1
Hualapai Indian Reservation	892	<1
Total	3,044,059	100*

*Due to rounding, actual percentage total may add to more than 100%.

Of the publicly owned lands within the WUI, BLM is the largest land manager with 1,275,080 acres, or 42 percent, of the WUI, and lands are located throughout the WUI. FWS lands are located along the Colorado River from approximately the Interstate Highway 40 (I-40) bridge to 5 miles north of Lake Havasu City. These federal lands provide extensive and popular hiking, boating, and recreational areas within or adjacent to the WUI and account for 16,670 acres, or 1 percent, of the WUI. The potential of escaped campfires or the need to evacuate the camping areas in the event of a wildfire warrants their inclusion in the MCCWPP area. NPS lands incorporate 53,668 acres, or 2 percent, of the WUI. The NPS manages the LMNRA including Pearce Ferry and Katherine Landing with the WUI. The LMNRA is actively managed for public recreation such as boating, sport fishing, hiking, and camping. Visitor use data from the LMNRA shows that the Katherine Landing's access road averages 1,003,834 visitors annually, while the data from the Pearce Ferry Road shows that visitor use averaged 131, 370 visitors from 2000 through 2007. ASP lands are located

along the Colorado River within and south of Lake Havasu City and managed as the Lake Havasu or Cattail Cove State Park on ASP lands or lands managed through a Recreation and Public Purposes Act lease from BLM. ASP accounts for 2,468 acres, or <1 percent, of the WUI. Cattail Cove State Park is composed of 350 acres, while Lake Havasu State Park is composed of 2,516 acres. Both state parks are actively managed for public recreation.

ASLD is also a large land manager in the WUI, accounting for 374,686 acres, or 12 percent, of the WUI. State lands were established in 1912 under the terms of the Arizona Enabling Act. With statehood, Arizona was granted ownership of four sections per township. The ASLD manages these State Trust lands to produce revenue for the Arizona State Trust beneficiaries, including the state's school system. Within the MCCWPP area, State Trust lands are managed primarily for recreation, natural resource protection, and livestock grazing.

Private land within the WUI composes the largest ownership within the WUI at 1,297,697 acres, or roughly 43 percent, of the WUI. Private lands are clustered near the communities with some scattered private inholdings located throughout the WUI. The municipalities of Kingman, Bullhead City, Lake Havasu City, and Colorado City contain the majority of private land acreage within the WUI. The MCCWPP WUI includes over 193,035 residents and 98,735 housing units (US Census Bureau 2006) and associated structures. Commercial structures are clustered along state and federal highways and community centers, and they are assumed to remain as the principal commercial corridors within the Mohave County at-risk communities.

The MCCWPP planning area boundary is identified in Figure 2.1. and is included within the *Statewide Strategy for Restoring Arizona's Forests* (Governor's Forest Health Councils, State of Arizona, 2007), which distinguishes nine forested landscapes. Two of these identified forested landscapes, the Arizona Strip and the Basin and Range, occur in Mohave County.

The Arizona Strip region ranges from approximately 1,400 feet at Lake Mead to over 8,000 feet at Mount Trumbull. Vegetation ranges from Mohave and Great Basin desert shrublands to pine-oak associations at the highest elevations. The area is sparsely populated and has few paved roads, including I-15, US Highway (US) 89A and State Route (SR) 386. The Virgin River flows through the communities of Beaver Dam and Littlefield in the northwest portion of the WUI. Many of the communities within the Arizona Strip are closely tied to communities in Nevada and Utah. The major fire management challenges described in the *Statewide Strategy for Restoring Arizona's Forests* include the following: "(1) extensive areas of continuous forest and woodland subject to uncharacteristically intense wildfire, (2) wildfire can negatively affect watersheds, soil, and native species and habitats, and (3) invasive cheat grass can establish near monocultures following severe fire, altering fire regimes," which increase wildland fire intensity and increase loss of natural habitat components. According to the recommendations for "Future Restoration Needs" of the Arizona Strip, as outlined in the *Statewide Strategy for Restoring Arizona's Forests*, "All forest restoration and management efforts should be developed to complement, where possible, community and county priorities. Only with this type of integration will restoration treatments be able to meet the diverse needs of a wide range of people and ecological circumstances." The Core Teams support the recommendations within the *Statewide Strategy for Restoring Arizona's Forests* and produced the MCCWPP to be complementary to those assessments and recommendations.

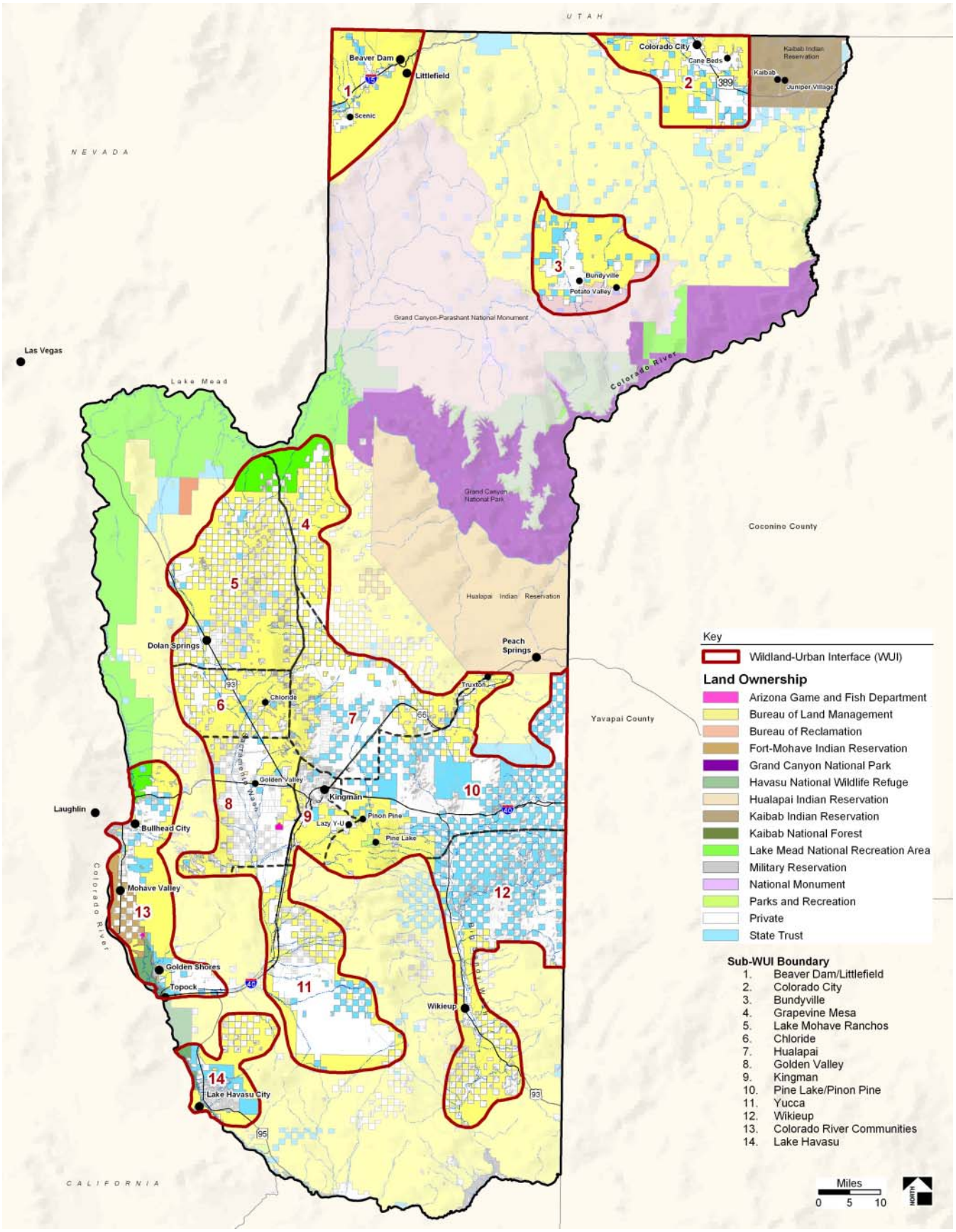


Figure 2.1. MCCWPP WUI area

The Basin and Range landscape as described in the *Statewide Strategy for Restoring Arizona's Forests* include the Cerbat and Hualapai Mountains within Mohave County to the north and south of Kingman. Elevations in this landscape range from 3,000 feet in the valley floors to over 8,000 feet at Hualapai Peak. Vegetation is variable in this landscape due to evolutional changes ranging from desert shrublands in the lower elevations to pine/mixed conifers at the highest elevations. Wildland fire within this landscape can be difficult to control due to limited access, rugged terrain, and heavy fuel loading. The 2002 Wild Cow and Lion Kill wildfires burned over 840 acres of ponderosa pine vegetation associations and threatened the communities of Pine Lake, Pinion Pine, Atherton Acres, and Hualapai Mountain Park. Recommendations for "Future Restoration Needs" of the Basin and Range landscape, as outlined in *Statewide Strategy for Restoring Arizona's Forests*, include the following: "(1) implement prudent use of wildland fire use events; (2) establish and maintain the appropriate landscape scale diversity of vegetative age classes, densities, and structure; and (3) maintain the presence of aspen in the region." The Core Teams support the recommendations within the *Statewide Strategy for Restoring Arizona's Forests* and produced the MCCWPP to be complementary to those assessments and recommendations.

The climate of Mohave County is varied—ranging from semiarid communities with relatively low precipitation, low humidity, and high summer temperatures; to communities associated with the Virgin and Colorado rivers; and to areas of ponderosa pine/mixed conifer forest with mild summers and cold winters. Precipitation averages from 3.5 to 20 inches per year depending on elevation and occurs primarily during two rainy periods—summer rainfall, which usually occurs in local torrential convection showers, and winter rainfall, which is usually slow and can occur over several days (Arizona Department of Commerce 2007).

The planning area includes 2 major rivers, the Colorado and the Virgin. The Colorado River is used extensively as a personal watercraft, speedboat, and pleasure-boat recreation area and supports several dams; 21 dams have been built on the Colorado and its tributaries. The river and its tributaries flow through the Great Basin, the Sonoran Desert, and the Mojave Desert and drain southwestern Wyoming and western Colorado; parts of Utah, Nevada, New Mexico, and California; and almost all of Arizona. Three-fourths of the basin is federal land devoted to national forests and parks and Indian reservations. The Virgin River is a 200-mile-long tributary of the Colorado River (Photo 2.1). It begins in southwestern Utah and flows in a southwesterly direction, flowing across the northwestern corner of Arizona through the Virgin River Gorge. The last 30 miles (48 km) of the Virgin River forms the north arm of Lake Mead.

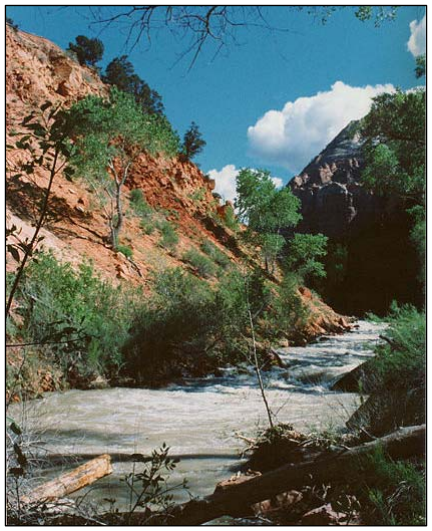


Photo 2.1. Virgin River habitat

The majority of public lands within the MCCWPP are administered by BLM. In accordance with the *Approved Arizona Statewide Land use Plan Amendment for Fire, Fuels, and Air Quality Management and Decision Record* (USDI BLM 2004a), BLM-administered public lands are assigned to one of two land use allocations for fire management. Allocation 1 lands include areas where fire is desired and there are few or no constraints for its use. Wildland fire may be used to achieve resource objectives, such as improved watershed or wildlife habitat. Where fuel loading is high and conditions are not initially suitable for wildland fire, fuel loads may be reduced by mechanical, chemical, or biological means to acceptable levels and to

meet resource objectives. Allocation 2 lands include areas where mitigation and suppression are required to prevent direct threats to life or property. It also includes areas where fire never played a large role in ecosystem management and where unplanned ignitions would have negative effects on resources. In these areas BLM will implement programs to reduce unwanted ignitions and emphasize prevention, detection, and rapid suppression. In addition to both land use allocations, BLM will undertake education, enforcement, and administrative fire-prevention measures to reduce human-caused fire.

Within the BLM's Kingman and Havasu FO areas, over 3,380,000 acres has been classified as land where fire is not desired at all. Less than 100,000 acres has been identified as land where unplanned wildfire is not desired due to current conditions. Over 300,000 acres has been identified as land where unplanned fire is desired, but there are significant constraints that must be considered before use. Within the Arizona Strip FO area over 625,000 acres has been identified as land where wildland fire is not wanted, and over 34,000 acres has been identified as land where unplanned wildfire is not desired due to current conditions. In addition, slightly more than 2 million acres has been identified as land where unplanned wildfire is desired, but there are significant constraints that must be considered before use.

A. Fire Regime and Condition Class

Before European settlement of North America, fire played a natural (historical) role in the landscape. Five historical fire regimes have been identified based on the average number of years between fires (fire frequency) combined with the severity (amount of overstory replacement) of fire on the dominant overstory vegetation (see Table 2.2).

Table 2.2. Fire regime information

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

Source: Schmidt et al. 2002

[a]Less than 75% of the dominant overstory vegetation replaced.

[b]Greater than 75% of the dominant overstory vegetation replaced (stand replacement).

The Mohave County WUI covers 3,044,059 acres, including 307,645 acres of land classified as developed and low-density open space and barren landscape (approximately 10% of WUI acres). WUI lands analyzed include Fire Regimes I (397,344 acres), II (536,210 acres), III (499,885 acres), and IV (1,302,975 acres) as described in *Development of Coarse-Scale Spatial Data for Wildland Fire and Fuel Management* (Schmidt et al. 2002). The condition class of wildland habitats describes the degree to which the current fire regime has been altered from its historical range, the risk of losing key ecosystem components, and the vegetative attribute changes from historical conditions. The following descriptions of condition classes are provided by the Arizona State Forester (2007b:3):

Condition Class 1:

Fire regimes are within a historical range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within the historical range.

Condition Class 2:

Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). This results in moderate changes to one or more of the following: fire size, intensity and severity, and landscape patterns. Vegetation attributes have been moderately altered from their historical range.

Condition Class 3:

Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range.

Because condition-class categories are based on coarse-scale data that are intended to support national-level planning, any interpolation of national data for localized conditions may not be valid (Fire Regime Condition Class [FRCC] Interagency Working Group 2005b) due to invasive and woody species habitat encroachment altering local fire regimes. Therefore, local agencies are asked to provide data for localized conditions (USDA FS 2000). The amount of land disturbance causing growth of flammable annuals (pigweed, Asian mustard, and thistles) and invasive grasses such as cheat grass in the northern WUI areas, red brome within the southern WUI, and increasing woody species invasions, especially saltcedar within the riparian corridors, indicate that the perennial and ephemeral riparian, uplands, and desert grassland habitats no longer conform to components of Condition Class 1 lands. As a result, local conditions indicate that the majority of wildland habitats within the WUI actually fall within Condition Classes 2 and 3.

As reported in the *Statewide Strategy for Restoring Arizona's Forests* (Governor's Forest Health Councils 2007:46), the majority of the Arizona Strip landscape (74%) has been classified as Condition Class III where there is a "high risk of losing key ecosystem components to fire." Within the Basin and Range landscape, fire exclusion combined with recent drought has exacerbated insect and mistletoe infestations, which create heavy down fuel loading in some areas that in turn increases the probability of uncharacteristic wildfire.

The desired future condition of federal land within the MCCWPP area is to return to or maintain wildland within Condition Class 1, as described in *Fire Regime and Condition Class (FRCC) Interagency Handbook Reference Conditions* (2005a):

> Open park-like savanna grassland, or woodland, or shrub structures maintained by frequent surface or mixed severity fires . . . Surface fires typically burn through the understory removing fire-intolerant species and small-size classes and removing less than 25 percent of the upper layer,

> thus maintaining an open single-layer overstory of relatively large trees . . . Mosaic fires create a mosaic of different-age, postfire grassland, savannah woodlands, or open shrub patches by leaving greater than 25 percent of the upper layer (generally less than 40 hectares [100 acres]). Interval[s] can range up to 50 [years] in systems with high temporal variability.

Desired future conditions for Great Basin Pinyon-Juniper Woodland, Lower Sonoran Desert Scrub, Montane Conifer Forest, and Riparian habitats, as described in the *Approved Arizona Statewide Land Use Plan Amendment for Fires, Fuels, and Air Quality Management and Decision Record* (USDI BLM 2004a: 2–3), are as follows:

Great Basin Pinyon-Juniper Woodland habitat:

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

Lower Sonoran Desert Scrub habitat:

> An adequate cover of and mix of natural plant species that have good vigor. Wildland fire would control or reduce exotic annual weeds and to limit woody vegetation to non-hazardous levels. Juniper densities, and densities of shrubs such as big sage brush will be maintained within their historic range.

Montane Conifer Forest habitat:

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

Riparian habitat:

> Annual weed cover and density is controlled and ladder fuels and downed woody debris are limited or not present. Disturbances that can potentially reduce natural vegetation cover and vigor are managed to maintain cover and mix of native riparian plant species.

B. Fuel Hazards

The arrangement of fuel, relative flammability, and fire potential of vegetation varies throughout the WUI. Wildland fuel hazards depend on a specific composition, type, arrangement, or condition of vegetation such that if the fuel were ignited, an at-risk community or its infrastructure could be threatened. Table 2.3 identifies the total amount of land in the WUI that was evaluated for overall wildland fire risk because of increased wildland vegetative fuel hazards. Historically, fire played an important role in keeping woody species in check and light ground fuels low (USDI BLM 2004b:3–8; Gori and Enquist 2003). However, with the suppression of natural wildfires within the last century, fire return intervals have increased, and invasions of desert grasslands by woody shrub, including mesquite and juniper species, and nonnative grasses, such as cheat grass and red brome, have altered native vegetative associations. The Core Teams reviewed vegetation associations found within the WUI as identified and mapped using Southwest Regional Gap Analysis Project (SWReGAP) data (USGS 2005; NatureServe 2004) (Figure 2.2). These

datasets provide the level of landscape description and vegetative land cover detail necessary for aligning wildland fuel flammability with existing vegetation. Vegetation associations were field verified for the major distinguishing types.

Table 2.3. Fuel model, fire-danger ratings, and intensity levels on vegetative associations in the WUI

Fuel type	Vegetative association	Fuel model	Wildfire risk rating[a]	Fire-danger rating model[b]	Flame length (ft)	Fire intensity level (FIL)	Rate of spread ft/hr (ch/hr)	Acres (%)
Desert shrub-scrub	Mixed Desert Scrub	1 and 2	L	T	4–6	4	2310–5150 (35–78)	591,868 (19)
	Sonoran Mid-elevation Desert Scrub	2 and 6	L	F and T	6	3	2110-–2310 (32–35)	428,754 (14)
	Sonoran Paloverde-Mixed Cacti Desert Scrub	1 and 2	L	L and T	4–6	3	2310–5150 (35–78)	327,812 (11)
	Sonora-Mohave Mixed Salt Desert Scrub	1 and 2	L	L and T	4–6	3	2310–5150 (35–78)	699,078 (23)
Shrublands	Inter-Mountain Basins Sagebrush Shrubland	1 and 3	M	B and T	4–12	6	5150–6860 (78–104)	70,212 (2)
	Inter-Mountain Basins Semi-Desert Shrub Steppe	1 and 2	L	F and T	4–6	3	2310–5150 (35–78)	85,305 (3)
	Pinyon-Juniper Shrubland	4 and 6	M	B and T	6–19	4–6	2110–4950 (32–75)	29217.7 (1)
	Mogollon Chaparral	4 and 6	H	B and T	6–19	4–6	2110–4950 (32–75)	205,327 (7)
	Great Basin Pinyon-Juniper Woodland	2 and 6	H	F	6	3	2110-–2310 (32–35)	90,005 (3)
	Colorado Plateau Pinyon-Juniper Woodland	4 and 6	H	B and T	6–19	6	2110–4950 (32–75)	288,615 (10)
	Invasive Southwest Woodland and Shrubland	2 and 3	H	E and T	6–12	6	2310–6860 (35–104)	24,539 (1)
Pine Forest	Pine Woodland	2 and 9	H	E and T	2.6–6	4-6	495–2310 (7.5–35)	13,201 (0.4)
Deciduous Southwest Riparian	North American Warm Desert Montane Riparian	6 and 9	H	E and T	2.6–6	6	495-–2110 (7.5–32)	11,716 (0.4)
	Rocky Mountain Lower Montane Riparian Woodland	6 and 9	H	E and T	2.6–6	6	495–2110 (7.5–32)	290 (.01)

Continued

Table 2.3. Fuel model, fire-danger ratings, and intensity levels on vegetative associations in the WUI

Fuel type	Vegetative association	Fuel model	Wildfire risk rating[a]	Fire-danger rating model[b]	Flame length (ft)	Fire intensity level (FIL)	Rate of spread ft/hr (ch/hr)	Acres (%)
Other	Barren Land Types	NA	L	NA	NA	NA	NA	72,620 (2)
	Developed, Open Space—Low Intensity	NA	L	NA	NA	NA	NA	43,174 (2)
	Developed, Medium—High Intensity	NA	L	NA	NA	NA	NA	34,528 (1)
	Agriculture	NA	L	NA	NA	NA	NA	17,123 (0.6)
	Open Water	NA	L	NA	NA	NA	NA	10,680 (0.4)
							Total	3,044,059

Source: National Fire Danger Rating System - Burgan 1988, and 1978 USDA Forest Service GTR INT-39 (USDA 1978)

[a]L = low, M = medium, and H = high, NA = not applicable.

[b]See Appendix B for the National Fire Danger Rating System definitions.

The existing arrangement and flammability of vegetation associations largely determine wildland fire behavior. Flammability for the Mohave County WUI is mapped in Figure 2.3. Evaluation of the vegetative fuels on federal and nonfederal land in the WUI was conducted through spatial analysis using geographic information system (GIS) technology in a series of overlays that helped the Core Teams and collaborators to identify areas at risk from wildland fire. For the WUI, the vegetation type, density, and distribution were analyzed to help categorize areas of highest risk of fire intensity and spread from wildland fuels.

The use of vegetative data in predicting wildfire behavior was quantified by developing descriptions of associated fuel properties that are described as fuel models. The fuel model (as described by Anderson 1982) and vegetation fuel fire-risk rating within the MCCWPP WUI are shown in Table 2.3. As described by the Arizona State Forester (2007b:1),

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

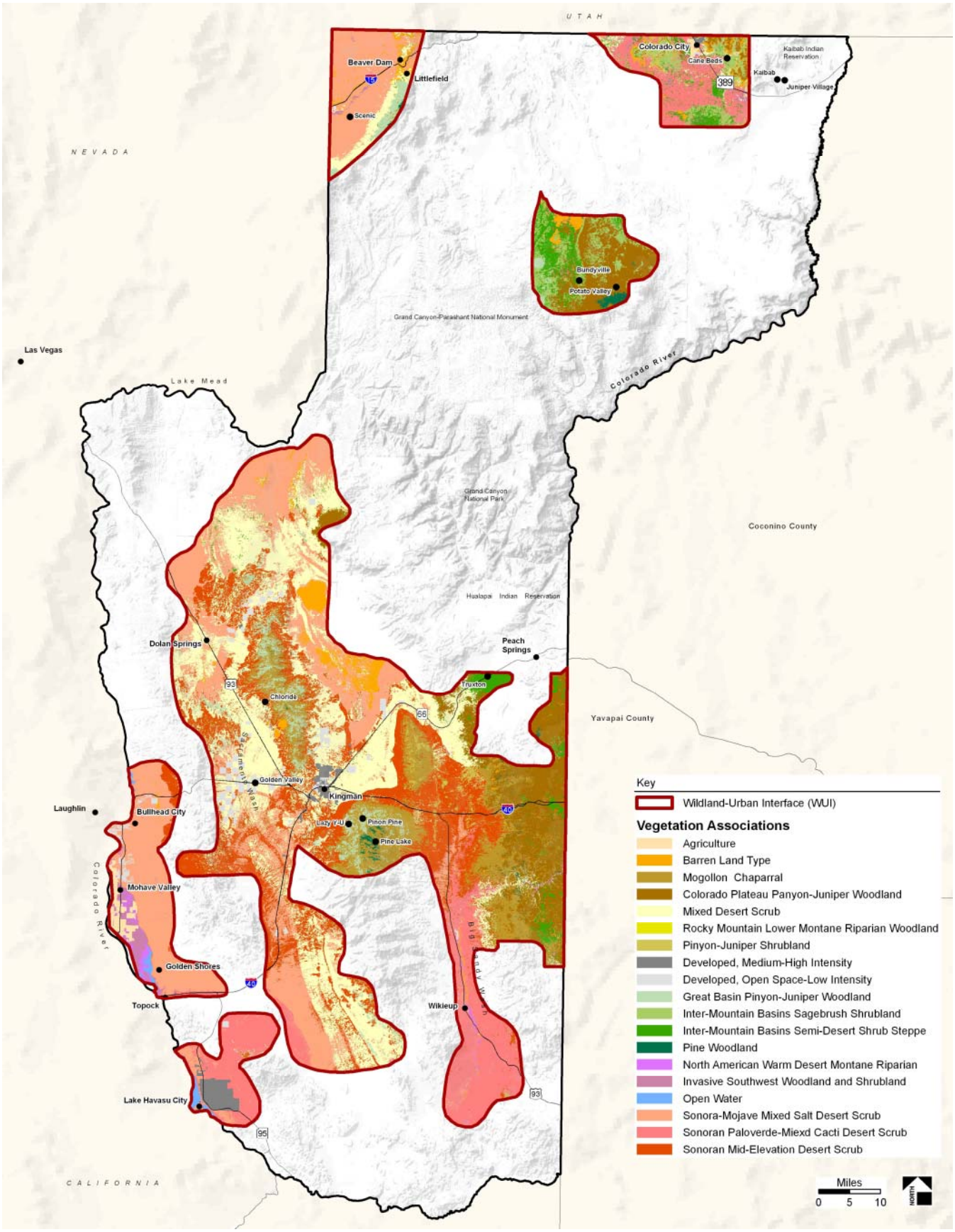


Figure 2.2. MCCWPP vegetation associations

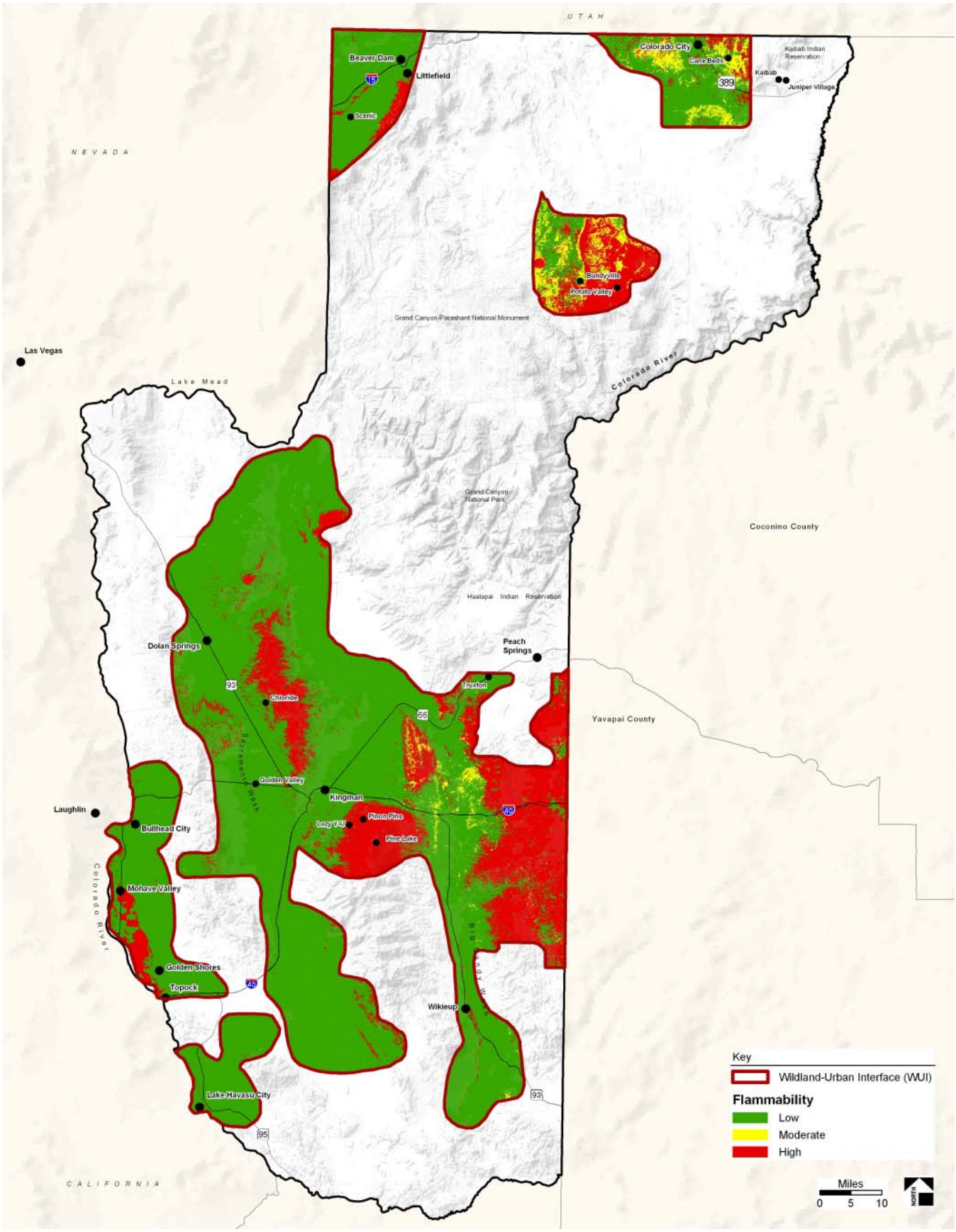


Figure 2.3. MCCWPP flammability

The Core Teams reviewed the fire behavior potential in the WUI and find the risk classification consistent with Situations 1, 2, and 3 as described by the Arizona State Forester (2007b:1–2):

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

Mohave County is composed of 23 separate ecological range sites (Natural Resources Conservation Service [NRCS] 2007). Vegetative production ranges from over 4,000 lb/acre during favorable precipitation years in highest-elevation sites, such as in the Canyon Spring range site in the 10- to 14-inch precipitation zone, to 50 lb/acre in lower desert scrub–mudstone hills range sites in the 6-inch precipitation zone during unfavorable precipitation years. Precipitation ranges from 12 to 17 inches annually with a winter-summer rainfall ratio of 60:40. Summer rains occurring between July and September originate in the Gulf of Mexico and are usually brief in duration and of high intensity. Cool-season rains originating in the Pacific Ocean are generally frontal, tend to be widespread, and are long in duration and of low intensity. May and June are the driest months of the year, with many natural fire ignitions occurring before the monsoon rains. Humidity is generally low, with mostly mild winters and hot summers in lower elevations to mild summers and cold winters in highest elevations. Some days in the dry months of May and June can exceed 100 degrees Fahrenheit. Cool-season vegetation growth begins in early spring and matures in early summer. Warm-season vegetation initiates growth after the summer rains and may remain green throughout the year in lower elevations.

Vegetative and physical characteristics of the WUI include 4 major vegetative fuel types composed of 13 major vegetation associations, 3 mostly nonvegetation associations, and 2 open-space residential vegetation associations (NatureServe 2004). These different vegetative communities are listed and described in Appendix A. Each vegetative community is assigned to a specific fuel model that predicts the rate of spread, flame length, and fire intensity levels possible for each vegetation association during average fire season and conditions. Assigning a fuel model to each vegetation association within the WUI will help predict wildfire behavior and thus proper suppression response (for detailed fuel model descriptions, see Anderson 1982).

The mean fire interval has a high degree of variability across vegetation associations in habitat replacements or major loss of habitat components, in conjunction with drought, which reduces fire frequency in deserts, and moist periods, which increase fire frequency (FRCC Interagency Working Group 2005a). Total wildland fuel load ranges from less than 500 lb/acre in desert and scrub/shrub types to over 20 tons/acre for dense timber-type habitats.

Vegetation Associations

The Desert Scrub vegetation association occurs on drier upland sites and includes areas of bare ground and rock also supporting a variety of grass, herbaceous, scrub, and shrub species (Photo 2.2). The Desert Scrub vegetation association constitutes 2,047,512 acres (67% of the WUI) and is the largest vegetation association within the MCCWPP.

Photo 2.2. Desert Scrub vegetation association

The Shrublands vegetation association includes the sagebrush shrublands, semidesert shrub-steppe, pinyon-juniper, and invasive woodlands and shrubland associations and is the second largest vegetative type within the WUI, accounting for 793,222 acres (26% of the WUI) (Photo 2.3). The xeroriparian areas within these associations provide movement corridors and foraging areas for a variety of wildlife species. Adjacent vegetation associations are often a mix of semidesert grassland and desert scrub. The understory of the shrub types will vary from a mix of nonnative grass with some areas of native grasses, depending on canopy closure. Areas of higher canopy closure (>60%) support little herbaceous and perennial grass cover, which limits fine fuels needed for fire laddering and limits rate of spread. Stands of mature juniper can include trees with trunks and limbs greater than 6 inches diameter at breast height (dbh), providing habitat for a variety of cavity-nesting bird species. These shrubland associations within the WUI provide recreational use, day use, and camping areas. Communities dominated by pinyon-juniper include a native or invaded graminoid understory, creating areas of open woodlands and savannas to areas of high canopy.

A major vegetative association of shrubland fuel types includes pinyon-juniper woodlands. This ecological system is characteristic of the rocky mesa tops and slopes on the plateaus and western slopes of northwestern Arizona. Associations consisting of stunted tree shrublands may extend further upslope along the lower-elevation margins of taller pinyon-juniper woodlands. Substrates are shallow/rocky and shaley soils at lower elevations (1,200–2,000 m). Sparse examples of the system grade into mixed bedrock canyon and tablelands where the vegetation is dominated by dwarfed (usually <3 m tall) *Pinus edulis* or *Juniperus osteosperma* trees forming extensive tall shrublands in the region along low-elevation margins of pinyon-juniper woodlands. Other shrubs, if present, may include areas of dense sagebrush (*Artemisia* spp.). Sagebrush communities occur throughout much of the WUI typically in broad basins between mountain ranges, plains, and foothills between 1,500 and 2,300 m elevation. Soils are typically deep, well drained, and nonsaline. These shrublands are dominated by sagebrush but include scattered juniper species. Perennial herbaceous components typically contribute less than 25 percent vegetative cover.

Pine forest woodland vegetative associations occur at the treeline/ecotone between grassland or shrubland associations and more mesic coniferous forests typically in warm, dry, exposed sites. Pine woodland occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops are most common. This ecological system generally occurs in soils characterized by good aeration and drainage, coarse textures, slightly acidic pH, an abundance of mineral material, and rockiness, and occurs in periods of drought during the growing season. Ponderosa pine (*Pinus ponderosa*) is the predominant conifer forming the tree canopy. The understory is usually shrubby, with sagebrush and oaks forming midstory vegetation and grasses forming the understory vegetative component. Mixed fire regimes and ground fires of variable return intervals maintain these woodlands, depending on climate, degree of soil development, and understory density. Within the distribution of Mohave County some ponderosa pine savannas—which are distinguished by a high frequency surface-fire regime, less steep or rocky environmental setting, and more open grassy understory—dominate.

Photo 2.3. Shrublands vegetation association
(photo courtesy of BLM)

The Deciduous Southwest Riparian association consisting of sycamore, cottonwood, walnut, ash, and willow can be intermixed with an understory of grasses and shrubs and often includes areas of near monocultures of saltcedar. The Deciduous Southwest Riparian association accounts for 12,004 acres (<1% of the WUI). This vegetation association may be underrepresented because of some xero- and mesoriparian association acres included with the shrubland associations. This vegetation association, however, contributes significantly to vegetation and wildlife biodiversity as well as to the principal recreational use areas within the WUI (Photo 2.4). In general, riparian areas have characteristics that reduce the frequency and severity of fire relative to the surrounding uplands. These characteristics include less steep slopes, surface water, saturated soils, shade, fewer lightning ignitions, cooler air temperatures, lower daily maximum temperature, higher relative humidity, higher fuel moisture content, and lower wind speed. However, late seral-stage riparian vegetation supports wildland fire similar to the surrounding potential natural vegetation group (PNVG) when a replacement fire occurs in surrounding PNVG during extreme drought and wind events. Late seral-stage riparian habitats can support nonreplacement fire in greater proportion of total fire frequency than surrounding PNVGs (FRCC Interagency Working Group 2005a: PNVG Code RIPA).

Photo 2.4. Deciduous Southwest Riparian vegetation association

Included within the total WUI are residential and open-space community lands occurring in the developed areas of the community. Developed lands as depicted in the SWReGAP land cover shows that within the WUI approximately 76,700 acres (3%) of lands evaluated for wildland fire potential are “developed,” with at least 20 percent of the land cover being nonpervious surfaces (Photo 2.5). However, private lands within the WUI account for approximately 43 percent of all WUI lands. Therefore, much of the WUI lands analyzed include private lands that are predominantly naturally landscaped. Developed, Open Space–Low Intensity lands include areas with some construction materials but mostly consist of native vegetation associations. Impervious surfaces account for less than 20 percent of total cover and most commonly include large-lot single-family housing units or multiple-acre private lands in single ownership, parks, golf

courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. Developed, Open Space, Medium-High Intensity lands includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20 to 49 percent of total cover. These areas most commonly include single-family housing units. Developed, Medium–High Intensity lands include areas with a mixture of constructed materials and vegetation. Impervious surface accounts for 50 to 79 percent of the total cover. These areas most commonly include single-family housing units, including highly developed areas where people reside or work in high numbers; examples include apartment complexes, row houses, and commercial/industrial. These lands may be considered at low risk for wildland fire. However, the threat of fire (structural or wildland ignition) spreading from developed lands to wildlands has been considered in determining risk within the WUI.

Photo 2.5. Developed lands within the WUI (photo courtesy of BLM)

Several fuel hazard components, including vegetation type and density, previously burned areas, and slope and aspect, were analyzed for wildland fire potential. For example, areas of the WUI can be heavily dissected, with some areas having slopes exceeding 20 percent that are heavily vegetated with trees and shrubs. Slopes greater than or equal to 20 percent and areas with south-, southwest-, or west-facing slopes in areas of high wildland fuels were identified as having greater risks because of fuel-ladder fire effects associated with steep terrain and decreased humidity associated with the microclimates created by exposed aspects. Areas with moderate fuel hazards on slopes greater than or equal to 20 percent are considered a high fuel hazard, while the same fuel type on slopes less than 20 percent is still considered a moderate fuel hazard. During extraordinary rainfall years, when rainfall is above average during the fall, winter, and spring season, increased germination and growth of grasses and forbs can created a heavier than normal fuelbed of grasses that can display high rates of spread and increased intensity levels that can ignite the overstory in vegetation in desert scrub/shrub associations that do not, under normal conditions,

sustain wildland fire. These areas of low-risk vegetation associations will, under these extraordinary circumstances, become areas of extremely high wildfire risk. Figure 2.4 shows areas of vegetative fuel hazard during a typical fire season. During a normal fire season, low-risk vegetative associations will be enhanced to a moderate level by influencing effects of slope and aspect, in a similar manner as moderate risk vegetative risk associations will increase to high risk from these same influencing factors. Other untreated or unburned areas that fall under the category of moderate ground fuels and that do not overlap areas with steep slopes or with south, southwest, or west aspects are considered a moderate risk from fuel hazards. All other areas have a low risk from fuel hazards, including the areas that have been treated or burned within the last 28 years. The wildland fuel hazards component influence was compiled to depict areas of high, moderate, and low wildland fire potential based on vegetation type, density, and arrangement and to show areas with higher wildfire risk and therefore of greater concern to the Core Teams during years of extraordinary rainfall and enhanced fire conditions creating extreme fire behavior. Table 2.4 identifies these various fuel hazards components and their assigned values. Visual representations of these fuel hazard components during extreme fire seasons are mapped in Figure 2.5.

Table 2.4. Fuel hazard components

Fuel hazards components	Influence[a]
Vegetation type and density	
Shrublands in Fuel Model 3, Pine forest >100 stems/acre, Deciduous Riparian >100 stems/acre, or moderate fuel types in slopes ≥20%	H
Upland Shrubland associations and juniper woodlands in Fuel Models 1, 2, and 3	M
Desert Scrub associations, barren land types, and developed areas	L
Burned areas	L
Slopes ≥20%	H
Aspect (south-, southwest-, or west-facing slopes)	M

Source: Logan Simpson Design Inc.

[a] H = high, M = moderate, L = low

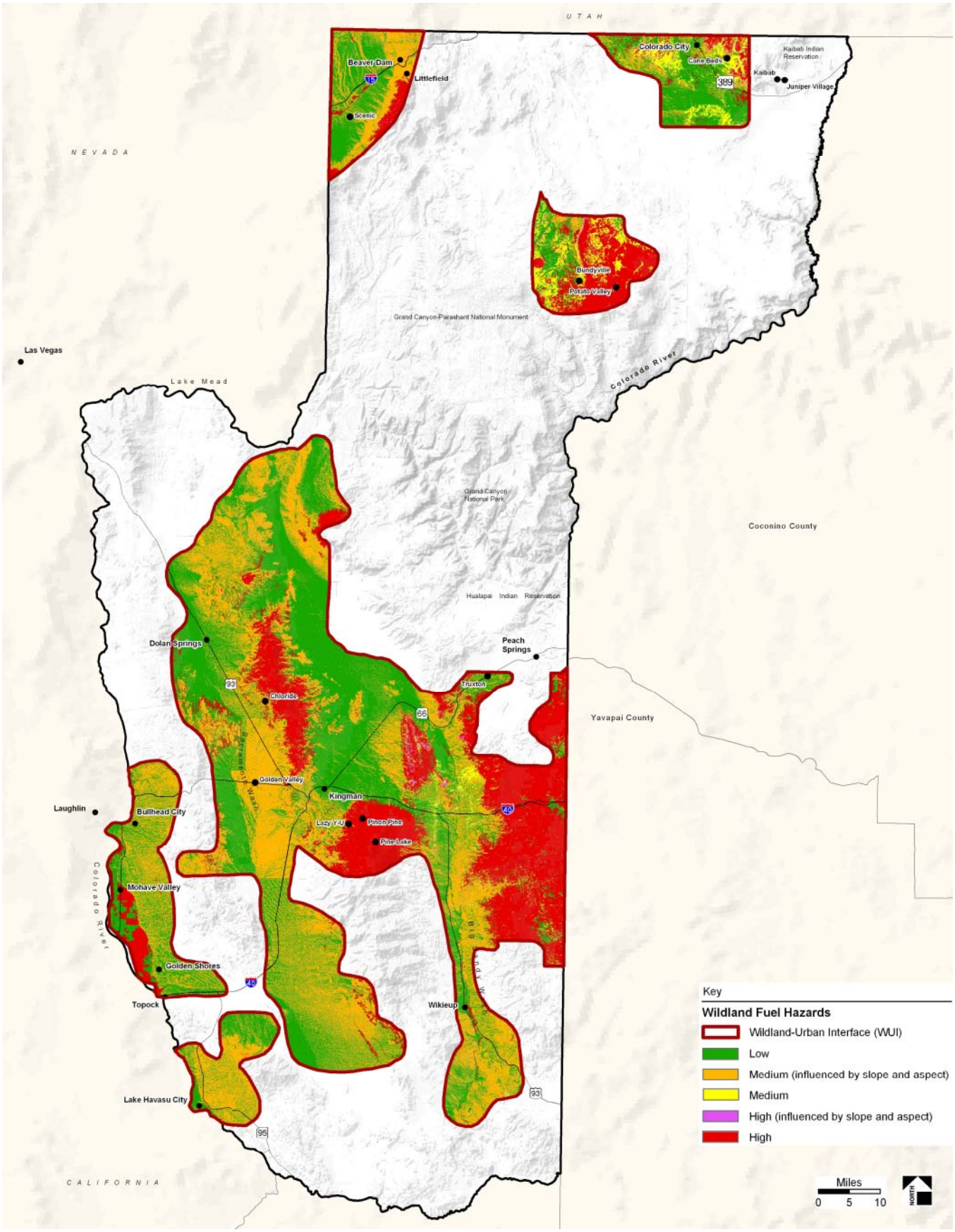


Figure 2.4. Wildland fuel hazards during typical fire season

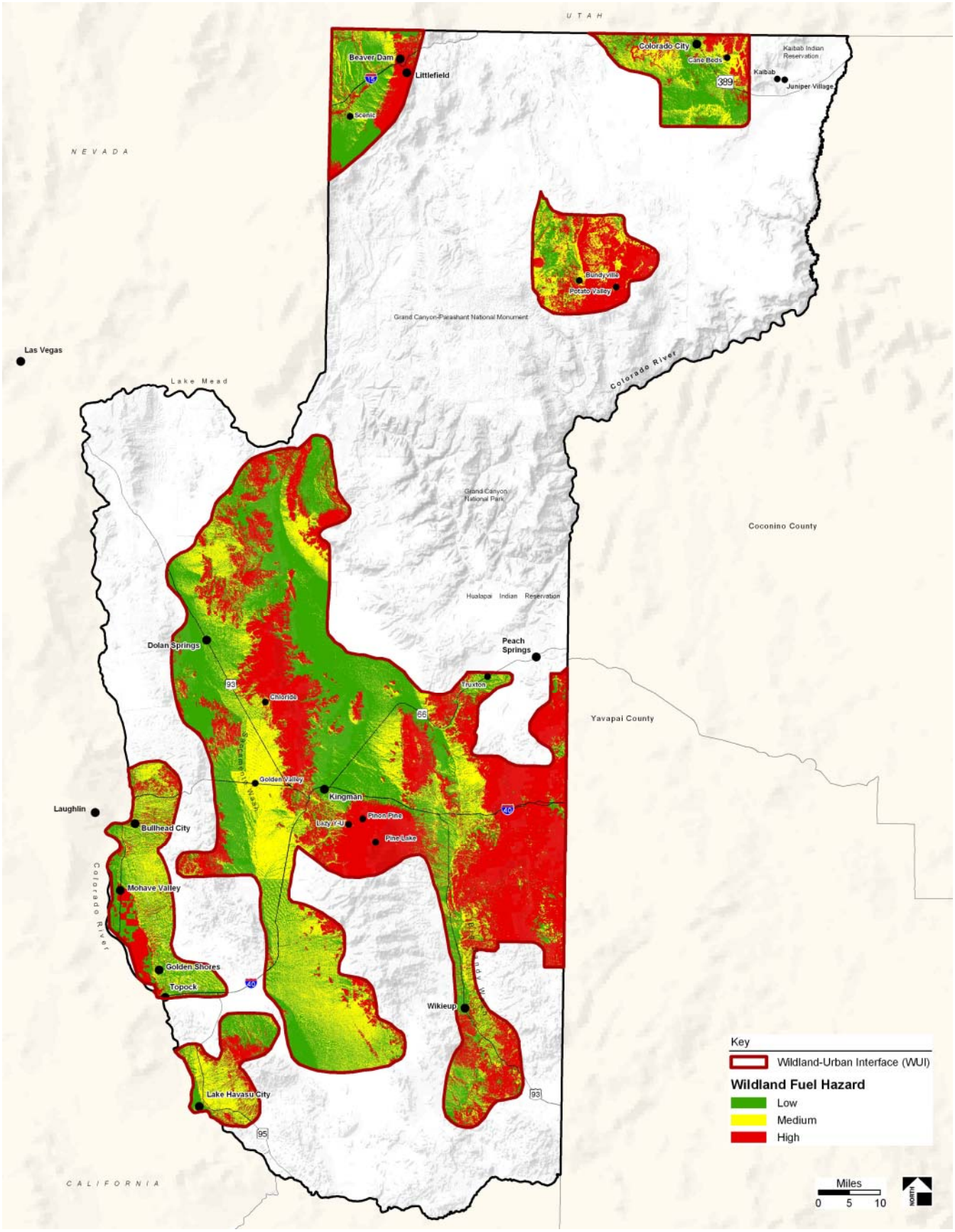


Figure 2.5. Wildland fuel hazards during extraordinary rainfall years

Riparian corridors, shrublands, and vegetative associations occurring in steep slopes with a south or southwest aspect are the greatest wildland fuel hazards within the MCCWPP. Saltcedar-invaded and early-seral-stage riparian habitats constitute a second major wildland fire risk vegetative association. Shrubland areas constitute the next greatest wildland fire risk, in relation to high slopes and south or southwest aspects. In riparian vegetation associations where riparian deciduous tree species are located, total wildland fuels can exceed 20 tons per acre and produce flame lengths greater than 6 feet above the overstory with a rate of spread of over 525 feet (8 chains) per hour. In addition, some shrublands with heavy invasions of nonnative grasses can produce wildfires of high intensity and high rates of spread that are capable of igniting adjacent overstory vegetation. Moderate wildland fuel risk is associated with the ecotone of the riparian and desert upland vegetation associations. In areas where shrub canopy exceeds 35 percent, light fuels produced by the herbaceous understory are reduced because of overstory shading and competition from overstory shrub species. Under extreme fire conditions, upland shrub communities can carry crown fires with moderate intensities and high rates of spread. Lower wildland fire risk occurs in desertscrub communities in which total fuel loading is low with no continuous arrangement of ground or aerial fuels. Desert upland vegetation associations are not fire-dependent communities, and wildfires within desert vegetation associations will be suppressed.

C. Conditions of Ignition and Past Fire Occurrence

Past regional wildfire events are important for determining the potential of an area to support wildland fire. Because of the combination of current drought conditions and a regional history of fires, there will be wildland fire ignitions within the WUI that must be suppressed. The fire history of the planning area, including recent large wildfires that have occurred within or close to the WUI, has been included in this analysis to determine the most likely areas for wildland fire ignition by either natural or human ignition.

Table 2.5 details the high, moderate, and low positive-influence values assigned to fire-start incidents. These include concentrated areas of lightning strikes and human-caused ignitions. High-potential areas have the greatest number of fire starts per 1,000 acres. The areas with the greatest potential for fire ignition, either from natural or human (though unplanned) causes, is located along the eastern portion of the WUI, with other fires occurring in the xeroriparian corridors within and adjacent to the WUI (see Figure 2.6).

Table 2.5. Ignition history and wildfire occurrence

Ignition history and wildfire occurrence component		Value
0–2	Fire starts/1,000 acres	L
2–4	Fire starts/1,000 acres	M
>4	Fire starts/1,000 acres	H

Source: Logan Simpson Design Inc., ASLD, and BLM

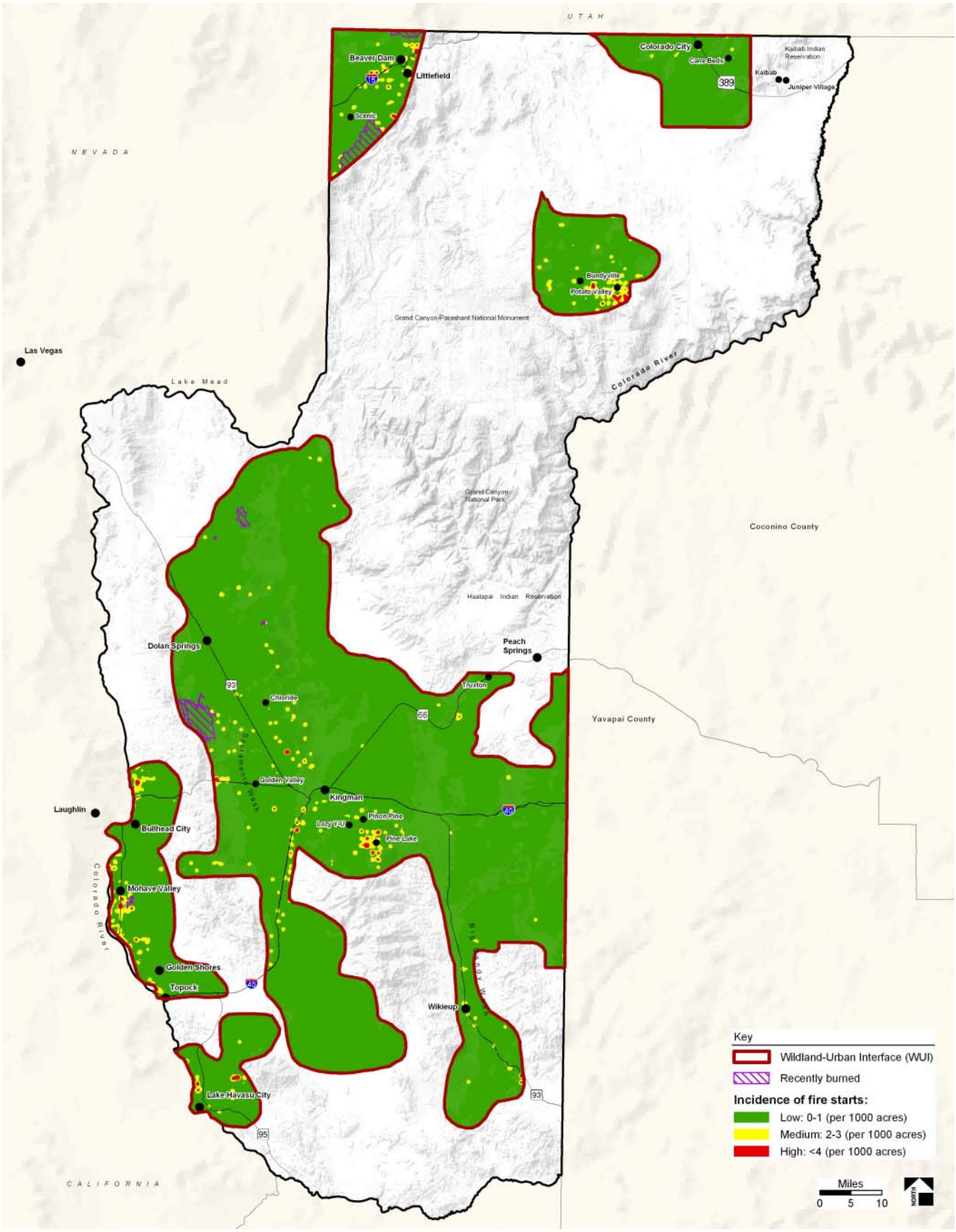


Figure 2.6. WUI ignition history

D. Community Values at Risk

Valued at-risk community resources include private and community structures, communication facilities, power lines, local recreation areas, cultural and historic areas, sensitive wildlife habitat, watersheds, natural resources, and air quality. As agreed to by the Core Teams, developed land and other infrastructures within the area of highest flammability were given the highest priority for protection. In areas where community values occur within or adjacent to areas of high risk due to the fuel hazards of vegetation associations, a cumulative risk from catastrophic wildland fire was created. These areas of cumulative risk are of greatest concern to the community. In accordance with Risk Factor 2: Risk to Social, Cultural and Community Resources identified by the Arizona State Forester (2007b:2), the Core Teams have determined that the Mohave County WUI does include areas consistent with Risk Factor 2, Situations 1, 2, and 3 (see Photos 2.6 and 2.7), as follows:

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

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

The Core Teams identified high-risk areas, including portions of Interstate Highway 40 (I-40), I-15, US 93, SR 95, SR 66, and SR 389, which continue to be the focus of commercial development. Residential community development is occurring throughout the WUI in a mix of high-density, single-family, and multiacre parcels. Structures associated with housing and commercial development located in isolated subdivisions and in more dispersed areas of the WUI are also at high risk. The Core Teams also identified

Photo 2.6. Example of an area of elevated concern

Photo 2.7. Unpaved road to a rural homestead

significant infrastructures, such as the communication tower sites in the Hualapai, Mohave, and Black Mountains, within the designated WUI and have recommended fuel modification treatments that will reduce the potential threat of wildland fire to these facilities. The Core Teams identified transportation corridors that will serve as evacuation routes and resource distribution corridors during a wildland fire. The Core Teams have also recommended fuel modification treatments for evacuation corridors that will provide safe evacuation as well as emergency vehicle response during a catastrophic wildland fire in the WUI.

2. Recreation Areas/Wildlife Habitat

Recreational features—including recreational and camping areas associated with Lake Havasu and Cattail Cove State Parks; the LMNRA, including Pearce Ferry and Katherine Landing; the HNWR; and designated camping and recreation areas within BLM-managed public lands within and adjacent to the WUI—are located throughout Mohave County. The LMNRA provides spectacular scenic vistas of Lake Mead and rugged and isolated backcountry. Striking and dramatic physical features include deep canyons, dry washes, sheer cliffs, distant mountain ranges, the lakes, colorful soils and rock formations, and mosaics of different vegetation.

These features are environmental, economic, and aesthetic resources for the surrounding communities and provide year-round recreational opportunities. Because of the benefits that these recreation areas provide to local citizens and community visitors and the potential for increased human-caused wildfire ignitions with increased recreational use, these areas have been analyzed as community values. The LMNRA Fire Management Plan (NPS 2004a) management objective is for the NPS to "manage the Recreation Area's wildlife and botanic communities to enable the re-establishment of naturally functioning ecosystems."

The WUI also includes known and potential habitat areas for several threatened, endangered, and sensitive (TES) species. Uplands within the WUI provide Mohave and Sonoran desert tortoise habitat, while riparian corridors include southwestern willow flycatcher habitat. The Colorado and Virgin Rivers provide aquatic habitats for native fishes, including the boneytail chub, razorback sucker, Virgin River chub, and woundfin. The land-management agencies use conservation strategies to mitigate risk to these species by implementing programs that meet natural-resource-management goals and objectives. Wildland fuel and vegetative restoration treatments within sensitive-species habitat may require additional site-specific analysis because of the extraordinary circumstances created by the presence of sensitive species or their habitats. The Core Teams reviewed Section 102.a.5.B of HFRA and understand that site-specific evaluations of individual recommended projects will determine whether sensitive wildlife species and habitats would benefit from habitat-enhancing treatments for reducing wildland fuel effect by lessening the threat of catastrophic wildland fire in the vegetative communities of the WUI, while also protecting the recreational values that local residents and visitors associate with the community.

3. Local Preparedness and Protection Capability

For many years, the Insurance Services Office (ISO) has conducted assessments and rated communities on the basis of available fire protection. The rating process grades each community's fire protection on a scale from 1 to 10 (1 is ideal and 10 is poor) based on the ISO's Fire Suppression Rating Schedule. Five factors make up the ISO fire rating: water supply—the most important factor—accounts for 40 percent of

the total rating, while type and availability of equipment, personnel, ongoing training, and the community's alarm and paging system account for the remaining 60 percent of the rating. Some areas within the Mohave County WUI are not within a fire district (FD); the ISO rating for these areas is 10. Other communities and municipalities within the WUI are within an FD and have ISO ratings ranging from 3 to 9; these areas are included in the overall risk analysis as reducing potential of catastrophic wildland fire. ISO ratings will vary within an FD depending on housing densities and distance of structures isolated from (usually 3 to 5 miles) a fire station.

The wildland and structural fire response within the WUI is provided by local fire departments. BLM and local fire departments provide support for initial wildland fire attack response for adjacent areas within the MCCWPP WUI. Initial attack response from additional local fire departments can occur under the authority of mutual-aid agreements between individual departments or under the intergovernmental agreements (IGAs) that individual fire departments or FDs have with the Arizona State Forester.

Land use in the planning area consists primarily of residences; agriculture; livestock production; community businesses; and community services, such as hospitals, schools, organized sports facilities, and airports. Surrounding areas are dominated by state lands, BLM lands, and private properties. Land uses within or close to the WUI include fuelwood cutting, hunting, and other recreational activities (e.g., hiking, bird watching, nature study, photography, and off-road-vehicle use). Section II.E of this CWPP provides a more detailed community assessment.

State Trust lands occur on the periphery of the communities and often surround developed private land parcels. State Trust lands are administered by ASLD, are managed for a variety of uses, and account for 12.31 percent (374,685.50 acres) of the WUI. State Trust lands within and adjacent to the WUI could be identified for sale for residential and commercial development or leased for commercial land development.

The primary block of federal land in the MCCWPP area consists of portions of BLM lands, which are found throughout the WUI. Mohave County provides extensive outdoor recreation opportunities as evidenced by visitor use of Lake Havasu and Cattail Cove State Parks, the LMNRA, and the HNWR. The open space provided by federal lands and recreational opportunities consistent with federal and state parks, in association with the significant wildlife habitats found within the county, provide the "quality of life" amenities that many county residents desire to protect and enhance.

Table 2.6 identifies the different values given to these community value components. Visual representations of these community value components are mapped in Figure 2.7.

Table 2.6. Community values

Community value component	Value
Housing and business structures and infrastructure in the WUI	H
Recreation areas	M
All other areas	L

Source: Logan Simpson Design Inc.

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

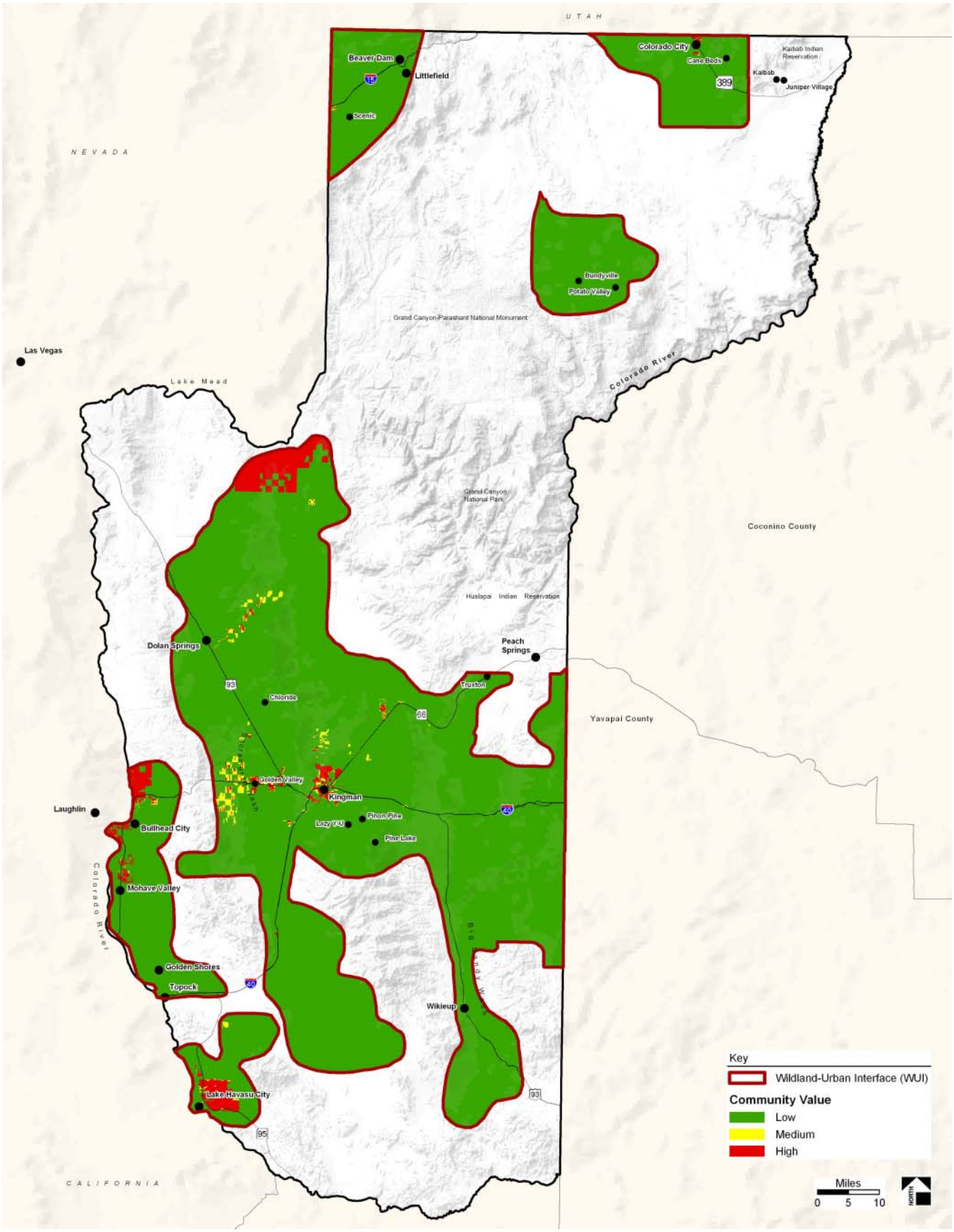


Figure 2.7. MCCWPP community values

E. Summary of Community Assessment and Cumulative Risk Analysis

The major concerns of the Core Teams and collaborators are (1) delayed response time by available mutual-aid fire departments, (2) obtainment of additional firefighting equipment and training, and (3) insufficient dispatch and communication capabilities on initial response units. Additionally, many residences in the identified WUI were not designed with adequate general or emergency vehicle access. Private structures without adequate access and readily available water supplies increase the risk of greater habitat and structural losses from large wildland fires (see Photos 2.6 and 2.7). A short-range goal of the Core Teams is the completion of individual wildland fire home assessments in each community as determined by the local fire department. Some fire departments have developed an incident action plan for sections of the WUI, but further assessments need to be completed. Recommendations to landowners for wildfire risk mitigation are included in Section III of this CWPP. Additional recommendations for remote private lands include identifying properties by placing names or addresses on identification placards or road signs and locating wells or surface water sources that could be used to replenish water supplies for fire response equipment—both ground-based drafting and aerial bucketing—by also placing water-source names on placards or road signs. The Core Teams recommend researching the possibility of an emergency contact autophone redial system for emergency alert notifications within the WUI.

The communities within each WUI are described below in more detail. The community descriptions include data on population and housing units, major transportation routes, major vegetation associations, and a summary of where in the WUI the highest risk of wildland fire occurs. Information (name, location, size) on fires within the last 3 years is included when available. Population and housing data was obtained from the US Census Bureau 2000 data (US Census Bureau 2006) unless noted otherwise.

1. North WUI Communities

Beaver Dam/Littlefield

The Beaver Dam/Littlefield WUI includes the unincorporated communities of Beaver Dam, Littlefield, and Scenic. These are rural communities located along I-15 and adjacent to the Virgin River riparian corridor. I-15 is the only major transportation route into these communities. According to 2000 census data, the population for the zip code that includes Beaver Dam/Littlefield is just over 1,000; no additional information on population or housing units was readily available. The Virgin River Gorge is located to the east of Littlefield. Land ownership within the WUI is primarily BLM land with private landownership scattered along I-15 and within the three main communities. ASLD owns parcels of land along the Virgin River riparian corridor and areas west of I-15.

The areas at highest risk for wildland fires within the WUI occur along the Virgin River riparian corridor, along other local riparian drainages, and along the eastern WUI boundary. I-15 is included in the area of high risk; I-15 has been identified as an evacuation route for this area. Vegetation associations along the eastern boundary, where the fire danger is highest, consists primarily of Great Basin Pinyon-Juniper Woodland and Mixed Desert Scrub. Vegetation associations within the rest of the WUI include Sonora-Mojave Mixed Salt Desert Scrub, North American Warm Desert Montane Riparian, Barren Land, and Inter-Mountain Basins Semi-Desert Shrub Steppe. Analysis of fire-start data for the last 28 years (since 1980)

indicates that highest incidences (<4 per 1,000 acres) of fires are along I-15 and the eastern WUI boundary, with most fire starts occurring east of I-15. The Mount Bangs Complex fire burned 12,200 acres along the eastern boundary, just south and east of Scenic in 2005, and the Jarvis fire burned 2,610 acres along the northern WUI boundary in 2006.

Colorado City

The Colorado City WUI includes the town of Colorado City and the unincorporated areas of Mohave County known as Centennial Park and Cane Beds along SR 389. The population of Colorado City is 3,334 with 457 housing units, of which 183 are owner occupied. SR 389 is the only major transportation route into Colorado City. Colorado City is bordered on the North by Hildale, UT and Utah Highway 59. Land ownership within the WUI is primarily BLM land, with private and ASLD holdings throughout. Privately owned lands are centered around the communities and along SR 389, the southeastern corner of the WUI is largely privately held as well. Vegetation associations within the WUI include the Colorado Plateau Pinyon-Juniper Woodland, Agriculture, Inter-Mountain Basins Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Shrub Steppe, Sonoran Paloverde-Mixed Cacti Desert Scrub, and Barren Lands. The areas of highest risk for wildland fire occur within the Colorado Plateau Pinyon-Juniper Woodland vegetation association in the northeastern corner of the WUI, north and east of SR 389. The areas of high risk incorporate lands adjacent to SR 389, which has been identified as an evacuation route for this area. Fire-start data analysis indicates a relatively low incidence (0–1 per 1,000 acres) of fire starts across the WUI, with a medium level (2–3 per 1,000 acres) of occurrences in the vicinity of and west of Colorado City. The MM9 fire burned 168 acres south of Cane Beds in 2006. The Colorado City Fire District maintains an ISO rating of 3. The Fire District includes the areas of Centennial Park and Cane Beds. The outlying areas of the Fire District have an ISO rating of 9. The FD maintains two type 6 engines, a water tender, three structural type 1 engines and a 100' ladder truck. The Fire District participates in the NIFC red card wildland certification program. The Fire District responds initial attack on fires within the fire district and neighboring BLM lands, working with the Color Country Interagency Fire Center in Cedar City, Utah.

Bundyville

The Bundyville WUI includes the rural areas around Potato Valley and Bundyville (also known as Mount Trumbull). These communities are located north of the Grand Canyon Parashant National Monument. Access to Bundyville is from BLM Road 1069 and Mohave County Road #5, both of which are dirt roads. No population or housing-unit information was readily available. Land within the WUI is owned by BLM, NPS, ASLD, and private entities. The BLM-administered Mount Trumbull Wilderness area is located within the Bundyville sub-WUI. The southern WUI boundary incorporates a portion of the Grand Canyon-Parashant National Monument managed by the NPS; state and private lands are located throughout the WUI with a high percentage of private lands in the middle of the WUI, north of Bundyville.

Vegetation associations within the WUI include the Colorado Plateau Pinyon-Juniper Woodland, Inter-Mountain Basins Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Shrub Steppe, Great Basin Pinyon-Juniper Woodland, Pine Woodland, and Barren Lands. The Colorado Plateau Pinyon-Juniper Woodland is dominant in the eastern half of the WUI, and the Inter-Mountain Basins Sagebrush Shrubland and Semi-Desert Shrub Steppe are the dominant vegetation types in the western half.

The areas of highest risk for wildland fire occur in the eastern half of the WUI within the Colorado Plateau Pinyon-Juniper Woodland association and the Pine Woodland association south of Potato Valley. The area of high risk incorporates lands adjacent to BLM Road 1069 and Mohave County Road #5, the only access roads into the area. Fire-start data analysis indicates that the highest occurrences (<4 per 1,000 acres) of fire in the last 28 years have occurred south of Potato Valley and between Bundyville and Potato Valley. The Stock Pond fire burned 60 acres along the northern WUI boundary in 2006.

2. Southern WUI Communities Identified by Response Areas

Grapevine Mesa

Although population and housing-unit data was not readily available for the Grapevine Mesa response area, this area is showing a steady increase in single-family dwelling construction with many large developments planned for the area. The area supports a large population of summer residents and second homeowners due to its proximity to the LMNRA and Grand Canyon National Park. A segment of Pearce Ferry Road is within this WUI and provides access to the Pearce Ferry at Lake Mead. Much of the WUI includes properties with poor access roads and limited water supply. The Grapevine Mesa Fire Department is the first line of defense for wildland fire suppression for this area and has an ISO rating of 8/9 within its district and 9/10 outside its district. The WUI includes a portion of the LMNRA, managed by NPS and other lands owned by BLM and private entities. The NPS lands are along the northern boundary of the WUI; BLM and private lands are scattered throughout the remaining area. BLM-owned land includes the largest Joshua tree forest in Arizona, and the potential for substantial impacts on the forest is a major concern for BLM and the Grapevine Mesa Fire Department.

Vegetation associations within the WUI include Mixed Desert Scrub, Colorado Plateau Pinyon-Juniper Woodland, Sonora-Mohave Mixed Salt Desert Scrub, Sonoran Mid-elevation Desert Scrub, and Barren Land. The Sonora-Mohave Mixed Salt Desert Scrub association occurs primarily in the north half of the WUI, with mixed Desert Scrub and Barren Lands occurring in the southern half. The Colorado Plateau Pinyon-Juniper Woodland association appears at higher elevations along the eastern WUI boundary.

The areas of highest risk for wildland fire occur within the Colorado Plateau Pinyon-Juniper Woodland and the Sonora-Mohave Mixed Salt Desert Scrub. Areas of high risk for wildland fire include lands adjacent to Pearce Ferry Road, the only access route into Pearce Ferry at Lake Mead. Fire-start data indicates that the entire WUI has a relatively low level of occurrences (0–1 per 1,000 acres), with a scattering of medium-level (2–3 per 1,000 acres) activity in the northern WUI.

Lake Mohave Ranchos

The Lake Mohave Ranchos response area includes the communities of Dolan Springs and other rural areas in the vicinity. Dolan Springs is a desert community at the base of Mount Tipton in the Cerbat Mountains, about 30 miles from Kingman. The population of Dolan Springs is 1,867, with over 1,311 housing units, of which 802 are owner occupied. The only major transportation route in the area is US 93. Pearce Ferry Road provides connectivity to Pearce Ferry at Lake Mead and US 93; Dolan Springs is considered the gateway to Lake Mead and Grand Canyon West. The BLM-administered Mount Tipton Wilderness area lies to the south and east of the community. Dolan Springs is primarily a residential and retirement community that offers several community facilities ranging from parks and a library to a

community center with conference rooms. Private and BLM lands are scattered across the WUI, with larger concentrations of private land ownership around Dolan Springs and Pearce Ferry Road. Some state land parcels and NPS (LMNRA) lands are also located with the WUI. Vegetation associations within the WUI include Mixed Desert Scrub; Inter-Mountain Basins Semi-Desert Shrub Steppe; Sonora-Mohave Mixed Salt Desert Scrub; Sonoran Mid-elevation Desert Scrub; Mogollon Chaparral; Great Basin Pinyon-Juniper Woodland; Developed, Open Space–Low Intensity; and Barren Land.

The areas of highest risk for wildland fire occur within the higher elevations of the Cerbat Mountains and White Hills where Mogollon Chaparral, Great Basin Pinyon-Juniper Woodland, and the Sonoran Mid-elevation Desert Scrub vegetation associations are prevalent, and within the private lands around Dolan Springs. Private lands adjacent to Pearce Ferry Road are also under high risk for wildland fire. Pearce Ferry Road provides access to Pearce Ferry at Lake Mead and should be considered an evacuation route for visitors to that area of the LMNRA. Fire-start data indicates that the majority of the WUI has a low level (0–1 per 1,000 acres) of occurrences with some medium-level (2–3 per 1,000 acres) activity scattered throughout. The White Hills Complex fire burned 2,390 acres within the WUI in 2006.

Chloride

The Chloride response area includes the community of Chloride and other rural areas along US 93 between Kingman and Dolan Springs. Chloride is located at the base of the Cerbat Mountains, and the primary economic base for this area is tourism and recreational activities such as hiking, camping, mountain biking, and rock hounding. According to the 2000 census data for the zip code (86431) that includes Chloride, the population is 352, with 283 housing units, of which 171 are owner occupied. BLM is the major landowner within the WUI, and privately owned lands are primarily located south of Chloride and west of US 93 in the Detrital Valley. ASLD owns a few parcels along US 93 and in Chloride. The Chloride FD has a current ISO rating of 8. This FD will be combining with the Hualapai Valley FD for enhanced administration and fire response. Vegetation associations within the WUI include Mixed Desert Scrub, Sonora-Mohave Mixed Salt Desert Scrub, Sonoran Mid-elevation Desert Scrub, Mogollon Chaparral, Great Basin Pinyon-Juniper Woodland, and Barren Land.

The areas of highest risk for wildland fire occur within the higher elevation of the Cerbat Mountains and Black Mountains where the Mogollon Chaparral, Great Basin Pinyon-Juniper Woodland, and the Sonoran Mid-elevation Desert Scrub vegetation associations are prevalent. High-risk areas include lands adjacent to US 93, which has been identified as a primary evacuation route. Fire-start data for the last 28 years indicates that most of the WUI has a relatively low occurrence (0–1 per 1,000 acres) of fire starts, with scattered medium-level (2–3 per 1,000 acres) activity in the southern WUI. The Union fire burned 2,290 acres in 2006, and the Twin Mills fire burned 11,900 acres in 2005, both of which are along the western WUI boundary.

Hualapai Valley

The Hualapai Valley response area includes the communities of Truxton, Hualapai Valley, Valle Vista, Hackberry, North Kingman, and other rural areas along Route 66 north of Kingman. The Hualapai Valley FD is composed of the Hualapai Valley Fire Department, with an ISO rating of 3; Valle Vista Fire Department, with an ISO rating of 6/9; and the Truxton Fire Department, with an ISO rating of 9.

According to the 2000 census data for the zip code (86401) that includes this area, the population is 38,857, with 17,511 housing units, of which 11,485 are owner occupied. Route 66 has been identified as an evacuation route for the area. The WUI also includes segments of the Burlington Northern Santa Fe Railroad. A majority of the lands within the WUI are owned by private entities and BLM, with scattered holdings by ASLD. The BLM-administered Mount Tipton Wilderness area lies along the western border of the Hualapai Valley sub-WUI. Much of the private lands are within the Hualapai Valley on the north side of the Cerbat Mountains. Vegetation associations within the WUI include Mixed Desert Scrub; Sonora-Mohave Mixed Salt Desert Scrub; Sonoran Mid-elevation Desert Scrub; Mogollon Chaparral; Inter-Mountain Basins Semi-desert Shrub Steppe; Colorado Plateau Pinyon-Juniper Woodland; Great Basin Pinyon-Juniper Woodland; Developed, Open Space–Low Intensity; and Barren Land.

The areas of highest risk for wildland fire occur within the higher elevations of the Cerbat Mountains where the Mogollon Chaparral, Great Basin Pinyon-Juniper Woodland, Colorado Plateau Pinyon-Juniper Woodland, and the Sonoran Mid-elevation Desert Scrub vegetation associations are prevalent, and within the developed areas adjacent to Route 66. Fire-start data for the last 28 years indicates that most of the WUI has a relatively low occurrence (0–1 per 1,000 acres) of fire starts.

Golden Valley

The Golden Valley response area includes the community of Golden Valley and other rural areas along SR 68 and within the Sacramento Valley east of the Black Mountains and west of Kingman. Golden Valley's population is 4,515, with 2,175 housing units, of which 1,552 are owner occupied. SR 68 and US 93 are the primary transportation corridors in the vicinity and have been identified as evacuation routes for the area. Lands within the WUI are primarily owned by private entities, with BLM-owned lands occurring along the western and eastern edges of the WUI at the base of the Black and Cerbat Mountains. The BLM-administered Mount Nutt Wilderness is located south the community west of the Sacramento Valley within the Golden Valley sub-WUI. Vegetation associations within the WUI include Mixed Desert Scrub; Sonora-Mohave Mixed Salt Desert Scrub; Sonoran Mid-elevation Desert Scrub; Mogollon Chaparral; Great Basin Pinyon-Juniper Woodland; and Developed, Open Space–Low Intensity.

The areas of highest risk for wildland fire occur within the higher elevations of the Black and Cerbat Mountains where the Mogollon Chaparral, Great Basin Pinyon-Juniper Woodland, and the Sonoran Mid-elevation Desert Scrub vegetation associations are prevalent, and within the developed areas adjacent to SR 68 and US 93. Fire-start data indicates that the majority of the WUI has a relatively low occurrence (0–1 per 1,000 acres) of fire starts, with slightly higher (medium) levels (2–3 per 1,000 acres) of activity scattered throughout the foothills of the mountain ranges. A high incidence (<4 per 1,000 acres) of fires has occurred adjacent to SR 68 near the western boundary of the WUI. The Black Mountain Complex fire burned 75 acres in 2006 in the foothills of the Black Mountains.

Kingman

The Kingman response area primarily serves the community of Kingman. The Kingman sub-WUI does include some residential development outside but adjacent to the municipal boundaries in which the Kingman FD responds to both structural and wildland fire initial attack. Kingman is situated in the Hualapai Valley between the Cerbat and Hualapai Mountains and is a regional trade, service, and

distribution center for northwestern Arizona. The population for this area is 20,069, with 8,604 housing units, of which 5,604 are owner occupied. Lands near Kingman are predominantly privately owned, with BLM owning most of the lands to the south near the Hualapai Mountains. Major transportation routes into Kingman include I-40, US 93, SR 66, and SR 68; these routes have also been identified as evacuation routes. The Lazy Y-U Ranch development and other residential developments near the base of the Hualapai Mountains have limited access. Evacuation of residents and access to the area by first responders and wildland firefighters is a concern that will be addressed by Mohave County and the Core Teams' recommendations.

Vegetation associations within the WUI include Mixed Desert Scrub; Sonora-Mohave Mixed Salt Desert Scrub; Sonoran Mid-elevation Desert Scrub; Mogollon Chaparral; Great Basin Pinyon-Juniper Woodland; Developed, Open Space–Low Intensity; and Developed, Medium–High Intensity.

The Kingman FD has an ISO rating of 4. The Kingman FD maintains two type 6 engines, one 3,500-gallon water tender with a nonrated pump, four structural type 1 engines with wildland hose and equipment, a single 105-foot ladder truck, and several specialty response vehicles. The Kingman FD has 55 line personnel with various levels of wildland firefighting training and experience and can dispatch duty crews without delay, depending on dispatch information and current local conditions. Off-duty personnel are available for additional suppression support. This FD maintains a mobile command post that may be used in extended major fire events. Since 2000 the Kingman FD has responded to an average of 50 wildland fires annually, with less than 20 percent of the response outside the district boundary.

Most of the WUI is under high risk for wildland fire, including the higher elevations of the Hualapai Mountains where the Mogollon Chaparral, Great Basin Pinyon-Juniper Woodland, and Sonoran Mid-elevation Desert Scrub vegetation associations are prevalent; within the developed areas of Kingman and the Lazy Y-U Ranch; and along the major evacuation routes. The community of Lazy Y-U is not within an FD, and no structural fire response is present; therefore, the community has an ISO rating of 10. Fire-start data for the last 28 years indicates that a high number of occurrences (<4 per 1,000 acres) are located along I-40 and near other developed areas within the WUI.

Pine Lake/Pinion Pine

The Pine Lake/Pinion Pine response area includes the communities of Pine Lake, Pinion Pine, and other rural areas north and south of I-40 and US 93 east of Kingman, including those in the Peacock and Cottonwood Mountains. The BLM-administered Wabayuma Peak Wilderness area is located to south of the communities. Population and housing-unit data was not readily available for Pine Lake/Pinion Pine. Lands south of I-40 near the Hualapai Mountains and in the northern WUI near Truxton are primarily owned by BLM; most of the lands in the middle of the WUI are owned by private entities or ASLD. I-40 and US 93 have been identified as evacuation routes for the area. Many areas of the WUI have limited access, and evacuation of residents and access into the area by first responders and wildland firefighters is a concern that will be addressed by Mohave County and the Core Teams' recommendations. The Pine Lake FD includes 150 improved properties and has an ISO rating of 9; the Pinion Pine FD also has an ISO rating of 9. BLM in association with the local FDs does implement prescribed fire for resource benefit and wildland vegetative fuel management.

Vegetation associations within the WUI include Mixed Desert Scrub, Sonora-Mohave Mixed Salt Desert Scrub, Sonoran Mid-elevation Desert Scrub, Mogollon Chaparral, Great Basin Pinyon-Juniper Woodland, Pine Woodland, Colorado Plateau Pinyon-Juniper Woodland, and Inter-Mountain Basins Semi-desert Shrub Steppe.

The areas at highest risk for wildland fire occur in the higher elevations of the Hualapai, Peacock, and Cottonwood Mountains where the Mogollon Chaparral, Great Basin Pinyon-Juniper Woodland, Sonoran Mid-elevation Desert Scrub, Pine Woodland, and Colorado Plateau Pinyon-Juniper Woodland vegetation associations are prevalent. This includes much of the privately owned parcels, I-40, Pine Lake, and Pinion Pine. Fire-start data for this area indicates that a high number (<4 per 1,000 acres) of fires have occurred near Pine Lake, in the Pine Woodland association, and near Route 66 south of Truxton. The remainder of the WUI has a relatively low occurrence (0–1 per 1,000 acres) of fire.

Yucca

The Yucca response area includes the community of Yucca and other rural areas located along the I-40 corridor south of Kingman. I-40 is the only major transportation route in the area, and it has been identified as an evacuation route. According to the 2000 census data for the zip code (86438) that includes Yucca, the population is approximately 282, with 194 housing units, of which 106 are owner occupied. Lands on the periphery of the WUI near the Hualapai and Mohave Mountains are owned by BLM, and the remainder of the WUI is owned by private entities or ASLD.

Vegetation associations within the WUI include Mixed Desert Scrub, Sonora-Mohave Mixed Salt Desert Scrub, Sonoran Mid-elevation Desert Scrub, and Sonoran Paloverde-Mixed Cacti Desert Scrub.

The areas at highest risk for wildland fire occur within the Sonoran Mid-elevation Desert Scrub vegetation association along the southern foothills of the Hualapai Mountains (along the eastern boundary of the WUI).The rest of the WUI is at a medium to low level of risk for wildland fire. Fire-start data indicates that most of the WUI has a relatively low level (0–1 per 1,000 acres) of fire activity, with a higher (medium) level (2–3 per 1,000 acres) of fires occurring along the I-40 corridor.

Oatman

The community of Oatman is located on Historic Route 66 between Kingman and Bullhead City. Oatman was settled in the late nineteenth and early twentieth centuries as a gold-mining town. Oatman and its 2-mile-away companion town of Goldroad were the largest producers of gold in Arizona in the early twentieth century. Local gold mines were closed during the Second World War; however, the Goldroad mine was reopened from 1995 through 1998. The mine has now become a tourist attraction, providing tours of the site. In 1952, Route 66, the main route from the Midwest to California, bypassed this stretch of mountains to become I-40 from Kingman, Arizona, to Needles, California. Oatman's wild burros are the descendants of burros brought by the miners; when they were no longer needed, they were turned loose. The wild burros wander the streets, greet tourists, and are one of the main tourist attractions of the community. The community includes about 40 gift, antique, and craft shops and several restaurants (Oatman Chamber of Commerce, oatman@oatmangoldroad.com, May 2008). The current access to Oatman is from the north at I-40 by Oatman Road. Access from I-40 at the Colorado River Bridge at Topock is from Old Highway 66, and from Mohave Valley access is from South Oatman Road. Information

from the 2000 census for the zip code (86433) that includes the community of Oatman shows the population at less than 150, with slightly more than 100 housing units. Land ownership within the Oatman area is composed primarily of BLM-administered lands with an intermix of private and state trust lands. The BLM-administered Mount Nut Wilderness area lies to the north, and the Warm Springs Wilderness lies to the south of the communities. Primary vegetation associations include desertscrub types in the lower elevation transitioning to chaparral associations at higher elevations and slopes to the west of the community.

The areas at highest risk of wildland fire occur with the Mogollon chaparral vegetation associations in areas of higher slopes in and to the west of the community. The community of Oatman is included within the Golden Valley sub-WUI, though fire protection is provided by the Oatman Fire Department. The Golden Valley sub-WUI is composed of 193,145 acres, of which 42,396 (22% of the WUI) are classified as high risk; 96,336 (50% of the WUI) are classified as moderate risk; and 54,414 (28% of the WUI) is classified as low risk.

Wikieup

The Wikieup response area includes the community of Wikieup and other rural areas along US 93 and south of I-40. US 93 and I-40 have been identified as evacuation routes for the area. Many areas of the WUI have limited access, and evacuation of residents and access into the area by first responders and wildland firefighters is a concern that will be addressed by Mohave County and the Core Teams' recommendations. According to the 2000 census data for the zip code (85360) that includes Wikieup, the population is 305, with 190 housing units, of which 94 are owner occupied. Lands in the vicinity of Wikieup are owned by BLM, with privately held lands scattered throughout. North of Wikieup in the Aquarius Mountains lands are either privately owned or owned by ASLD.

Vegetation associations within the WUI include Mixed Desert Scrub, Sonora-Mohave Mixed Salt Desert Scrub, Sonoran Mid-elevation Desert Scrub, Sonoran Paloverde-Mixed Cacti Desert Scrub, Colorado Plateau Pinyon-Juniper Woodland, Mogollon Chaparral, North American Warm Desert Montane Riparian, and Inter-Mountain Basins Semi-desert Shrub Steppe.

Most of the WUI is at a high level of risk for wildland fire, especially in the higher elevations of the Aquarius Mountains and Hualapai Mountains where the Colorado Plateau Pinyon-Juniper Woodland, Mogollon Chaparral, and Inter-Mountain Basins Semi-desert Shrub Steppe vegetation associations are prevalent and in areas with a high density of residential communities. Fire-start data indicates that most of the area has had a relatively low number (0–1 per 1,000 acres) of fire occurrences in the last 28 years, with higher occurrences (2–3 per 1,000 acres) occurring along US 93.

Colorado River Communities

The Colorado River Communities response area includes the communities of Mohave Valley, Bullhead City, Golden Shores, Topock, and Fort Mohave Indian Reservation and has over 36.87 miles of shoreline along the Colorado River. Farming; tourism; and recreational activities, such as boating, water skiing, golfing, camping, and gambling (on reservation lands), provide the economic base for these communities. The response area supports a population of over 53,500 people, with over 25,000 housing units. Land ownership within the WUI is diverse: BLM owns lands to the east of SR 95 near the

Black Mountains; FWS manages the HNWR; Fort Mohave Indian Reservation owns lands interspersed with private development in the vicinity of Mohave Valley; NPS manages a portion of the LMNRA at the north end of the WUI; and state-owned and privately owned lands are scattered throughout the remainder of the WUI. Major transportation corridors within the response area include I-40, SR 95, SR 68, and Old Highway 66 (Route 66). The Bullhead City FD has an ISO rating of 4; Mohave Valley FD has an ISO rating 5; and Fort Mohave has an ISO rating of 6.

Vegetation associations within the WUI include North American Warm Desert Montane Riparian; Invasive Southwest Woodland and Shrubland; Sonoran Mid-elevation Desert Scrub; Sonora-Mohave Mixed Salt Desert Scrub, Agriculture; Open Water; Barren Land; and Developed, Open Space–Low Intensity.

The lands at greatest risk of wildland fire are those covered by invasive species such as the shoreline of the Colorado River, the Invasive Southwest Woodland and Shrubland association, and lands within the Sonoran Mid-elevation Desert Scrub association north of SR 95 at the north end of the WUI. Land-management agencies, in association with local FDs, do implement prescribed fire for wildlife habitat enhancement and vegetation fuel management. The vegetation along the Colorado River can consist of near monotypic stands of saltcedar or mixed riparian heavy vegetative fuels. There are currently no agreed upon fuel models for these riparian systems, which have posed difficulty for fire behavior analysts in predicting fire behavior during a wildfire event. Wildfires in this riparian system can produce high-intensity fire with rapid rates of spread during the nontypical fire season with the same consistency as during the normal fire season. This condition poses greater WUI risk than that of upland wildland fuels. Developed areas adjacent to SR 95 and near the Colorado River and associated riparian corridor are at the highest level of risk from wildland fire. Fire-start data indicates that a high level (<4 per 1,000 acres) of fires have started adjacent to SR 95, adjacent to the Colorado River, and within the LMNRA.

Lake Havasu

The Lake Havasu response area supports one major community, Lake Havasu City. The population for this area is 41,938, with 23,018 housing units, of which 13,903 are owner occupied. The Lake Havasu response area has over 26.41 miles of shoreline along the Colorado River. The major transportation corridor for Lake Havasu City is SR 95, which has been identified as an evacuation route. Tourism and recreational activities compose the primary economic base for the area. Lake Havasu was created in 1938 by the construction of Parker Dam along the Colorado River. Lands within the WUI are owned by BLM, FWS (the HNWR), ALSD, and private entities.

Vegetation associations within the WUI include Sonoran Paloverde-Mixed Cacti Desert Scrub; Sonora Mohave Mixed Salt Desert Scrub; Open Water; and Developed, Medium–High Intensity.

The lands at greatest risk for wildland fire are those within the Sonoran Paloverde-Mixed Cacti Desert Scrub association, although much of the WUI is either at a low or medium level of risk for wildland fire. The developed area of Lake Havasu City and those areas adjacent to SR 95 also occur at a high level of risk for wildland fire. Fire-start data indicates that a high level of fire activity (<4 per 1,000 acres) occurs just west of SR 95 and at the eastern edge of the WUI. The majority of the WUI has a low incidence (0–1 per 1,000 acres) of fire starts.

3. Cumulative Risk Analysis

The cumulative risk analysis synthesizes the risk associated with fuel hazards, wildfire ignition points, wildfire occurrence, and community values. These different components were analyzed spatially, and an overall cumulative risk for the WUI was calculated. Table 2.7 and Figure 2.8 display the results of the cumulative risk analyses, identifying the areas and relative percentages of WUI areas of high, moderate, and low risk.

Table 2.7. Cumulative risk levels by percentage of the WUI area

MCCWPP community	High risk (%)	Acres	Moderate risk (%)	Acres	Low risk (%)	Acres	Total acres
Beaver Dam/Littlefield WU	26	41,593	21	33,597	52	82,771	157,961
Colorado City	17	29,419	32	55,070	50	85,537	170,026
Bundyville	54	92,378	29	49,000	17	28,917	170,295
Grapevine Mesa	39	50,448	20	25,280	41	52,101	127,830
Lake Mohave Ranchos	33	115,248	19	67,115	47	163,479	345,842
Chloride	36	46,953	21	27,257	42	54,594	128,804
Hualapai Valley	23	63,167	11	30,874	65	175,751	269,792
Golden Valley	22	42,396	50	96,336	28	54,414	193,145
Kingman	48	32,413	28	18,569	24	16,446	67,428
Pine Lake/ Pinion Pine	62	263,211	17	71,623	22	92,383	427,217
Yucca	8	22,605	48	132,850	44	121,595	277,050
Wikieup	64	244,798	15	56,218	21	79,637	380,652
Colorado River Communities	26	57,120	36	77,897	38	83,426	218,443
Lake Havasu	37	40,344	29	31,686	34	37,543	109,573
Total		1,142,093	38	773,372	25	1,128,594	37

Source: Logan Simpson Design Inc.

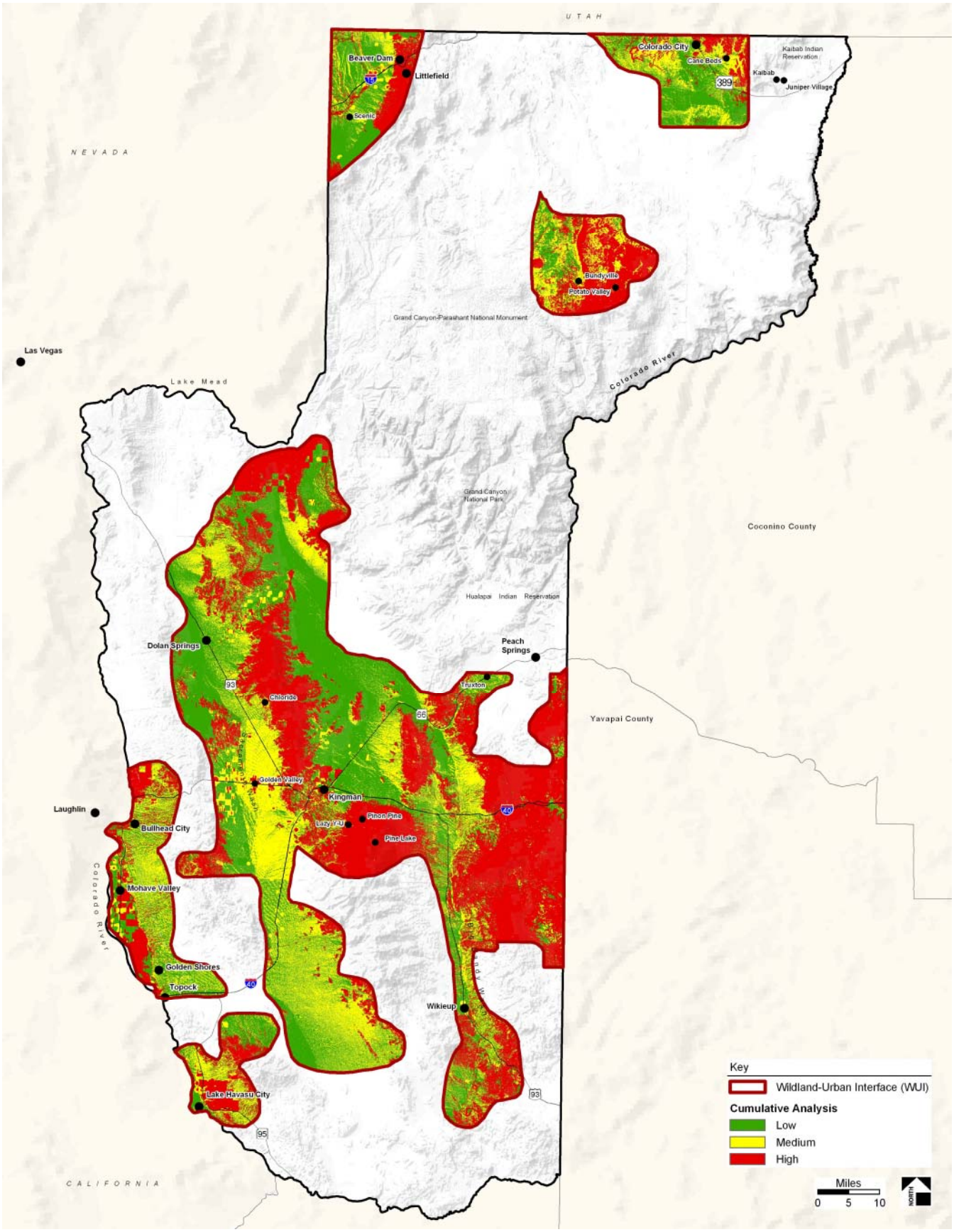


Figure 2.8. MCCWPP cumulative risk analysis

III. COMMUNITY MITIGATION PLAN

This section outlines MCCWPP priorities for wildland fuels treatments as well as the recommended methods of treatment and management strategies for mitigating the potential spread of catastrophic wildland fire throughout the WUI. In addition, this section presents recommendations for enhanced wildland fire protection capabilities and public education, information, and outreach.

A. Fuel Reduction Priorities

After determining the areas at greatest risk for wildland fire (Section II of this CWPP), the Core Teams developed a series of proposed actions, including residential treatments, a series of firebreaks appropriate for the wildland fuel types, and fuel mitigation treatments for undeveloped landscape areas (Table 3.1). Wildland fire mitigation projects have been proposed by the Core Teams for public and private lands classified as at risk. These proposed actions are recommended to prevent wildfire spread from public lands onto private land. Conversely, these treatments will reduce the risk of fires spreading from private property to public lands by reducing wildland fuels and creating a defensible space for wildland firefighters. A primary goal of the MCCWPP is for proposed treatments to be continuous across property boundaries, allowing for the most effective protection from wildfires.

Hazardous fuels reduction recommendations on public lands vary by constituting either a single firebreak in appropriate width and length within the WUI or broader land treatment applications of wildland fuel reduction and habitat restorations adjacent to the WUI. Additional firebreaks or hazardous fuels reduction projects may be developed over time and will conform to the types of treatment recommendations developed by the Core Teams. Firebreak recommendations in vegetative fuel types were developed by the ASFD, BLM, local fire departments, and the Core Teams' participating resource specialists, and they are based on firebrand movement during the peak fire season under normal seasonal weather conditions in relation to slope and fuel type. The recommended land treatments and fuelbreaks will enhance public and firefighter safety, provide for community value protection, enhance restoration of native vegetation, and provide for wildlife habitat needs. There are several designated wilderness areas within the MCCWPP WUI, including the Mount Trumbull, Mount Tipton, Mount Nutt, Wabayuma Peak, and Warm Springs Wilderness areas. Wildland fuel mitigation treatments within wilderness areas will be conducted by the BLM under appropriate wilderness regulations. The Core Teams may recommend fuelbreaks along specific identified private in-holdings adjacent to wilderness boundaries to allow BLM to utilize appropriate management response (Appendix F).

The wildland vegetative fuel and firebreak recommended treatments meet the MCCWPP goals of enhancing firefighter and public safety, reducing hazardous wildland fuels on both public and private lands, improving fire prevention and suppression, restoring riparian and rangeland health, involving the community, and expediting project implementation. To prioritize wildland fuel mitigation projects, the Core Teams analyzed wildland fuel hazards, fire history, and community values. This combined risk assessment was compiled in a single map of the community that depicts areas of low-, moderate-, and high-risk evaluations (Figure 2.8). These risk areas were further identified and categorized into management site-specific areas (treatment management units) of the WUI, with an overall risk value determined for each management area. In the MCCWPP, 101 management units were identified and given overall risk values (Figure 3.1).

Table 3.1. Fuel modification and treatment plans

Treatment No.	1				2		3		4	
	Developed private parcels <2 acres				Undeveloped private parcels or single-structure parcels >2 acres		Grassland firebreaks		Oak/pinyon/juniper and shrublands within the WUI	
Treatment category	**Zone 1** (0–10 feet from structures)	**Zone 2** (10–30 feet from structures)	**Zone 3** (30–100 feet from structures)	**Zone 4** (100–600 feet around home)	**Slopes <20%**	**Streambeds, channels, and slopes ≥20%**	**Slopes <20%**	**Slopes ≥20%**	**Landscape treatment outside firebreaks**	**Firebreaks**
Vegetation	Remove ladder fuels by pruning the lower third of trees or shrubs up to a maximum of 10 feet to reduce flammable vegetation. Remove and destroy insect-infested, diseased, and dead trees and shrubs. Grasses and forbs may be cut with a mower to a 4-inch stubble. Remove dead plant material from ground; prune tree limbs overhanging roof; remove branches within 10 feet of chimney; remove flammable debris from gutters and roof surfaces.	Remove ladder fuels by pruning the lower third of trees or shrubs up to a maximum of 10 feet; remove and destroy insect-infested, diseased, and dead trees. Create separation between trees, tree crowns, and other plants based on fuel type, density, slope, and other topographical features. Reduce continuity of fuels by creating a clear space around brush or planting groups. Grasses and forbs may be cut with a mower to a 4-inch stubble. All snags and vegetation that may grow into overhead electrical lines, other ground fuels, ladder fuels, dead trees, and thinning from live trees must be removed.	Remove ladder fuels by pruning the lower third of trees or shrubs up to a maximum of 10 feet; remove and destroy insect-infested, diseased, and dead trees. Maximum density of trees (whichever is greater: 60 BA at 80–100 trees/acre *or* average density of 100 trees/acre). Grasses and forbs may be cut with a mower to a 4-inch stubble.	For natural areas, thin selectively and remove highly flammable vegetation. Carefully space trees; choose Firewise plants.[a]	Remove ladder fuels by pruning the lower third of trees or shrubs up to a maximum of 8 feet; remove and destroy insect-infested, diseased, and dead trees. Maximum density of trees (whichever is greater: 60 BA at 80–100 trees/acre *or* average density of 100 trees/acre) See fuel modification plan (this section) developed to promote riparian health, to prevent spread of fire to adjacent property, and to create defensible space with considerations for wildlife and groundwater protection. Single structure or structures on parcels in excess of 2 acres should include Treatment 1 in proximity to structures and Treatment 2 for remaining acres.	Remove dead, diseased, and dying trees. Fell dead trees away from stream channels with defined bed and banks. Areas should be hand-thinned and hand-piled; inaccessible areas may be treated with periodic Rx. Develop fuel modification plan (this section) for treatments.	Grassland types may be mechanically treated, including mowing, chopping, or mastication, to reduce or remove vegetation or may be grazed to a stubble height. Ensure that removal of vegetation within a designed firebreak of >1 chain (66 feet) in width and length is sufficient to protect federal, state, or private land values. Fuel reduction treatments within grassland vegetation types may include multiple-entry burns to maintain stand structure and reduce fine fuels. Trees and shrubs >8 inch drc should be thinned to a variable distance of 15 to 35 feet between trees. Trees and shrubs <8 inches drc should be removed. Mechanical/chemical or grazing treatment may be used to maintain firebreaks on private lands. See the fuel modification plan (this section) developed to prevent spread of fire to adjacent property and to create defensible space with considerations for wildlife and groundwater protection.	Same as for slopes <20%. Fuel treatments may require hand-thinning and hand-piling or grazing in steep slopes. Rx may be used to reduce high fire potential (see Treatment 5). Designated firebreaks may be increased to no more than 2 chains in steep slopes where herbaceous (fine fuels) and subshrub species fuel loads increase to pretreatment levels within 3 years. See fuel modification plan (this section) developed to promote forest health, to prevent spread of fire to adjacent property, and to create defensible space with considerations for wildlife and groundwater protection.	Spacing may be variable with a 20- to 35-foot minimum to promote (1) wildlife habitat while breaking horizontal fuel loading, which allows for patches of closely spaced trees for adequate cover, and (2) other habitat components while incorporating openings to increase herbaceous forage production, to maximize edge effect, and to promote fire-resilient stands. Mechanical thinning and Rx (see Treatment 5) can be used to reduce vegetative fuels and move stands toward potential natural vegetation groups as described in the *FRCC Interagency Handbook* (FRCC Interagency Working Group 2005a) or grazed to like conditions. All trees >10 inches drc will be targeted as "leave trees" unless removal is necessary to achieve the desired spacing.	Woodland and shrub trees <8 inches drc will be thinned to a spacing of 15 feet between trees, or Rx will be applied to achieve like conditions. Shrub and tree trunks will be severed <4 inches from the ground. Mechanical treatments, such as crushing, chipping, mastication, and Rx, may be used to create open stands producing flame lengths of ≤4 feet to minimize crown-fire potential and producing vegetative fuel conditions conducive to suppression action. Herbaceous and subshrub understory may be mechanically treated, including mowing, chopping, and masticating, or grazed to limit fine-fuel loading while protecting soil integrity from rainfall runoff.
Slash	Remove or reduce natural flammable material 2–4 feet above the ground around improvements. Remove vegetation that may grow into overhead electrical lines, ladder fuels, and dead trees. Thinning from live trees must be removed (chipped, etc.). Remove all leaf litter to a depth of 1 inch.	Control soil erosion from small waterflow channels by use of rock or noncombustible velocity-reducing structures. Remove all leaf litter to a depth of 1 inch.	Same as Zones 1 and 2.	Slash may be burned, piled and burned, or chipped and removed. Slash from grassland treatments may be burned, removed, masticated, turned, or grazed for like treatment.	All slash, snags, and vegetation that may grow into overhead electrical lines; other ground fuels; ladder fuels; dead trees; and thinning from live trees must be removed, mechanically treated (chipped, etc.), or piled and burned along with existing fuels.	Clean dead and down debris in channels where debris may be mobilized in floods, thus creating downstream jams. Some slash and debris can be scattered and retained in small, ephemeral streambeds in which slash can help retain runoff and sediment and provide headcut stabilization.	Slash from grassland treatments may be burned, removed, masticated, or turned (disked).	Same as for slopes <20%; however, slash may be hand-piled and ignited with Rx as the primary slash reduction treatment.	Slash may be burned, piled and burned, or chipped and removed. Slash from grassland treatments may be burned, removed, masticated, or turned.	Slash may be burned, piled and burned, or chipped and removed. Slash from grassland treatments may be burned, removed, masticated, or turned.

Note: BA = basal area; R_x = prescribed fire; drc = diameter at root collar; ASLD = Arizona State Land Department; BLM = Bureau of Land Management; WUI = wildland-urban interface.

[a]A list of Firewise plants can be found in the Firewise literature listed in Appendix C, Educational Resources.

Continued

Table 3.1. Fuel modification and treatment plans

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

Note: BA = basal area; R_x = prescribed fire; drc = diameter at root collar; ASLD = Arizona State Land Department; BLM = Bureau of Land Management; WUI = wildland-urban interface.

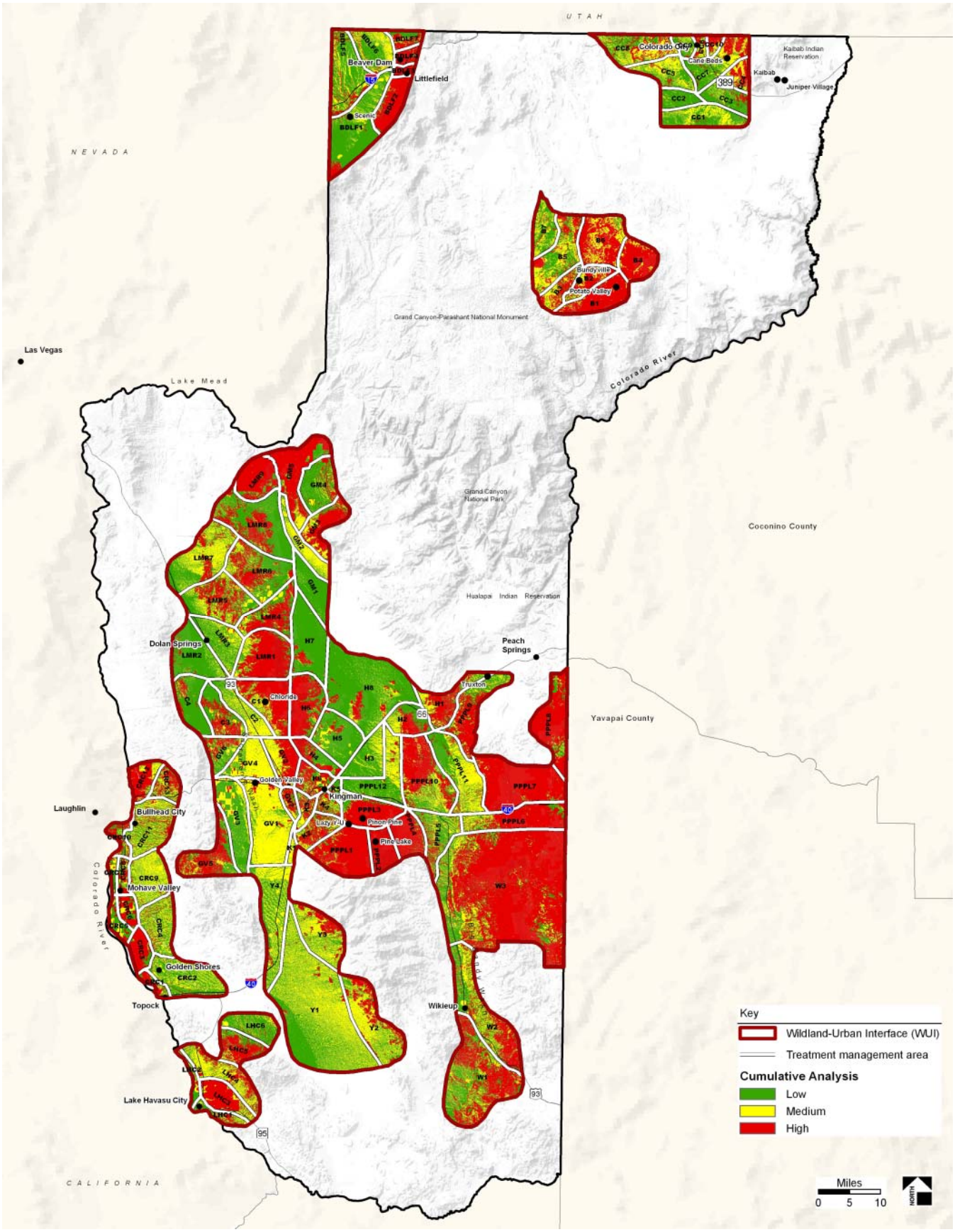


Figure 3.1. MCCWPP treatment management units

The Core Teams described the location of each management unit in the WUI and then assigned recommended treatments for each unit (Table 3.2).The treatment management areas listed in Table 3.2 do not always coincide with FD boundaries or lie within established FDs; for example, Lazy Y-U is not in any FD or under BLM jurisdiction for fire protection, and therefore, no FD is responsible for that community's treatment management.

Table 3.2. Identified treatment management units

Treatment management area	Map ID	Risk value	Location and description	Recommended treatment[a]	Total acres	Federal acres	State Trust acres[b]	Nonfederal acres[b]
Beaver Dam/ Littlefield (BDLF)	BDLF1	Low	Area generally east of the Virgin River and west of the Virgin Mountains, south of I-15; includes the community of Scenic	1,2,4,8, 9,	50,587	43,542	1,216	5,829
	BDLF2	High	Foothills of the Virgin Mountains south of Littlefield	4,5,8	20,726	20,726	—	—
	BDLF3	High	Area generally includes the lands surrounding the community of Littlefield	1,2,4,8,9	3,934	3,790	—	144
	BDLF4	High	Area generally includes the lands surrounding the community of Beaver Dam	1,2,4,8,9	6,636	6,594	—	42
	BDLF5	Moderate/ high	Area north of the Virgin River and west of Beaver Dam Wash; includes I-15	4,5,8,9	41,782	34,719	2,404	4,659
	BDLF6	Low/ moderate	Area generally includes the lands east of Beaver Dam Wash and west of Beaver Dam Mountains, north of I-15	1,2,3,5,7,9	25,352	20,252	2,452	2,647
	BDLF7	High	Lands north of Beaver Dam and west of the Beaver Dam Mountains	4,5,7,9	9,093	9,093	—	—
Colorado City (CC)	CC1	Low	Area between Rouch Road and the southern WUI boundary	1,2,3,4,5,6,8	27,731	14,458	5,866	7,406
	CC2	Low	Area between Sandridge Wash and Rouch Road	1,2,3,4,5,6,8	12,103	8,873	1,717	1,514
	CC3	Low	Area generally south of SR 389 and north of Rouch Road	1,2,3,4,5,6,8	17,940	1,771	4,303	11,866
	CC4	High	Area generally north of SR 389 and southeast of Cane Beds	1,2,3,4,5,8	11,441	6,513	2,258	2,670
	CC5	Moderate	Area north of Sandridge Wash and south of Cane Beds Road	1,2,3,4,5,8	22,642	15,975	2,402	4,266
	CC6	High	Community of Colorado City	1,2,3,6	5,405	1,178	15	4,212
	CC7	Moderate/ high	Community of Cane Beds and lands north and south of SR 389	1,2,3,4,5,6,8	28,839	12,139	2,061	14,640

Continued

Table 3.2. Identified treatment management units

Treatment management area	Map ID	Risk value	Location and description	Recommended treatment[a]	Total acres	Federal acres	State Trust acres[b]	Nonfederal acres[b]
	CC8	Moderate/ high	Area generally between Short Creek to the east and the WUI boundary to the west	1,2,4,5,8	32,976	25,994	3,834	3,147
	CC9	Low/ moderate	Area bounded by Short Creek to the south and the WUI boundary to the north, west of SR 389	1,2,4,5,8	7,133	1,878	953	4,302
	CC10	High	Area north of Cane Beds and bounded by Rose Canyon Road to the east and Cottonwood Springs Wash to the west	1,2,4,5,8	4,592	4,290	—	302
Bundyville (B)	B1	Moderate	Area generally in the vicinity of Potato Valley in the southeastern portion of the WUI including the Mt Trumbull Wilderness Area	1,2,4,5,6,8	26,120	21,943	2,062	2,115
	B2	High	Area includes lands in the general vicinity of Bundyville including the Mt Trumbull WA	1,2,4,5,6,8	15,469	8,564	2,696	4,209
	B3	High	Area includes lands to the west of Bundyville	1,2,4,5,6,8	14,619	6,228	1,365	7,026
	B4	High	Area includes BLM lands in the eastern portion of the WUI, northeast of Potato Valley including the Mt Trumbull WA	1,2,4,5,6,8	21,707	17,190	2,178	2,339
	B5	High	Area generally within the private and state lands in the middle of the WUI	1,2,4,5,6,8	37,307	15,843	7,291	14,173
	B6	High	Area includes BLM lands in the northern portion of the WUI, north of Bundyville	1,2,4,5,6,8	36,115	31,637	3,065	1,413
	B7	Moderate/ high	Area includes BLM lands in the northwestern portion of the WUI	1,2,4,5,6,8	19,156	14,045	3,832	1,279
Grapevine Mesa (GM)	GM1	Low	Southern portion of the WUI, east of Pearce Ferry Road	1,2,8	22,709	12,057	—	10,651
	GM2	Moderate	Area includes lands south of the LMNRA to the east the WUI boundary	1,2,4,5,8	18,473	11,117	—	7,356
	GM3	High	Area primarily includes BLM lands at the south end of the Grapevine Mesa, to the eastern WUI boundary	1,2,4,5,8	22,834	18,528	—	4,306
	GM4	Moderate	Area includes private parcels along Pearce Ferry Road in Grapevine Mesa, to the eastern WUI boundary	1,2,4,5,8	27,255	17,024 (666 NPS)	258	9,973
	GM5	High	Northern portion of the WUI that includes the LMNRA	1,2,4,5,8	40,472	31,724 (23,957 NPS)	70	8,679

Continued

Table 3.2. Identified treatment management units

Treatment management area	Map ID	Risk value	Location and description	Recommended treatment[a]	Total acres	Federal acres	State Trust acres[b]	Nonfederal acres[b]
Lake Mohave Ranchos (LMR)	LMR1	High	BLM lands near the Cerbat Mountains including the Mt. Tipton WA	1,2,4,5,8	41,232	32,959	627	7,645
	LMR2	Low	Area west of US 93, west of Dolan Springs to the WUI boundary	1,2,3,8	35,333	13,759	1,210	20,364
	LMR3	Moderate	Area generally includes the development surrounding the community of Dolan Springs, east of US 93	1,2,3,4,8	26,273	9,500	1,586	1,5186
	LMR4	High	Area east of Pearce Ferry Road to the eastern WUI boundary including the Mt. Tipton WA	1,2,4,5,8	29,976	15,381	1,501	13,094
	LMR5	Moderate/ high	Area generally east of US 93 and west of Pearce Ferry Road, north of Dolan Springs including the Mt. Tipton WA	1,2,4,5,8	43,377	27,598	79	15,700
	LMR6	Moderate/ high	Lands generally northwest of Pearce Ferry Road and west of Antares Road including the Mt. Tipton WA	1,2,3,5,8	44,922	22,293	1,209	21,420
	LMR7	Moderate/ high	Lands to the east of US 93 and southeast of the WUI boundary	1,2,3,5,8	48,071	23805	1,285	22,982
	LMR8	Moderate/ high	Area south of the LMNRA, to the western WUI boundary, and west of Antares Road (the eastern WUI boundary)	1,2,3,5,8	56,292	30,150	1,297	24,845
	LMR9	High	Portion of the LMNRA in the north edge of the WUI	1,2,3,5,8	25,231	22,145 (18,717 NPS)	—	3,087
Chloride (C)	C1	High	Area includes the community of Chloride to the northern and eastern WUI boundary	1,2,3,5,6,8	36,212	29,652	1,010	5,549
	C2	Moderate	Lands generally adjacent to US 93 as it crosses through the WUI	1,2,3,5,8	22,550	11,253	1,945	9,352
	C3	High	Area generally between Detrital Wash and the foothills of the Black Mountains	1,2,3,8	23,716	17,002	564	6,150
	C4	Moderate	Eastern foothills of the Black Mountains to the WUI boundary	1,2,3,8	25,211	13,478	—	11,733
Hualapai Valley (H)	H1	High	Area includes the lands in the northernmost section of the WUI, north of SR 66; includes the community of Truxton and the Grand Wash Cliffs	1,2,3,4,5,8	24,974	16,258	615	8,101
	H2	High	Area includes the area south of SR 66 to the WUI boundary	1,2,3,4,5,8	20,045	8,213	807	11,025

Continued

Table 3.2. Identified treatment management units

Treatment management area	Map ID	Risk value	Location and description	Recommended treatment[a]	Total acres	Federal acres	State Trust acres[b]	Nonfederal acres[b]
	H3	Low/ moderate	Area north of Kingman, east of SR 66 to the WUI boundary	2,3,8	24,585	72	7,284	72
	H4	High	Area north of Kingman, west of SR 66	1,2,3,4,5	22,176	9,922	2,340	9,914
	H5	Moderate	Area includes a portion of Hualapai Valley, west of SR 66	1,2,3,8	31,715	285	6,363	25,067
	H6	High	Area includes a portion of the Cerbat Mountains, east of Chloride	1,2,3,4,5,	33,268	19,969	3,168	10,131
	H7	Moderate	Western edge of the WUI, east of Pearce Ferry Road including the Mt. Tipton WA	1,2,3,5,8	41,521	17,675	37	23,809
	H8	Moderate	Area includes a large portion of the Hualapai Valley, north and west of SR 66 to the north WUI boundary	1,2,3,5,8	89,417	12,363	11,437	65,617
Golden Valley (GV)	GV1	Moderate/ high	Sacramento Valley, east of Sacramento Wash, to I-40; the community of Golden Valley, south to the WUI boundary	1,2,3,8	55,591	2,718	1,891 (730 other)	50,982
	GV2	Moderate/ high	Area east of US 93 to the WUI boundary	1,2,3,4,	14,374	9,339	1,055	3,980
	GV3	Low/ moderate	Sacramento Wash west to the Black Mountains the Wabayuma Peak WA	1,2,3,8	36,326	7,141	—	29,185
	GV4	Moderate	Area generally north of SR 68, west of US 93, and east of BLM lands in the Black Mountains	1,2,3,8	26,566	3,621	441	22,503
	GV5	High	Portion of the WUI within the Black Mountains in the vicinity of Oatman the Wabayuma Peak WA	1,2,3,8	31,074	22,151	536	8,387
	GV6	High	BLM lands north of SR 68 at the Black Mountains to the WUI boundary	1,2,3,8	16,619	7,382	643	8,593
	GV7	High	BLM lands at the eastern edge of the WUI, south of the intersection of US 93 and SR 68	1,2,3	7,019	5,883	20	1,115
Kingman (K)	K1	Moderate	Area within the WUI south of Griffith Wash and east of I-40	1,2,3	4,098	2,513	48	1,537
	K2	High	Area includes BLM lands in the Hualapai Mountains and the community of Lazy Y-U	1,2,3,4,5	18,011	13,675	844	3,493
	K3	High	Area generally surrounding the community of McConnico, south of the US 93/I-40 intersection	1,2,3	9,024	3,551	223	5,240

Continued

Table 3.2. Identified treatment management units

Treatment management area	Map ID	Risk value	Location and description	Recommended treatment[a]	Total acres	Federal acres	State Trust acres[b]	Nonfederal acres[b]
	K4	High	Area south of Hualapai Mountain Road to the WUI boundary	1,2,3	8,410	2,711	988	4,711
	K5	High	Area north of Hualapai Mountain Road, east of Kingman to the WUI boundary	1,2,3	3,807	—	642	3,165
	K6	High	Area includes Kingman and the area generally bounded by SR 66 on the east, US 93 on the west, I-40 on the south, and the WUI boundary on the north	1,2,3	15,775	2,047	1,282	2,047
Pine Lake/ Pinion Pine (PPPL)	PPPL1	High	Area in the Hualapai Mountains, east of Pine Lake to the western WUI boundary, south of Pinion Pine including the Wabayuma Peak WA	1,2,4,5,8	39,480	35,989	916 (local or ASP)	2,575
	PPPL2	High	Area includes the general vicinity of Pine Lake in the Hualapai Mountains and lands south to the WUI boundary	1,2,4,5,8	17,726	15,218	1,918 (1,346 local or ASP)	590
	PPPL3	High	Area includes the general vicinity of Pinion Pine in the Hualapai Mountains, south of I-40 the Wabayuma Peak WA	1,2,3,4,5,8	27,321	17,752	2,629	6,939
	PPPL4	High	Area in the Hualapai Mountains, east of Pine Lake the Wabayuma Peak WA	1,2,3,4,5,8	21,512	15,228	2,680	3,604
	PPPL5	High	Area generally south of I-40, west of US 93, and east of the Hualapai Mountains	1,2,3,8	27,060	5,032	9,556	12,472
	PPPL6	High	Area south of I-40, to the WUI boundary, east of Hackberry Wash	1,2,4,5,8	39,149	—	18,589	20,561
	PPPL7	High	Area generally includes the Cottonwood Mountain, north of I-40 to the WUI boundary	1,2,4,5,8	60,660	—	26,003	34,657
	PPPL8	High	Lands in the far northeastern section of the WUI	1,2,4,5,8	37,601	689	14,015	22,869
	PPPL9	High	Area includes the community of Truxton and the area south of SR 66 to the WUI boundary	1,2,4,5,8	34,045	22,273	1,363	10,409
	PPPL10	High	Area generally between Hackberry Wash to the east and the western edge of the Peacock Mountains and north of I-40	1,2,4,6,8	53,561	881	15,916	36,764
	PPPL11	Moderate	Area generally east of Hackberry Wash and west of the Cottonwood Mountains	1,2,3,8	42,909	4,142	20,402	18,366

Continuec

Table 3.2. Identified treatment management units

Treatment management area	Map ID	Risk value	Location and description	Recommended treatment[a]	Total acres	Federal acres	State Trust acres[b]	Nonfederal acres[b]
	PPPL12	Moderate	Area generally bounded by the Peacock Mountains to the east, the WUI boundary to the north and west, and I-40 to the south	1,2,3,8	34,534	1,431	15,563	17,540
Yucca (Y)	Y1	Moderate	Area south and west of Alamo Road to the WUI boundary the Warm Springs WA	1,2,3,8	146,608	36,105	5,838	104,665
	Y2	Moderate/ high	Area generally northeast of Alamo Crossing Road to the Hualapai Mountains	1,2,3,8	46,354	13,463	7,276	25,615
	Y3	Moderate/ high	Area generally north of Alamo Crossing Road to the Hualapai Mountains the Warm Springs WA	1,2,3,8	34,962	21,335	—	13,627
	Y4	Moderate	Area includes the lands adjacent to I-40 to the WUI boundary	1,2,3,8	47,796	24,572	932	21,992
Wikieup (W)	W1	High	Area south of Wikieup and south of US 93, to the southern WUI boundary	1,2,3,4,7,8,9	81,962	52,346	—	29,617
	W2	High	Area includes the lands surrounding the community of Wikieup and the area adjacent to US 93 to Cane Springs; includes Big Sandy Wash	1,2,3,4,7,8,9	56,461	36,671	—	19,789
	W3	High	Area adjacent to and east of US 93 to the eastern WUI boundary; includes the Aquarius Mountains and Knight Creek	1,2,3,4,7,8,9	240,744	12,824 (703 tribal land)	88,713	139,207
Colorado River Communities (CRC)	CRC1	High	HNWR	1,2,3,5,7,9	6,204	5,301 (109 tribal land)	721	182
	CRC2	Moderate	Area includes the community of Golden Shores and the southeast section of the WUI including a section of I-40	1,2,3,8	38,208	7,795 (304 tribal land)	5,942	24,472
	CRC3	High	Area includes the southernmost portion of lands owned by Fort Mohave Indian Reservation, north of the HNWR	1,2,3,5,6,7,9	12,958	11,712 (3,252 tribal land)	527	718
	CRC4	Moderate/ high	BLM lands at the Black Mountains, south of Boundary Cone Road	1,2,3,5,8	27,289	25,589 (291 tribal land)	1,325	375
	CRC5	High	Portions of Fort Mohave Indian Reservation, west of SR 95, south of Mohave Valley	1,2,3,5,6,7,9	8,905	5,640 (all tribal land)	—	3,265
	CRC6	High	Portion of Fort Mohave Indian Reservation, east of SR 95, south of Mohave Valley	1,2,3,5,6,7,9	97,59	4,237 (4,216 tribal land)	—	5,521

Continued

Table 3.2. Identified treatment management units

Treatment management area	Map ID	Risk value	Location and description	Recommended treatment[a]	Total acres	Federal acres	State Trust acres[b]	Nonfederal acres[b]
	CRC7	High	Lands generally west of SR 95 in western Mohave Valley	1,2,3,5,6,7,9	4,607	4,607 tribal land	—	—
	CRC8	High	Area includes the community of Mohave Valley and portions of SR 95	1,2,3,5,6,7,9	7,636	4,237 (4,217 tribal land)	90	5,571
	CRC9	Moderate/ high	BLM lands within the Black Mountains, north of Boundary Cone Road	1,2,3,8	29,964	20,280 (493 tribal land)	4,930	4,753
	CRC10	High	Area generally west of SR 95, west and south of Bullhead City	1,2,3,5,6,7,9	9,140	1,299 (251 tribal land)	850	6,766
	CRC11	High	Area includes Bullhead City, a portion of SR 95, east to the Black Mountains	1,2,3,8	36,395	10,053	4,896	21,447
	CRC12	High	LMNRA, includes Katherine Landing and a portion of SR 68	1,2,3,6,7,9	15,777	12,694 (10,258 NPS)	753	2,331
	CRC13	High	Area generally east of the LMNRA and north of SR 68	1,2,3,8	13,541	9,984	1,301	2,257
Lake Havasu City (LHC)	LHC1	High	Lands west and south of SR 95 to the southern WUI boundary	1,2,3,6,7,9	9,088	7,229	1,205	654
	LHC2	High	Lands adjacent to the Colorado River, west of SR 95	1,2,3,6,7,9	6,326	6,574 (3,246 FWS)	310	647
	LHC3	High	Developed area around Lake Havasu City, generally north and east of SR 95; includes portions of SR 95	1,2,3	21,551	2,496	2,763	16,293
	LHC4	High	Primarily state lands, east of Lake Havasu City to the eastern WUI boundary; includes a section of SR 95	1,2,3	31,284	12,008 (1,747 FWS)	15,159	4,116
	LHC5	High	Area includes the foothills of the Mohave Mountains, north of Lake Havasu City	1,2,3	20,021	15,064	—	4,956
	LHC6	Moderate	Area in the northeastern most section of WUI; includes a mix of private and BLM lands near the Mohave Mountains	1,2,3	21,323	14,522	—	6,801

Note: FWS = US Fish And Wildlife Service; HNWR = Havasu National Wildlife Refuge; LMNRA = Lake Mead National Recreation Area; NPS = National Park Service; WA = Wilderness Area.
[a] See Table 3.1 for recommended treatments.
[b] "—" indicates no State Trust or nonfederal acres within the treatment management area.

Private land treatments in the WUI typically occur on small land parcels near power lines, structures, and other obstacles. In many cases, cut trees and slash cannot be piled and burned on small private land parcels, or it is not the preferred slash treatment by the owner of a small residential lot or by the local fire departments. Therefore, the Core Teams recommend that wildland fuel reduction treatments on small

residential parcels normally include that slash be removed whole or chipped and transported to a disposal site. The Core Teams are not opposed to considering alternate vegetative treatments to achieve wildland vegetative fuel mitigation objectives, such as an experimental grazing program using primary grazers within the WUI, adjacent to state or federal lands. The Core Teams also recommend that fallow agricultural lands be restored through the planting of native vegetation species in accordance with the *National Conservation Practice Standards, Range Planting*, Code 550 (NRCS 2002). The Core Teams also recommend that firebreaks constructed on both public and private lands be maintained in accordance with the above-mentioned mitigation measures and stipulations on a rotating 2- or 3-year interval, or as deemed necessary, to ensure the integrity of the firebreak through removal of fine and light vegetative fuels, therefore restricting wildland fire movement.

Treatment of wildland fuels within the WUI is expected to generate considerable slash and vegetative waste material. Private individual use of wood products from fuel reduction treatments within the WUI is primarily for fuelwood. Commercial use of the woody material from fuel reduction treatments is also primarily limited to fuelwood, and any commercial value of treatment by-products will not significantly affect treatment costs. If wildland fuel modification prescriptions require follow-up pile burning or herbicide application after vegetation treatment, the total cost/acre treated could be as high as $5,000.00/acre on small land parcels consisting mostly of individual plant treatments within a riparian corridor and as high as $3,500/acre for small acreage treatments in heavy chaparral/timber (USDA and New Mexico Energy, Minerals and Natural Resources Department, Forestry Division 2005).

For private land treatments to be both fiscally reasonable and timely, the Core Teams investigated land treatment costs from a variety of sources. Equivalent land treatment costs are not directly available for the MCCWPP WUIs. Costs estimates within northern Arizona average $12,000.00/acre on timbered private parcels and slightly less than $600.00/acre for forested landscape treatments that produce a fire-resilient stand appropriate for the habitat (Lloyd Wilmes, Sitgreaves Community Wildfire Protection Plan Coordinator, personal communication). Within nontimbered vegetative stands of the MCCWPP WUI, the estimates for land treatment costs vary by vegetation type, geography, and distance from communities. Within nontimbered stands of the MCCWPP WUIs, estimates for land treatments costs are based on per acre estimates for roller chopping, mastication, and other mechanical vegetative fuel treatments, including broadcast burning at $950.00/acre.

The Core Teams recommend that when available, wildland fuel modification projects be contracted to ASFD to ensure that treatments are conducted in a timely fashion and at a reasonable cost. However current cost estimates for treatments in the WUI are based on the estimates produced by the Core Teams.

The Core Teams recommend that private landowners who wish to adopt fuel modification plans other than those described in Table 3.1 should have the plan prepared or certified by a professional forester, a certified arborist, or other qualified individuals. Fuel modification plans for federal and state lands within 0.5 mile of private land may be prepared for wildlife and watershed benefits, including the retention of large snags or vegetative patches of high wildlife value, in areas more than 600 ft from private lands in which fire resiliency is not impaired and will not compromise public or firefighter safety. A fuel modification plan must identify the actions necessary to promote rangeland, wildlife, or watershed health and to help prevent the spread of fire to adjacent properties by establishing and maintaining defensible space. The action identified

by the fuel modification plan should be completed before development of the property or identified during project initiation on federal and state lands.

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

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

- A copy of the site plan
- Methods and timetables for controlling, changing, or modifying fuels on the properties in a timely and effective manner
- Elements for removal of slash, snags, and vegetation that may grow into overhead electrical lines; removal of other ground fuels, ladder fuels, and diseased, dying, and dead trees; and thinning of live trees
- Methods and timetables for control and elimination of diseased or insect-infested vegetation
- A plan for the ongoing maintenance of the proposed fuel reduction and control measures for disease and insect infestations
- A proposed vegetation management plan for groupings of parcels under multiple ownership that has been accepted by all individual owners (subject to compliance with this section)

HFRA was designed to expedite administrative procedures for conducting hazardous wildland fuel reduction and restoration projects on federal lands. Regardless of priority treatments selected for federal lands, an environmental assessment must be conducted for fuel reduction projects. Although HFRA creates a streamlined and improved process for reviewing fuel reduction and restoration treatments, it still requires that appropriate environmental assessments be conducted and that collaboration be maintained. To meet conditions established by the Healthy Forests Initiative, the USDA and the USDI adopted two new categorical exclusions from the normal review steps of an environmental assessment or an environmental impact statement. These exclusions are for hazardous fuels reductions and for rehabilitation of resources and infrastructure damaged by wildfire. For a hazardous fuels reduction project on public lands to be categorically excluded from documentation of the results of an environmental assessment, the project must meet specific requirements:

- It must have less than 4,500 acres to be treated, with mechanical slash treatment restricted to no more than 1,000 acres.
- Its lands must be within Condition Class 2 or 3 and not be in a wilderness or wilderness study area.
- It must not include the use of pesticides, herbicides, or new road or infrastructure construction.
- It may include sale of vegetative products if the primary purpose is to reduce hazardous fuels.

The recommended treatments within the MCCWPP have been developed consistent with federal land-management action alternatives and are intended to be compliant with Categorical Exclusion 10, Fuel Reduction. The purpose of Categorical Exclusion 10, Fuel Reduction, is “to facilitate efficient planning and decision making concerning rehab of areas so as to reduce risks to communities caused by severe fires, and to restore fire-adapted ecosystems” (USDA FS 2000).

B. Prevention and Loss Mitigation

The MCCWPP will be used as a resource to help coordinate long-term interagency mitigation of catastrophic wildfire events in at-risk communities within Mohave County. The goals of the MCCWPP are to:

- improve fire prevention and suppression for firefighter and public safety and to protect private property,
- promote community involvement and education,
- recommend measures to reduce structural ignitability in the MCCWPP area,
- preserve the aesthetics and wildlife values within riparian areas,
- identify funding needs and opportunities,
- expedite project planning through partnerships with ASLD, BLM, and other private and public entities in managing wildland fire risk within the WUI.

The MCCWPP should be reviewed and updated as needed. Successful implementation of this plan will require a collaborative process among multiple layers of government entities as well as a broad range of community interests.

The Core Teams and collaborators have made the following action recommendations to meet the goals of the MCCWPP:

1. MCCWPP Administration and Implementation

Establish a countywide community MCCWPP Working Group, composed of the Mohave County Fire Officers Association, MCDEM, ASFD, BLM, Mohave County Planning and Zoning, community members, concurring agencies, and members of the Core Teams, to coordinate individual agency implementation of the recommendations for fuel modification, public outreach, protection capability, and structural ignitability within the MCCWPP WUI area, including fuel hazards removal on private lands within the WUI.

2. Improved Protection Capability and Reduction in Structural Ignitability

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

a. Obtain one fully functional type 6 engine and one fully functional type 1 engine for wildland fire response by local fire districts (FDs).
b. Obtain a medium-size water tender for local FD use; strategically locate additional water-storage tanks, wells, or other water sources for tender filling throughout the FDs; maintain helicopter landing sites; and update mapping capabilities of local FDs.
c. Improve dispatch and alerting capabilities by establishing a community emergency alert system. The County and local communities will continue to jointly investigate an emergency contact autophone redial system for emergency public communication.

d. Obtain a chipper/shredder, tub grinder, air curtain destructor, and other equipment necessary for treatment and processing of vegetative slash for use by local FDs for wildland fuel mitigation projects.

e. Obtain one multipurpose utility vehicle with attachments for chipping, brush cutting, and miniwater tending tool, such as the Bobcat Toolcat.

f. Implement GIS and GPS (Global Positioning System) software and laptops to update mapping capabilities of local FDs.

g. Arrange for the acquisition, operation, and maintenance of a green-waste disposal site within reasonable proximity to the citizens and encourage the use of the disposal site for all vegetative material removed during wildland fuel treatments on private lands within the WUI.

h. Provide enhanced and coordinated firefighting training and equipment, such as personal protective equipment and second-generation fire shelters, for newly certified wildland firefighters and volunteer firefighters.

i. Develop and maintain mutual-aid agreements with neighboring fire departments and FDs for wildland and structural fire response support and other emergency response.

j. In coordination with MCDEM, develop an emergency notification (autophone redial system) and evacuation plan for the communities.

k. Develop a presuppression plan with BLM and LMNRA along the boundary of the WUI.

l. Explore the adoption of a WUI code or ordinance, based on the International Wildland Fire Code, for adoption by individual FDs or by Mohave County for areas not covered under an FD.

m. Explore additional personnel training in the National Fire Plan Operations and Reporting System (NFPORS). NFPORS is a planning process used by BLM to develop and track wildland fuel prevention programs. The Core Teams recommend cross-training FD personnel in the adoption and use of NFPORS as part of a comprehensive fire management program within Mohave County.

n. Develop additional wildland fire preplans for all high-hazard locations across Mohave County where they have not been adopted.

o. Develop IGAs with Mohave County on nuisance-abatement projects located in high-hazard communities.

p. Explore amending subdivision regulations to include additional public safety (fire protection) requirements for the protection of life and property in areas located outside FDs. The Core Teams recommend that Mohave County advise and assist in the establishment of FDs within new or existing developed areas of the county. The Core Teams also recommend that no new residential and commercial developments in high-risk areas within the WUI be approved by the Mohave County Planning and Zoning Commission unless the involved developers provide prior written commitment to obtain and financially support fire protection services or FD formation or annexation into an existing FD before a pre-agreed phase of buildout. Such amendments and recommendations will involve collaboration between local FDs, the Mohave County Board of Supervisors, and Mohave County Planning and Zoning.

q. Meet annually, immediately before the fire season, to coordinate early suppression deployment and to determine training and equipment needs.

r. Pine Lake FD and Kingman BLM FO will explore agreement with private landowner for the expansion and sealing of Pine Lake and the lake at Laughlin Ranch to provide dependable water sources for aerial bucketing and ground drafting for wildland firefighting resources.

s. Replace the existing water tank on the Oatman Fire Department's water tender.

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

Mohave County, BLM, ASFD, and the Core Teams will continue the development and implementation of public outreach programs to help create an informed citizenry. The goal is to have residents support concepts of fire-safe landscaping and naturally functioning wildland systems through restoration management and rapid response to wildland fire. The MCCWPP is intended to be a long-term strategic instrument containing prescriptive recommendations to address hazardous fuels. A grassroots collaborative structure of individual citizens, supported by local governments as full partners, will provide the most effective long-term means to achieve these goals and to maintain community momentum. Additional educational resources are listed in Appendix C. The components of such a structure include the following recommendations:

a. Assist in implementing a Firewise Communities/USA Recognition program in communities where the program is supported by the local FDs. The Firewise Communities approach emphasizes community and individual responsibility for safer home construction and design, landscaping, and maintenance. The Core Teams will also help identify high-priority communities that would most benefit from a Firewise Communities program.

b. Expand the use of current public information tools for fire-safe residential treatments as an immediate action step. This will be accomplished through information mailers to homeowners, presentations by local FDs, use of the Arizona Firewise Partners Public Information Trailer (BLM Kingman Field Office) at community events, and development of specific promotional materials by Mohave County.

c. Place fire-danger information signs on major access roads throughout the WUI area. Community bulletins and other public service announcements concerning wildfire threat and preparedness should be developed with assistance from ASFD, BLM, and Mohave County.

d. Place and maintain bilingual wildfire caution signs within camping areas and access routes in some areas of the WUI.

e. Complete the wildland fire home assessment through the use of Redzone software, or an equivalent software system, and submit wildland fire hazard mitigation strategies to landowners for each private property assessed.

f. Replace and maintain fencing adjacent to high-use and illegal off-road-vehicle use areas within or adjacent to the WUI.

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

The Core Teams and its collaborators will continue to support and promote private contractors who perform fire-safe mitigation work. The County will continue to support and promote new businesses involved in the wildland fuel reduction market. Mohave County, BLM, and local FDs are committed to encouraging, as appropriate, the use of vegetative by-products from the WUI fuel management program for commercial or community-service organization use. Commercial use of the woody material from fuel reduction treatments is primarily limited to fuelwood, and any commercial value of treatment by-products will not significantly affect treatment costs. Possible by-product uses encouraged by the communities include the following:

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

IV. MCCWPP PRIORITIES: ACTION RECOMMENDATIONS AND IMPLEMENTATION

The Core Teams have developed action recommendations (see Section III of this CWPP) necessary to meet the plan's objectives. A series of recommendations that will reduce structural ignitability, improve fire prevention and suppression, and enhance public outreach have also been developed by the Core Teams. A unified effort to implement this collaborative plan requires timely decision making at all levels of government.

To meet MCCWPP objectives, the Core Teams have developed the following action recommendations. At the end of each year, projects implemented from these action recommendations will be monitored for effectiveness of meeting MCCWPP objectives. For the life of the MCCWPP, recommendations for additional projects will be made for each future year on the basis of project performance from the previous implemented projects.

A. Administrative Oversight

Generally, the most efficient way to manage the mitigation of wildland fire threat in the WUI is through identifying, delegating, implementing, and monitoring the action recommendations of the MCCWPP. Establishing a unified effort to collaboratively implement the MCCWPP embraces adaptive management principles that enhance decision making and reduce inconsistency at all levels of government.

The Core Teams recommend the establishment of a countywide community MCCWPP Working Group, composed of the Fire Officers Association, MCDEM, and BLM, to work with the Core Teams and concurring agencies to accomplish the recommendations for outreach and structural ignitability within the MCCWPP WUI area, which includes fuel hazards removal on private lands within the WUI. The countywide community Working Group should consist of community members, members of the local fire departments, and additional representation as needed by the MCDEM, ASLD, BLM, and other concurring agencies such as the LMNRA.

The charter of the MCCWPP Working Group will be to:

1. Prioritize on a countywide basis the wildland fuel modification, structural ignitability, protection capability, and public outreach projects listed in the approved MCCWPP, in accordance with the criteria detailed below, and review for possible reprioritization at least once annually, starting within 2 months of final MCCWPP approval by ASFD.

   Note: Fuel modification and community planning, outreach, and warning programs will be prioritized by the Working Group as a whole; other projects involving firefighter training, equipment, communications, facilities, and apparatus will be recommended by the Fire Officers Association or its representatives in the Working Group.

2. Support FDs or other agencies in the submittal of grant applications and the solicitation of other funding opportunities to implement wildland fuel modification, structural ignitability, protection capability, and public outreach projects established as CWPP priorities by the Working Group.

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

3. Support FDs and other agencies and community groups in the implementation of projects established as priorities by the Working Group.
4. Compile annual monitoring and reporting to provide information on additional measures necessary to meet MCCWPP goals, including additional future recommendations from FDs and other agencies for inclusion in the priorities list.
5. Act as an advisory group to Mohave County Planning and Zoning and to developers in outlying areas to ensure adequate road conditions and water supplies for emergency services and secure developer agreement to establish and fund fire services and equipment in residential and commercial developments as a condition of approval of such developments by the Mohave Planning and Zoning Commission.
6. Recommend the establishment of fire services in grandfathered developments within the WUI when residential and commercial densities and vegetation/fuel load factors approach a threshold correlating to high risk to public and fire fighter safety, and private property protection.
7. Utilize the following general Criteria for Prioritization of Proposed Projects and Action Items:
    a. Geographic/Fuel Load/Residential Density:
        i. The Hualapai Mountain area, including Pine Lake and Pinion Pine FDs and surrounding areas, will receive long-term priority due to its vegetation, high fuel load, ignition history, and threatened communities.
        ii. In any given year, the Working Group will evaluate countywide weather, vegetation, and fuel load conditions and projections, as well as current residential and commercial densities, to determine short-term priority adjustments for projects in all WUI areas of the county for that year.
        iii. In any given year, the Working Group will evaluate the progress of new developments and increasing residential and commercial densities to determine potential needs and priorities within the WUI for the next three years following that given year.
    b. Categorical/Functional Criteria: Priorities will generally be established in the order listed below; these priorities are subject to review and change by the Working Group on an ongoing basis:
        i. Fuel modification projects (first priorities will be for those projects within FD, BLM, or ASFD jurisdictions).
        ii. Enhanced wildland firefighter training and acquisition of Personal Protective Equipment.
        iii. Wildland fire suppression equipment and tools, including brush engines and tenders
        iv. Water storage sites and supply facilities.
        v. Community planning and outreach activities, including warning signs/systems, identification/improvement of evacuation routes, etc.
        vi. Radios for primary use by trained and designated wildland fire crews
        vii. Helicopter pads for firefighter deployment and/or evacuation.
        viii. Structural fire engines.

ix. Fire stations in areas with sufficiently high threat and population densities as determined by Working Group annual analysis.

x. Other communications projects.

Note: Although communications are critical and high in importance, support by the MCCWPP Working Group for funding for radios and repeaters should be focused on ensuring adequate communications among crews at wildland fire scenes if such funding is unavailable from other grant sources and if current repeaters do not cover high-risk areas. Wildland fire dispatch needs will continue to be addressed by ASFD and BLM. Funding for vehicle or personal radios, repeaters, or other communication equipment for multiple or general uses should be sought from grant sources (State Homeland Security Grant Program and others) targeting communications needs rather than from grant sources targeting wildland fire response and mitigation needs. Also, although structural engines and new fire stations will be needed in new high-density areas within the WUI, their high upfront cost and multimission use may not be cost effective relative to other projects, particularly when competing for limited wildland fire grant funding. The funding of these engines and stations should be a primary focus of the Working Group's advisory role to Mohave County Planning and Zoning to require that developers provide funding for fire suppression equipment/facilities as a condition of Commission approval of developments and subdivisions.

The agencies involved in the formation of this plan, support local community efforts and will work with the communities as needed to accomplish action items. BLM and ASLD will coordinate fuel mitigation projects on state and public lands within the WUI in coordination with the countywide community Working Group when established. The Core Teams and the proposed countywide community Working Group will be responsible for the submission of grants and solicitation of other opportunities to implement wildland fuel mitigation projects on private lands, and to support public information, education, and outreach within the WUI. Successful award of grant funds will be used to implement the action recommendations for private land treatments, mitigation features for reduced structural ignitability, firefighting response, and public outreach. BLM, MCDEM, and the Core Teams will pursue funding to construct and maintain firebreaks as well as broader applications of wildland fuel mitigation projects within the WUI. Annual monitoring and reporting compiled by the countywide community Working Group will provide information on additional measures necessary to meet MCCWPP goals.

B. Priorities for Mitigation of Hazardous Wildland Fuels

Table 4.1 displays the priority for construction of firebreaks and landscape wildland fuel treatments within the WUI as recommended by the Core Teams. These action recommendations will reduce wildfire potential to the community and have "high" valuations for reducing wildland fire risk. The Core Teams recognize that not all acres within a high-risk landscape can be treated. Site-specific analysis will determine treatments acres and methods that produce a fire-resilient vegetative stand appropriate for the habitat.

Table 4.1. Action recommendations for wildland fuel modification

Management area	Location and description	Project partners	Estimated treatment costs[a]
PPPL 1	In the Hualapai Mountains, east of Pine Lake to the western WUI boundary, south of Pinion Pine	MCDEM, ASLD, BLM, and Pinion Pine and Pine Lake FDs	12,826 high-risk acres, FY 2009–12 = $753,390.00/year; cost estimated to average $300.00/acre on nonfederal lands and $12,000.00/acre on private lands
PPPL 2	Includes the general vicinity of Pine Lake in the Hualapai Mountains and lands south to the WUI boundary	MCDEM, ASLD, BLM, and Pinion Pine and Pine Lake FDs	5,908 high-risk acres, FY 2009–12 = $826,800.00/year; cost estimated to average $300.00/acre on nonfederal lands and $12,000.00/acre on private lands
PPPL 3	Includes the general vicinity of Pinion Pine in the Hualapai Mountains, south of I-40	MCDEM, ASLD, BLM, and Pinion Pine and Pine Lake FDs	9,107 high-risk acres, FY 2009–12 = $1,604,567.00/year; cost estimated to average $300.00/acre on nonfederal lands and $12,000.00/acre on private lands
BDLF 2	The foothills of the Virgin Mountains south of Littlefield	MCDEM, BLM, ASLD, and Beaver Dam/Littlefield FD	6,908 high-risk acres, FY 2009–12 at $650.00/acre = $1,496,733.00/year
BDLF 3	Generally includes the lands surrounding the community of Littlefield	MCDEM, BLM, ASLD, and Beaver Dam/Littlefield FD	1,311 high-risk acres, FY 2009–12 at $650.00/acre = $284,050.00/year
H 6	Includes a portion of the Cerbat Mountains, east of Chloride	ASLD, BLM, MCDEM, and Hualapai Valley FD	11,090 high-risk acres, FY 2009–12 at $650.00/acre = $2,402,833.00/year
C 1	Includes the community of Chloride to the northern and eastern WUI boundary	ASLD, BLM, MCDEM, and Chloride FD	9,243 high-risk acres, FY 2009–12 at $300.00/acre = $924,300.00/year
GV 2	Area east of US 93 to the WUI boundary	ASLD, BLM, MCDEM, and Golden Valley FD	4,790 high-risk acres, FY 2009–12 at $300.00/acre = $47,913.00/year
B 1	Area surrounding Potato Valley, southeast of Bundyville	BLM, ASFD, and MCDEM	8,706 high-risk acres, FY 2009–12 at $650.00/acre = $1,886,300.00/year
Firebreak maintenance	1- to 2-year rotating maintenance of fine and light fuels in Firebreaks K7, BD/LF28, BC20, H17,	ASLD, BLM, MCDEM, and participating FDs	500 acres/year of light understory fuel treatments in excess of 4 acres treated/10-hour day = $99,093.00

Note: PPPL = Pinion Pine/Pine Lake Sub-WUI, BDLF = Beaver Dam/Littlefield Sub-WUI , H = Havasu Sub-WUI , C = Chloride Sub-WUI, GV = Golden Valley Sub-WUI, B = Bundyville Sub-WUI.

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

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

The Core Teams and collaborators will evaluate, maintain, and, where necessary, upgrade community wildfire preparation and response facilities, capabilities, and equipment. Table 4.2 lists the identified action items submitted by individual FDs for structural ignitability and public outreach within their respective jurisdictions. Table 4.3 lists the future recommendations for wildland fire protection and reduced ignitability.

The MCCWPP Working Group will meet within two months of the final approval of the MCCWPP by ASFD to prioritize projects on a countywide basis for the upcoming year, and thereafter at least annually to reevaluate projects and reallocate priorities as needed. Such countywide prioritization will not impinge on or interfere with individual FD prerogatives to independently seek funding for projects within their jurisdictions without Working Group support.

Table 4.2. Action recommendations for structural ignitability and public outreach

Project partners	Action recommendation type	Specific recommendation	Estimated costs	Timeline
MCDEM, BLM, ASFD, ASLD, Pinion Pine FD	1.2 Wildland Fire Protection and Reduced Ignitability	Construct a series of 5,000-gal water-storage facilities located strategically throughout residential areas	Install water-storage facility/year: $5,000.00/facility	Locate and install one water-storage facility in 2009
	1.3 Enhanced Public Education, Information, and Outreach	Work with land agencies for the acquisition, operation, and maintenance of a green-waste disposal site within reasonable proximity to community	Locate and coordinate with land-management agency; excavate pit and fence: $20,000.00	Begin planning with agencies in FY 2008/09; implement in FY 2009/10
MCDEM, BLM, ASFD, Pine Lake FD	1.2 Wildland Fire Protection and Reduced Ignitability	Pine Lake FD and Kingman FO will explore agreement with private landowner for the expansion and sealing of Pine Lake and the lake at Laughlin Ranch to provide dependable water sources for aerial bucketing and ground drafting firefighting resources.	Locate and coordinate with private landowner; excavate and seal tank: $48,000.00	Begin planning with agencies in FY 2008/09; implement in FY 2009/10
MCDEM, BLM, ASFD, Grapevine Mesa FD	1.2 Wildland Fire Protection and Reduced Ignitability	Provide enhanced and coordinated firefighting training, including equipment for volunteer firefighters	Initial and annual refresher and enhancement training and equipment for individual firefighters and annual multiagency training exercise: $15,000.00/year	Train at least four firefighters annually, beginning in 2009
		Obtain one fully functional type 6 engine	Type 6 fire-response brush engine: $80,000.00	Solicit grant funding in FY 2009/10; obtain by FY 2010/11
		Obtain one fully functional type 1 engine	Class A engine with full turn out: $368,000.00	Solicit grant funding in FY 2009/10; obtain by FY 2010/11
		Obtain personal protection equipment, including new clothing and second-generation fire shelters for all firefighters	Full turnout gear at $800.00/firefighter; equip five firefighters/year	Solicit funding in FY 2009/10; obtain five wildland fire gear in 2010

Continued

Table 4.2. Action recommendations for structural ignitability and public outreach

Project partners	Action recommendation type	Specific recommendation	Estimated costs	Timeline
		Develop a strategically located helicopter landing zone with water supply	Survey area within the district for location and begin landowner or land-management agency agreement in FY 2009/10	Solicit funds to prepare site for emergency lighting, landing, bucketing, and staging
MCDEM, BLM, ASFD, ASLD, Grapevine Mesa FD		Develop a water-storage system	Install one water-storage facility/year: $5,000.00/facility	Locate and initiate site agreement with landowner or land-management agency in 2009; obtain funds to construct in 2010
MCDEM, BLM, ASFD, Truxton FD		Obtain one fully functional type 6 engine	Type 6 fire-response brush engine: $80,000.00	Solicit grant funding in FY 2009/10; obtain by FY 2010/11
MCDEM, BLM, ASFD, ASLD, Truxton FD		Install water-storage tank (20,000-gal capacity) and necessary pump system	Install water-storage tank $20,000.00	Locate and initiate site agreement with landowner or land-management agency in 2009; obtain funds to construct in 2010
MCDEM, BLM, ASFD, Chloride FD		Obtain water tender (3,000-gal capacity) with foam system attachments	Water tender with foam system: $85,000.00	Solicit grant funding in FY 2009/10; obtain by FY 2010/11
		Recruit and train 10 volunteer firefighters for wildland fire response	Initiate recruitment process, brochure and promotion material, initial wildland fire training: $6,600.00	Initiate recruitment and training in 2009; maintain cadre of no less than 10 wildland firefighters
MCDEM; BLM; ASFD; Hualapai Valley FD, including Hackberry, Valle Vista, and Long Mountain areas		Obtain 4X4 type 6 fire engine for Hackberry and Valle Vista	Type 6 fire-response brush engine: $80,000.00/engine	Solicit grant funding in FY 2009/10; obtain by FY 2010/11
		Obtain type 5 fire engine with foam system for Hualapai Valley and Long Mountain	Type 5 fire-response engine: $105,000.00/engine	Solicit grant funding in FY 2009/10; obtain by FY 2010/11
		Obtain 4X4 water tender (2,000-gal capacity) for Hackberry, Valle Vista, and Long Mountain	Water tender with foam system: $85,000.00/tender	Solicit grant funding in FY 2009/10; obtain by FY 2010/11

Continued

Table 4.2. Action recommendations for structural ignitability and public outreach

Project partners	Action recommendation type	Specific recommendation	Estimated costs	Timeline
		Recruit and train 10 volunteer firefighters for wildland fire response for Hackberry, Valle Vista, Hualapai, and Long Mountain	Initiate recruitment process, brochure and promotion material, initial wildland fire training: $6,600.00/FD area	Initiate recruitment and training in 2009; maintain cadre of no less than 10 wildland firefighters/FD area
		Obtain wildland firefighter basic training and turnout gear for at least 10 firefighters in Hackberry	Full turnout gear at $800.00/firefighter; equip 10 firefighters/year	Solicit funding in FY 2009/10; obtain wildland fire turnout gear and basic training in 2010
MCDEM; BLM; ASFD; ASLD, Hualapai Valley FD, including Hackberry, Valle Vista, and Long Mountain areas		Construct fire station in Hackberry for equipment housing and staging Construct fire station on Stockton Hill Road at Milepost 17 for equipment housing and staging	Locate and initiate site agreement with landowner or land-management agency; obtain design and construction cost estimates	Initiate land acquisition process in 2009; obtain funds to design and construct in 2012
		Construct regional dispatch center for coordination of wildland fire response assets for rural FDs in Hualapai Valley	Locate and initiate site agreement with landowner or land-management agency; obtain design and construction cost estimates	Initiate land acquisition process in 2009; obtain funds to design and construct in 2011
		Install radio reaper tower and communication system in Long Mountain area	Locate and initiate tower site agreement with existing communication company or public safety agency; obtain design and construction cost estimates	Initiate agreement, equipment list, and cost estimates in 2010; obtain funds to design and construct in 2012
MCDEM, BLM, ASFD, Beaver Dam/ Littlefield FD		Obtain 20 handheld programmable radios for firefighter dispatch and communication	King digital programmable handheld radios, $880.00/radio: $17,600.00	Obtain grant funding in 2009
		Obtain 20 handheld GPS units	Handheld GPS units with base map and PC cable, $270.00/unit: $5,400.00	Obtain grant funding in 2009
MCDEM, BLM, ASFD, ASLD, Beaver Dam/ Littlefield FD		Install radio reaper tower and communication system in Scenic area	Locate and initiate tower site agreement with existing communication company or public safety agency; obtain design and construction cost estimates	Initiate agreement, equipment list, and cost estimates in 2010; obtain funds to design and construct in 2012

Continued

Table 4.2. Action recommendations for structural ignitability and public outreach

Project partners	Action recommendation type	Specific recommendation	Estimated costs	Timeline
		Construct substation in Scenic area for dispatching and equipment housing and staging	Locate and initiate site agreement with landowner or land-management agency; obtain design and construction cost estimates	Initiate land acquisition process in 2009; obtain funds to design and construct in 2012
		Install water-storage tank (10,000-gal capacity) and necessary pump system in Scenic area	Install water-storage: $10,000.00	Locate and initiate site agreement with landowner or land-management agency in 2009; obtain funds to construct in 2012
MCDEM, BLM, ASFD, Oatman FD		Replace water tank on the existing water tender	Install new water tank and retrofit pump and attachments: $6,000.00	Solicit funds for tank; install and equip in 2010
MCDEM, BLM, ASFD, Grapevine Mesa FD	1.3 Enhanced Public Education, Information, and Outreach	Develop a fire-safety awareness program for community groups	Promote and conduct a community fire-awareness day at local FD: $2,000.00	Solicit funds for promotion, brochures, and event materials in 2009; conduct in 2009
		Obtain fire-severity signs, no-smoking signs, and fire-restriction signs	Construction and placement: $5,000.00	Obtain funding for construction agreement with ADOT for landowner locations in 2009; install in 2010
		Create fire-safety and fire-awareness posters for public places	Development, printing, and distribution costs: $5,000.00	Solicit funds for production and printing in 2009; publish and post in 2009
		Submit articles on fire safety and awareness for publication in local papers and other publications	Obtain national and local fire-safety material suitable for news print	Publish fire-safety information quarterly in local newspaper: $200.00/quarter

Table 4.3. Future recommendations for wildland fire protection and reduced ignitability

Partners	Project[a]	Equipment/expenses	Timeline
MCDEM, ASFD, BLM, and associated FD	**E1—**Obtain a medium-size water tender to better able traverse rural landscape than larger units	1,500-gal water tenders, 4-wheel drive: $65,000.00	Acquire tender in FY 2007/08; assess additional tender needs in FY 2010/11
MCDEM, ASFD, BLM, and associated FD	**E2—**Acquire and implement the emergency contact autophone redial public notification system with trained operators	Enhancement of existing radio repeater and autophone redial software and hardware	Assess costs in FY 2009; install in FY 2010/11
MCDEM, ASFD, and BLM Fire Officers Association	**E3—**Obtain one multipurpose utility vehicle with attachments for chipping, brush cutting, and miniwater tending, such as Bobcat Toolcat with trailer and minimum 3-ton toe vehicle (dump or stake bed)	Multipurpose utility vehicle: $145,000.00	Acquire in FY FY 2010/11; implement use in FY 2012
MCDEM, ASFD, BLM, and associated FD	**E4—**Develop GIS capability (software and hardware) within MCDEM in coordination with agency partners to update MCDEM with current conditions, to deploy resources in response to threats and risk analysis, and to view details in field vehicle with laptop units	Purchase GIS computer for headquarters, ARC-INFO software, and basic training: $10,000.00 Purchase four case-hardened laptops for field operations with GIS software: $5,000.00 each	Begin in FY FY 2010/11: start with base computer and two laptops; purchase additional laptops as personnel increases
MCDEM, ASFD, BLM, and associated FD	**I1—**Retrofit existing wells or water supplies for local FD use (outlet pipes, valves, and hose thread adaptors); maintain sites; cost-share hose and nozzle for immediate protection at site	Pipe and valve installation and site maintenance: $10,000.00 initial, $2,500.00 annually	Begin in FY 2010/11; maintain annually
MCDEM, ASFD, BLM, and associated FD	**A1—**Develop and maintain written mutual-aid agreements with neighboring fire departments and districts for wildland fire, structure fire, and other emergency response	Staff time, coordination efforts, research, and meetings: $5,000.00	Inventory existing agreements; determine deficiencies and implement any needed agreements in FY 2009/11
MCDEM, ASLD, BLM, and associated FD	**A2—**Work with Mohave County to develop a notification and evacuation plan for the community	Staff time, coordination efforts, research, and meetings: $5,000.00	Begin planning in FY 2010/11; implement in FY 2011
MCDEM, ASFD, BLM, and associated FDs	**A3—**Develop a presuppression plan with BLM and local FD along the eastern and western boundary of the Mount Tipton Wilderness	Staff time, coordination efforts, research, and meetings: $5,000.00	Begin planning in FY 2010/11; implement in FY 2010/11
MCDEM, ASFD, BLM, and associated FDs	**A4-** Acquire, and train in the use of, resource assessment software for consistency in risk assessment and mitigation strategies	Staff time, coordination efforts, research, and meetings: $5,000.00	Begin planning in FY 2010/11; implement in FY 2010/11
MCDEM and associated FDs	**A5-** Encourage local FDs to adopt and enforce fire-safety codes	Staff time, coordination efforts, research, and meetings: $5,000.00	Begin planning in FY 2010/11; implement in FY 2010/11

Continued

Table 4.3. Future recommendations for wildland fire protection and reduced ignitability

Partners	Project[a]	Equipment/expenses	Timeline
MCDEM, and associated FDs	**A6-** Develop additional wildland fire preplans for other high-hazard locations throughout Mohave County	Staff time, coordination efforts, research and meetings: $5,000.00	Begin planning in FY 2010/11; implement in FY 2010/11
MCDEM, and associated FDs	**A7-** Encourage FDs to develop IGAs with Mohave County on nuisance-abatement projects within high-hazard communities	Staff time, coordination efforts, research, and meetings: $5,000.00	Begin planning in FY 2010/11; implement in FY 2010/11
MCDEM, Mohave County P&Z, County supervisors, and associated FDs	**A8-** Encourage FDs to work with county supervisors and Mohave County P&Z to amend subdivisions regulations to include additional public and property safety (fire protection) requirements in areas located outside FDs	Staff time, coordination efforts, research, and meetings: $5,000.00	Begin planning in FY 2010/11; implement in FY 2010/11

Note: P&Z = Planning and Zoning Office

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

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

The MCDEM will implement public outreach and education programs for residents to heighten awareness and understanding of the threat that wildland fire poses to the community.

Table 4.4 displays the MCCWPP priority recommendations to promote community involvement. Additional programs that could be used or developed to enhance community outreach and education may be developed and implemented in the future. The Core Teams will use the resources of the ASFD, Flagstaff District Office, and BLM for additional public education programs and community outreach. Community bulletins and other public service announcements concerning wildfire threat and preparedness should be developed with assistance from the ASFD, Flagstaff District Office, and BLM.

Table 4.4. Future recommendations for enhanced public education, information, and outreach

Partners	Project	Equipment/expense	Timeline
MCDEM, BLM, associated FDs, ASFD	Establish and maintain roadside fire-danger warning signs and other informational and directional road signs along major roads as determined by the Fire Officers Association	Construction and placement: $5,000.00	Construct and implement in FY 2010/11
	Create and distribute community bulletin	Development, printing, and distribution costs: $5,000.00	Develop in FY 2009; distribute continually
	Acquire Redzone or equivalent software and field data recorders or PDAs (personal digital assistants) to complete home fire assessments and implement fire-safe recommendations	Software and data recorder: $1,300.00 Assessment completion: $2,000.00	Acquire software and complete assessments in FY 2010/11; implement recommendations in FY 2011
	Encourage private businesses that perform fire-safe land treatments; encourage market development of WUI by-products from vegetative fuel mitigation programs	Marketing plan to be developed	Initiate community marketing planning meetings in FY 2011
	Replace and maintain fencing adjacent to high OHV (off-highway vehicle) use areas	Assess in 2011, initial plan for 1 mile of new or repaired fencing	Estimate $6,000.00m per mile of standard 4-wire fencing

V. MONITORING PLAN

Monitoring is essential to ensure that MCCWPP goals are met. As MCCWPP administrators, the local fire departments, MCDEM, ASLD, and BLM will actively monitor the progress of the MCCWPP action recommendations to determine the effectiveness of ongoing and completed projects in meeting MCCWPP objectives, as well as to recommend future projects necessary to meet MCCWPP goals.

In accordance with Section 102.g.5 of HFRA, MCCWPP communities will participate in any multiparty monitoring program established by state and federal agencies, or other interested parties, to assess progress toward meeting MCCWPP objectives. This authority to participate in multiparty monitoring will be vested in the MCCWPP administrators. The Core Teams believe that participation in multiparty monitoring will provide effective and meaningful ecological and socioeconomic feedback on landscape and site-specific fuel reduction projects and watershed enhancements and will also help BLM, MCDEM, and ASLD with land-management planning.

The MCCWPP administrators will request participation in any post-wildfire analysis and burned area emergency response (BAER) planning with lead state or federal agencies. Immediate post-wildfire analysis and planning is essential to Mohave County to enhance public safety from possible flood and debris flows, municipal watershed pollution, and other post-wildfire habitat and community impacts.

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

A. Administrative Oversight, Monitoring, and MCCWPP Reporting

The MCCWPP administrators, composed of the Fire Officers Association, MCDEM, and BLM, will be mutually responsible for implementing and monitoring MCCWPP action recommendations in coordination with a future established countywide community Working Group. The MCCWPP administrators should identify appropriate grant and other funding mechanisms necessary to implement the action recommendations of the MCCWPP. Grant information should be routinely searched to identify updated grant application cycles. In addition to Appendix C of this CWPP, the following is a list of federal, state, and nongovernmental Web sites that can be monitored to obtain updated information about grant application cycles:

Federal

- www.fs.fed.us/r3
- www.fs.fed.us/r3/partnerships/
- www.fireplan.gov
- www.firegrantsuport.com
- www.az.nrcs.usda.gov
- www.blm.gov/az
- www.firewise.org

- www.ncwg.gov

State

- www.azsf.az.gov
- www.azgfd.gov
- www.cals.arizona.edu/firewise
- www.southwestareagrants.org

Nongovernmental

- www.iwjv.org
- www.sonoran.org
- www.iafc.org

As needed, the MCCWPP administrators in coordination with a future established countywide community Working Group will produce a report detailing the success of MCCWPP project implementation and overall progress toward meeting MCCWPP goals. The administrators should report successful grant awards received for implementing the MCCWPP action recommendations to MCCWPP signatories. The MCCWPP administrators' report will also include recommendations to the signatories for updating the Community Mitigation Plan and the Prevention and Loss Mitigation Plan portions of the MCCWPP, using adaptive management principles. This information will ensure timely decision making for all levels of government and will provide input necessary for the development of future work plans and for prioritization of project recommendations over the life of the MCCWPP. Appendix D provides information on the data used in the analysis of the MCCWPP and the appropriate contact for future reference concerning updating the MCCWPP. Once the MCCWPP is updated, it will be submitted to the MCDEM, the Arizona State Forester, all participating FDs, other signatories, and BLM for their concurrence. Once concurrence is achieved, the action recommendations of the updated MCCWPP are to be forwarded for funding through HFRA and other appropriate funding sources.

B. Effectiveness Monitoring

Table 5.1 shows the performance measures the MCCWPP administrators will use to assess MCCWPP performance against goals for the fiscal year. In addition to monitoring the listed performance measures, MCCWPP administrators should assess the current status of wildland fuel hazards and look for any new or developing issues not covered by the MCCWPP. As new issues arise, such as new invasive-species infestations, further identification of risks and recommendations for treatment should be identified, and the MCCWPP should be updated or amended as necessary to meet the MCCWPP goals. To help track fuel treatments being planned and completed through local, state, and federal programs, MCCWPP administrators will cooperate by providing requested detailed mapping information to the Arizona State Forester's office.

Table 5.1. Performance measures to assess MCCWPP progress

Goal	Performance measure
Improve fire prevention and suppression	Reduction of wildland fire occurrence and acres burned (unplanned) in the WUI: • MCDEM has implemented an emergency notification (autophone redial system) and evacuation plan. • Local FDs have initiated discussion for adoption and enforcement of fire-safety codes. • Wildland fire preplans for all high-hazard locations across Mohave County have been adopted. • Local FDs have developed IGAs with Mohave County on nuisance-abatement projects located in high-hazard communities. • Local FDs in conjunction with Mohave County Board of Supervisors and Planning and Zoning are working toward amending subdivision regulations to include additional public safety (fire protection) requirements for the protection of life and property in areas located outside FDs. • Effectiveness monitoring of fire prevention and suppression will include – acres burned and degree of severity of wildland fire, – percentage of wildland fire controlled on initial attack, – number of homes and structures lost to wildland fire. • New water sources developed in key areas. • Acquire type 6 and type 1 engines. • Consistent fire training in use. • Wildland firefighter turnout gear acquired as needed. • Mutual-aid agreements with ASLD, BLM, and neighboring FDs updated and approved. • Strategically located helicopter Landing Zone in use by Grapevine Mesa FD.
Reduce hazardous forest fuels	High-risk areas effectively treated by acre: • Number of treated acres of nonfederal WUI lands that are in Condition Class 2 or 3 are identified as high priority by the MCCWPP and should be moved to Condition Class 1 or another acceptable level of wildland fuel. • Total acres treated through any fuel reduction measures, including Rx, that are conducted in, or adjacent to, the WUI. The change of condition class should be determined for small projects or treatment areas through the use of the LANDFIRE database.
Restore watershed health	Acres of fuel reduction or watershed enhancement treatments that meet restoration treatment guidelines for riparian habitats: • Coordination with and support of MCDEM, ASLD, and BLM in implementing and determining social, economic, and environmental effects of riparian restoration treatments (Treatment 9). • Acres of saltcedar-invaded riparian areas identified and undergoing restoration treatments.

Continued

Table 5.1. Performance measures to assess MCCWPP progress

Goal	Performance measure
Promote community involvement	Community-outreach programs initiated: • Countywide community Working Group initiated. • Public outreach programs and promotions implemented to enhance volunteer efforts to reduce hazardous fuels. • Number and areas (community or dispersed residents) of private landowners supportive of and implementing fuel reduction projects. • MCDEM and local FDs developed and implemented evacuation plans for identified high-risk areas. • Individual home assessments completed in WUI boundary high-risk areas. • Roadside fire-danger warning signs in English and Spanish installed at strategic points within the WUI. • Green-waste disposal and processing site secured and operational. • Fire-awareness articles printed in local newspapers. • Fire-safety awareness program, posters, and information available in public places.
Encourage economic development	Wood-products industry growth and diversification to use all sizes of material removed by fuel reduction treatments: • Number of value-added wood products developed by the community. • Number of new markets (local firewood sales) for local products created.

VI. Declaration of Agreement and Concurrence

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

Agreement

Pete Byers, Chairman
Mohave County Board of Supervisors — 9/15/08 Date

John Salem, Mayor
City of Kingman — 9-3-2008 Date

Mark Nexsen, Mayor
Lake Havasu City — 11/26/08 Date

Jack Hakim, Mayor
Bullhead City — 2-5-09 Date

Terrill Johnson, Mayor
Colorado City — 9-15-2008 Date

Chuck Osterman, Chief
Kingman Fire Department — 2/4/09 Date

Tom Little, Chief
Grapevine Mesa Fire Department — 11/20/08 Date

Dave Estenson, Chief
Lake Mohave Ranchos Fire Department — 10-20-08 Date

Mel Sorensen, Chief
Mohave Valley Fire Department — 11/03/08 Date

Jake Barlow, Chief
Colorado City Fire Department — 12/12/08 Date

Jeffery Hunt, Chief
Beaver Dam/Littlefield Fire Department — 09/18/2008 Date

Tony Beacom, Chief
Pine Lake Fire Department — 8/14/08 Date

Joe Jackson, Chief
Pinion Pine Fire Department — 10-15-08 Date

Rudy Barboa, Chief
Golden Valley Fire Department — 8-14-08 Date

Rick Southey, Chief
Bullhead City Fire Department — 8/14/08 Date

Mike Eno, Chief
Fort Mojave Mesa Fire Department — 20 OCT 08 Date

Wayne L. Eder, Chief
Northern Arizona Consolidated Fire District #1
Hualapai Valley, Valle Vista, Chloride, Valentine, and Truxton Fire Departments — 10/1/08 Date

Mathew Espinoza, Chief
Desert Hills Fire Department — 9-25-08 Date

Bill Blake, Chief
Oatman Fire Department — 11-25-08 Date

Jim Todd, Chief
Yucca Fire Department — 9-25-08 Date

Jim Boyle, Chief
Golden Shores Fire District — 10-15-08 Date

Concurrence

Victoria Christiansen
Arizona State Forester

9/21/2009
Date

Scott R. Florence
Scott Florence, District Manager
Arizona Strip District Office, BLM

8/27/08
Date

Rebecca Heick
Rebecca Heick, District Manager
Colorado River District Office, BLM

8/25/08
Date

for Gary W Wanlass
William Dickinson, Superintendent
Lake Mead National Recreation Area

11/25/08
Date

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VIII. GLOSSARY OF FIRE MANAGEMENT TERMS

A

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

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

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

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

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

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

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

Aspect: Direction toward which a slope faces.

B

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

C

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

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

Catastrophic: (Severe wildland fire) Fire that burns more intensely than the natural or historical range or variability, thereby fundamentally changing the ecosystem, destroying communities and/or rare or threatened species/habitats, or causing unacceptable erosion. [definition added from USDI Bureau of Land Management. 2004. Proposed Statewide Land Use Plan for Fire, Fuels and Air Quality Management]

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

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

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

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

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

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

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

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

> Condition Class 1. For the most part, fire regimes in this Fire Condition Class are within historical ranges. Vegetation composition and structure are intact. Thus, the risk of losing key ecosystem components from the occurrence of fire remains relatively low.
>
> Condition Class 2. Fire regimes on these lands have been moderately altered from their historical range by either increased or decreased fire frequency. A moderate risk of losing key ecosystem components has been identified on these lands.
>
> Condition Class 3. Fire regimes on these lands have been significantly altered from their historical return interval. The risk of losing key ecosystem components from fire is high. Fire frequencies have departed from historical ranges by multiple return intervals. Vegetation composition, structure and diversity have been significantly altered. Consequently, these lands verge on the greatest risk of ecological collapse. (Cohesive Strategy, 2002, in draft)

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

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

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

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

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

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

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

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

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

Curing: Drying and browning of herbaceous vegetation or slash.

D

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

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

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

Deployment: See Fire Shelter Deployment.

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

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

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

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

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

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

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

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

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

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

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

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

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

E

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

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

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

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

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

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

Environmental Assessment (EA): EAs were authorized by the National Environmental Policy Act (NEPA) of 1969. They are concise, analytical documents prepared with public participation that determine if an Environmental Impact Statement (EIS) is needed for a particular project or action. If an EA determines an EIS is not needed, the EA becomes the document allowing agency compliance with NEPA requirements.

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

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

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

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

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

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

F

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

> Groups I and II include fire return intervals in the 0 - 35 year range. Group I includes Ponderosa pine, other long needle pine species, and dry site Douglas fir. Group II includes the drier grassland types, tall grass prairie, and some Pacific chaparral ecosystems.
>
> Groups III and IV include fire return internals in the 35 - 100+ year range. Group III includes interior dry site shrub communities such as sagebrush and chaparral ecosystems. Group IV includes lodgepole pine and jack pine.
>
> Group V is the long interval (infrequent), stand replacement fire regime and includes temperate rain forest, boreal forest, and high elevation conifer species.

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

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

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

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

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

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

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

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

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

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

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

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

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

Firewise: A public education program developed by the National Wildland Fire Coordinating Group that assists communities located in proximity to fire-prone lands. (For additional information visit the Web site at

http://www.firewise.org.)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

G

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

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

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

H

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

Hand Line: A fireline built with hand tools.

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

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

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

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

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

Helispot: A temporary landing spot for helicopters.

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

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

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

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

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

Home Ignition Zone: The home and its immediate surroundings. The home ignition zone extends to a few tens of meters around a home not hundreds of meters or beyond. Home ignitions and, thus, the WUI fire loss problem principally depend on home ignitability.

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

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

Hotspot: A particular active part of a fire.

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

I

Incendiary: Causing or capable of causing fire.

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

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

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

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

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

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

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

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

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

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

J

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

Jump Spot: Selected landing area for smokejumpers.

Jump Suit: Approved protection suite work by smokejumpers.

K

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

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

L

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

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

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

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

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

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

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

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

M

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

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

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

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

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

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

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

N

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

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

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

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

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

O

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

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

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

P

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

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

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

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

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

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

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

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

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

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

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

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

R

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

S

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Survivable Space: The distance between vegetational fuels and a structure necessary to protect the building from radiant heat and its ignition mechanics. The separation distance was formerly called “Defensible Space” due to the implication that the fire department could intercede. The term “Survivable Space” eliminates the dependence on manual suppression and implies that the distance alone provides the protection. (see Defensible Space)

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

T

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

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

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

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

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

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

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

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

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

U

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

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

Unplanned and Unwanted Wildland Fires: An unplanned and unwanted fire is one burning outside the parameters as defined in land use plans and fire management plans for that location (including areas where the fire can be expected to spread) under current and expected conditions. Unplanned and unwanted fires include fires burning in areas where fire is specifically excluded; fires that exhibit burning characteristics (intensity, frequency, and seasonality) that are outside prescribed ranges, specifically including fires expected to produce severe fire effects; unauthorized human caused fires (arson, escaped

camp fires, equipment fires, etc.); and fires that occur during high fire dangers, or resource shortage, where the resources needed to manage the fire are needed for more critical fire management needs. Unplanned is not the same as unscheduled. The time of a lightning fire ignition is not known; however, a lightning-caused fire could still be used to meet fuels and ecosystem management objectives if that type of fire is expected to burn within the parameters of an approved plan; the fire is burning within the parameters for the area; is not causing, or has the potential to cause, unacceptable effects; and funding and resources to manage the fire are available.

V

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

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

W

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

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

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

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

Wildland: [definition added from Wikipedia.org] wildland is an areas of land where plants and animals exist free of human interference. Ecologists assert that wildlands promote biodiversity, that they preserve historic genetic traits and that they provide habitat for wild flora and fauna.

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

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

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

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

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

Wind Vectors: Wind directions used to calculate fire behavior.

APPENDIX A. VEGETATION ASSOCIATION DESCRIPTIONS

The following is general information about the Southwest Regional GAP Analysis Project landcover descriptions used for the vegetation analysis portion of this CWPP. The information contained in this appendix is taken from the Southwest Regional GAP Analysis Project—Land Cover Data Legend Descriptions (USGS 2005). The following includes the vegetation associations composing the WUI of the MCCWPP. For additional information, see the Southwest Regional Landcover Data Web site (http://ftp.nr.usu.edu/swgap/landcover.html).

DESERT SHRUB-SCRUB ASSOCIATIONS

S070 Sonora-Mohave Mixed Salt Desert Scrub

Concept Summary:

This system includes extensive open-canopied shrublands of typically saline basins in the Mojave and Sonoran deserts. Stands often occur around playas. Substrates are generally fine-textured, saline soils. Vegetation is typically composed of one or more *Atriplex* species such as *Atriplex canescens* or *Atriplex polycarpa* along with other species of *Atriplex*. Species of *Allenrolfea, Salicornia, Suaeda*, or other halophytic plants are often present to codominant. Graminoid species may include *Sporobolus airoides* or *Distichlis spicata* at varying densities.

S129 Sonoran Mid-elevation Desert Scrub

Concept Summary:

This transitional desert scrub system occurs along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region between 750-1300 m. Stands occur in the Bradshaw, Hualapai, and Superstition mountains among other desert ranges and are found above Sonoran Paloverde-Mixed Cacti Desert Scrub (CES302.761) and below Mogollon Chaparral (CES302.741). Sites range from a narrow strip on steep slopes to very broad areas such as the Verde Valley. Climate is too dry for chaparral species to be abundant, and freezing temperatures during winter are too frequent and prolonged for many of the frost-sensitive species that are characteristic of the Paloverde Mixed-Cacti Desert Scrub such as *Carnegiagigantea, Parkinsonia microphylla, Prosopis* spp., *Olneya tesota*, *Ferocactus* sp. and *Opuntia bigelovii*. Substrates are generally rocky soils derived from parent materials such as limestone, granitic rocks or rhyolite. The vegetation is typically composed of an open shrub layer of *Larrea tridentata, Ericameria linearifolia*, or *Eriogonum fasciculatum* with taller shrub such as *Fourqueria splendens*, *Canotia holacantha* (limestone or granite) or *Simmondsia chinensis* (rhyolite).. The herbaceous layer is generally sparse.

S063 Sonoran Paloverde-Mixed Cacti Desert Scrub

Concept Summary:

This ecological system occurs on hillsides, mesas and upper bajadas in southern Arizona and extreme southeastern California. The vegetation is characterized by a diagnostic sparse, emergent tree layer of Carnegia gigantea (3-16 m tall) and/or a sparse to moderately dense canopy codominated by xeromorphic deciduous and evergreen tall shrubs Parkinsonia microphylla and Larrea tridentata with Prosopis sp., Olneya tesota, and Fouquieria splendens less prominent. Other common shrubs and dwarf-shrubs include Acacia greggii, Ambrosia deltoidea, Ambrosia dumosa (in drier sites), Calliandra eriophylla, Jatropha cardiophylla, Krameria erecta, Lycium spp., Menodora scabra, Simmondsia chinensis, and many cacti including Ferocactus spp., Echinocereus spp., and Opuntia spp. (both cholla and prickly pear). The sparse

herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. On slopes, plants are often distributed in patches around rock outcrops where suitable habitat is present.

SHRUBLANDS VEGETATION ASSOCIATIONS

S054 Inter-Mountain Basins Sagebrush Shrubland

Concept Summary:

This ecological system occurs throughout much of the western U.S., typically in broad basins between mountain ranges, plains and foothills between 1500-2300 m elevation. Soils are typically deep, well-drained and non-saline. These shrublands are dominated by *Artemisia tridentata ssp. tridentata* and/or *Artemisia tridentata* ssp. *wyomingensis*. Scattered Juniper spp., Sarcobatus vermiculatus and Atriplex spp. may be present in some stands. Ericameria nauseosa, Chrysothamnus viscidiflorus, Purshia tridentata, or Symphoricarpos oreophilus may codominate disturbed stands. Perennial herbaceous components typically contribute less than 25% vegetative cover. Common graminoid species include *Achnatherum hymenoides*, *Bouteloua gracilis*, *Elymus lanceolatus*, *Festuca idahoensis*, *Hesperostipa comata*, *Leymus cinereus*, *Pleuraphis jamesii*, *Pascopyrum smithii*, *Poa secunda*, or *Pseudoroegneria spicata*.

S057 Mogollon Chaparral

Concept Summary:

This ecological system occurs across central Arizona (Mogollon Rim), western New Mexico and southwestern Utah and southeast Nevada. It often dominants along the mid-elevation transition from the Mojave, Sonoran, and northern Chihuahuan deserts into mountains (1000-2200 m). It occurs on foothills, mountain slopes and canyons in dryer habitats below the encinal and *Pinus ponderosa* woodlands. Stands are often associated with more xeric and coarse-textured substrates such as limestone, basalt or alluvium, especially in transition areas with more mesic woodlands. The moderate to dense shrub canopy includes species such as *Quercus turbinella, Quercus toumeyi, Cercocarpus montanus, Canotia holacantha, Ceanothus greggii, Forestiera pubescens (= Forestiera neomexicana), Garrya wrightii, Juniperus*

deppeana, Purshia stansburiana, Rhus ovata, Rhus trilobata, and *Arctostaphylos pungens* and *Arctostaphylos pringlei* at higher elevations. Most chaparral species are fireadapted, resprouting vigorously after burning or producing fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires.

S079 Inter-Mountain Basins Semi-Desert Shrub Steppe

Concept Summary:

This ecological system occurs throughout the Intermountain western U.S., typically at lower elevations on alluvial fans and flats with moderate to deep soils. This semi-arid shrub-steppe is typically dominated by graminoids (>25% cover) with an open shrub layer, but includes sparse mixed shrublands without a strong graminoid layer. Characteristic grasses include *Achnatherum hymenoides, Bouteloua gracilis, Distichlis spicata, Hesperostipa comata, Pleuraphis jamesii, Poa secunda*, and *Sporobolus airoides*. The woody layer is often a mixture of shrubs and dwarf-shrubs. Characteristic species include *Atriplex canescens, Artemisia filifolia, Chrysothamnus greenei, Chrysothamnus viscidiflorus, Ephedra* spp., *Ericameria nauseosa, Gutierrezia sarothrae*, and *Krascheninnikovia lanata*. Scattered *Artemisia tridentata* may be present but does not dominate. The general aspect of occurrences may be either open shrubland with patchy grasses or patchy open herbaceous layer. Disturbance may be important in maintaining the woody component. Microphytic crust is very important in some occurrences.

S052 Colorado Plateau Pinyon-Juniper Shrubland

Concept Summary:

This ecological system is characteristic of the rocky mesa tops and slopes on the Colorado Plateau and western slope of Colorado, but these stunted tree shrublands may extend further upslope along the low elevation margins of taller pinyon-juniper woodlands. Sites are drier than Colorado Plateau Pinyon-Juniper Woodland (CES304.767). Substrates are shallow/rocky and shaley soils at lower elevations (1200-2000 m). Sparse examples of the system grade into Colorado Plateau Mixed Bedrock Canyon and Tableland (CES304.765). The vegetation is dominated by dwarfed (usually <3 m tall) *Pinus edulis* and/or *Juniperus osteosperma* trees forming extensive tall shrublands in the region along low-elevation margins of pinyon-juniper woodlands. Other shrubs, if present, may include *Artemisia nova, Artemisia tridentata ssp. wyomingensis, Chrysothamnus viscidiflorus*, or *Coleogyne ramosissima*. Herbaceous layers are sparse to moderately dense and typically composed of xeric graminoids

PINYON JUNIPER ASSOCIATIONS

S040 Great Basin Pinyon-Juniper Woodland

Concept Summary:

This ecological system occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada. It is typically found at lower elevations ranging from 1600-2600 m. These woodlands

occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Woodlands dominated by a mix of *Pinus monophylla* and *Juniperus osteosperma*, pure or nearly pure occurrences of *Pinus monophylla*, or woodlands dominated solely by *Juniperus osteosperma* comprise this system. *Cercocarpus ledifolius* is a common associate. Understory layers are variable. Associated species include shrubs such as *Arctostaphylos patula, Artemisia arbuscula, Artemisia nova, Artemisia tridentata, Cercocarpus ledifolius, Cercocarpus intricatus, Coleogyne ramosissima, Quercus gambelii, Quercus turbinella*, and bunch grasses *Hesperostipa comata, Festuca idahoensis, Pseudoroegneria spicata, Leymus cinereus (= Elymus cinereus)*, and *Poa fendleriana*. This system occurs at lower elevations than Colorado Plateau Pinyon-Juniper Woodland (CES304.767) where sympatric.

S039 Colorado Plateau Pinyon-Juniper Woodland

Concept Summary:

This ecological system occurs on dry mountains and foothills of the Colorado Plateau region from the Western Slope of Colorado to the Wasatch Range, south to the Mogollon Rim and east into the NW corner of New Mexico. It is typically found at lower elevations ranging from 1500-2440 m. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay. *Pinus edulis* and/or *Juniperus osteosperma* dominate the tree canopy. In the southern portion of the Colorado Plateau in northern Arizona and northwestern New Mexico, *Juniperus monosperma* and hybrids of *Juniperus* spp may dominate or codominate tree canopy. *Juniperus scopulorum* may codominate or replace *Juniperus osteosperma* at higher elevations. Understory layers are variable and may be dominated by shrubs, graminoids, or be absent. Associated species include *Arctostaphylos patula, Artemisia tridentata, Cercocarpus intricatus, Cercocarpus montanus, Coleogyne ramosissima, Purshia stansburiana, Purshia tridentata, Quercus gambelii, Bouteloua gracilis, Pleuraphis jamesii*, or *Poa fendleriana*. This system occurs at higher elevations than Great Basin Pinyon-Juniper Woodland (CES304.773) and Colorado Plateau shrubland systems where sympatric.

PINE FOREST ASSOCIATIONS

S036 Rocky Mountain Ponderosa Pine Woodland

Concept Summary:

This very widespread ecological system is most common throughout the cordillera of the Rocky Mountains. It is also found in the Colorado Plateau region, west into scattered locations in the Great Basin, and north into southern British Columbia. These woodlands occur at the lower treeline/ecotone between grassland or shrubland and more mesic coniferous forests typically in warm, dry, exposed sites. Elevations range from

less than 500 m in British Columbia to 2800 m in the New Mexico mountains. Occurrences are found on all slopes and aspects, however, moderately steep to very steep slopes or ridgetops are most common. This ecological system generally occurs on igneous, metamorphic, and sedimentary material derived soils, with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acid pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. These woodlands in the eastern Cascades, Okanagan and northern Rockies regions receive winter and spring rains, and thus have a greater spring "green-up" than the drier woodlands in the central Rockies. *Pinus ponderosa* is the predominant conifer; *Pseudotsuga menziesii, Pinus edulis*, and *Juniperus* spp. may be present in the tree canopy. The understory is usually shrubby, with *Artemisia nova, Artemisia tridentata, Arctostaphylos patula, Arctostaphylos uva-ursi, Cercocarpus montanus, Cercocarpus ledifolius, Purshia stansburiana, Purshia tridentata, Quercus gambelii, Symphoricarpos oreophilus, Prunus virginiana, Amelanchier alnifolia*, and *Rosa* spp. common species. *Pseudoroegneria spicata* and species of *Hesperostipa, Achnatherum, Festuca, Muhlenbergia*, and *Bouteloua* are some of the common grasses. Mixed fire regimes and ground fires of variable return interval maintain these woodlands, depending on climate, degree of soil development, and understory density.

DECIDUOUS SOUTHWEST RIPARIAN ASSOCIATIONS

S097 North American Warm Desert Montane Riparian Woodland and Shrubland

Concept Summary:

This ecological system consists of low-elevation (<1200 m) riparian corridors along medium to large perennial streams throughout canyons and the desert valleys of the southwestern United States and adjacent Mexico. The vegetation is a mix of riparian woodlands and shrublands. Dominant trees include *Acer negundo, Fraxinus velutina, Populus fremontii, Salix gooddingii, Salix lasiolepis, Celtis laevigata var. reticulata*, and *Juglans major*. Shrub dominants include *Salix geyeriana, Shepherdia argentea*, and *Salix exigua*. Vegetation is dependent upon annual or periodic flooding and associated sediment scour and/or annual rise in the water table for growth and reproduction.

S093 Rocky Mountain Lower Montane Riparian Woodland and Shrubland

Concept Summary:

This system is found throughout the Rocky Mountain and Colorado Plateau regions within a broad elevation range from approximately 900 to 2800 m. This system often occurs as a mosaic of multiple communities that are tree-dominated with a diverse shrub component. This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. They can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. Dominant trees may include *Acer negundo, Populus angustifolia, Populus balsamifera, Populus deltoides, Populus fremontii, Pseudotsuga*

menziesii, Picea pungens, Salix amygdaloides, or *Juniperus scopulorum*. Dominant shrubs include *Acer glabrum, Alnus incana, Betula occidentalis, Cornus sericea, Crataegus rivularis, Forestiera pubescens, Prunus virginiana, Rhus trilobata, Salix monticola, Salix drummondiana, Salix exigua, Salix irrorata, Salix lucida, Shepherdia argentea*, or *Symphoricarpos* spp. Exotic trees of *Elaeagnus angustifolia* and *Tamarix* spp. are common in some stands. Generally, the upland vegetation surrounding this riparian system is different and ranges from grasslands to forests.

OTHER COVER TYPES AND NONVEGETATED ASSOCIATIONS: ALTERED, DISTURBED, DEVELOPED

N21 Developed, Open Space—Low Intensity

Description: Open Space: Includes areas with a mixture of some construction materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. Developed, Low intensity: Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49 percent of total cover. These areas most commonly include single-family housing units.

N22 Developed, Medium—High Intensity

Description: Developed, Medium Intensity: Includes areas with a mixture of constructed materials and vegetation. Impervious surface accounts for 50-79 percent of the total cover. These areas most commonly include single-family housing units. Developed, High Intensity: Includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover. Source: NLCD draft legend, 25 July 2003

N31 Barren Land Types

Description: (Rock/Sand/Clay)-Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulation of earthen material. Generally, vegetation accounts for less than 15% of total cover.

N80 Agriculture

Description: Agriculture—unable to make distinction between N81 and N82.

N11 Open Water

Description: All areas of open water, generally with less than 25% cover of vegetation or soil.

D04 Invasive Southwest Riparian Woodland and Shrubland

Description: *Tamarix* spp. Semi-Natural Temporarily Flooded Shrubland Alliance (A842), or *Elaegnus angustifolus* Semi-Natural Woodland Alliance (A3566).

APPENDIX B. NATIONAL FIRE DANGER RATING SYSTEM FUEL MODEL SELECTION KEY

I. Mosses, lichens, and low shrubs predominate ground fuels

A. Overstory of conifers occupies more than one-third of the site

Model Q

B. No overstory or it occupies less than one-third of the site

Model S

II. Marsh grasses and/or reeds predominate

Model N

III. Grasses and/or forbs predominate

A. Open overstory of conifer and/or hardwoods

Model C

B. No overstory

1. Woody shrubs occupy more than one-third, but less than two-thirds of the site

Model T

2. Woody shrubs occupy less than two-thirds of the site

a. The grasses and forbs are primarily annuals

Model A

b. Grasses and forbs are primarily perennials

Model L

IV. Brush, shrubs, tree reproduction or dwarf tree species predominate

A. Average height of woody plants is 6 feet or greater

1. Woody plants occupy two-thirds or more of the site

a. One-fourth or more of the woody foliage is dead

1) Mixed California chaparral

Model B

2) Other types of brush

Model F

b. Up to one-fourth of the woody foliage is dead

Model Q

c. Little dead foliage

Model O

2. Woody plants occupy less than two-thirds of the site

Model F

B. Average height of woody plants is less than 6 feet

1. Woody plants occupy two-thirds or more of the site

a. Western United States

Model F

b. Eastern United States

Model O

2. Woody plants occupy less than two-thirds but greater than one-third of the site

a. Western United States

Model T

b. Eastern United States

Model D

3. Woody plants occupy less than one-third of the site

a. Grasses and forbs are primarily annuals

Model A

b. Grasses and forbs are primarily perennials

Model L

V. Trees predominate

A. Deciduous broadleaf species predominate

1. Area has been thinned or partially cut, leaving slash as the major fuel component

Model K

2. Area has not been thinned or partially cut

a. Overstory is dormant; leaves have fallen

Model E

b. Overstory is in full leaf

Model R

B. Conifer species predominate

1. Lichens, mosses, and low shrubs dominate as understory fuels

Model Q

2. Grasses and forbs are the primary ground fuel

Model C

3. Woody shrubs and/or reproduction dominate as understory fuels

a. Understory burns readily

1) Western United States

Model T

2) Eastern United States

a) Understory is more than 6 feet tall

Model O

b) Understory is less than 6 feet tall

Model D

b. Understory seldom burns

Model H

4. Duff and litter, branch wood, and tree boles are the primary ground fuel

a. Overstory is over mature and decadent; heavy accumulation of dead debris

Model G

b. Overstory is not decadent; Only a nominal accumulation of debris

1) Needles are 2 inches or more in length (most pines)

a) Eastern United States

Model P

b) Western United States

Model U

2) Needles are less than 2 inches long

Model H

VI. Slash is the predominate fuel type

A. Foliage is still attached; little settling

1. Loading is 25 tons/acre or greater

Model I

2. Loading is less than 25 tons/acre but greater than 15 tons/acre

Model J

3. Loading is less than 15 tons/acre

Model K

B. Settling is evident; foliage is falling off; grasses, forbs and shrubs are invading

1. Loading is 25 tons/acre or greater

   Model J

2. Loading is less than 25 tons/acre

   Model K

APPENDIX C. EDUCATIONAL RESOURCES

Firewise Information and Web Sites

Firewise Communities/USA national recognition program. *http://www/Firewise.org/USA*

The FireFree Program, sponsored by SAFECO Corporation, Wildfire Defense Get in the Zone, Reduce Your Risk of Wildfire pamphlet. *http://www.Safeco.com/Safeco/about/giving/firefree.org*

Living with Fire—A Homeowners' Guide. A 12-page tabloid, which is produced regionally by US Department of Interior agencies (Bureau of Indian Affairs, Bureau of Land Management, Fish and Wildlife Service, National Park Service), the USDA Forest Service, and state land departments. This is one of the most detailed pieces of Firewise information for landowners to reference when creating survivable space around their homes. *http://www.or.blm.gov/nwfire/docs/Livingwithfire.pdf*

Fire Information Clearinghouse Web site from the San Juan Public Lands Center.
http://www.SouthwestColoradoFires.org

Best Practices and Tools for Collaboration

The Collaboration Handbook, Red Lodge Clearinghouse. *http://www.rlch.org/content/view/261/49*

Ecosystem management Initiative at the University of Michigan.
http://wwwsnre.umich.edu/ecomgt.collaboration.htm

Western Collaborative Assistance Network*. http://www.westcanhelp.org*

BLM Partnership website. *http://www.blm.gov/partnerships/tools.htm*

Forest Service Partnership Resource Center*. http://www.partnershipresourcescenter, org/index.shtml*

International Association of Fire Chief's Leader's guide for Developing a Community Wildfire Protection Plan. *http://wwwcsfs.colostate.edu/librar/.pdfs/cwpp/CWPP_LG.pdf*

Joint Fire Sciences Collaboration and CWPP Presentation*. http://www.jfsp.fortlewis.edu/KTWorkshops.asp*

Grant Web Sites

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*

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*

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

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

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

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

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

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

Firewise. *http://www.firewise.org/usa/funding.htm*

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

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

Grant opportunities search Web site *www.grants.gov*

Arizona Wildfire and the Environment Series

Firewise publications from the University of Arizona: Forest Home Fire Safety; Fire-Resistant Landscaping; Creating Wildfire-Defensible Spaces for Your Home and Property; Homeowners' "Inside and Out" Wildfire Checklist; Firewise Plant Materials for 3000 Feet and Higher Elevations; Soil Erosion Control After a Wildfire; Recovering from Wildfire; A Guide for Arizona's Forest Owners; Wildfire Hazard Severity Rating Checklist for Arizona Homes and Communities. *http://cals.arizona.edu; http://cals.arizona.edu/pubs*

Monitoring and Evaluation Resources

USDA Forest Service Collaborative Restoration Program – Multiparty Monitoring Guidelines. *http://www.fs.fed.us/r3/spf/cfrp/monitoring/index.shtml*

Rural Voices for Conservation Coalition – Multiparty Monitoring Issue Paper. *http://www.ri.uoregon.edu/programs/CCE/communityfireplanning.html*

Other

Federal Emergency Management Agency (FEMA) State Hazard Mitigation Offices. *http://www.floods.org/shmos.htm*

National Fire Plan. *http://www.fireplan.gov/community_assist.crm*

National Fire Protection Association (NFPA) NFPA 299 (Standard for Protection of Life and Property from Wildfire); NFPA 295 (Standard for Wildfire Control); NFPA 291 (Recommended Practice for Fire Flow Testing and Marking of Hydrants); NFPA 703 (Standard for Fire Retardant Impregnated Coatings for Building Materials); NFPA 909 (Protection of Cultural Resources); NFPA 1051 (Standard for Wildland Fire Fighter Professional Qualifications); NFPA 1144 (Standard for Protection of Life and Property from Wildfire); NFPA 1977 (Standard on Protective Clothing and Equipment for Wildland Fire Fighting). *http://www.nfpa.org; http://www.nfpa.org/Catalog*

National Fire Lab. *http://www.firelab.org/fbp/fbresearch/WUI/home.htm*

Protect Your Home from Wildfire. Publications to help assist you with wildfire prevention. Colorado State Forest Service. *http://www.colostate.edu/Depts/CSFS/homefire.html*

US Fire Administration, FEMA, US Department of Homeland Security. *http://www.usfa.fema.gov; http://www.fema.gov/regions/viii/fires/shtm; http://www.fema.gov/kidswldfire*

Fire Education Materials. *http://www.symbols.gov*

National Interagency Fire Center, National Park Service fire site. *http://www.nifc.nps.gov/fire*

PBS NOVA—"Fire Wars." *http://www.pbs.org/wgbh/nova/fire*

D'Goat Ranch, LLC. Jason Garn. (801) 440-2149. Leasing and goat herding for vegetative mitigation projects.

Woody Biomass Utilization Desk Guide.
http://www.forestsandrangelands.gov/woody_biomass/documents/biomass_deskguide.pdf

Pamphlets

Saving Homes from Wildfires: Regulating the Home Ignition Zone, by the American Planning Association (APA).

This May 2001 issue of the APA's Zoning News examines the wildfire threat to the wildland urban interface zone and shows how development codes can be used to save residential areas.

Books

Everyone's Responsibility: Fire Protection in the Wildland Urban Interface, NFPA, 1994. This National Fire Protection Association book shows how three communities dealt with interface problems.

Firewise Construction Design and Materials Publication, sponsored by the Colorado State Forest Service (CSFS) and the Federal Emergency Management Agency (FEMA). This booklet is 38 pages of detailed home construction ideas to make a home Firewise. Various other publications are available from the CSFS on wildland urban interface issues.

Is Your Home Protected from Wildfire Disaster? A Homeowner's Guide to Wildfire Retrofit, IBHS, 2001. This Institute for Business and Home Safety book provides homeowners with guidance on ways to retrofit and build homes to reduce losses from wildfire damage.

Stephen Bridge, Road Fire Case Study, NFPA, 1991. Provides information to assist planners, local officials, fire service personnel, and homeowners.

Wildland Fire—Communicator's Guide. This is a guide for fire personnel, teachers, community leaders, and media representatives.

CD ROMs

Arizona Firewise Communities Educator's Workshop, Payson, AZ, February 18–19, 2003.

Burning Issues, Florida State University and the USDI Bureau of Land Management, 2000. Interactive multimedia program for middle and high school students to learn about the role of fire in the ecosystems and the use of fire managing rural areas.

Wildland Fire Communicator's Guide. This interactive CD-ROM compliments the book.

Other Publications

It Can't Happen to My Home! Are You Sure? A publication by the USDA Forest Service, Southwestern Region, 12 page document.

Wildfire Strikes Home! It Could Happen to You, How to Protect Your Home! / Homeowners Handbook, from the USDI Bureau of Land Management, the USDA Forest Service and state foresters (publication nos. NFES 92075 and NFES 92074).

APPENDIX D. INFORMATION DATA SHEET AND CONTACTS

D.1. CWPP Base Information Data Source

Name	Type	Source	Contact/Web address
Wildland Fuel Hazards	Shapefile	Logan Simpson Design Inc.	Richard Remington (480) 967-1343; rremington@lsdaz.com
Wildland-Urban Interface (WUI)	Shapefile	Logan Simpson Design Inc.	Richard Remington (480) 967-1343; rremington@lsdaz.com
Vegetation Zones	Raster	Southwest Regional Gap Analysis Project (USGS 2005)	http://earth.gis.usu.edu/swgap/
Well Locations	Shapefile	ADWR	ADWR 602-771-8638 mxb@azwater.gov
Land Ownership	Shapefile	State of Arizona	http://www.land.state.az.us/alris/index.html
Ignition History	Shapefile	Bureau of Land Management	http://wildfire.cr.usgs.gov/firehistory/

All final analysis GIS data, including flammability analysis, fuel hazards analysis, ignition history and density, community values analysis, cumulative risk analysis, treatment management units, and areas of elevated concern, are located at the Mohave County Office of Emergency Management and at Logan Simpson Design Inc.

D.2. Mohave County CWPP Contact Personnel

Byron Steward
Emergency Management Coordinator
Mohave County Division of Emergency Management
3675 E. Andy Devine Ave., Suite C
PO Box 7000
Kingman, Arizona 86402
(928) 757-0930
Byron.Steward@co.mohave.az.us

Richard Remington
Senior Project Manager
Logan Simpson Design Inc.
51 West Third Street, Suite 450
Tempe, Arizona 85281
(520) 884-5500
rremington@lsdaz.com

Steve Engle
Senior Engineering Technician, GIS
Mohave County Public Works
PO Box 7000
3675 E. Andy Divine Ave., Suite C
Kingman, AZ 86402
(928) 757-0910
Steven.Engle@co.mohave.az.us

APPENDIX E. INVASIVE SPECIES

The following information is presented by the Core Teams to assist municipal, state, and federal land managers with basic recommendations for the management of invading saltcedar, red brome, and cheatgrass within the county. Invading tree species information is taken from the online Fire Effects Information System (Zouhar 2003), the *Strategy for Long-Term Management of Exotic Trees in Riparian Areas for New Mexico's Five River Systems, 2005–2014* (USDA FS and New Mexico Energy, Minerals and Natural Resources Department, Forestry Division 2005), and the *San Juan Basin Watershed Management Plan* (San Juan County Watershed Group 2005). All information provided for red brome and cheatgrass was taken from the USDA Forest Service's Fire Effect Information System (www.fs.fed.us/database/feis/plants).

Saltcedar

The continued degradation of native riparian plant communities from invading tree species is a significant concern to the citizens of Mohave County.

Saltcedar is one of the most widely distributed and troublesome nonnative invasive plants along watercourses in the southwestern United Sates. Saltcedar reduces recreational usage of parks, and riparian areas for camping, hunting, fishing, and agriculture. Since its escape from cultivation, saltcedar has spread primarily in the southwestern US and northern Mexico although its distribution extends into many parts of North America. It is especially pervasive in, and has dominated many low areas bordering the channel of the southwest river systems since the 1940s. More than 50 percent of the area covered by floodplain plant communities was dominated by saltcedar by 1970 (<www.fs.fed.us/database/feis/plants>). Saltcedar dominated communities are often monotypic, though cottonwood and willow are common associates. Several studies in Arizona and New Mexico suggest that saltcedar communities do not support as high a density of native bird species as do native plant communities, however saltcedar provides habitat for a number of bird species including white-winged and mourning doves, summer tanager, yellow billed cuckoo and the endangered Southwestern willow flycatcher. Saltcedar communities can trap and stabilize alluvial sediments, reducing the width, depth and water-holding capacity of river channels. This can subsequently increase the frequency and severity of overbank flooding. These stands can have extremely high evapotranspiration rates when water tables are high but not necessarily when water tables are low or under drought conditions. Because saltcedar stands tend to extend beyond the boundaries of native phreatophytes and to develop higher leaf area index, water use by saltcedar on a regional scale might be substantially higher than for other riparian species. While the natural flood disturbance regime seems to promote native species and discourage saltcedar, consistent natural river flow conditions through riparian areas is rarely sustained in the MCMCCPP.

There is little quantitative information on prehistoric frequency, seasonality, severity, and spatial extent of fire in North American riparian ecosystems. Fires in low- to mid-elevation southwestern riparian plant communities dominated by cottonwood, willow and/or mesquite are thought to have been infrequent. Increases in fire size or frequency have been reported for river systems in recent decades. Fire appears to be less common in riparian ecosystems where saltcedar has not invaded. Increases in fire size and frequency are attributed to a number of factors including an increase in ignition sources, increased fire

frequency in surrounding uplands, and increased abundance of fuels. The structure of saltcedar stands may be more conducive to repeated fire than that of native vegetation. Saltcedar can contribute to increased vertical canopy density, creating volatile fuel ladders, thereby increasing the likelihood of negative impacts of wildfire. Saltcedar plants can have many stems and high rates of stem mortality, resulting in a dense accumulation of dead, dry branches vertically within the canopy as well as within the fuel bed. Large quantities of dead branches and leaf litter are caught in saltcedar branches above the ground surface, enhancing the crowns' flammability. In summary, the likelihood of fire in southwestern riparian ecosystems is greatest with the combination of flood suppression, water stress, and saltcedar presence. The presence of saltcedar in southwestern riparian ecosystems may favor its own propagation by further altering the natural disturbance regime, thereby further decreasing the already limited extent of native cottonwood and willow communities. Additionally, in the absence of flooding, regeneration of native trees is impeded, and organic matter accumulates, thus increasing chances for future fires that may further alter the species composition and structure of southwestern riparian systems and promote the spread of saltcedar and other fire tolerant species (<www.fs.fed.us/database/fesi/plants/tree/tamspp/fire_ecology>).

Once established in large stands saltcedar can rarely be controlled or eradicated with a single method, and many researchers and managers recommend combining physical, biological, chemical, and cultural control methods. Removing saltcedar must also be accompanied by an ecologically healthy plant community that is weed resistant and meets other land use objectives such as wildlife habitat or recreational use benefits. The best phenological stage to burn and reburn saltcedar to reduce density, canopy, and hazardous fuel loads is during the peak of summer, presumably due to ensuing water stress. Use of fire alone to control saltcedar, however, is generally ineffective, only killing above ground portions of the plant leaving the root crown intact and able to produce vigorous sprouts. Saltcedar stands can burn hot with erratic fire behavior with numerous firebrands transported downwind from the headfire. Prescribe fire set-up requires poorly receptive fuels downwind from the headfire. Saltcedar in dense stands that have not burned in 25–30 years exhibit extreme fire behavior and crowning due to closed canopy at any time of the year. They can have flame lengths exceeding 140 feet, resulting in near complete fuel consumption. Stands reburned after 5 to 6 years show vastly different fire behavior, carrying fire only if there is adequate fine fuel load and continuity. Due to the ability to transport fire brands at least 500 feet downwind, blacklines should be at least 700 feet wide, headfires installed with temperatures 65–95 degrees Fahrenheit, relative humidity of 25–40 percent, and wind speeds less than 15 miles per hour.

Managers must be prepared for extreme fire behavior in old decadent stands. Where high intensity fire is not preferred due to presence of less fire resistant vegetative species, fuel reductions through mechanical and chemical controls are recommended. Ignited prescribed fire can be used to thin dense saltcedar stands to follow-up applications of mechanical and chemical controls (www.fs.fed.us/database/feis/plants/tree/tamspp/fire_effects). Mechanical and chemical methods are commonly employed for saltcedar control (*Low-Impact, Selective Herbicide Application for Control of Exotic Trees: Saltcedar, Russian Olive and Siberian Elm A preliminary Field Guide by Doug Parker and Max Williamson*, USDA May 2003). November through January is the most effective time to achieve first time kills of saltcedar by cutting below the root collar, probably because the plants are entering dormancy at that time and translocating resources into their roots. Whole tree extraction through use of equipment such as the patented Boss Tree Extractor (<www.bossreclamation.com>) has achieved 90 percent mortality subsequent to initial treatment. In areas

where native riparian vegetation species or other habitat issues create a need for agile specific treatment designs, whole tree removal may be considered as the preferred treatment. Herbicide application is most effective when applied immediately after cutting. Full strength application of garlon® painted on cut stumps within 15 minutes of cutting or applied with a backpack sprayer using 20-30% mix of garlon® with Ag. Oil has been successful with the exception of spring months when sap is moving up from the root mass. (*Low-Impact, Selective Herbicide Application for Control of Exotic Trees: Saltcedar, Russian Olive and Siberian Elm A preliminary Field Guide by Doug Parker and Max Williamson* USDA May 2003). Extraction and mulching of saltcedar will require treatments of re-sprouts by mechanical or chemical control methods. Changes in nature of disturbance from fire (frequency, intensity, and severity) have been effected by both saltcedar invasion and by other changes in the invaded communities. Fire frequency and fire behavior in saltcedar invaded communities are thought to be different than in native plant communities. In the absence of flooding to remove debris, accumulation of woody material can increase to levels that may have a profound effect on the ecology of the system.

Red Brome

In general, red brome initiation and establishment is a direct response to fall rains. Initial growth is relatively slow, followed by a rapid increase in vegetative growth coinciding with warming spring temperatures. Flowering and fruiting generally occur in April and May. Seeds are disseminated in summer.

Red brome is commonly an early to mid-seral species in California chaparral. It is usually sparse in early succession chaparral systems of northern California but may increase rapidly in areas of low soil fertility and moisture. Peak population numbers require several years for seed dispersal into burns or buildup from on-site producers. Continued disturbance such as grazing and repeated low-severity fires favor red brome over native early-seral chaparral species.

Red brome generally shortens fire return intervals. The increased presence of red brome has promoted fires in areas where fire was previously infrequent due to insufficient fuels. Once established red brome may increase fire frequency by enhancing potential for start and spread. In general, red brome produces an abundant and continuous cover of persistent fine fuels, promoting fast, "hot" fires. Areas of the Mojave Desert dominated by red brome are more susceptible to fire than areas dominated by native forbs. Dead red brome culms and blades are persistent (commonly 2 years); herbage of most Mojave Desert annual species usually lasts 1 year or less. Red brome produces high amounts of persistent flammable fuels in perennial plant interspaces, promoting ignition and spread.

Heat generated by burning red brome is sufficient to ignite and consume dead stems of native Mojave Desert forbs. Flames may also consume small shrubs such as white bursage (*Ambrosia dumosa*), winterfat (*Krascheninnikovia lanata*), white burrobush, and Anderson wolfberry (*Lycium andersonii*). However, flames fueled by red brome are generally insufficient to ignite large shrubs such as creosote bush.

Within the Sonoran Desert, dead and dry red brome is easily ignited, supporting fast-moving surface fires. Fire return intervals are also shortened, changing the vegetal composition through increase of non-native components and loss of native plant species. Red Brome has failed to become established in previously burned chaparral stands in the BLM Colorado River District. Arizona interior chaparral communities are composed of varying plant species compositions, enhanced by the predominate bi-modal rainfall patterns

of southern Mohave County. Soils in this type are mostly shallow decomposed granite complexes that may hinder establishment of annual grasses. Red Brome can become a wildlife fire enhancing component in down slope desert scrub/shrub types in years of extraordinary rainfall.

Cheat Grass

Cheatgrass is most widespread in sagebrush steppe communities of the Intermountain West. Many of the ecosystems that cheatgrass has invaded are seriously altered, and no longer support the vegetation of the potential natural community. Cheatgrass can maintain dominance for many years on sites where native vegetation has been eliminated or severely reduced by grazing, cultivation, or fire. The concept of potential natural communities based only on native species is seriously challenged by cheatgrass. Where cheatgrass is highly adapted, it might have to be recognized as a component of the potential plant community. In these situations, cheatgrass may remain the de facto climax dominant, regardless of site potential. The following discussion focuses primarily on component species of potential natural communities that cheatgrass has invaded, from low-elevation salt-desert shrub communities in the southern Great Basin into higher-elevation juniper (*Juniperus* spp.), pinyon-juniper (*Pinus-Juniperus* spp.), pine woodlands, and the coniferous forest zone of the Rocky Mountains.

According to Stewart and Hull in 1949 and Beatley in 1966, only a few cheatgrass plants were found in black greasewood-shadscale (*Sarcobatus vermiculatus-Atriplex confertifolia*) and salt-desert shrub associations. Today, cheatgrass is common in these communities, especially in wet years. Associated species may include budsage (*Artemisia spinescens*), bottlebrush squirreltail (*Elymus elymoides*), Sandberg bluegrass (*Poa secunda*), and Indian ricegrass (*Achnatherum hymenoides*). Cheatgrass also occurs with blackbrush (*Coleogyne ramosissima*), galleta (*Pleuraphis jamesii*), and many other salt-desert species.

In the Intermountain West, and most specifically the sagebrush steppe and bunchgrass zones, cheatgrass occurs in and often dominates large acreages of rangeland where native dominants include big sagebrush (*Artemisia tridentata*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Thurber needlegrass (*Achnatherum thurberianum*)], needle-and-thread grass (*Hesperostipa comata*), western wheatgrass (*Pascopyrum smithii*), basin wildrye (*Elymus cinereus*, Idaho fescue (*Festuca idahoensis*), rough fescue (*F. altaica*), bottlebrush squirreltail, low sagebrush (*Artemisia arbuscula*), spiny hopsage (*Grayia spinosa*), and rabbitbrush (*Chrysothamnus* spp.). Cheatgrass often co-occurs with Sandberg bluegrass and/or bottlebrush squirreltail, and on some Nevada sites has replaced Indian ricegrass or blue grama (*Bouteloua gracilis*). By 1932 cheatgrass had replaced big sagebrush on burned-over areas in the Great Salt Lake region of Utah, and occupied these sites in dense stands associated with cutleaf filaree (*Erodium cicutarium*), rabbitbrush, broom snakeweed (*Gutierrezia sarothrae*), and several other relatively unpalatable species and annual weeds. Cheatgrass invades sites dominated by silver sagebrush (*A. cana*) and blue grama in Wyoming.

In pinyon-juniper and mountain brush lands, cheatgrass can be found growing among Rocky Mountain juniper (*J. scopulorum*), western juniper (*J. occidentalis*), singleleaf pinyon (*Pinus monophylla*), Utah juniper (*J. osteosperma*), Colorado pinyon (*P. edulis*), Gambel oak (*Quercus gambelii*), Emory oak (*Q.*

emoryi), antelope bitterbrush (*Purshia tridentata*), curlleaf mountain-mahogany (*Cercocarpus ledifolius*), skunkbush sumac (*Rhus trilobata*), snowberry (*Symphoricarpos* spp.), serviceberry (*Amelanchier pallida*), and mountain big sagebrush.

Cheatgrass is common in the ponderosa pine (*Pinus ponderosa*) zone throughout the West. It may be found with Douglas-fir (*Pseudotsuga menziesii*), and on dry sites in the grand fir (*Abies grandis*) forest zone. Cheatgrass is restricted to dry and exposed areas in western redcedar-western hemlock (*Thuja plicata-Tsuga heterophylla*) associations. It is uncommon in mature forest stands, and is usually found only after disturbance or on dry and exposed sites within forest zones.

Disturbance: Often the critical factor opening niches for cheatgrass invasion is a heightened disturbance regime. Cultivation and subsequent land abandonment, excessive livestock grazing, overstory removal, and repeated fires can interact, or act singly, to proliferate cheatgrass. Excessive grazing and frequent fires can damage biological soil crusts and many perennial plants, thus encouraging cheatgrass establishment, survival, persistence, and dominance. Where fires have occurred at higher elevations, bunchgrasses have recovered vigorously with little cheatgrass invasion. Cheatgrass is less invasive in mesic environments, where it does not compete as effectively with established perennial grasses.

Fire adaptations: Cheatgrass establishes from soil-stored and transported seed after fire. It has long been known that cheatgrass is highly adapted to a regime of frequent fires. Cheatgrass has a very fine structure, tends to accumulate litter, and dries completely in early summer, thus becoming a highly flammable, often continuous fuel. By the time of burning most cheatgrass seeds are already on the ground, and those not near the heat of burning shrubs can survive and allow cheatgrass to pioneer in the newly burned area. Even if fire comes when cheatgrass plants are still green and kills them before they can set seed, there may be enough viable cheatgrass seed in litter and upper layers of soil for plants to reestablish.

Cheatgrass is a strong competitor in the postfire environment, where it takes advantage of increased resource availability and produces an abundant seed crop. A cheatgrass population may average around 1,000 plants per square foot (10,750 per m^2) prior to burning. During a wildfire, most of the cheatgrass seeds beneath the canopy of sagebrush plants are killed by the heat associated with the burning of the shrub. Some cheatgrass seeds located in the interspaces among shrubs are also consumed, while those that are buried or lying in cracks in the soil will likely survive. The next season, surviving seeds germinate and establish at a density of about 1 plant per square foot ($11/m^2$). These plants are released from competition, and have more water and nutrients available to them. The cheatgrass plants in this sparse population can produce abundant tillers, each supporting many flowers, thus producing a large seed crop.

Fire facilitates cheatgrass dominance on some sites by interrupting successional trajectories of postfire plant communities, and cheatgrass facilitates fire and can thus shorten the interval between fires. This grass/fire cycle is a serious ecological threat on sites where most native plant species are poorly adapted to fire and is recognized in many ecosystems worldwide. This cycle has been documented in the Great Basin since the 1930s, and has been reported in the Mojave and Sonoran deserts beginning in the early 1980s. The result is a type conversion from native shrub and perennial grasslands to annual grasslands adapted to frequent fires.

Fire regimes: Cheatgrass expansion has dramatically changed fire regimes and plant communities over vast areas of western rangelands by creating an environment where fires are easily ignited, spread rapidly, cover large areas, and occur frequently. Cheatgrass promotes more frequent fires by increasing the biomass and horizontal continuity of fine fuels that persist during the summer lightning season and by allowing fire to spread across landscapes where fire was previously restricted to isolated patches. Fire in these habitats can have severe effects on native species of plants and animals, although the impact of fire regime changes may differ by region and ecosystem type due to differences in the composition and structure of the invaded plant communities and to climatic differences such as occurrence of summer thunderstorms.

Postfire plant communities in the Mojave and Sonoran deserts are typically dominated by nonnative annual grasses, so burned areas are likely to be more susceptible to fire than unburned areas. Repeated fires stress and kill native perennials. Eventually wind and water erosion may occur, removing and diluting soil organic matter and attendant nutrient concentrations and safe sites around shrubs. After fire has eliminated native perennials, essential mycorrhizae may also be eliminated. Biological soil crusts are also killed by severe fire, and the unusually large, frequent fires associated with cheatgrass dominance can preclude crust species recolonization and succession.

Cheatgrass fire regime: Cheatgrass often dominates postfire plant communities, and once established, cheatgrass-dominated grasslands greatly increase the potential and recurrence of wildfires. Cheatgrass fires tend to burn fast and cover large areas, with a fire season from 1 to 3 months longer than that of native rangeland. The average fire-return interval for cheatgrass-dominated stands is less than 10 years. This adaptation to and promotion of frequent fires is what gives cheatgrass its greatest competitive advantage in ecosystems that evolved with less frequent fires. The cheatgrass-fire cycle is self-promoting, as it reduces the ability of many perennial grasses and shrubs to re-establish and furthers the dominance of cheatgrass. Moisture availability can affect cheatgrass productivity and thus affect fuel loads on a site. Drought years may reduce the dominance of cheatgrass in both recently burned and unburned areas, thus decreasing fuel loads and the chance of fire.

Immediate Fire Effect on Cheatgrass: Live cheatgrass plants are susceptible to heat kill, as with a flame thrower or handled propane torch, though they are difficult to burn when green. When cheatgrass plants are dry enough to burn, they are already dead, and have already set seed. Fire will then reduce cheatgrass plants to ash.

Cheatgrass seeds are also susceptible to heat kill, but can survive fires of low-severity if the entire litter layer is not consumed or if seeds are buried deeply enough to be insulated from the heat. The amount of litter or ash left on a site is a good indicator of the amount of cheatgrass seed surviving on that site. Low density of cheatgrass immediately following fire indicates either low numbers of cheatgrass seed in the seed bank, or poor survival of seeds during fire.

Discussion and Qualification Of Fire Effect: The effects of fire on cheatgrass plants and seeds vary with timing and severity of fire and the composition and density of the prefire plant community. If fire occurs when seed remains in panicles above ground, most seeds will be killed and cheatgrass density will decline

immediately following fire. The chances of seed surviving fire are enhanced once they have dispersed onto or beneath the soil surface. In sagebrush communities, most of the litter and cheatgrass seeds are found under the canopies of sagebrush plants. The woody biomass of the shrub, plus litter accumulations, provide sufficient fuel to elevate temperatures high enough for a long enough period to consume cheatgrass seeds on these microsites. Some cheatgrass seeds in the interspace zones are also consumed by fire, but many survive even though the cheatgrass herbage is completely consumed. Fire from herbaceous fuel alone is not usually hot enough to consume cheatgrass seeds. Although fires in pure cheatgrass stands, without woody fuel, are less severe, cheatgrass seed banks can be substantially reduced after fire.

Discussion And Qualification Of Plant Response: Cheatgrass response to fire depends on plant community and seed bank composition, density, and spatial distribution; season of burning; fire severity, frequency and patchiness; scale of consideration; postfire management; and climatic conditions. Generalizations are difficult because each combination of climate, vegetation, and soil must be considered separately, as well as considerations of environmental differences both at the time of burning and during subsequent plant reestablishment.

Timing of fire: If burned during a crucial time during seed ripening, fire can greatly reduce the density of the succeeding cheatgrass stand; however, postfire seed production may equal or exceed that of the prefire population, resulting in increased density the following year. Timing of fire is important also because of variable damage to potential competitors in the native community. For example, cool-season perennial grasses such as bluebunch wheatgrass and western wheatgrass may be less damaged by late-summer wildfires than by fires earlier in the growing season.

Fire size and frequency: Nonnative, invasive grasses generally benefit from fire and promote recurrent fire. Fire kills biologic soil crusts, thereby allowing more germination sites for cheatgrass for several years or even decades, as crusts are slow to recover. Recurrent fires also tend to enhance cheatgrass dominance because native species cannot usually persist under a regime of frequent fires. Native plant assemblages are thus converted to nonnative annual grasslands. Frequency and size of fires is then further increased.

Fire Management Considerations: As a management tool, fire can be used to either kill unwanted species or to simulate historic fire regimes and promote desired species. Historic fire regimes did not occur in the presence of many invasive plants that are currently widespread, and the use of fire may not be a feasible or appropriate management action if fire-tolerant invasive plants are present. For example, while fire may be an important natural component of the Great Basin ecosystem, its reintroduction by land mangers is complicated by the presence of invasive plants such as cheatgrass. Fire management should be conducted in ways that prevent establishment of invasive species, and the management of fire and invasive plants must be closely integrated for each to be managed effectively.

Rasmussen presents considerations (e.g. species composition, fuel load, fuel continuity, and weather) to be addressed when using prescribed fire in sagebrush steppes, and general prescriptions that could be used. When precipitation is below 12 inches (300 mm), caution should be used to ensure desired plant response. If the objective is to maintain the perennial herbaceous vegetation, prescribed burning is most

effective when used before sagebrush dominates the site and effectively excludes perennial herbaceous plants. Such timing reduces the need for seeding following a burn. If the objective is to maintain the sagebrush, prescribed burning has very limited applicability.

Cheatgrass fuels: In the absence of grazing, grass biomass during the fire season may represent 2 years of fuel accumulation, which appears to be optimal for grassland fires. Abundant, continuous cover of cheatgrass can lead to rapid spread of wildfires so that under conditions of high temperatures, low humidity, and wind, the fires are very difficult to suppress.

Brooks compared the roles of nonnative annual grasses and other annual plants in facilitating the spread of fires in the Mojave Desert. Landscapes dominated by nonnative annual grasses, especially annual bromes (*Bromus* spp.), are more flammable than those dominated by native forbs. Possible explanations for this include higher surface-to-volume ratio of grasses compared to forbs; more continuous vegetative cover; and the ability of alien annual grasses to remain rooted and upright longer than native forbs, allowing them to persist as flammable fuels into the summer when the threat of fire is highest. Thick layers of annual plant litter accumulate, and litter decomposes especially slowly in desert regions. Accumulations of litter led to particularly hot temperatures, long flame residence times, and continuous burn patterns in experimental fires in the Mojave Desert.

Cheatgrass provides a flammable link between open grasslands and forests. It cures early in the fire season and ignites readily during dry periods because of its finely divided stems and pedicels, and it responds readily to changes in atmospheric moisture because of its fine structure. Moisture content is the single most important factor influencing cheatgrass flammability, and varies with plant phenology and color change as follows:

Plant color	Moisture content (%)
Green	>100
Purple	30–100
Straw	<30

Since there is considerable variation in plant coloration in a stand, close inspection is necessary to determine the predominant coloration. Cheatgrass is not readily ignitable until it reaches the straw-colored stage. The time required for the moisture content to drop from 100% to 30% ranged from 8 days on a northern exposure in western Montana, to 23 days on a southern exposure in different years, with an average of 14 days. The onset of purple coloring forewarns of hazardous fire conditions within about 2 weeks.

Cheatgrass ignites and burns easily when dry, regardless of quantity, and can support rapid rate of fire spread. Flammability of cheatgrass fuels depends primarily on moisture content, weight, and porosity.

Fuel management/fire prevention: On areas where cheatgrass is abundant, special measures may be necessary to prevent recurrent fires, and thus prevent the elimination of fire-sensitive perennial grasses and forbs and other potential adverse impacts. Fire suppression can discourage invasion and spread of cheatgrass. Grazing management to reduce fuel loads and greenstripping are 2 methods employed to prevent large recurrent fires in areas dominated by cheatgrass. Additionally, herbicides are being tested for effectiveness in creating fuelbreaks in cheatgrass-dominated range.

Cattle grazing can reduce the accumulation of cheatgrass litter and thus lessen the fire hazard on a site. Grazing cheatgrass in winter can reduce cheatgrass herbage and seeds while protecting the dormant perennial grasses. Davison provides more detailed information on using livestock grazing to reduce fuel loads and subsequent fire occurrence and severity in cheatgrass-dominated rangelands.

Greenstripping is a method of establishing fuel breaks to impede the flow of wildfires and thereby increase the fire-free interval on a site dominated by cheatgrass. These fuel breaks are 30 to 400 feet (10-120 m) wide, and are seeded with fire-resistant vegetation. As of 1994, 451 miles (16,280 acres) of experimental and operational greenstrips had been established in Idaho. The effectiveness of greenstrips, or any fuels modification project, in reducing wildfire spread is enhanced by 3 factors: 1) disrupting fuel continuity (e.g. by replacing cheatgrass with caespitose grasses such as crested wheatgrass, which have large spaces between individual shrubs); 2) reducing fuel accumulations and volatility (e.g. shrub stands are thinned to maintain a minimum distance of 10 feet (3 m) between plants); and 3) increasing the density of plants with high moisture and low volatile oil content, thus reducing both the potential for ignition and rate of fire spread. Plants used in greenstrips remain green and moist into late summer, making the greenstrip area less flammable for a longer time. Wildfire speed may slow when entering a greenstrip, thus allowing fire suppression crews to extinguish the fire. Some wildfires burn into greenstrips and extinguish. Native plants in the Great Basin generally do not meet firebreak criteria. Crested wheatgrass and forage kochia are effective in retarding wildfire spread, compete well in a weedy environment, and have been the most successful species in greenstrips. Both plants can, however, be invasive and spread into areas where cheatgrass is being managed with prescribed fire.

Revegetation after cheatgrass fires: After wildfires or when planning prescribed burning in areas where cheatgrass is present, managers must decide whether the burned area should be seeded or whether sufficient perennial grasses are present to revegetate a site and successfully compete with cheatgrass. Seeding may not be necessary or desirable if native plant species are able to recover after fire. Cheatgrass-dominated communities tend to have extremely sparse perennial seed banks, however, and the cheatgrass seed bank generally recovers by the 2nd postfire year. In Utah, natural revegetation (no seeding) is most effective at higher elevations where sufficient moisture and a diverse population of perennial vegetation exist, especially on north- and east-facing slopes. Below 6,000 feet (1,820 m) and in much of Utah's arid environment, cheatgrass and other weedy species readily invade and dominate burned areas. Seeding following fire may be needed to prevent cheatgrass dominance in Wyoming big sagebrush and pinyon-juniper communities, but not in mountain big sagebrush communities.

Revegetation of burned areas is desirable to assure forage for livestock and wildlife, and to minimize the potential for erosion and/or invasion by nonnative species. Ideally, wildfire rehabilitation should enhance the recovery of native vegetation through the seeding of native plants adapted to local environmental conditions. Native plants such as basin wildrye (*Leymus cinereus*), bluebunch wheatgrass, western wheatgrass, Indian ricegrass, big sagebrush, and fourwing saltbush (*Atriplex canescens*) have been used in rehabilitation seedings. Early seral species such as bottlebrush squirreltail may provide managers with native plant materials that can successfully germinate and establish in the presence of invasive annuals and do well after subsequent fire. Bottlebrush squirreltail deserves consideration as a post-wildfire revegetation species because in greenhouse experiments, it has substantially greater growth in post-wildfire soil compared with unburned soil, and exhibits relatively higher growth rates in post-wildfire soil compared to cheatgrass. Restoration projects using native species mixes to provide a variety of above- and belowground growth forms, and sowing at high densities, may increase establishment of desirable plants while providing adequate competition against invasive plants. Federal policy currently encourages the use of native plant materials on public lands; but because the primary objective of wildfire rehabilitation on public lands is not ecological restoration but rather prevention of erosion and invasion by undesirable nonnative species, and because of the limited availability of native seeds, the use of native species is not mandatory for revegetation. Because of difficulties related to cost, handling, and reliability of native seed supplies in wildfire rehabilitation situations, many managers prefer nonnative plant materials and traditional seeding methods.

Many large areas have been seeded with nonnative, herbaceous forage species including crested wheatgrass, intermediate wheatgrass, tall wheatgrass (*Thinopyrum ponticum*), Russian wildrye (*Psathyrostachys juncea*), smooth brome, alfalfa, and yellow sweetclover (*Melilotus officinalis*). Seeds for these species are readily available and responsive to standard seeding methods; plants establish and grow rapidly, and have wide environmental tolerances. Many cultivars are also drought tolerant, grazing tolerant, and competitive against other, less desirable nonnative species. The most reliable and persistent grass for low-elevation, drought-prone areas of the Intermountain West is crested wheatgrass. It establishes rapidly even under relatively dry conditions and tends to persist for many years, although some sites seeded to crested wheatgrass return to cheatgrass dominance over time. Grasses that are most competitive against cheatgrass include 'Hycrest' crested wheatgrass, 'Luna' intermediate wheatgrass, 'Bozoisky' Russian wildrye, and smooth brome. The competitive advantage for establishment of crested wheatgrass seedlings is lost if burned areas are not seeded the year of the fire. Forbs such as alfalfa tend to have low persistence in rehabilitation seedings. Current goals of making wildfire rehabilitation objectives compatible with other management objectives on public lands may require careful planning of treatments and some modifications of standard practices, such as greater use of native plants. The identification and use of competitive native perennial plants for arid-land rehabilitation has become a priority for managers and researchers. In big fire years - such as 1996, when millions of acres burned - the scale of the demand for seed greatly exceeds the supply of native plant seed, especially of local genotypes. The competitive ability of nonnative species and the relatively low cost and high availability of their seed will continue to appeal to those faced with of large-scale burns in cheatgrass-prone areas. If managers are able to predict large fires in advance, perhaps more efforts could be made to have more native seed available for specific sites.

APPENDIX F. NATIONAL FIRE AND AVIATION EXECUTIVE BOARD APPROPRIATE MANAGEMENT RESPONSE

National Fire and Aviation Executive Board

Memorandum

To: Fire Management

From: National Fire and Aviation Executive Board

Date: June 20, 2007

Subject: Clarification of Appropriate Management Response

The National Fire and Aviation Executive Board (NFAEB) provides the following clarification for implementing the Appropriate Management Response (AMR) under current Federal Wildland Fire Management Policy and agency directives. The intent is to clarify Federal Wildland Fire Management Policy, to enable agency administrators to take full advantage of the flexibility afforded by existing policy.

Key Points to Clarify Policy:

The Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy (2003) is the primary wildland fire policy reference source. Agencies have incorporated policy intent and direction from that source in respective directives, manuals, handbooks, and interagency operations guides.

The Federal Fire Policy requires all wildland fires from unplanned ignitions to be managed for either protection objectives (wildfire) or resource benefit objectives (wildland fire use). Under current policy, a single fire cannot be managed for both objectives concurrently.

Appropriate Management Response (AMR) encompasses all of the response actions necessary to manage a wildfire or wildland fire use event for the duration of the event. In implementing the AMR, the full spectrum of tactical options, from monitoring a fire at a distance to intensive suppression actions are available to the fire manager. Beginning with the initial response to any wildland fire, decisions will reflect the goal of using available firefighting resources to manage the fire for the most effective, most efficient and safest means available.

The AMR strategies and tactics used to manage a wildland fire will be based on objectives identified in the Land/Resource Management Plan and/or Fire Management Plan.

The AMR strategies and tactics will consider firefighter and public health and safety, fire cause, current and predicted weather, current and potential fire behavior and fire effects, values to be protected from fire, management priorities, resource availability, cumulative effects of the fire, and cost effectiveness. Direct assessment of resource benefits from fire is currently allowed only where wildland fire use has been identified in the Land/Resource Management Plan and/or Fire Management Plan as an acceptable strategy.

Marc Rounsaville
USDA-Forest Service
Fire and Aviation Management
Deputy Director

Timothy M. Murphy
Bureau of Land Management
Fire and Aviation
Deputy Director

for Lyle Carlile
Bureau of Indian Affairs
Fire Director

Brian McManus
U. S. Fish and Wildlife Service
Fire Director

Mike Wallace
National Park Service
Fire Director

for Dan Smith
National Association of State Foresters
Fire Director