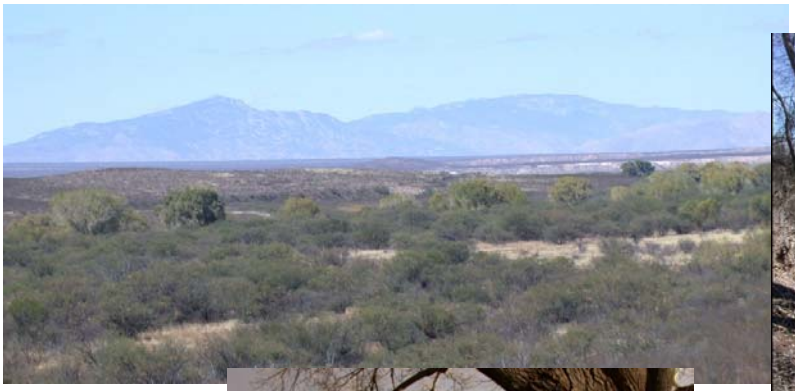
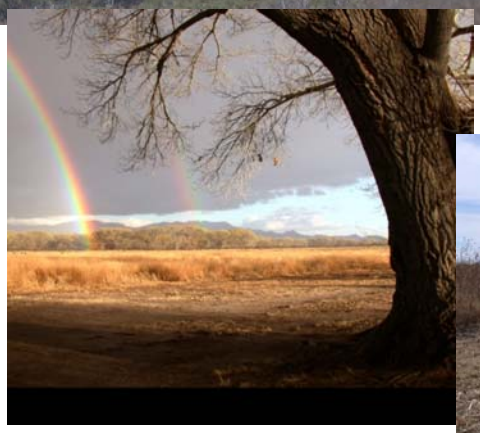
Upper San Pedro Watershed
WILDFIRE HAZARD ASSESSMENT & MITIGATION PLAN
Lewis Springs Community

U.S. Department of the Interior
Bureau of Land Management

A Wildland-Urban Interface Communities-at-Risk Program





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ANCHOR POINT

Safford/Tucson Fire Management Zone
San Pedro Riparian National Conservation Area
Cochise County, Arizona **August 2003**

FINAL

UPPER SAN PEDRO WATERSHED
WILDFIRE HAZARD ASSESSMENT AND MITIGATION PLAN
LEWIS SPRINGS COMMUNITY
COCHISE COUNTY, ARIZONA
AUGUST 2003

A WILDLAND URBAN INTERFACE
COMMUNITIES-AT-RISK PROGRAM

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U.S. Department of the Interior
Bureau of Land Management
Safford/Tucson Fire Management Zone
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BLM Contract No.: GS-10F-0367L
BLM Order No.: AAD020144

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INTRODUCTION

Federal wildland management agencies often bear several important fire management responsibilities within Wildland Urban Interface (WUI) areas. "The role of Federal agencies in the Wildland Urban Interface includes wildland firefighting, hazard fuels reduction, cooperative prevention and education, and technical assistance." (Federal Wildland Fire Management Policy and Review, 1995).

Wildland fire is a growing threat as urban sprawl rapidly spreads into areas with wildland vegetation. The problem is not new, though the severity of the problem is increasing as growing populations are drawn to the qualities of living available in the WUI. A growing number of areas in Arizona have a need for fuels reduction, but have not been analyzed for treatment. For fire management leaders, there is the challenge of accomplishing the greatest benefit, to the highest priority areas, with limited funding.

WUI fuels reduction projects typically have high per-acre costs and few acres of accomplishment, compared to other larger, less complex, and lower profile projects. It is important to implement the projects in areas where risk levels are the highest and success is likely (Wildland Urban Interface Risk Determination System for Areas Managed by Arizona Bureau of Land Management, 2000).

The three categories of WUI areas identified and discussed in 1986 at a Wildland Urban Interface meeting in Boston are widely used. The concept was presented by Charles W. Philpot, Associate Deputy Chief for Research, USDA Forest Service. (Protecting People and Homes From Wildfire in the Interior West: Proceedings of the Symposium and Workshop, 1988). He identified:

- Classic Interface, where city boundaries and suburbs press against wildland vegetation.
- Mixed Interface, where homes, small subdivisions, and other structures are intermixed with wildland vegetation.
- Occluded Interface, where islands of wildland vegetation occur inside a metropolitan area (Arizona BLM does not have areas in the category of "Occluded Interface").
- Rural Setting, where homes, ranches, and other structures are scattered, but adjacent to wildland vegetation on BLM lands (modified with the

assistance of Field Office/Zone Fire Management Officers to more accurately represents the situation for BLM Arizona).

As is the case on most federal lands throughout the United States, wildland fires have been suppressed for well over one hundred years in Arizona. Due to wildland fire suppression and other management practices, fuels have increased to unnatural levels. Today, due to a buildup in fuels, wildland fires are often difficult to control, expensive, and extremely hazardous to firefighters. "The challenge of managing wildland fire in the United States is increasing in complexity and magnitude. Catastrophic wildfire now threatens millions of wildland acres, particularly where vegetation patterns have been altered by past land-use practices and a century of fire suppression." (Federal Wildland Fire Management Policy and Review, 1995).

The potential for wildland fire within the WUI is recognized as a growing threat, as urban sprawl accelerates. The number of families and homes threatened by wildland fire adjacent to BLM lands has not yet been determined; however, the USDA Forest Service, Southwestern Region, conducted a study of WUI in Arizona involving their lands. "There is an estimated 129,000 homes within the high risk Wildland Urban Interface in Arizona and building continues." (Arizona's Wildland Urban Interface, National Forest Fuels Reduction Treatment Proposals, 1997)

The 2000 fire season was the worst one in the United States in 50 years. Over 90,000 fires burned nearly 7 million acres of public and private lands, resulting in loss of property, damage to resources, and a disruption of community services. Many of these fires burned in Wildland Urban Interface areas and exceeded the fire suppression capabilities of those areas. The scale and intensity of the 2000 fire season capped a decade characterized by a dramatic rise in the number of large wildfires, the associated costs of fire suppression, as well as the values at risk in the WUI. The acres burned by early September 2002 were nearly 6.5 million acres by approximately 65,000 fires. There is an urgent need to combine the most effective elements of the traditional reactive approach to fire management with proactive community-based collaborative approaches.

The primary objective of the Wildland Urban Interface Communities-at-Risk Program is to reduce the risk of wildland fire in urban interface communities through education, prevention, hazardous fuels reduction, and to increase fire protection capabilities.

The primary benefit of a community mitigation program is the reduced likelihood of a structure fire moving to the forest, or from a wildfire moving to structures. Secondary benefits include the reduced risk that fire will move from one property

to the next, and the increased probability that fire crews will be able to contain and suppress the fire at an early stage, before it grows unmanageable.

In 2002, the Tucson Field Office of the BLM funded a WUI Wildfire Hazard Risk Assessment (risk assessment) and Wildland Fire Hazard Mitigation Plans (mitigation plans) for several communities near the San Pedro Riparian National Conservation Area (SPRNCA), or adjacent to BLM land in the upper reaches of the San Pedro watershed. This report presents the results of that project.

SUMMARY OF THE 10-YEAR COMPREHENSIVE STRATEGY

In August 2000, then-President Clinton directed the Secretaries of Agriculture and the Interior to develop a response to severe wildland fires, reduce fire impacts on rural communities, and ensure effective firefighting capacity in the future. The result was the National Fire Plan, which Congress later supported through appropriations language in the FY 2001 Appropriations Act and other written direction. As part of its direction, Congress directed the Secretaries of the Interior and Agriculture to work with the Governors to develop this strategy in the FY 2001 Interior and Related Agencies Appropriations Act (P.L. 106-291). The direction requires "close collaboration among citizens and governments at all levels," which, by extension, includes a geographically diverse group of people, representing all levels of government, tribal interests, conservation and commodity groups, and community-based restoration groups.

The resulting strategy developed by Federal, State, tribal, and local government and nongovernmental representatives improved the management of wildland fire and hazardous fuels, as well as met the need for ecosystem restoration and rehabilitation in the United States on Federal and adjacent State, tribal, and private forest and range lands. In addition, this strategy outlined a new collaborative framework to facilitate implementation of proactive and protective measures that are appropriate to reduce the risk of wildland fire to communities and the environments.

This strategy reflects the views of a broad cross-section of governmental and nongovernmental stakeholders. It outlines a comprehensive approach to the management of wildland fire, hazardous fuels, and ecosystem restoration and rehabilitation on Federal and adjacent State, tribal, and private forest and range lands in the United States. This strategy emphasizes measures to reduce the risk to communities and the environment and provides an effective framework for collaboration to accomplish this task.

A set of core principles was developed to guide the identification of goals for this strategy. These principles include such concepts as collaboration, priority setting, and accountability.

An open, collaborative process among multiple levels of government and a range of interests will characterize the fulfillment of this strategy. The end results sought by all stakeholders are healthier watersheds, enhanced community protection, and diminished risk and consequences of severe wildland fires.

The primary goals of the 10-Year Comprehensive Strategy are:

1. Improve Prevention and Suppression

2. Reduce Hazardous Fuels

3. Restore Fire Adapted Ecosystems

4. Promote Community Assistance

This community-based approach to wildland fire issues combines cost-effective fire preparedness and suppression to protect communities and the environment with a proactive approach that recognizes fire as part of a healthy, sustainable ecosystem.

WILDFIRE HAZARD ASSESSMENT

OVERVIEW

An assessment of wildfire hazard was completed on a community level for each of the six communities and three rural areas shown in Figure 1. Delineation of the study areas generally follow political boundaries. Assessments were made for up to 100 feet beyond the study area boundaries, if vegetation, topography or other considerations indicated a critical situation.

In addition to the community level assessment, 444 homes were surveyed individually to determine each home's susceptibility to wildfire. Homes selected for individual surveys were identified using Cochise County GIS data, and were those shown as being inside the study areas and within 1/4-mile of the SPRNCA boundary. There were instances where GIS data indicated that a home was within the 1/4-mile buffer, but field survey crews found that it was actually more than a half mile away. There were also homes that the survey crew found within 1/4-mile of the SPRNCA that were not included in the County's GIS database. The survey crews tried to collect data on all homes within the quarter-mile buffer.

STUDY AREA PROFILE

The Lewis Springs study area is located approximately 10 miles East of Sierra Vista and immediately North of Highway 90. Lewis Springs is on the East side of the San Pedro River.

The community of Escapule is an inholding of private properties within the SPRNCA. Because Escapule differs so much from the rest of the Lewis Springs study area, it has been considered separately from the rest of the Lewis Springs study area in this report. The Escapule community is located approximately 5 miles northeast of Sierra Vista off of the Charleston-Tombstone Road on the west side of the San Pedro River. There are approximately 40 homes in the community. The predominate vegetation in the area is a mix of grass and 8-10 foot Mesquite. Along the river corridor there are mature cottonwood trees along with dense understory.

The Lewis Springs study area is serviced by the Fry Fire Department and is approximately 10 miles from the nearest station. The community of Escapule is also served by the Fry Fire Department and is approximately 9 miles from the nearest station.

The Lewis Springs study area encompasses approximately 15.4 square miles (including the community of Escapule) or 9856 acres.

Assuming an overall average response speed of 40 miles per hour, the response time to the community is around 15 minutes from when the truck leaves the station. Response time to a specific location will vary due to the availability of responders and equipment, the exact location of the address in relation to the closest responding station, time of day, weather and road conditions.

The study area is characterized by:

- The average lot size within the study area is between one and five acres.
- The average slope in the Lewis Springs area is 3 percent, and in the Escapule area is 15 percent.
- The primary aspect of the study area is Flat.
- The predominate fuel types are Anderson's Fuel Model 5 and 6.
- Slash on the ground is considered to be low in volume in Lewis Springs, moderate in volume in Escapule.
- Vegetative fuel loading is Moderate in Lewis Springs, High in Escapule.
- Ladder fuels in Lewis Springs are low, and are high in Escapule.

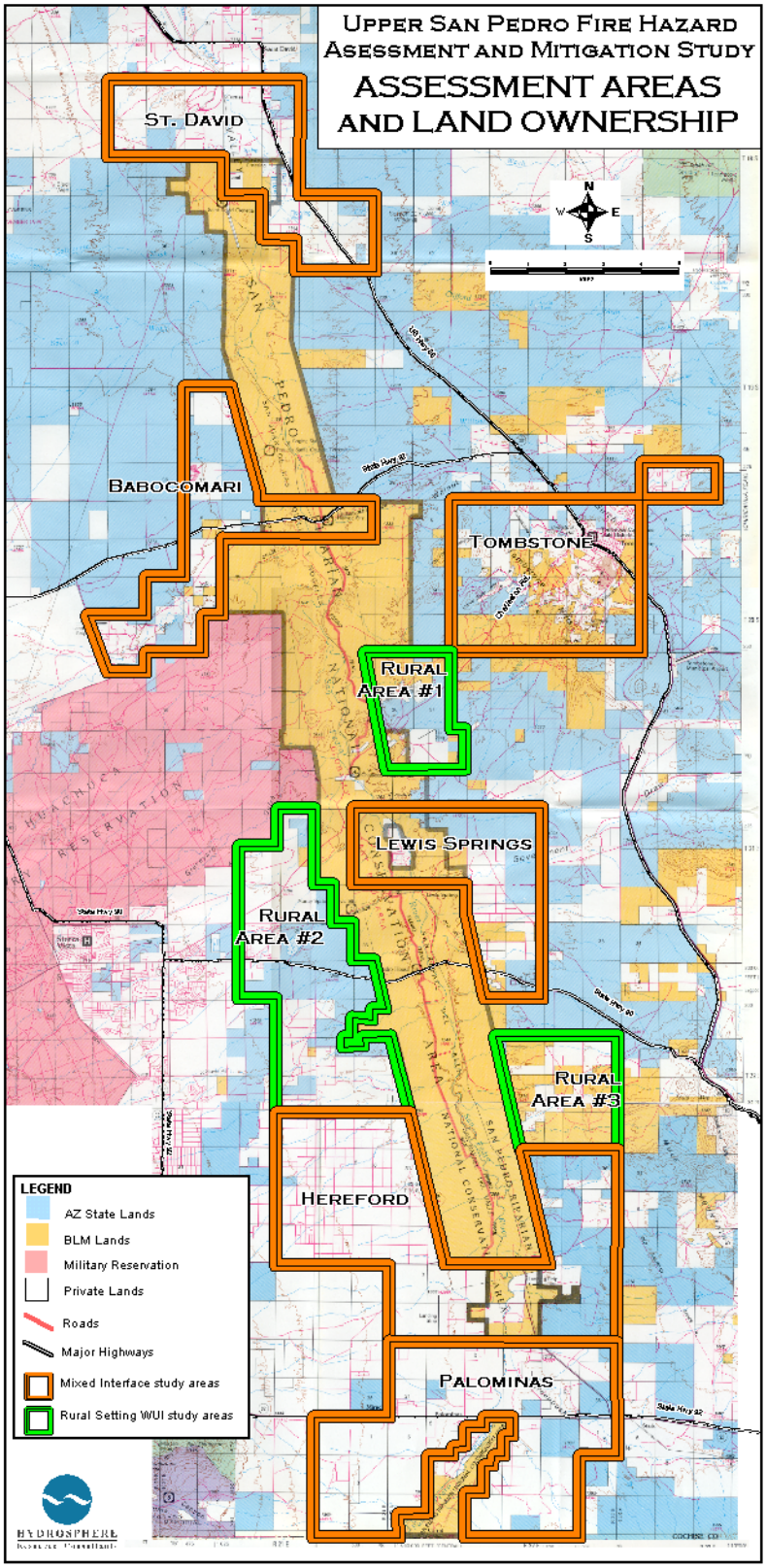

Figure 1. Location Map

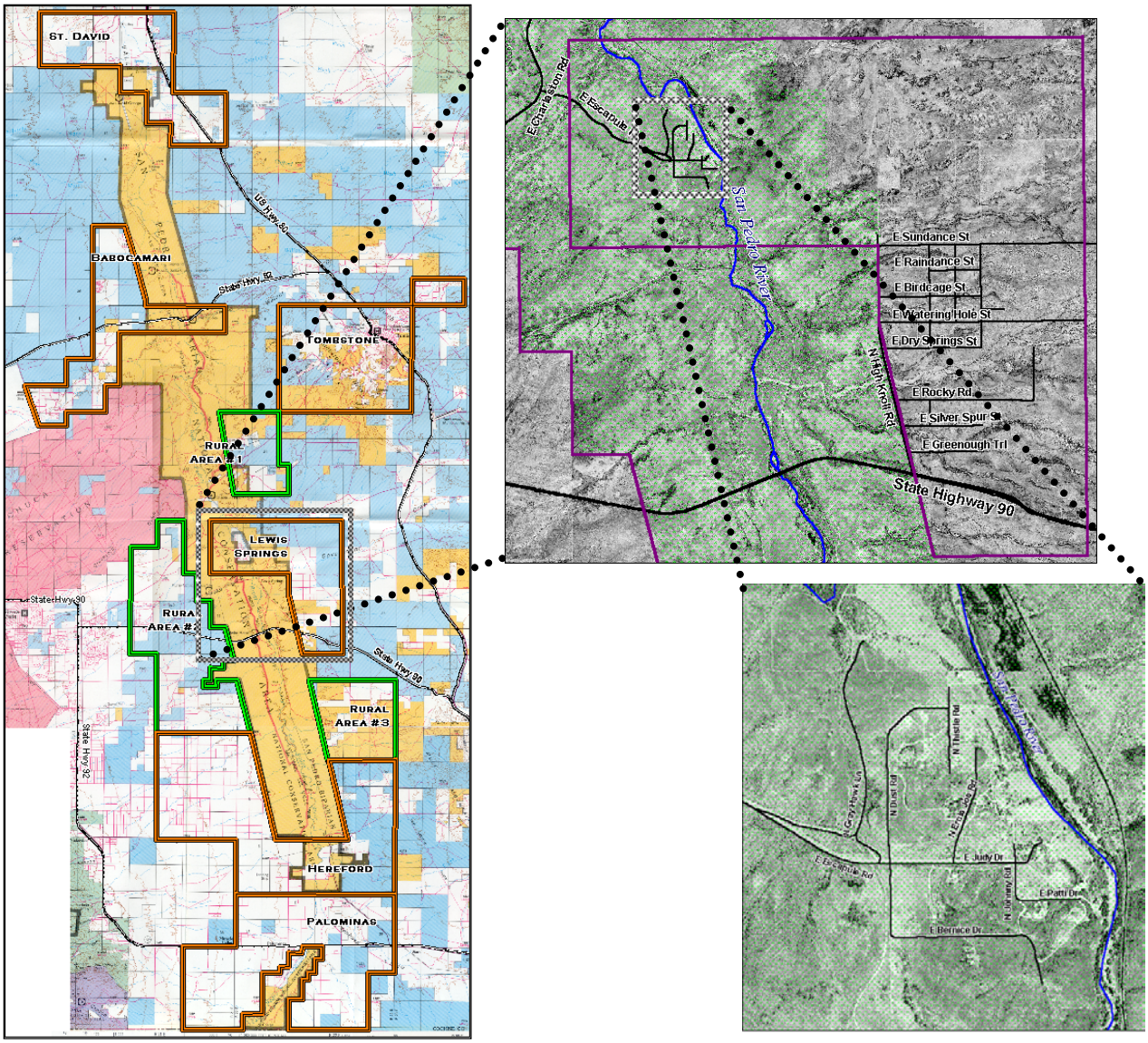

Figure 2. Lewis Springs Study Area Location

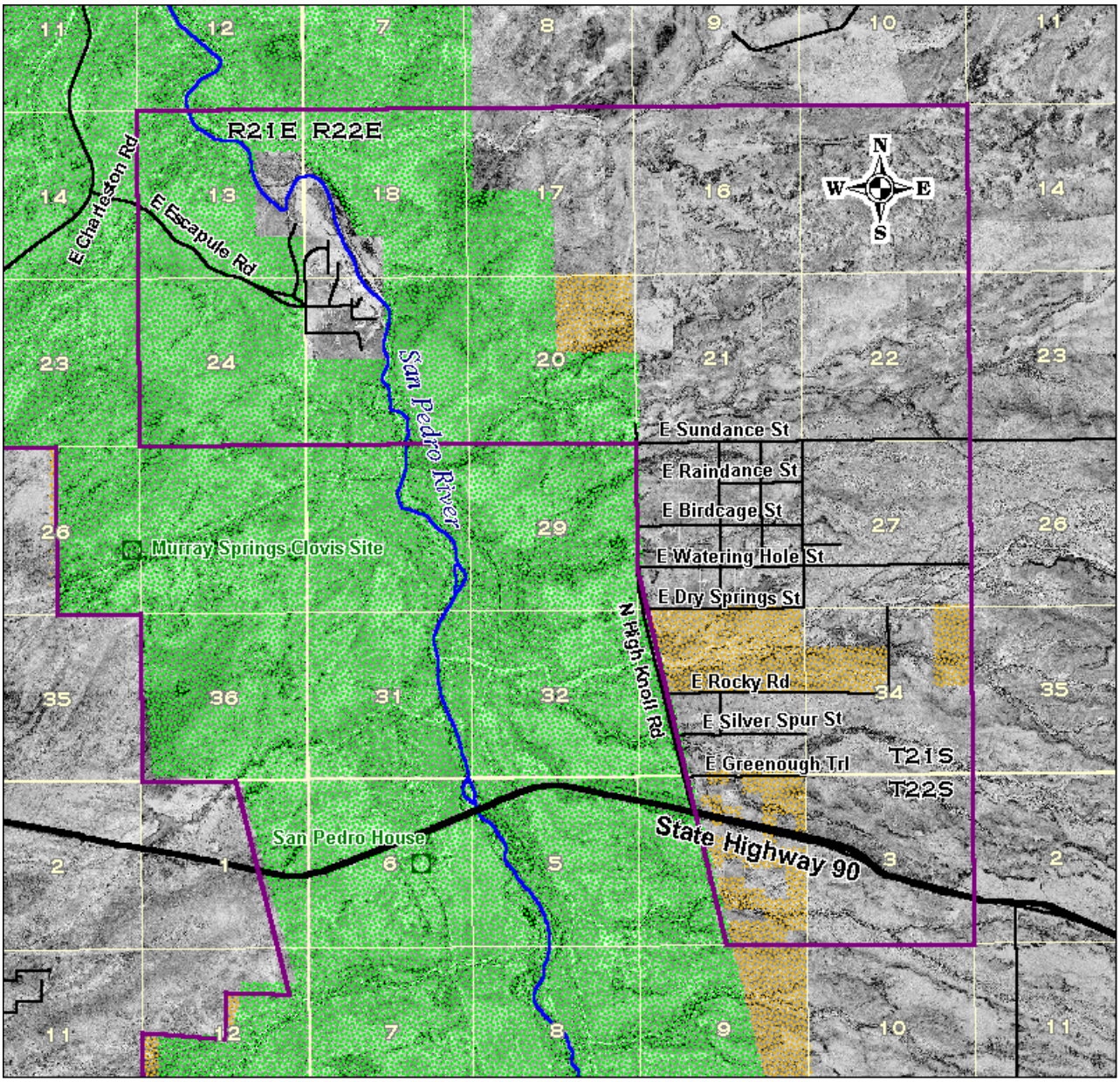

Figure 3. Lewis Springs Study Area

(Scale: 1 inch = 1 mile)

FUEL PROFILE

Past and present land use practices have changed the historical fire regime and the resultant fuel profile in this ecosystem. Vegetation in the area contains a low to moderate slash component. The area contains very open or discontinuous vegetation and has a low ladder fuel component. The fuels are characterized as light shrub with little or no grass understory.

Fire behavior modeling is done by generalizing fuel types found in the field into fuel model types. The area in and around SPRNCA are comprised several fuel models, each with its own characteristics. The Fuel Models used for this project were:

- Fuel Model 1 is short grass, less than 1 foot high. Fire occurs at the surface and moves rapidly through the cured grass and associated material.

- Fuel Model 3 is for tall grass, averaging 3 feet high, though considerable variation may occur. Fires in this fuel type is the most intense of the grass group and displays high rates of spread under the influence of wind. Wind may drive fire into the upper heights of the grass and across standing water.

- Fuel Model 5 is for continuous stands of low brush, with heights not exceeding six feet. Fires are generally not very intense because surface fuel loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material.

- Fuel Model 6 represents dormant brush and hardwood slash, generally not exceeding 6 feet in height. Fires carry through the shrub layer where the foliage is more flammable than Fuel Model 5, but this requires moderate winds, greater than 8 miles per hour at midflame height. Fire will drop to the ground at low wind speeds or at openings in the stand.

- Fuel Model 8 is for closed timber litter, which is comprised mainly of needles, leaves, and occasionally twigs, with little undergrowth. Fires are generally slow-burning ground fires with low flame lengths, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up.

Behave model runs were completed using the following parameters:

Fuel Moisture by Fuel Type			Slope
10-hr Fuels	100-hr Fuels	Herbaceous	
5%	6%	100%	10%

The overall fuel profile is classified as Fuel Model 5 (Anderson 1982).

FUEL MODEL 5 – LOW BRUSH

Figure 4. General Fuel Profile for Fuel Model 5

Characteristics

This model consists of continuous stands of low brush. Generally, heights do not exceed six feet. The stands will have a grass or scattered grass understory. Usually shrubs are short and almost totally cover the area[1].

Common Types/Species

Young, green stands with no dead wood would qualify such as Mixed Forbs, Mixed Upland Scrub, and Whitethorn. Mountain grasses are also associated with this type.

[1] Anderson, Hal. 1982. Aids to determining Fuel Models for Estimating Fire Behavior. Gen. Tech. Rep. INT-122. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 22 p. (NFES 1574).

Fire Behavior

The fires are generally not very intense because surface fuel loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material. Fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and the grasses or forbs in the understory. Cured leaves retained on shrubs can cause greater intensities.

Table 1: Rate of spread in chains/hour (1 chain=66 ft) for Fuel Model 5

Fine Dead Fuel moisture %	Mid-flame Wind Speed					
	2.0	4.0	6.0	8.0	10.0	12.0
2.0	9.7	22.5	38.2	56.2	76.0	97.5
4.0	8.7	20.1	34.2	50.3	68.1	87.3
6.0	7.5	17.5	29.8	43.8	59.2	76.0
8.0	5.5	12.7	21.6	31.8	43.1	55.2
10.0	2.7	6.4	10.8	15.9	21.5	21.8
12.0	2.6	6.1	10.4	15.3	20.1	20.1

Table 2: Flame Length in Feet for Fuel Model 5

Fine Dead Fuel moisture %	Mid-flame Wind Speed					
	2.0	4.0	6.0	8.0	10.0	12.0
2.0	4.3	6.4	8.1	9.7	11.2	12.5
4.0	3.9	5.8	7.4	8.8	10.1	11.4
6.0	3.5	5.1	6.5	7.8	8.9	10.0
8.0	2.6	3.8	4.9	5.8	6.7	7.5
10.0	1.4	2.0	2.6	3.1	3.5	3.6
12.0	1.3	2.0	2.5	3.0	3.4	3.4

FUEL MODEL 6 - BRUSH

Figure 5. General Fuel Profile Fuel Model 6

Characteristics

The shrubs are mature and usually do not exceed 6 feet in height. Additionally, Fuel Model 6 contains a dead vegetative component that contributes to its flammability.

Common Types/Species

A broad range of shrub conditions is covered by this model. Fuel situations to be considered include Mesquite, Saltcedar, and mixed upland scrub. Even hardwood slash that has cured can be considered.

Fire Behavior

Fires carry through the shrub layer where the foliage is more flammable than Fuel Model 5, but this requires moderate winds, greater than 8 miles per hour (13 km/h) at midflame height. Fire will drop to the ground at low wind speeds or at openings in the stand. The Summary Report contains complete descriptions of all fuel models.

Table 3: Rate of spread in chains/hour (1 chain=66 ft) for Fuel Model 6

Fine Dead Fuel moisture %	Mid-flame Wind Speed					
	2.0	4.0	6.0	8.0	10.0	12.0
2.0	17.2	38.5	63.9	92.4	123.5	156.8
4.0	13.9	31.1	51.7	74.8	99.9	126.9
6.0	11.7	26.2	43.5	62.9	84.1	106.8
8.0	10.2	22.9	38.1	55.0	73.6	93.4
10.0	9.2	20.7	34.4	49.7	66.5	84.4
12.0	8.5	19.1	31.7	45.9	61.4	77.9

Table 4: Flame Length in Feet for Fuel Model 6

Fine Dead Fuel moisture %	Mid-flame Wind Speed					
	2.0	4.0	6.0	8.0	10.0	12.0
2.0	5.0	7.3	9.2	10.9	12.4	13.9
4.0	4.3	6.2	7.8	9.3	10.6	11.8
6.0	3.8	5.5	6.9	8.2	9.3	10.4
8.0	3.4	5.0	6.3	7.4	8.5	9.5
10.0	3.2	4.7	5.9	7.0	8.0	8.9
12.0	3.1	4.4	5.6	6.7	7.6	8.5

SURFACE FUEL TYPES AND HOME LOCATIONS

Fuel types were generated from aerial photos with a 1-meter resolution of the study area. Fuel typing was based on a fuels map generated for the SPRNCA, and extended outward to cover the community study areas.

Home locations were obtained through the Cochise County GIS Department, and through the GPS readings taken at the homes that were individually surveyed. Mapping of homes with relation to fuel types is for general use only. Specific fuels around homes may vary because of previous mitigation or landscaping completed by the homeowner.

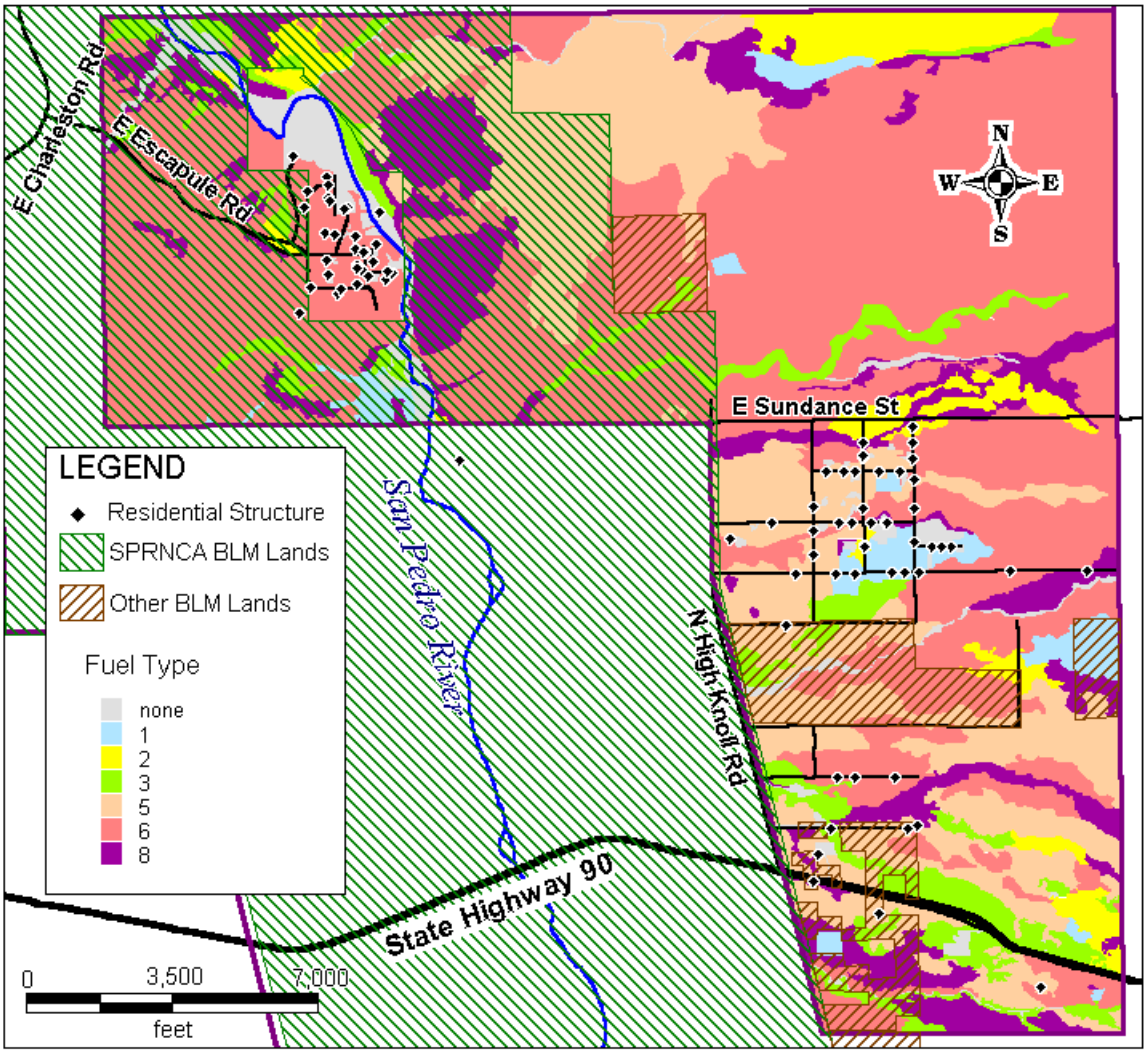

Figure 6. Home Locations in Relation to Fuel Types

WATER SUPPLY

There is no municipal hydrant system available in this area. Water for fire fighting is limited to surface streams or cisterns installed by individual homeowners. Determining the existence of cisterns was beyond the scope of this project. Water sources in the study area are limited, and may vary seasonally.

WILDFIRE HAZARD RATING

The expected fire behavior for the study area was completed using a custom model developed by RedZone Software of Boulder, Colorado. The hazard from fuels was then evaluated in relation to the structures in the area to produce an overall assessment of the 'areas of concern' within the study area. The key inputs and results are described below.

Model Description

The Wildfire Hazard classification represents a relative ranking of locations based upon expected surface fire intensity. The surface fire intensity is dependent upon fuel type, slope, aspect, and elevation.

The hazard level is determined based upon a Fire Behavior Index calculated using custom calculations based on the USDA Forest Service's fire behavior model BEHAVE. BEHAVE is a nationally recognized set of calculations to estimate a fire's intensity and rate of spread given certain conditions of topography, fuels and weather. RedZone Software uses a custom model developed using ESRI's ArcView 3.2 and BEHAVE to evaluate the potential fire conditions in the study area.

The study areas were broken down into 10-meter grids. Using ArcView's spatial analysis capabilities, each 10-meter square grid is queried for its slope, aspect and fuel type. These values are input into a BEHAVE model run using reference weather information. The outputs to the model include the estimated Rate of Spread (ROS) and Flame Length (FL), Fireline Intensity (FI) and Heat per Unit Area (HPUA) for a fire in that 10 meter square grid. The model computes these values for each grid cell in the study area. These values are then reclassified into Wildfire Hazard classes of None, Low, Moderate, High, and Extreme.

Hazard ratings refer to the fire behavior expected if an ignition were to occur.

- Low - flame lengths are small and not very intense and the rate of spread is slow.

- Moderate - flame lengths are over two feet and more intense and the fire moves more quickly.
- High - flame lengths are at least 4 feet and intense with rapid fire spread.
- Extreme - flame lengths over 8 feet, very high intensity and very rapid rates of spread.

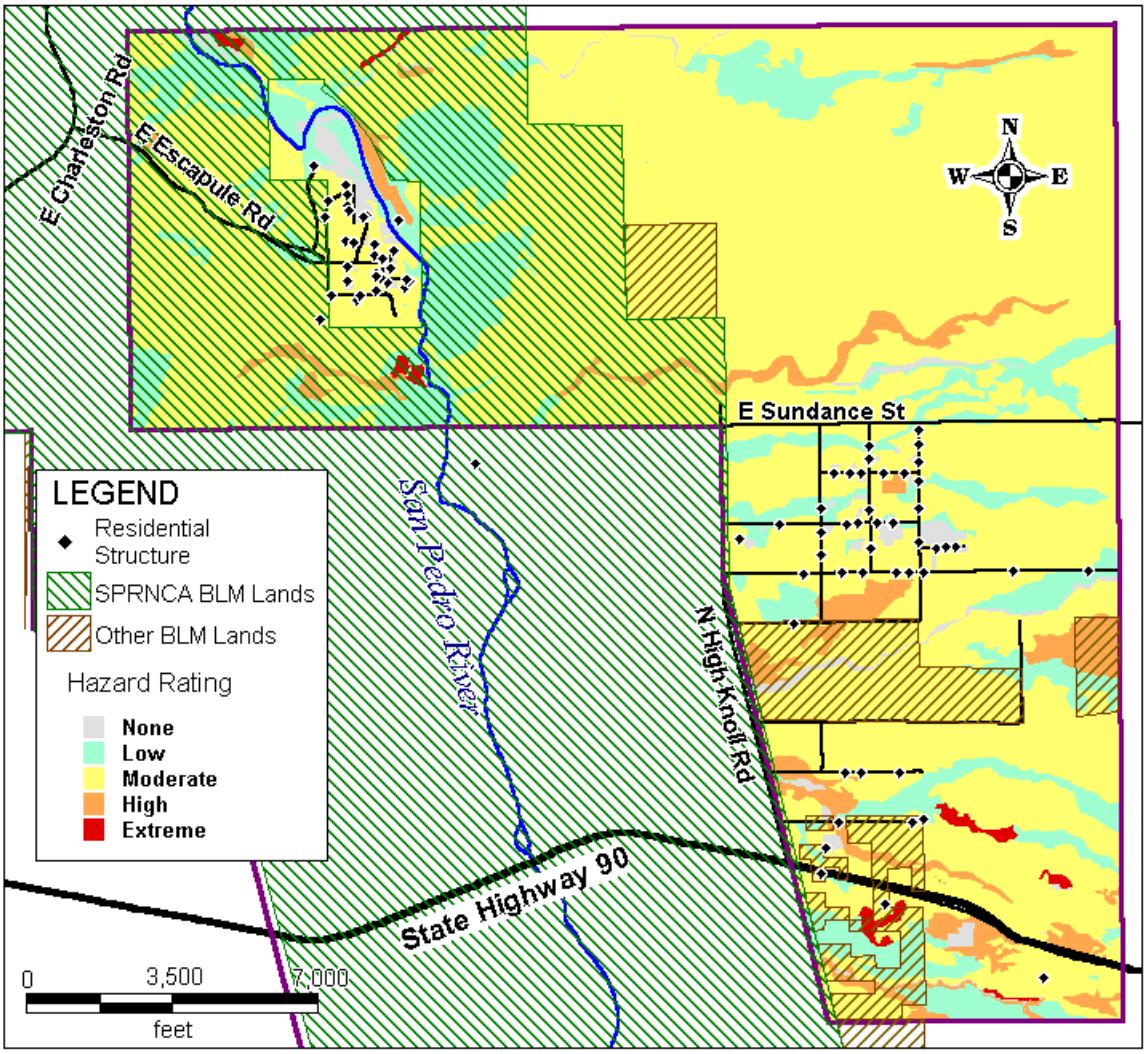

Figure 7. Wildfire Hazard Evaluation

WILDFIRE HAZARD-RISK EVALUATION - AREAS OF CONCERN RATING

The Areas of Concern Theme shows the results of the Areas of Concern Evaluation in which the Hazard Classification is combined with the Values at Risk assessment.

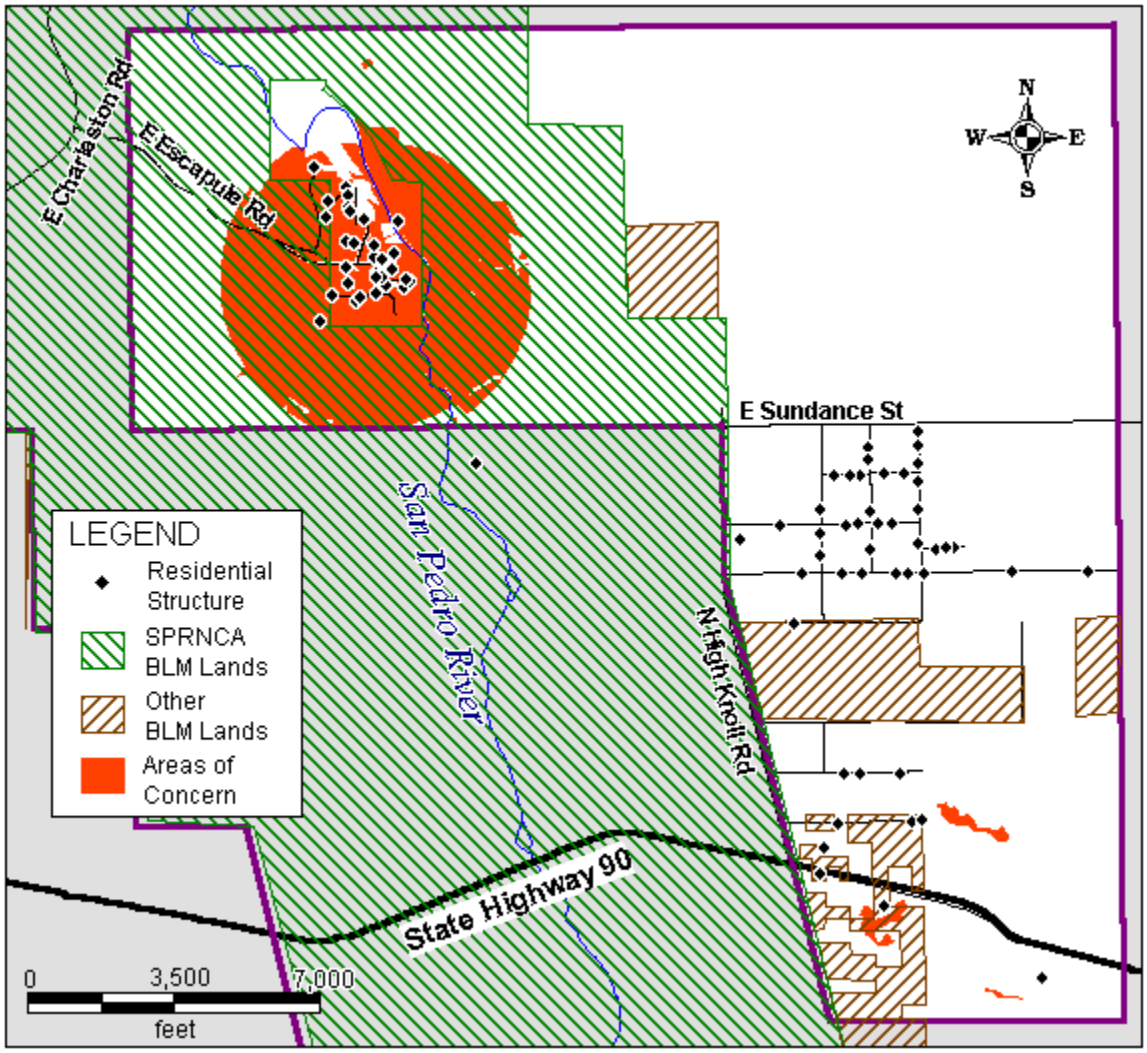

Figure 8. Areas of Concern

COMMUNITY MITIGATION PLAN

Wildfire hazard mitigation is defined as actions taken to lessen or reduce the effects of wildfire on the structure or area being protected. Mitigation does not guarantee that a wildfire will not affect a structure or area, only that an effort has been made to reduce the severity and intensity of the fire so that the area being protected will be able to survive the fire. The following recommendations for mitigation were based on the community assessment, public comments, and interviews with local fire and emergency officials.

WATER SUPPLY

There is no municipal hydrant system available. NFPA 299 Chapter 6-4 recommends a minimum water supply be available to provide a minimum fire flow of 250 gallons/min for 2 hours (30,000 gallons). This can be accomplished numerous ways.

Recommendations

- Install two 10,000-gallon cisterns, one in the Lewis Springs area, and one in the Escapule area. Augment the recommended fire flow rate with tender shuttle operations.

- Lower cost cisterns may be available by obtaining re-conditioned bulk liquid storage units from a railroad company.

INGRESS AND EGRESS

The Lewis Springs community has two ingress/egress roads to utilize during an emergency. North High Knoll Road is located north of Highway 90 and East Sundance street runs east to Highway 80. These roads and all arterial roads are life safety escape routes and should be improved to provide year round ingress and egress. These escape routes should be protected from fire impingement. Heavy smoke from burning vegetation along the road can create unsafe driving conditions and panic. Severe fire behavior can hinder or prevent escape along road. Overall, the density of the vegetation is not high and does not constitute a high priority for fuels reduction work along evacuation routes.

The community of Escapule has essentially only one ingress/egress road, East Escapule Road, to utilize during an emergency. East Escapule Road is located off of South Charleston Road. East Escapule Road and all other arterial roads

servicing the community are life safety escape routes and should be improved and/or maintained to provide ingress and egress. This escape route should be protected from fire impingement. Heavy smoke from burning vegetation along the road can create unsafe driving conditions and panic. Severe fire behavior can hinder or prevent escape along roads. Overall, the density of the vegetation is high and constitutes a high priority for fuels reduction work along evacuation routes.

Recommendations for Lewis Springs

- Install a culvert or concrete dip on North High Knoll Road to help ensure a higher quality road system.
- Improve road conditions to accommodate year round ingress and egress of fire apparatus and citizen vehicles.

Recommendations for Escapule

- Post placards clearly marking "fire escape route". This will provide functional assistance during an evacuation and communicate a constant reminder of wildfire to the communities. Be sure to mount signage on non-combustible poles.
- Thin along the road corridors at least 35 feet in width on each side.
- Evacuation route west of North Dust Road, approximately 2.9 acres, 1,750 linear feet.
  a. This distance should be modified to account for increased slope and other topographic features that increase fire intensity.
  b. Existing and natural barriers to fire should be incorporated into the project dimensions.
- Maintain fuels reduction on a 3 to 5 year interval.
- Incorporate conforming turnaround standards on all arterial road terminuses.
- Install a “fire danger rating” sign at the main entrance. Signage must be maintained to reflect current fire danger.
- New roads constructed in the area should be required to create fire safe ingress and egress through fuels reduction and quality road construction.
- Grasses utilized for roadside stabilization should be a short grass seed mix, and mowed to a maximum height of 6-inches in the peak fire season.

EVACUATION, STAGING AREAS AND PROTECTING IN PLACE

Creating a safety zone/staging area should be considered at the intersection of North High Knoll Road and Highway 90 for the Lewis Springs subdivision. This area would be designated as a meeting area where citizens could obtain direction and updates before implementing a full evacuation. It is imperative that citizens get approval before evacuating East or West on Highway 90 to avoid getting trapped by the fire, or creating congestion that will impede incoming emergency apparatus. A portion of the area could also be used as a staging area for incoming emergency vehicles during initial attack. Local landowners in coordination with their fire department should determine best and most appropriate sites. Protecting in place (citizens staying in their homes) should also be considered.

Recommendations

- Post placards clearly marking "fire escape route" on North High Knoll Road and "staging area" at the intersection of North High Knoll Road and Highway 90. This will provide functional assistance during an evacuation and communicate a constant reminder of wildfire to the communities. Be sure to mount signage on non-combustible poles.

- Install a “fire danger rating” sign at the staging area. Signage must be accurately maintained.

- Install a direct 911 call box at the staging area. This phone would give the citizens direct, priority contact with Cochise County dispatch to obtain clear directions for recommended evacuation procedures.

- Maintain the staging area by mowing, burning or other mechanical removal. Keep the area clear of all materials, especially hazardous and flammable ones.

- New roads constructed in the area should be required to create fire safe ingress and egress through fuels reduction and quality road construction.

- Grasses utilized for roadside stabilization should be a short grass seed mix, and mowed to a maximum height of 6-inches in the peak fire season.

COMMUNITY-WIDE FUELS PROJECTS

There are no major fuels reduction project opportunities identified for the Lewis Springs area.

The Escapule area was rated as a high risk for wildfire. Increasing the thinning width along East Escapule Road will not only increase the safety of the escape route but would create a fuel break for the homes to the south. Another area of concern is the hillside northeast of East Judy Drive and north of East Patti Drive.

- Thin 100 feet on each side of East Escapule Road between North Dust and North Johnny roads for 1,460 linear feet, clearing approximately 6.7 acres. This will ensure reliable emergency access along these roads.

- Thin 70 feet on each side of East Escapule Road between North Dust and the west fork of North Gray Hawk Lane for approximately 1,750 feet, clearing 5.6 acres. This will continue to provide an evacuation route on East Escapule Road, but because the vegetation contains less biomass in this area, the thinning does not have to extend as far from the road.

- Create the East Judy Drive fuel break, recommended to be 50 feet wide, 1,400 feet long, clearing approximately 1.6 acres. This will separate fuels in the riparian corridor from the homes on North Johnny and East Patti.

- Maintain fuels reduction on a 3 to 5 year interval

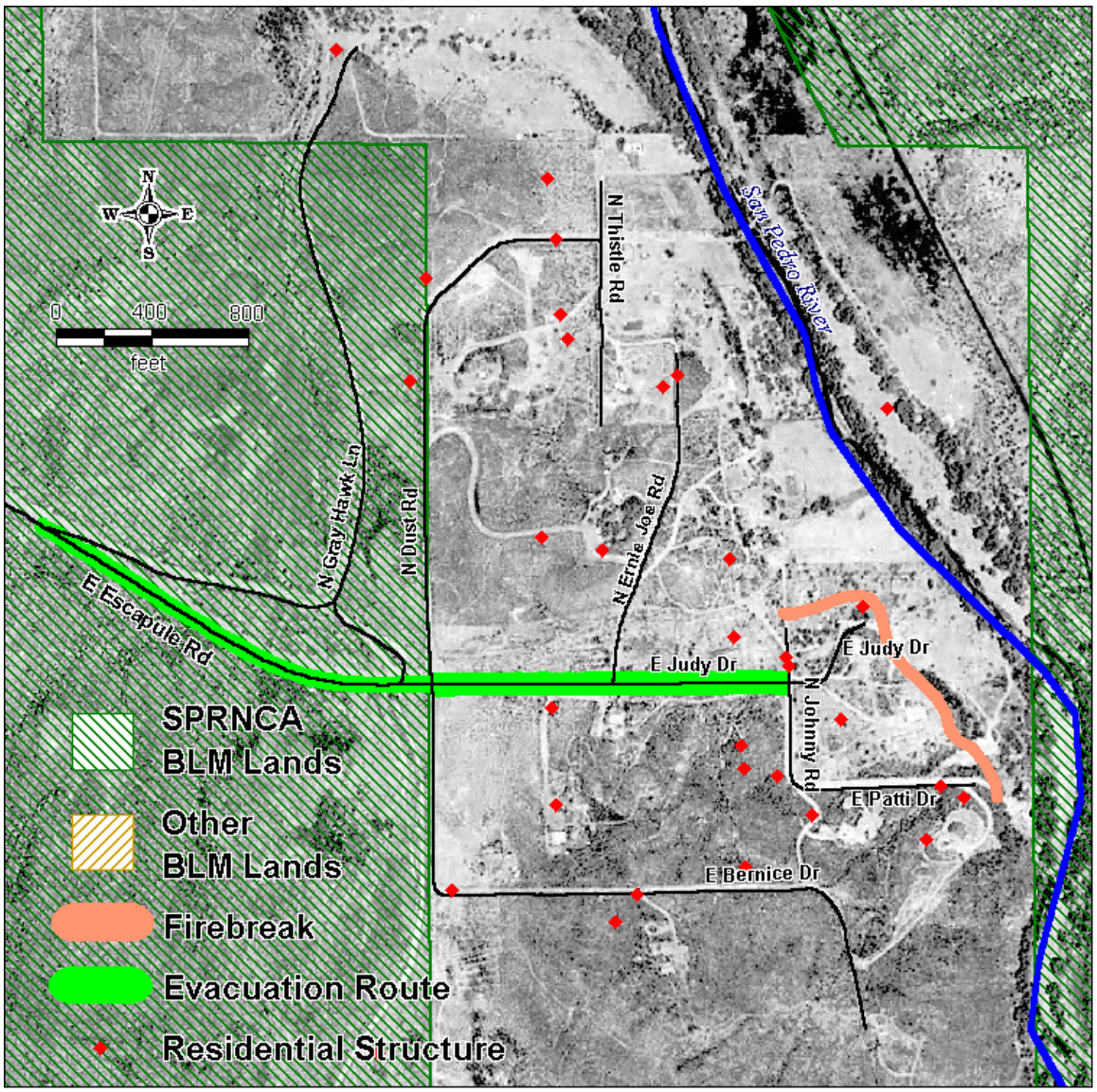

Figure 9. Evacuation Route and Recommended Fuel Breaks

HOME MITIGATION FOR LEWIS SPRINGS

Only three homes in the Lewis Springs area were surveyed. Only homes within a quarter-mile of the SPRNCA boundary were surveyed. Community responsibility for self-protection from wildfire is essential. Educating homeowners is the first step in promoting a shared responsibility. Part of the educational process is defining the hazard and risks both at the mid level and parcel level. A matrix of common fire mitigation needs is displayed below.

Recommendations

Community Involvement

Community Fire Safe Councils or Wildfire Coordinating Groups. People in these groups could work toward common community fire preparedness goals, collaboratively work with government agencies, developing demonstration projects, promoting grassroots education, and to complete fire grant applications, and to work toward the Firewise Communities / USA recognition program.

Address Signage

The three (3) homes surveyed do not have reflective, visible address signage.

- Facilitate address signage for all homes that do not have visible addresses.
- Contact Cochise County Emergency Services or the Fry Fire Department for assistance.

Gated Access

Two (2) homes surveyed have a gated access.

- Arrange for local Fire Department access to all gated structures.

Vegetation

One (1) home surveyed has vegetation either overhanging or within 5 feet of the home.

- Facilitate a limbing and chipping program to assist the community.

Defensible Space

One (1) home surveyed has non-conforming defensible space.

- Educate homeowners and conduct a defensible space inspection with recommendations for fuels reduction for all interested homeowners in the community.
- Implementation of defensible space on all homes is necessary if a Protect in Place strategy is used.

HOME MITIGATION FOR ESCAPULE

Only homes within a half-mile of the SPRNCA boundary were surveyed. All 29 homes in Escapule were surveyed. Community responsibility for self-protection from wildfire is essential. Educating homeowners is the first step in promoting a shared responsibility. Part of the educational process is defining the hazard and risks both at the mid level and parcel level. A matrix of common fire mitigation needs is displayed below.

Recommendations

Community Involvement

Community Fire Safe Councils or Wildfire Coordinating Groups. People in these groups could work toward common community fire preparedness goals, collaboratively work with government agencies, developing demonstration projects, promoting grassroots education, and to complete fire grant applications, and to work toward the Firewise Communities / USA recognition program.

Address Signage

Seventeen (17) homes surveyed do not have reflective or visible address signage.

- Facilitate address signage for all homes that do not have visible addresses.
- Contact Cochise County Emergency Services or the local Fire Department for assistance.

Gated Access

Ten (10) homes surveyed have a gated access.

- Arrange for local Fire Department access to all gated structures.

Vegetation

Sixteen (16) homes surveyed have vegetation either overhanging or within 5 feet of the home.

- Facilitate a limbing and chipping program to assist the community.

Defensible Space

Eighteen (18) homes surveyed have non-conforming defensible space.

- Educate homeowners and conduct a defensible space inspection with recommendations for fuels reduction for all interested homeowners in the community.
- Implementation of defensible space on all homes is necessary if a Protect in Place strategy is used.

Utilize neighborhood public meetings to determine common mitigation requirements for the community

- It is often possible to obtain discounts for volume efforts.
- Facilitate neighborhood fuels reduction projects through:
  a. Cost share grants,
  b. Utilization of BLM fire mitigation specialist.

OTHER REPORTS FROM THIS PROJECT

A total of seven reports were produced for this project. They are available from the Tucson Field Office, or are available on-line at:

http://azwww.az.blm.gov/azso.htm

http://azwww.az.blm.gov/tfo/index.htm

Appendix A: Summary of Individual Home Surveys

Individual home survey information is available from the BLM Safford Field Office, Tucson Field Office and the Sierra Vista Project Office. Information is only available for local fire departments or landowners for which assessments were done. This information is also available through the RedZone software, at the Tucson Field Office through the Fire Mitigation Specialist.

Table A.1 Wildfire Hazard - Values at Risk Evaluation for Lewis Springs			
HOME SURVEY QUESTIONS AND ANSWERS			
	Homes		Homes
VISIBLE ADDRESS:		**DANGEROUS TOPOGRAPHY:**	
Not Present		Not Applicable	3
Present, Not Reflective		< 150 feet	
Present and Reflective	3		
HOMEOWNER:		**INDOOR SPRINKLER:**	
Yes		Yes	
No		No	
ROOFING MATERIAL:		**UTILITY LINE:**	
Asphalt		Below Ground	
Metal		Above Ground	
Tin		Unanswered	
SIDING MATERIAL:		**COMBUSTIBLE MATERIAL:**	
Non-Flammable		None Present	
Wood Sheeting			
EAVES:		**VEGETATION NEAR ROOF:**	
Enclosed		Not Applicable	
Not Present		Branches / Limbs within 5 feet	
Not Enclosed		**ROAD WIDTH:**	
GRADE:		Less than 20'	2
Flat (0% - 5%)	2	Greater than 24' wide	1
Low (6% - 8%)		**FUEL TYPE:**	
Moderate (9% - 12%)		Shrub (FM5)	
Steep (>12%)	1	Light:	
LENGTH / TURN:		Moderate:	3
>300 ft. with turnaround	3	Heavy:	
DRIVEWAY WIDTH:		**FUEL CONTINUITY:**	
1 Engine (8 - 22 feet)	3	> 30 feet but < 60 feet	
CLEARANCE:		< 30 feet WITH defensible space	
Yes	3	**DEFENSIBLE SPACE:**	
GATED ACCESS:		Non-Conforming	
Yes	2	None	
No	1	Conforming	
ASPECT:		**SEASONAL WATER SOURCE:**	
Flat (0% - 5%)	3	Unknown	
WATER SOURCES:		Other	
		INGRESS / EGRESS:	
		One Road In / Out	2
ON-SITE WATER:		Two or more roads in / out	1
None		**SLOPE:**	
Cistern		Less than 9%	3

Table A.2 Wildfire Hazard - Values at Risk Evaluation for Escapule			
HOME SURVEY QUESTIONS AND ANSWERS			
	Homes		Homes
VISIBLE ADDRESS:		**DANGEROUS TOPOGRAPHY:**	
Not Present	11	Not Applicable	6
Present, Not Reflective	6	more than 150 feet	15
Present and Reflective	12	less than 150 feet	8
HOMEOWNER:		**UTILITIES:**	
Yes	8	One Underground, One Above Ground	4
No	21	All Above Ground	23
ROOFING MATERIAL:		Unanswered	1
Asphalt	19	All Utilities Underground	1
Metal	9	**PREDOMINANT MATERIAL:**	
Tile	1	Non-Combustible Siding / Deck	17
SIDING MATERIAL:		Combustible Siding and Deck	9
Non-Flammable	20	Non-Combustible Siding / Wood Deck	3
Wood Sheeting	9	**OPEN UNDERNEATH:**	
EAVES:		No	26
Enclosed	14	Yes	3
Not Present	11	**VEGETATION NEAR ROOF:**	
Not Enclosed	4	Not Applicable	13
GRADE:		Branches / Limbs within 5 feet	12
Flat (0% - 5%)	15	Overhanging Branches / Limbs	4
Low (6% - 8%)	10	**ROAD WIDTH:**	
Moderate (9% - 12%)	1	Less than 20'	11
Steep (>12%)	3	Between 20' and 24'	18
LENGTH / TURN:		**FUEL TYPE:**	
>300 ft., with turnaround	6	Shrub (FM6)	
<300 ft., no turnaround	9	Light:	6
>=300 ft., no turnaround	2	Moderate:	20
<=300 ft., with turnaround	12	Heavy:	3
DRIVEWAY WIDTH:		**DEFENSIBLE SPACE:**	
1 Engine (8 - 22 feet)	21	less than 20 feet or none	13
Not Applicable (<50ft)	3	20 - 50 feet	8
Inaccessible	1	50 - 75 feet	2
2 Engines (>22ft)	4	more than 75 feet	6
CLEARANCE:		**DEFENSIBLE SPACE CONFORMS?**	
Yes	29	Non-Conforming	18
GATED ACCESS:		None	9
Yes	10	Conforming	2
No	19	**SEASONAL WATER:**	
FIRE STATIONS:		Unknown	16
Unanswered	29	No	13
WATER SOURCES:		**INGRESS / EGRESS:**	
Unimproved Water Source <1 mile from home	17	One Road In / Out	29
No water available	12	**ASPECT:**	
ON-SITE WATER:		Flat (0% - 5%)	15
Cistern	1	South (SE<-S->SW)	1
Stream (w / dry hydrant)	14	North (NW<-N->NE)	8
Swimming Pool	2	West (SW<-W->NW)	3
None	12	East (NE<-E->SE)	2
SLOPE:			
Less than 9%	12		
Between 10% and 20%	13		
Between 21% and 30%	4		

Appendix B: BLM, Safford/Tucson Fire Management Zone Video Library

Firewise

1) NFES 1271, Developing a Cooperative Approach to Wildfire Protection, ’97, 24 min.

2) NFES 2103, Firefighter Safety in the Wildland Urban Interface (27m), Firefighter Safety (17m), Safety Checkout (10m), 90’s, 54 min.

3) NFES 2182, Wildfire Control: An Introduction for Rural and Volunteer Fire Departments, ’91, 27 min.

4) NFES 2186, The Meeting: Fire Protection Planning in the WUI, ’91, 32 min.

5) NFES 2376, Focus on Wildland Fire, Prevention: Profiling Four Programs That Really Work, ’94, 21 min.

6) NFES 2411, Firewise Landscaping part I: Overview, ’93, 13 min.

7) NFES 2412, Firewise Landscaping Part II: Design and Installation, ’94, 16 min.

8) NFES 2413, Firewise Landscaping Part III: Maintenance, ’94, 9 min.

9) NFES 2414, Firewise Landscaping Part III: Maintenance (Spanish Version), ’94, 10 min.

10) NFES 2509, One Step Beyond, ’96, 17 min.

11) NFES 2533, Building a Firewise Home, ’97, 20 min.

12) NFES 2534, Making Your Home Firewise, ’97, 23 min.

13) NFPA Broadcast, Protecting Your Home Against Wildfire, 4/88, 19 min.

14) NFPA, Preventing Home Ignitions, 1/02, 19 min.

15) CSFS, Are you Firewise?, 2000, 11 min.

16) CDF, Fire Safe Inside and Out, 90’s, 25min.

17) Fire Safe Council and CA Interagency Prevention Committee, Fire Safe Landscaping, PSA's, 90's, est. 15 min.

18) Forest Service, Protecting Your Home From Wildfire, 00's, 26 min.

19) Forest Service Fire Science Lab, Preventing Home Ignitions, 00's, 19 min.

20) Firewise Communities, Introducing Firewise Communities Workshop and Wildfire! Preventing Home Ignitions, 00's, 25 min

21) Combo Pack, Creating Fire Resistant Environments (14m), Fire Protection Planning: The Meeting (32m), Protecting Your Home Against Wildfire (17m), 00's, 63 min.

22) Firewise Communities/USA, A Project of the National WUI Fire Program, 16 min.

Fire for Resource Benefit

23) Utah State Extension, Noxious Weeds: A Biological Wildfire, Applying Fundamentals of Wildfire Management to Improve Noxious Weed Control, 11/96, 15min.

24) BLM Prescribed Fire, 3/98, 12 min.

Wildland Firefighting

1) Firefighter Safety, Discussion Guide, '95, 6 min.

2) Managing Wildland Fire Teleconference, est.>1 hour

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 U.S. Dept. of Interior agencies (Bureau of Indian Affairs, Bureau of Land Management, Fish and Wildlife Service, National Park Service), 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:
www.SouthwestColoradoFires.org

GRANT WEB SITES

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

U.S. 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, 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/

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://www.cals.arizona.edu. or
http://cals.arizona.edu/education/firewise/

OTHER:

Federal Emergency Management Agency State Hazard Mitigation Officers
http://www.floods.org/shmos.htm

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

National Fire Protection Association - International NFPA 299 Standard for (Protection of Life and Property from Wildfire)
NFPA 295 (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 (Protective Clothing and Equipment for Wildland Fire Fighting)
www.NFPA.org

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
www.usfa.fema.gov
www.fema.gov/regions/viii/fires/shtm
www.fema.gov/kidswldfire

Fire Education Materials
www.symbols.gov

National Interagency Fire Center, NPS fire site
www.NIFC.nps.gov/fire

PBS NOVA - "Fire Wars"
www.PBS.org/wgbh/nova/fire/

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 way 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, for fire personnel, teachers, community leaders and media representatives.

CD ROM

Arizona Firewise Communities Educator's Workshop, Payson, AZ, Feb. 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 (publications: NFES 92075 and NFES 92074).

Appendix D: Community Collaboration / Cooperation

When they function properly, collaborative endeavors between agencies, stakeholder groups and other interested parties use the strengths of individuals and organizations to maximize the benefits to the group. Collaborative stewardship processes have been used in ecosystem management for about a decade (Ouachita National Forest, Catron County Citizens Group, Greater Flagstaff Forest Partnership, Flathead Partnership, The Hayfork Watershed Center, among many others). The following is a summary of the major elements found in successful collaborations.

Focus of Collaboration: The focus in collaboration should be upon integrating social, economic, and ecological factors or dimensions in forest management. Examples of this have occurred in forest planning, watershed rehabilitation, and forest restoration. The words defining and describing this work include participation, democracy, public involvement, openness, trust, shared responsibility, reaching common ground, honesty, listening and learning.

Success Factors: Certain qualities or principles make collaboration successful. Here are a few: representation and access; information exchange and learning; continuity of participation (Moote and McClaran, 1997). Clear objectives and projects; manage the process carefully, consistently and continually, and connect implementation to planning (RESOLVE 2001).

Barriers and Roadblocks: Collaborative processes may face hurdles that will have to be overcome. These include domination by the convening party; inability of the partners to listen to each other; the facilitating agency did not have proper authority; perception of responsibility among the partners was unclear; the project or partnership objectives were unrealistic (Lugenbill,2003).

History of Collaboration in Fire Management: After several large fires occurred in the early 1980's, efforts were made to understand public perceptions of fire. Some of these research efforts have been called public acceptability studies, and include the acceptance of smoke, of processes of prescribed fire planning and management, and of fire impacts on social values such as wildlife (Taylor, Jonathan and Terry Daniel. 1984; Taylor, Jonathan et al. 1988).

The 2000 wildfire season changed the thinking towards the wildland urban interface, and we witnessed an emerging cluster of actions that has become known as the National Fire Plan (NFP). The NFP states, "that a collaborative structure - with States and local governments as full partners, will be the most efficient and effective way of implementing a long-term program." It notes a congressional

directive that a strategy will be developed with "close collaboration among citizens and governments at all levels (10-Year Strategy, Western Governor's Association, 2002 and the Interior and Related Agencies Appropriations Act, FY 2001, PL 106-291).

Community Collaborative Linkages to the National Fire Plan (NFP): There are a number of dimensions that present opportunities for collaboration or partnership between agencies, communities, governments, groups, interests and associations. Work can be done using one or more of these dimensions. Working strategically, it may be possible to create a team effort to address aspects of all of these, which will likely increase the team's effectiveness and chances for success.

1. **Collaborative Planning Dimension:**

- Community or county fire plans identify hazardous fuel areas on private and public lands, improve interagency coordination. and develop community awareness and support for fuel treatment projects;
- Creates the opportunity for coordinated fuel treatments on public and private lands;
- Opens the dialogue about the wildland-urban interface boundary to include broader scale landscape issues such as water quality, scenic vistas, and amenity-based economies.

2. **The Social Dimension - Community Organization:**

- Communities can begin working on a neighbor-to-neighbor basis regarding fire prevention education and mitigation;
- Establish a cooperative effort with regard to slash disposal or removal;
- Creation of a community fire safe council;
- Continually building up of regional/county capacity can occur: Example in Southwestern Colorado, County Fire planning in 2001, Missionary Ridge Fire in 2002, and the Pinion pine die-off / problem solving. In 2003, the fire prevention campaign "What are You Waiting for?" was developed.

3. **The Economic Dimension- Sustainability:**

- Inclusion of the wood products industry and fuel thinning businesses:
- Creation of private businesses to assist with fuel reduction;
- Produce value added uses of resultant raw material from fuel treatments;

- Build a well-integrated, sustainable relationship between the economic and ecological dimensions to produce healthy forests.

4. The Information/Communication Dimension - Depth and Continuity:

- Information gaps exist about the natural role of fire, how fires behave, and when and where they can be suppressed (People and Fire in Western Colorado, 2003);

- Informal networks are critical to community communication and participation;

- Readily available information is needed -- newspaper, GIS maps, radio, videos, web-based (see southwestcoloradofires.org) -- to reduce the number of people who may feel there is inadequate or inaccurate information about fires and ecosystem management, and the ecological conditions on public lands;

- Social realities are built and reinforced during and after wildfires, so communication is critical to build or sustain community trust and involvement.

5. The Prevention Education/Mitigation Dimension - Community Mobilization:

- Risk reduction along the wildland urban interface is a community issue, not an individual property protection question. There are synergistic gains when mitigation is based on neighborhood responsibility and action;

- Support may be available from established community networks such as neighborhood associations, real estate trade groups, fire districts, and the Red Cross;

- Group resources can be used to plan and implement hands-on demonstration projects, conduct field tours, help with slash removal and establish neighbors to neighbor programs.

Appendix E: Glossary of Terms

Adopted from NIFC, http://www.nifc.gov/fireinfo/glossary.html

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, or county 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.

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 also 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 also 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.)

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 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).

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 which is burning from the bottom up.

Chain: A unit of linear measurement equal to 66 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 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 toe 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.

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.

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 which 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.

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 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 form 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: Violent convection caused by a large continuous area of intense fire. Often characterized by destructively violent surface indrafts, near and beyond the perimeter, and sometimes by tornado-like whirls.

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.

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

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

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.

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.

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.

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.

Ladder Fuels: Fuels which 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**icro-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 which 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.

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: A group formed under the direction of the Secretaries of Agriculture and the Interior and comprised of representatives of the U.S. Forest Service, Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. 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.

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.

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.

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, crass, 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 which reduced 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.

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 blowup 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.

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 which 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.

Uncontrolled Fire: Any fire which threatens to destroy life, property, or natural resources, and

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.

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.

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.

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 F: Wildland Urban Watch Outs

1. Wooden construction and wood shake roofs.
2. Poor access and narrow one-way roads.
3. Inadequate water supply.
4. Natural fuels 30' or closer to the structures.
5. Extreme fire behavior.
6. Strong winds.
7. Structures in chimneys, box canyons, narrow canyons, or on steep slopes (30% or greater) in flashy fuels.
8. Bridge load limits.
9. Power lines and poles–watch for both overhead and fallen lines.
10. Propane and above ground fuel tanks with nearby vegetation or wooden improvements.
11. Evacuations of public, livestock, pets, animals are planned or occurring.
12. Local citizens attempting suppression.

Upper San Pedro Watershed

WILDFIRE HAZARD ASSESSMENT & MITIGATION PLAN

For Lewis Springs

A Wildland-Urban Interface Communities-at-Risk Program