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Executive Summary

The Mora County, New Mexico, Wildland-Urban Interface Plan (WUIP) has been written by SEC, Inc. to provide the Mora County Fire Chiefs Association (MCFCA) with a program-based fire management plan for private lands throughout the County. The plan is written for a 10-year time period and is focussed on six MCFCA-defined goals, which include:

- Assess WUI homes and subdivisions according to their wildfire hazard.
- Educate private landowners on the threat of wildland fire and motivate them to reduce wildfire hazard around their homes.
- Reduce wildfire hazard in the landscape, specifically in those areas posing the greatest hazard to high-density development.
- Identify training and equipment needs of the MCFCA.
- Identify funding opportunities for project work.
- Identify potential uses and markets of wood products to stimulate economic opportunity.

A reduced wildfire hazard aimed at protecting life and property is the primary WUIP goal. To develop mitigation strategies for wildfire hazard in the wildland-urban interface (WUI), locations of individual homes in both subdivisions and low-density rural settings were identified from aerial photos. SEC staff then took these aerial photos into the field with a wildfire hazard rating form, and every identified home was assessed and given a wildfire hazard rating.

A total of five subdivisions comprising 289 homes were identified and assessed. Four of the five subdivisions are rated as a high fire hazard, and one is rated as a moderate fire hazard. In addition to the subdivision assessments, a total of 257 individual, non-subdivision homes were assessed. In general, most of these homes fared better than the subdivision homes.

In addition to the home assessment work, a vegetation type map has been produced for the entire County. This work identified four primary vegetation types occurring within or adjacent to WUI development. These types include semi-arid grasslands, pinyon-juniper (*Pinus edulis-Juniperus* spp.) woodlands, montane ponderosa pine (*Pinus ponderosa*), and mid-elevation mixed conifer dominated by Douglas-fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*). High-elevation spruce-fir (*Picea englemanii-Abies lasiocarpa*) also occurs within the County, but because of limited access and harsh weather, this zone is largely restricted to only a few summer homes.

Forest management treatment priorities based on management goals and field assessments are included to provide efficient plan implementation. These priorities are based on minimizing the number of homes that might be lost in the event of a fire, and are focussed on fuels reduction work in and around the WUI subdivisions in the County.

The top priority is to focus efforts on defensible space for individual homes within subdivisions. Defensible space is that area between a home and an oncoming wildfire where the vegetation has been cleared or modified to reduce the wildfire hazard.

The second priority is to create fuelbreaks immediately adjacent to a subdivision's outer perimeter of homes. A fuelbreak is a strategically located block or strip of land in which a cover of dense, heavy, or flammable vegetation has been permanently changed to one of lower fuel volume and reduced flammability.

Lastly, sections on funding opportunities and small-diameter timber utilization are included to help address economic development. However, with few exceptions, current outlets for small-diameter material are limited to small, cottage industries that cannot process large volumes. These limited product line problems, along with unquantified barriers in the chain of custody, are the major constraints to the development of regional non-traditional wood product industries. To overcome these small-diameter utilization problems, a study is recommended to determine improvements necessary in the operational steps of converting small-diameter timber into a finished wood product. The study should involve an assessment of all phases of processing and marketing of small-diameter products.

Chapter 1: Introduction

Purpose Statement

The Mora County, New Mexico, Wildland-Urban Interface Plan (WUIP) has been written by SEC, Inc. to provide the Mora County Fire Chiefs Association (MCFCA) with a program-based fire management plan for private lands throughout the County.

The plan is written for a 10-year time period and adopts an integrated approach to management focussed on reducing the risk of catastrophic fire in the wildland-urban interface (WUI), and increasing regional economic opportunity.

Format of Plan

Following the Introduction, *Chapter 2: Resource Description*, provides a description of current resources within the County. Sections on County wildland fire organizations, residential wildfire hazard, forest wildfire hazard, threatened and endangered species, archaeological resources, and water and roads are included. These sections define baseline resource conditions that drive management. *Chapter 3*: *Fire Hazard Reduction Strategies*, provides some local regulatory approaches to fire hazard reduction. A section on community fire education, with an emphasis on the individual homeowner taking responsibility for wildfire hazard reduction on their property is also included. *Chapter 4: Management Recommendations*, includes the management recommendations for the County, and includes treatment priorities based on minimizing the loss of life and property in the event of a fire. *Chapter 5: Management Implementation*, includes sections on grant programs and timber utilization. These sections address economic development by identifying funding sources for project work, and potential markets in which to sell various wood products.

The wildland/urban interface

The WUI is a term used to refer to a geographic area in which flammable wildland fuels are in close proximity to urban structures (The WHIMS Manual 2001). With regard to wildfire in the WUI, the term urban refers to both low-density development of a few residential structures over large areas, and to high-density development that is heavily interlaced with wildland vegetation (Slaughter 1996).

Wildfire hazard and risk

Wildfire hazard is the potential for a fire, once started, to burn and move across the landscape. Fuels, weather, and topography combine to create hazard conditions.

Wildfire risk, on the other hand, represents the potential for a fire to start because of an ignition source. High-risk areas include high frequency lightning strike sites, or anywhere that people typically congregate or use, such as subdivisions, campsites, or roads.
In Mora County, two factors have contributed to fuel buildups and an increase in wildfire hazard; these include approximately 80 years of effective fire suppression and heavy grazing practices. In addition, wildfire risk has increased as a function of increased development and population density in areas that were formerly undeveloped.

Historically, wildfires were started by lightening. Native Americans also lit fires to improve game habitat and maintain travel corridors. When Hispanic settlers moved into New Mexico, the character and structure of the landscape they found was due to the occurrence of frequent fire caused by both lightening and native peoples.

By the 1920's, active, vigorous exclusion of fire became the policy of western land management agencies. This shifted historic wildfire occurrence patterns from frequent, low intensity events to very frequent, moderate-to-severe events. In many cases, the effectiveness of past fire suppression has allowed forest fuels to accumulate to dangerous levels. The result is that when a wildfire occurs today, there is a greater likelihood the event will be much more intense than in the past.

Grazing practices have also contributed to fuel buildups. When Hispanic settlers moved into the area 200 plus years ago, they began grazing their land with sheep and cattle. This grazing pressure led to a decrease in the continuity of the grass and forb fuel type. The result was that fires were often smaller than in the past because of less ground fuel, and shrub and tree species in the forest increased.

The expansion of residential and commercial development is increasing wildfire risk. This is true because population increases with development, as well as the number of transitory visitors interested in recreation. Additionally, many new residents have social and cultural values based upon urban expectations and romanticized ideas of living with nature. This background ill prepares them to recognize and accept the risks of living within the WUI environment (Cortner et al. 1990). The attitudes and values of these residents, and their lack of ecological understanding, can also predispose them to reject ecologically sound solutions to the wildfire problem.

County Description

Mora County is located in northwest New Mexico and occupies a land area of approximately 1,932 square miles (figure 1). The landscape is very diverse, ranging from grassland plains in the eastern and central portions of the County to montane forests and high-country alpine lands in the Sangre de Cristo Mountains. In general, heavily stocked forests, steep canyons, strong winds, and semi-arid conditions describe the physical conditions of the mountainous lands.

Land ownership in the County is predominantly private, with 1,643 square miles, or 85 percent of the lands classified as private. Of these lands, the Mora Land Grant comprises 1,073 square miles, or 65 percent of the private land. The remaining ownership includes public and State lands, which comprise 289 square miles, or 15 percent of the County.

Figure 1: Location Map

The County is rural in nature with no major metropolitan areas and a year 2000 population of approximately 5,180 people (U.S. Census Bureau 2001). Despite the small population, the County's growth from 1990 to 2000 was 21.5 percent (U.S. Census Bureau 2001). This growth is primarily related to an influx of new residents, many of who come from an urban environment and now live in a rural wildland setting.

Management goals

The desired future condition for the County is a reduced wildfire hazard and increased economic opportunity. Embodied in the desired future condition are six specific goals.

- Assess and rate WUI homes and subdivisions according to their wildfire hazard.
- Educate private landowners on the threat of wildland fire and motivate them to reduce wildfire hazard around their homes.
- Reduce wildfire hazard in the landscape, specifically in those areas posing the greatest hazard to high-density development.
- Identify training and equipment needs of the MCFCA.
- Identify funding opportunities for project work.
- Identify potential uses and markets of wood products to stimulate economic opportunity.

A reduced wildfire hazard aimed at protecting life and property is the primary WUIP goal. This is best accomplished by familiarizing firefighting personnel with conditions and hazards around the County, and by motivating individual homeowners to take responsibility for "fireproofing" their residence. The education and motivation of individual homeowners is critical, as the firefighting resources of the County cannot be expected to "save" every home threatened by fire.

The reduced wildfire hazard goal is highly compatible with the increased economic opportunity goal. This is because wildfire hazard recommendations include fuels reduction work aimed at minimizing the potential for catastrophic fire. If the County can secure dollars for implementation of this type of work, then the work and the products produced from the work should help to stimulate the local economy.

Chapter 2: Resource Description

County Wildland Fire Organizations

Federal and State government, and the MCFCA, which is a non-government group of local volunteer fire departments, serve as the primary firefighting entities within the County. The U.S. Forest Service represents the federal government, but their jurisdiction is limited to national forest service lands, which account for slightly less than 8 percent of the County. The New Mexico Forestry Division - Las Vegas District - represents State government, and has statutory responsibility for fire suppression on State and private lands, which account for approximately 91 percent of the County. The MCFCA also has responsibility for fire on State and private lands. This responsibility is defined through a Joint Powers Agreement (JPA) between the Forestry Division and Mora County, and defines the wildfire suppression relationship between the two entities. A copy of the JPA can be found in Appendix A.

MCFCA Fire Departments

Departments

The MCFCA is comprised of 10 volunteer fire departments funded through the State Fire Marshal's Office (SFMO). These departments have divided the County into 13 districts with each department serving one or more district. In addition, one new department in Ledoux is being established; this was made possible through a U.S. Department of Agriculture Rural Utilities Service grant. The current and proposed fire department names, locations, and districts can be found on the enclosed Wildland Fire Resource Map. A list of each fire department showing addresses, members, and phone numbers can be found in Appendix B.

Funding

The funding process for volunteer fire departments in New Mexico is complicated. Essentially, it begins with the State Insurance Division, which is a department within the Public Regulation Commission (LexisNexis 2001). All money received by the Insurance Division for fees, licenses, penalties, and taxes is paid daily by the superintendent of the State Treasurer and then credited to the "Insurance Department Suspense Fund." At the end of every month, all money derived from property and vehicle insurance are then transferred from this "suspense" fund to what is known as the "Fire Protection Fund."

The State Fire Marshal, who serves as the Bureau Chief of the Fire Marshal Bureau of the Insurance Division, then allocates these funds to incorporated cities, towns, and villages,

and to county fire districts in proportion to their respective needs. This determination of need is based on:

- Whether or not a fire department has met various requirements of the SFMO (reporting requirements primarily).
- Whether or not the department possesses fire equipment in serviceable condition to respond to a fire incident.
- Whether or not a department has been regulated in accordance with a duly enacted ordinance for a period of at least one year.

Assuming all these requirements have been met, an annual allocation is then made to fire departments in accordance with what is known as the Insurance Services Office (ISO) Public Protection Classification (PPC) program. ISO is an independent organization that serves insurance companies, insurance regulators, fire departments, and others by providing information about risk. ISO's PPC program evaluates a community's fire protection according to a uniform set of criteria, incorporating nationally recognized standards developed by the National Fire Protection Association and the American Water Works Association. This data is then analyzed to assign a PPC rating from 1 to 10. Class 1 represents the best public protection, and Class 10 equals less than the minimum recognized standard (Insurance Services Office 2002).

A community's PPC evaluation and final class rating depends on:

- Fire alarms and communication systems, including telephone systems, telephone lines, staffing, and dispatching systems.
- The fire department, including equipment, staffing, training, and the geographic distribution of fire companies.
- The water supply system, including condition and maintenance of hydrants, and a careful evaluation of the amount of available water compared with the amount needed to suppress fires.

A community's PPC rating is important because virtually all U.S. insurers of homes and businesses use ISO's PPC in calculating premiums. In general, the cost of fire insurance in a community with a good PPC is substantially lower than in a community with a poor PPC. ISO's PPC rating is also important to the MCFCA because it directly influences their allocation of dollars from the SFMO. The 1999 SFMO allocations to volunteer fire departments, based on their PPC class ratings, can be found in table 1 (LexisNexis 2001).

All of the MCFCA fire departments, with the exception of one, are main stations, but are currently classified with an ISO PPC rank of 9 or 10 (personal communication, C. Aragon, MCFCA, 2002). Efforts focussed on increasing the PPC rank of these departments will bring more money to the fire program, help to save lives and property, and help the community to save money on fire insurance.

Table 1. 1999 SFMO Allocations to Volunteer Fire Departments.

PPC Class Number	Main Station Allocation (dollars)	Substation Allocation (dollars)
1	58,245	21,584
2	53,957	20,145
3	49,641	18,705
4	45,323	17,266
5	43,164	15,827
6	41,007	14,388
7	38,848	13,670
8	36,691	12,950
9	27,339	10,797
10	24,460	none

Residential Wildfire Hazard

Assessment Procedures

To develop mitigation strategies for wildfire hazard in the WUI, the location of individual homes in both subdivisions and low-density rural settings were identified. By selecting the individual ownership parcel as the minimum unit of evaluation, the WUIP provides information that is useful to the individual homeowner. The information is also useful for summarizing the hazard across larger management units such as fire protection districts, and ultimately the entire County.

Because of the size and diversity of the County, identification of homes focussed on those areas generally west of State Highways 518 and 434. These portions of the County are those that generally have homes in close proximity to heavy fuels. To locate homes on the ground, 1997 digital ortho-quads (aerial photos) were downloaded from the Internet and printed at a scale of 1:7920 (U.S.G.S. Earthexplorer 2002). All homes occurring within the forest or approximately 300 feet from the forest were delineated from the quads, which were then shared with the MCFCA for further identification of homes that were missed in the original delineations. SEC staff then took the quads into the field with a wildfire hazard rating form, and every identified home was assessed and given a wildfire hazard rating according to criteria on the checklist form. The fire hazard assessments took place in the fall and winter of 2001.

Two wildfire hazard rating forms were used in the assessment of homes (Appendix C), one for the home occurring within a subdivision, and one for the home occurring in an isolated setting with no other homes around it. The “isolated” home form was slightly modified from the assessment form presented in the Firewise Communities Workshop handbook (Firewise Communities 1997); the subdivision form was taken directly from the handbook.

Seven primary assessment factors were included on the wildfire hazard rating forms to determine the nature and severity of a wildfire hazard to structures. These factors are building construction and design, placement of utilities, surface fuel models, topography,

existence of defensible space, access, and water availability. The first four factors determine the base hazard for a structure, and relate to the characteristics of the fuel or utility on or near a site, and to the likelihood that this material will become involved in an approaching fire. The last three factors contribute to lessening the base hazard by providing a protective zone around the home (defensible space), or by providing protection resources available to fight the fire.

Each of the seven primary factors, and sub-factors within each primary group, were rated on a scale of 1 to 10, with a score of 1 representing the lowest risk and a score of 10 representing the highest risk. These ratings were summed together at the bottom of each wildfire hazard rating form to arrive at an individual home's fire hazard rating.

Each home could fall into one of four hazard rating categories, which are defined as low hazard (less than 49 points), moderate hazard (49 to 68 points), high hazard (69 to 83 points), and extreme hazard (84 plus points). With respect to the subdivisions, an overall subdivision hazard rating represents the average hazard rating of all homes and/or structures within the subdivision. Because of this averaging, a few low or high hazard ratings can artificially decrease or inflate the overall subdivision rating.

Upon completion of the assessment work, data was brought into a geographic information systems mapping program (Arcview 3.2), and home wildfire hazard ratings were mapped. Individual and subdivision homes are found on the enclosed Wildland Fire Resource Map, and Subdivision Treatment Map, respectively. All mapped homes are color-coded by fire hazard rating category and numbered, and can be cross-referenced with the wildfire hazard rating forms by the map home numbers, which are also found on the hazard forms (enclosed).

In addition to the home assessment work, a one-half mile radius adjacent to each subdivision was walked to ground-truth vegetation types, and to gather canopy closure and fuel model data. This perimeter, and the area within each subdivision, have been defined as the WUI area for the subdivision.

Subdivision Fire Hazard Ratings

Five WUI subdivisions were identified in the County; these include Sierra Bonita, Rincon, Christmas Tree Canyon, Cebolla Springs, and Trumbull Canyon. Sierra Bonita and Rincon are located in the northwest part of the County north of the Village of Guadalupita and immediately east and west, respectively, of State Highway 434. These two subdivisions are within the Guadalupita Fire District. Trumbull Canyon and Christmas Tree Canyon are located in the west-central part of the County immediately west of State Highway 434. The Guadalupita and Mora Fire Districts share suppression responsibilities for these subdivisions. Cebolla Springs is located in the southwest part of the County south of the Village of Buena Vista and west of State Highway 518. This subdivision is within the Buena Vista Fire District. The wildfire hazard ratings for each of the five subdivisions can be found in tables 2 through 6.

Table 2. Sierra Bonita Subdivision Fire Hazard Rating.

Element A. Subdivision Design	Points	Average Subdivision Rating
1. Ingress and egress		
Two or more primary roads	1	5
One road, primary route	3	
One way in/out	5	
2. Primary road width		
Minimum of 20 ft	1	3
Less than 20 ft	3	
3. Road accessibility		
Smooth road, grade < 5%	1	3.2
Rough road, grade > 5%	3	
Other	5	
4. Secondary road terminus		
Loop roads, cul-de-sacs		3.3
Outside radius > 50 ft	1	
Outside radius < 50 ft	3	
Cul-de-sac turnaround		
Dead-end roads < 200 ft	3	
Dead-end roads > 200 ft	5	
5. Average lot size		
More than 10 acres	1	3
Between 1-10 acres	3	
Less than 1 acre	5	
6. Street signs		
Present [4" in size & reflectorized]	1	5
Not present	5	
Element B. Vegetation		
1. NFDRS fuel models		
Light (grasses, forbs, sawgrasses, and tundra) Fuel models A, C, L, N, S, and T	1	7.2
Medium (light brush and small trees) Fuel models D, E, F, H, P, Q, and U	5	
Heavy (dense brush, timber, and hardwoods) Fuel models B, G, and O	10	
Slash (timber harvesting residue) Fuel models J, K, and L	10	
2. Defensible space		
More than 100 ft of treatment from buildings	1	8
30-70 ft of treatment from buildings	5	
No defensible space treatment	10	

Table 2 (continued). Sierra Bonita Subdivision Fire Hazard Rating.

Element C. Topography	Points	Average Subdivision Rating
1. Slope		
Less than 9%	1	6
Between 10-20%	4	
Between 21-30%	7	
Between 31-40%	8	
Greater than 40%	10	
D. Additional Rating Factors		
1. Rough topography that contains steep canyons	2	4
2. Areas with a history of higher fire occurrence than surrounding areas due to special situations such as heavy lightning, railroads, escaped debris burning, arson, etc.	3	
3. Areas that are periodically exposed to unusually severe fire weather and strong dry winds	4	
E. Roofing Material		
1. Construction material		
Class A roof	1	1.8
Class B roof	3	
Class C roof	5	
Non-rated	10	
F. Existing Building Construction		
1. Materials (predominate)		
Noncombustible siding/deck	1	8.6
Noncombustible siding/wood deck	5	
Combustible siding and deck	10	
G. Available Fire Protection		
1. Water source availability (on-site)		
500 gpm hydrants <1000 apart	1	3
Hydrants above or draft site	2	
No hydrants or draft site available	3	
2. Water source availability (off-site)		
Sources within 20 minutes round-trip	1	6.8
Sources within 21-45 minutes round-trip	5	
Sources > 46 minutes round-trip	10	
H. Utilities (gas and electric)		
1. Placement		
All underground utilities	1	3.9
One underground, one aboveground	3	
All aboveground	5	
I. Totals for Subdivision (average check-point totals)		
1. Low Hazard: < 49 points		**72**
2. Moderate Hazard: 49-68 points		
3. High Hazard: 69-83 points		
4. Extreme Hazard: 84+ points		

Table 3. Rincon Subdivision Fire Hazard Rating.

Element A. Subdivision Design	Points	Average Subdivision Rating
1. Ingress and egress		
Two or more primary roads	1	4.7
One road, primary route	3	
One way in/out	5	
2. Primary road width		
Minimum of 20 ft	1	3.1
Less than 20 ft	3	
3. Road accessibility		
Smooth road, grade < 5%	1	3.8
Rough road, grade > 5%	3	
Other	5	
4. Secondary road terminus		
Loop roads, cul-de-sacs		3.5
Outside radius > 50 ft	1	
Outside radius < 50 ft	3	
Cul-de-sac turnaround		
Dead-end roads < 200 ft	3	
Dead-end roads > 200 ft	5	
5. Average lot size		
More than 10 acres	1	3
Between 1-10 acres	3	
Less than 1 acre	5	
6. Street signs		
Present [4" in size & reflectorized]	1	4.7
Not present	5	
Element B. Vegetation		
1. NFDRS fuel models		
Light (grasses, forbs, sawgrasses, and tundra) Fuel models A, C, L, N, S, and T	1	8.2
Medium (light brush and small trees) Fuel models D, E, F, H, P, Q, and U	5	
Heavy (dense brush, timber, and hardwoods) Fuel models B, G, and O	10	
Slash (timber harvesting residue) Fuel models J, K, and L	10	
2. Defensible space		
More than 100 ft of treatment from buildings	1	7.9
30-70 ft of treatment from buildings	5	
No defensible space treatment	10	

Table 3 (continued). Rincon Subdivision Fire Hazard Rating

Element C. Topography	Points	Average Subdivision Rating
1. Slope		
Less than 9%	1	5.9
Between 10-20%	4	
Between 21-30%	7	
Between 31-40%	8	
Greater than 40%	10	
D. Additional Rating Factors		
1. Rough topography that contains steep canyons	2	4
2. Areas with a history of higher fire occurrence than surrounding areas due to special situations such as heavy lightning, railroads, escaped debris burning, arson, etc.	3	
3. Areas that are periodically exposed to unusually severe fire weather and strong dry winds	4	
E. Roofing Material		
1. Construction material		
Class A roof	1	1.7
Class B roof	3	
Class C roof	5	
Non-rated	10	
F. Existing Building Construction		
1. Materials (predominate)		
Noncombustible siding/deck	1	8
Noncombustible siding/wood deck	5	
Combustible siding and deck	10	
G. Available Fire Protection		
1. Water source availability (on-site)		
500 gpm hydrants <1000 apart	1	2.9
Hydrants above or draft site	2	
No hydrants or draft site available	3	
2. Water source availability (off-site)		
Sources within 20 minutes round-trip	1	10
Sources within 21-45 minutes round-trip	5	
Sources > 46 minutes round-trip	10	
H. Utilities (gas and electric)		
1. Placement		
All underground utilities	1	3.8
One underground, one aboveground	3	
All aboveground	5	
I. Totals for Subdivision (average check-point totals)		
1. Low Hazard: < 49 points		**75**
2. Moderate Hazard: 49-68 points		
3. High Hazard: 69-83 points		
4. Extreme Hazard: 84+ points		

Table 4. Christmas Tree Canyon Subdivsion Fire Hazard Rating.

Element A. Subdivision Design	Points	Average Subdivision Rating
1. Ingress and egress		
Two or more primary roads	1	4.8
One road, primary route	3	
One way in/out	5	
2. Primary road width		
Minimum of 20 ft	1	3
Less than 20 ft	3	
3. Road accessibility		
Smooth road, grade < 5%	1	3
Rough road, grade > 5%	3	
Other	5	
4. Secondary road terminus		
Loop roads, cul-de-sacs		4.3
Outside radius > 50 ft	1	
Outside radius < 50 ft	3	
Cul-de-sac turnaround		
Dead-end roads < 200 ft	3	
Dead-end roads > 200 ft	5	
5. Average lot size		
More than 10 acres	1	3
Between 1-10 acres	3	
Less than 1 acre	5	
6. Street signs		
Present [4" in size & reflectorized]	1	5
Not present	5	
Element B. Vegetation		
1. NFDRS fuel models		
Light (grasses, forbs, sawgrasses, and tundra) Fuel models A, C, L, N, S, and T	1	8.7
Medium (light brush and small trees) Fuel models D, E, F, H, P, Q, and U	5	
Heavy (dense brush, timber, and hardwoods) Fuel models B, G, and O	10	
Slash (timber harvesting residue) Fuel models J, K, and L	10	
2. Defensible space		
More than 100 ft of treatment from buildings	1	6.8
30-70 ft of treatment from buildings	5	
No defensible space treatment	10	

Table 4 (continued). Christmas Tree Canyon Subdivision Fire Hazard Rating.

Element C. Topography	Points	Average Subdivision Rating
1. Slope		
Less than 9%	1	6.2
Between 10-20%	4	
Between 21-30%	7	
Between 31-40%	8	
Greater than 40%	10	
D. Additional Rating Factors		
1. Rough topography that contains steep canyons	2	4
2. Areas with a history of higher fire occurrence than surrounding areas due to special situations such as heavy lightning, railroads, escaped debris burning, arson, etc.	3	
3. Areas that are periodically exposed to unusually severe fire weather and strong dry winds	4	
E. Roofing Material		
1. Construction material		
Class A roof	1	2.1
Class B roof	3	
Class C roof	5	
Non-rated	10	
F. Existing Building Construction		
1. Materials (predominate)		
Noncombustible siding/deck	1	9.7
Noncombustible siding/wood deck	5	
Combustible siding and deck	10	
G. Available Fire Protection		
1. Water source availability (on-site)		
500 gpm hydrants <1000 apart	1	2.9
Hydrants above or draft site	2	
No hydrants or draft site available	3	
2. Water source availability (off-site)		
Sources within 20 minutes round-trip	1	5
Sources within 21-45 minutes round-trip	5	
Sources > 46 minutes round-trip	10	
H. Utilities (gas and electric)		
1. Placement		
All underground utilities	1	3.7
One underground, one aboveground	3	
All aboveground	5	
I. Totals for Subdivision (average check-point totals)		
1. Low Hazard: < 49 points		**72**
2. Moderate Hazard: 49-68 points		
3. High Hazard: 69-83 points		
4. Extreme Hazard: 84+ points		

Table 5. Trumbull Canyon Subdivision Fire Hazard Rating.

Element A. Subdivision Design	Points	Average Subdivision Rating
1. Ingress and egress		
Two or more primary roads	1	5
One road, primary route	3	
One way in/out	5	
2. Primary road width		
Minimum of 20 ft	1	3.2
Less than 20 ft	3	
3. Road accessibility		
Smooth road, grade < 5%	1	3.2
Rough road, grade > 5%	3	
Other	5	
4. Secondary road terminus		
Loop roads, cul-de-sacs		4.8
Outside radius > 50 ft	1	
Outside radius < 50 ft	3	
Cul-de-sac turnaround		
Dead-end roads < 200 ft	3	
Dead-end roads > 200 ft	5	
5. Average lot size		
More than 10 acres	1	1.2
Between 1-10 acres	3	
Less than 1 acre	5	
6. Street signs		
Present [4" in size & reflectorized]	1	5
Not present	5	
Element B. Vegetation		
1. NFDRS fuel models		
Light (grasses, forbs, sawgrasses, and tundra) Fuel models A, C, L, N, S, and T	1	8.2
Medium (light brush and small trees) Fuel models D, E, F, H, P, Q, and U	5	
Heavy (dense brush, timber, and hardwoods) Fuel models B, G, and O	10	
Slash (timber harvesting residue) Fuel models J, K, and L	10	
2. Defensible space		
More than 100 ft of treatment from buildings	1	6.4
30-70 ft of treatment from buildings	5	
No defensible space treatment	10	

Table 5 (continued). Trumbull Canyon Subdivision Fire Hazard Rating.

Element C. Topography	Points	Average Subdivision Rating
1. Slope		
Less than 9%	1	5
Between 10-20%	4	
Between 21-30%	7	
Between 31-40%	8	
Greater than 40%	10	
D. Additional Rating Factors		
1. Rough topography that contains steep canyons	2	4
2. Areas with a history of higher fire occurrence than surrounding areas due to special situations such as heavy lightning, railroads, escaped debris burning, arson, etc.	3	
3. Areas that are periodically exposed to unusually severe fire weather and strong dry winds	4	
E. Roofing Material		
1. Construction material		
Class A roof	1	2.5
Class B roof	3	
Class C roof	5	
Non-rated	10	
F. Existing Building Construction		
1. Materials (predominate)		
Noncombustible siding/deck	1	8.5
Noncombustible siding/wood deck	5	
Combustible siding and deck	10	
G. Available Fire Protection		
1. Water source availability (on-site)		
500 gpm hydrants <1000 apart	1	2.8
Hydrants above or draft site	2	
No hydrants or draft site available	3	
2. Water source availability (off-site)		
Sources within 20 minutes round-trip	1	7.5
Sources within 21-45 minutes round-trip	5	
Sources > 46 minutes round-trip	10	
H. Utilities (gas and electric)		
1. Placement		
All underground utilities	1	3.4
One underground, one aboveground	3	
All aboveground	5	
I. Totals for Subdivision (average check-point totals)		
1. Low Hazard: < 49 points		**71**
2. Moderate Hazard: 49-68 points		
3. High Hazard: 69-83 points		
4. Extreme Hazard: 84+ points		

Table 6. Cebolla Springs Subdivision Fire Hazard Rating.

Element A. Subdivision Design	Points	Average Subdivision Rating
1. Ingress and egress		
Two or more primary roads	1	3
One road, primary route	3	
One way in/out	5	
2. Primary road width		
Minimum of 20 ft	1	3
Less than 20 ft	3	
3. Road accessibility		
Smooth road, grade < 5%	1	3
Rough road, grade > 5%	3	
Other	5	
4. Secondary road terminus		
Loop roads, cul-de-sacs		3.8
Outside radius > 50 ft	1	
Outside radius < 50 ft	3	
Cul-de-sac turnaround		
Dead-end roads < 200 ft	3	
Dead-end roads > 200 ft	5	
5. Average lot size		
More than 10 acres	1	3
Between 1-10 acres	3	
Less than 1 acre	5	
6. Street signs		
Present [4" in size & reflectorized]	1	5
Not present	5	
Element B. Vegetation		
1. NFDRS fuel models		
Light (grasses, forbs, sawgrasses, and tundra) Fuel models A, C, L, N, S, and T	1	6.9
Medium (light brush and small trees) Fuel models D, E, F, H, P, Q, and U	5	
Heavy (dense brush, timber, and hardwoods) Fuel models B, G, and O	10	
Slash (timber harvesting residue) Fuel models J, K, and L	10	
2. Defensible space		
More than 100 ft of treatment from buildings	1	5.3
30-70 ft of treatment from buildings	5	
No defensible space treatment	10	

Table 6 (continued). Cebolla Springs Subdivision Fire Hazard Rating.

Element C. Topography	**Points**	**Average Subdivision Rating**
1. Slope		
Less than 9%	1	4
Between 10-20%	4	
Between 21-30%	7	
Between 31-40%	8	
Greater than 40%	10	
D. Additional Rating Factors		
1. Rough topography that contains steep canyons	2	4
2. Areas with a history of higher fire occurrence than surrounding areas due to special situations such as heavy lightning, railroads, escaped debris burning, arson, etc.	3	
3. Areas that are periodically exposed to unusually severe fire weather and strong dry winds	4	
E. Roofing Material		
1. Construction material		
Class A roof	1	2.3
Class B roof	3	
Class C roof	5	
Non-rated	10	
F. Existing Building Construction		
1. Materials (predominate)		
Noncombustible siding/deck	1	8.8
Noncombustible siding/wood deck	5	
Combustible siding and deck	10	
G. Available Fire Protection		
1. Water source availability (on-site)		
500 gpm hydrants <1000 apart	1	2
Hydrants above or draft site	2	
No hydrants or draft site available	3	
2. Water source availability (off-site)		
Sources within 20 minutes round-trip	1	7.5
Sources within 21-45 minutes round-trip	5	
Sources > 46 minutes round-trip	10	
H. Utilities (gas and electric)		
1. Placement		
All underground utilities	1	1.5
One underground, one aboveground	3	
All aboveground	5	
I. Totals for Subdivision (average check-point totals)		
1. Low Hazard: < 49 points		**63**
2. Moderate Hazard: 49-68 points		
3. High Hazard: 69-83 points		
4. Extreme Hazard: 84+ points		

Subdivision Fire Hazard Rating Summary

As tables 2 through 6 show, four of the five WUI subdivisions are rated as a high fire hazard, and one subdivision, Cebolla Springs, is rated as a moderate fire hazard. In general, these high fire hazard scores are a function of poor subdivision roads, lack of nearby water sources, heavy fuels, lack of defensible space, and combustible building materials on homes. Below is a summary of various subdivision characteristics important to wildland fire suppression.

Sierra Bonita/Rincon

Taken together, the Sierra Bonita and Rincon subdivisions, located in the Guadalupita Fire District, represent the largest subdivisions in both numbers of homes and area. Sierra Bonita has 184 homes or structures on 723 acres and Rincon has 39 homes or structures on 683 acres. The WUI area (one-half mile subdivision perimeter plus subdivision area) for both subdivisions is 4,043 acres. Because of the proximity of these two subdivisions to each other, and their similar fire hazard conditions, these two areas are treated as one management unit from this point on. Homesites within Sierra Bonita and Rincon are generally located on 10 to 30 percent slopes with west and east aspects, respectively. The forest is a heavily stocked, transitional ponderosa pine and mixed conifer type in Sierra Bonita, and a ponderosa pine type in Rincon. There is one access route into and out of Sierra Bonita, and two access routes into and out of Rincon. No significant water source for firefighting is present near homes in either of these subdivisions, but some large ponds exist immediately east of State Highway 434 and just north of the entrance road into Sierra Bonita. Figures 2 and 3 show Sierra Bonita and Rincon homes. In both figures, heavy, untreated fuels surround homes.

Figure 2. Sierra Bonita home on ridge. Note heavy fuels.

Figure 3. Rincon home with fast-burning grassland fuels and steep slope.

Christmas Tree Canyon

Christmas Tree Canyon, located in the Mora/Guadalupita Fire Districts, is the second largest subdivision in terms of number of homes, with 41 homes on 452 acres. The total WUI area for this subdivision is approximately 2,153 acres. Homesites are generally on

10 to 30 percent slopes with primarily northwest, northeast, and east aspects. The forest is a heavily stocked, transitional ponderosa pine and mixed conifer type. There is only one reasonable access route into and out of this area. A large pond that should contain year-round water is present near the subdivision headquarters on the north end of the subdivision. Figure 4 shows an untreated stand within the subdivision. Figure 5 shows a treated (thinned) stand near the area in figure 4.

Figure 4. Christmas Tree Canyon untreated stand.

Figure 5. Christmas Tree Canyon thinning.

Trumbull Canyon

Trumbull Canyon, also located in the Mora/Guadalupita Fire Districts, is the third largest subdivision in number of homes, with 17 homes on 605 acres. The WUI interface for this community is approximately 2,456 acres. Homesites are generally on 10 to 30 percent slopes with variable aspects. The forest is a heavily stocked, transitional ponderosa pine and mixed conifer type. There is only one reasonable access route into and out of this subdivision. A large pond that should contain year-round water is present directly south of the main entrance road, approximately 1/3- mile from State Highway 434. Figure 6 shows a very heavily stocked, untreated mixed conifer stand with heavy fuels and high canopy closure values. Figure 7 shows the large pond south of the entrance road.

Figure 6. Trumbull Canyon untreated stand.

Figure 7. Trumbull Canyon pond.

Cebolla Springs

Cebolla Springs, located in the Buena Vista Fire District, is the smallest WUI subdivision in the County with only 8 homes on 243 acres. The WUI area is 1,743 acres. Homes are generally on 10 to 20 percent slopes with relatively flat aspects surrounded by a heavily stocked ponderosa pine forest type. Access is by one primary road that runs through the center of the subdivision from south to north. The possibility of escaping a fire by exiting northward on this main road is unknown. Permanent water for firefighting is present on some lots in aboveground fire hydrants. Figure 8 shows a very heavily stocked stand of small-diameter ponderosa pine.

Figure 7. Cebolla Springs untreated stand.

Individual Subdivision Home Fire Hazard Ratings and Lot Size

In addition to the subdivision fire hazard ratings, hazard ratings for individual subdivision homes have been compiled in table 7.

Table 7. Individual Subdivision Home Fire Hazard Ratings.

Subdivision	Number of Homes Within Each Fire Hazard Rating Category			
	Extreme	High	Moderate	Low
Sierra Bonita	9	73	79	23
Rincon	5	23	9	2
Christmas Tree Canyon	2	25	14	0
Trumbull Canyon	1	6	8	2
Cebolla Springs	0	2	6	0

As table 7 shows, a large number of subdivision homes are in the extreme hazard, high hazard, and moderate hazard categories. Many of these homes could reduce their fire hazard rating with the implementation of defensible space treatments, and/or

modifications to the homes themselves. This is evident by the presence of some home ratings in the low hazard category.

The average lot size in Sierra Bonita, Rincon, Christmas Tree Canyon, and Cebolla Springs is approximately 1 to 5 acres, with 1 to 2-acre lots being more common than 3 to 5-acre lots. The average lot size at Trumbull Canyon is greater than 10 acres.

Individual Home Fire Hazard Ratings

A total of 257 individual homes were assessed during the fieldwork, and in general, most of these homes fared better than the subdivision homes. The wildfire hazard ratings for these homes break out as follows: extreme hazard 0, high hazard 33, moderate hazard 141, and low hazard 83.

The variability in these homesites' location, vegetation, defensible space, lot size, etc. precludes any generalizations. However, the mapped homes can be cross-referenced with their corresponding wildfire hazard rating forms to gain specific information about each assessed home.

Forest Wildfire hazard

Vegetation Types

Vegetation is an important component contributing to wildfire hazard because the general vegetation within an area determines the nature of the fire behavior expected if a wildfire occurs. A Vegetation Map (enclosed) has been produced for the entire County using Arcview 3.2 and data from the National GAP Analysis Program (1996). This process identified four major vegetation types occurring within or adjacent to development. These types include semi-arid grasslands, pinyon-juniper (*Pinus edulis-Juniperus* spp.) woodlands, montane ponderosa pine (*Pinus ponderosa*), and mid-elevation mixed conifer dominated by Douglas-fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*). High-elevation spruce-fir (*Picea englemanii-Abies lasiocarpa*) also occurs within the County, but because of limited access and harsh weather, this zone is largely restricted to only a few summer homes. These different vegetation types, with the exception of the spruce-fir, are discussed in terms of their general fire history and ecology, and their implications for fire management.

Grasslands

In Mora County, semi-arid grasslands occur in the central and eastern portions of the County on approximately 1,077 square miles, or 56 percent of the County. This vegetation type supports fine fuels which burn often, primarily as a function of the abundance of fuel and the semi-arid climate. The good news is that most grassland fires are easy to suppress because per acre fuel quantities are low and the fuels burn quickly. Fire spread by embers from the flaming front are usually limited and direct flame contact

is usually required to ignite structures. Therefore, the clearing of grass from around buildings or the establishment of watered lawns can provide a measure of protection. The bad news is that this clearing must be done every year, as grasses are annuals. Also, the vastness of the County's plains lengthens response time for firefighters, and the fast-moving nature of these fires makes it difficult to defend numerous scattered homes.

Pinyon-Juniper Woodlands

Pinyon-juniper woodlands occur on approximately 271 square miles, or 14 percent of the County. These woodland communities are located primarily in the foothills of the Sangre de Cristos, and are popular residential building sites because of the screening and privacy they provide in an otherwise open, semi-arid country. Wildfire in this stand type is typically confined to slow-moving surfaces fires; however, in hot, dry, windy conditions many of these stands can support fast-moving crown fires which will destroy homes and anything else in their path.

Ponderosa Pine

The ponderosa pine type occurs on approximately 197 square miles, or slightly over 10 percent of the County's lands. All the WUI subdivisions in the County are located within the ponderosa pine type, presumably as a result of accessibility, a relatively mild climate, and high aesthetic appeal.

Ponderosa pine, primarily as a function of thick protective bark, develops a resistance to surface fire at an early age and is well adapted to survival of frequent fire. Fire scar research has shown that before 1920, most stands burned at intervals ranging from 2 to 25 years (Martin 1982). Frequent surface fires thinned out smaller trees and kept stands open and park-like, allowing little opportunity for fuel buildup and stand-destroying crown fires. With the introduction of previously discussed fire suppression policies, most of these forests have experienced little fire in the last 80 or so years. Consequently, today's stands are characterized by dense patches of understory trees and heavy accumulations of understory litter and duff material, and when a wildfire occurs under dry, windy conditions, it often develops into an uncontrollable, stand-replacing event.

Ponderosa pine grows in a semi-arid climate, and after a few days of dry weather pine litter will readily burn. This means a dangerous fire situation is possible during much of the year. As far as homeowners are concerned, the good news is that fuels management is very effective in this forest type. The bad news is that without fuels management the risk of severe fires can threaten homes during seasons when fires are generally uncommon.

Mixed Conifer

Mixed conifer forests occur on approximately 206 square miles, or almost 11 percent of the County's lands. This forest type intermingles with the ponderosa pine type at its lowest elevations, and the spruce-fir type at its highest elevations. Subdivision and

individual homes are located within this forest type, but are generally in the lower ponderosa pine/mixed conifer transition zone.

Historic burn intervals in this forest type are highly variable, ranging from 20 to 150 years (Arno 1980, Dieterich 1983, Martin 1982). This variability is largely a function of varying moisture regimes, with the lower elevation stands burning on the shorter intervals. Like the variability in burn interval, fire in this vegetation type is also variable, ranging from light surface fires to stand-replacing conflagrations.

In Mora County, development in this stand type is often surrounded by dense vegetation, both in the overstory and the understory; however, these stands only become a fire hazard during severe drought. As with ponderosa pine, fuels management in this forest type is very effective, but slightly more difficult because of the greater fuel quantities generally present.

Fuel Models

The primary vegetation types in the County have been associated with 13 descriptive fuel models (Anderson 1982). These models are known as the National Forest Fire Laboratory (NFFL) fuel model classifications, and are classified into four groups. These groups include grass (models 1, 2, and 3), shrubs (models 4, 5, 6, and 7), timber (models 8, 9, and 10), and logging slash (models 11, 12, and 13).

Each model represents the dead surface fuels in which a fire is most likely to burn, and the corresponding fire severity associated with the fuels during the severe period of the fire season. Fires burn differently in the different fuel models under the same weather conditions, primarily as a function of different fuel loading on a tons/acre basis, and the fuel loading distribution among the fuel particle size classes.

The vegetation type/fuel model associations were determined through aerial photo interpretation. A percentage of these photo interpretation calls were then ground-truthed in the field to determine accuracy of the photo interpretation work, and to give further insight to the County's generalized vegetation type/fuel model relationships.

The grassland types throughout the County are typically associated with fuel model 1. Fire spread in this model is governed by fine, nearly continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly across the landscape. When fuel moisture averages 8 percent and the effective wind speed is 5 miles/hour, a fire in model 1 has a predicted flame length of 4 feet and will spread at a rate of approximately 5,148 feet/hour (Anderson 1982).

The pinyon-juniper stand type is associated with fuel models 2 and 6. Sparsely stocked stands with an understory dominated by grass fit model 2, and sparsely or heavily stocked stands dominated by sage (*Artemesia* spp.) or oak (*Quercus* spp.) fit model 6. Fire spread in model 2 is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, litter, and dead-down stemwood from the

timber overstory contribute to fire intensity. Fire spread in model 6 is through the sage or oak layer. Fire in this have been discussed above. Moderately-to-heavily stocked ponderosa pine types are dominated by an understory of pine litter and dead-down woody material, and are associated with fuel model 9. Fires in this model are typically moderately fast- burning surface fires, but concentrations of down material can contribute to the torching out of trees, spotting (firebrands carried by the fire), and crowning (fire burning in the upper crowns of trees). When dead fuel moisture content is 8 percent, live fuel moisture is 100 percent, and an effective wind speed at mid-flame height is 5 miles/hour, fire has a predicted flame length of 2.6 feet and will spread at a rate of approximately 495 feet/hour (Anderson 1982).

Mixed conifer and spruce-fir stand types occur throughout the County's mid-to-high elevation sites, and are associated with fuel models 8 and 10. Pure aspen stands also occur at these higher elevations, and are also associated with fuel model 8, which is characterized by needle and leaf litter, small twigs, and the occasional "jackpot" of heavily concentrated dead-down woody material. Fires in this model are typically slow-burning surface fires with low flame lengths. Fuel model 10 understories are characterized by a significant volume of dead-down woody material, which can lead to torching, spotting, and crowning, and a corresponding difficulty with fire control. When dead fuel moisture averages 8 percent, live fuel moisture is 100 percent, and the effective wind speed at mid-flame height is 5 miles/hour, a fire in model 8 has a predicted flame length of 1 foot and will spread at a rate of approximately 106 feet/hour (Anderson 1982). In model 10, assuming the same fuel moisture and wind conditions as noted above, a fire will have a predicted flame length of 4.8 feet and will spread at approximately 521 feet/hour (Anderson 1982). Table 8 summarizes a number of fuel characteristics associated with the described vegetation types and fuel models. model will drop to the ground at low wind speeds or openings in the stand. When fuel moisture averages 8 percent and the effective wind speed is 5 miles/hour, a fire in model 2 has a predicted flame length of 6 feet and will spread at a rate of approximately 2,310 feet/hour (Anderson 1982). In model 6, when dead fuel moisture averages 8 percent, live fuel moisture is 100 percent, and the effective wind speed is 5 miles/hour, a fire has a predicted flame length of 6 feet and will spread at approximately 2,112 feet/hour (Anderson 1982).

Pure or mixed stands of gambel oak (*Quercus gambelii*) and wavyleaf oak (*Quercus unduluta*) occur on various rocky sites within the County, and on some sites that have experienced disturbances such as fire or heavy logging. These stand types are
characterized by fuel model 6, and exhibit fire flame lengths and rates of spread as described above.

The County's sparsely stocked ponderosa pine stand types typically have an understory dominated by grass or oak, and are represented by fuel models 2 and 6, respectively. Fire characteristics for these fuel models

Table 8. Fuel Model Characteristics.

Vegetation Type	Fuel Model	Fuel Bed Depth (feet)	*Flame Length (feet)	*Rate of Spread (feet/hour)	**% Moisture of Extinction (dead fuels)
Grasslands	1	1	4	5,148	12
Pinyon-Juniper	2	1	6	2,310	15

	6	2.5	6	2,112	25
Oak	6	2.5	6	2,112	25
Ponderosa Pine	2	1	6	2,310	15
	6	2.5	6	2,112	25
	9	1	2.6	495	25
Aspen	8	0.2	1	106	30
Mixed Conifer	8	0.2	1	106	30
	10	1	4.8	521	25
Spruce-Fir	8	0.2	1	106	30
	10	1	4.8	521	25

* Flame length and rate of spread values correlate to weather conditions noted above in narrative
** % Moisture of Extinction equals moisture level at which fire will not spread

Two other points need clarification with respect to the fuel models. Any forest type can fall into model 10 if enough heavy down material is present. Examples of this might include insect or disease ridden stands, windthrown stands, overmature stands with deadfall, and aged light thinning or partially cut slash (tops and limbs from felled trees). Also, any forest type can fall into the slash models of 11, 12, and 13 if enough slash material is present on the ground. However, these slash models typically occur only during an active timber sale.

Canopy Closure

Canopy closure is the progressive reduction of space between tree crowns as they spread laterally. Canopy closure was qualitatively assessed in the field for each of the County's WUI subdivision areas because it is an important attribute affecting crown fire spread and intensity. At over approximately 40 percent canopy closure tree crowns are generally close enough together to allow fire to rapidly "jump" from tree to tree as a "running crown fire."

Canopy closure values were defined by dominant vegetation type and tree diameter through use of an alpha-numeric system. Table 9 shows the vegetation type identifiers and associated canopy closure values used in this process. For example, a P8 designation would identify a well-stocked ponderosa pine sawtimber stand with a canopy closure of 40 to 70 percent. Canopy closure values will be further discussed in Chapter 4 – Management Recommendations.

Table 9. Canopy Closure Values.

Dominant Subdivision Vegetation Types	Size Class	Canopy Closure
P – Ponderosa pine	Seedling & Saplings (0.1" – 4.9" diameter)	1 – 10-39 2 – 40-70 3 - > 70
MC – Mixed conifer	Pulpwood (5" – 9.9" diameter)	4 – 10-39 5 – 40-70 6 - > 70

	Sawtimber (10" diameter and larger)	7 – 10-39 8 – 40-70 9 - > 70

Threatened AND Endangered Species

Wildlife

The Bison-M database (version 7, 2002) was queried to identify Federal and State of New Mexico threatened and endangered (T&E) species known to occur in Mora County. A list of these species can be found in table 10.

Table 10. Federal and New Mexico T&E Species Known to Occur in Mora County.

Common Name	Scientific Name	Status
Southwestern willow flycatcher	*Empidonax traillii extimus*	Federal & State endangered
Bald eagle	*Haliaeetus leucocephalus*	Federal & State threatened
Mountain plover	*Charadrius montanus*	Federal threatened
Mexican spotted owl	*Strix occidentalis lucida*	Federal threatened
White-tailed ptarmigan	*Lagopus leucurus altipetens*	State endangered
Southern redbelly dace	*Phoxinus erythrogaster*	State endangered
American marten	*Martes americana origenes*	State threatened
American peregrine falcon	*Falco perigrinus anatum*	State threatened
Boreal owl	*Aegolius funereus*	State threatened
Baird's sparrow	*Ammodramus bairdii*	State threatened
Suckermouth minnow	*Phenacobius mirabilis*	State threatened

At this time, no Federal or State T&E wildlife species are known to occur within any of the recommended treatment sites discussed in Chapter 4 – Management Recommendations. If any T&E species are found during any project implementation work, stop work in the immediate vicinity of the species and contact SEC for a biological evaluation.

Plants

The current website of the New Mexico Rare Plant Technical Council (version 15, 2001) lists no Federal or State of New Mexico T&E plant species, and five rare plant species in Mora County. Rare species are those of management concern because of limited distribution, habitat loss or degradation, and/or some other factor. The rare species are Arizona willow (*Salix arizonica*), one-flowered milkvetch (*Astragalus wittmannii*), Pecos mariposa lily (*Calochortus gunnisonii* var. *perpulcher*), Sapello Canyon larkspur (*Delphinium sapellonis*), and spiny aster (*Eurybia horrida*).

At this time, no rare plant species are known to occur within any of the recommended treatment sites discussed in Chapter 4 – Management Recommendations. If in the future such a species is found, care should be taken to protect both the species and its habitat.

Archaeological Resources

According to the New Mexico Office of Cultural Affairs - Historic Preservation Division - the location of privately registered archaeological sites is not available to the public. However, Scott Geister, an employee of the Historic Preservation Division, was given proposed treatment area location data and used it to identify presence or absence of sites. According to Mr. Geister, no archaeological sites are known to occur within any of the plan-recommended treatment areas (personal communication, 2002).

Archaeological sites were also watched for during fieldwork. No sites were found, and at this time, there is no knowledge of any sites within any of the recommended treatment areas. If any site is found in the future, flag the location, stop work in the area, and contact SEC for information on how to proceed.

Water

Water resources have been identified on the enclosed Wildland Fire Resource Maps according to water source, and include tanks and/or ponds, and perennial and intermittent streams. The source for this data is the U.S. Department of Commerce (Geography Division) TIGER database (2001). In addition, the Ocate/Ojo Feliz Fire Departments sent a listing of water resources on their districts. This list can be found in Appendix D.

Roads

Roads have been identified on the enclosed Wildland Fire Resource Maps, the Vegetation Maps, and the Subdivision Treatment Maps according to road type. The source for this data is the U.S. Department of Commerce (Geography Division) TIGER database (2001).

Chapter 3: Fire Hazard Reduction Strategies

Planning and Zoning

The current Mora County planning and zoning regulations were adopted in July of 1995 by the Board of County Commissioners to implement the goals and policies of the Mora County Comprehensive Land Use Plan. These regulations govern the development and use of land, and are contained in a document entitled the *Mora County Development Guidance System*. The regulations apply to all portions of the County not within the zoning jurisdiction of any incorporated municipality.

In drafting and adopting the County regulations, the County Commissioners and planners recognized that fire protection in rural areas such as Mora County is extremely important because of the distance and time required to respond to such emergencies. Therefore, the regulations identify eight factors (Mora County Development Guidance System 1996) that must be incorporated in the development process to ensure adequate fire protection. These eight factors include the following:

1. All new major subdivisions must be within four miles of the nearest fire station, as measured by the most direct route from the station to the site, unless a substation is built within the subdivision to support the new development.

2. Development in forested areas must comply with the New Mexico State Forestry publication entitled *Wildfire Safety Guidelines for Rural Homeowners*. This document states that:

    - Roof coverings shall be of a noncombustible Underwriter Laboratory approved material.
    - An external water supply shall be provided on site with sufficient storage for adequate fire protection.
    - Power lines and telephone lines shall be installed underground.
    - Defensible space should be maintained consistent with the slope criteria established in the above-referenced document.

3. Fire hydrant systems that meet the current National Fire Protection Association (NFPA) standards shall be installed not more than 1,000 feet apart and fully charged prior to approval of the final plat. In the absence of a working hydrant system, water cisterns of good design (metal or concrete) shall be provided at strategic locations with a minimum capacity per cistern of 100 gallons per acre protected, or 500 gallons per dwelling unit, whichever is greater, prior to approval of the final plat. Reduced cistern capacity on cluster developments with large open spaces may be permitted. Access to each cistern shall be dedicated to the County for use by the local fire protection agencies. Provision for continued maintenance of the cisterns shall be included in the conditions for final plat approval, either with a homeowner's association or dedication to the County. The developer should construct and maintain the cistern for one year prior to acceptance by the County.

4. Subdivisions and new development must provide adequate access for firefighting and emergency vehicles.

5. Subdivisions and new development must be adequately marked and signs posted to provide easy identification for emergency vehicles. Road signs of durable and permanent materials shall be installed at all intersections in the subdivision prior to final plat approval. Proposed road names shall not duplicate other existing or proposed road names within the County. House or lot numbering should be clearly visible from the road.

6. Practical fuelbreak systems shall be installed and approved as needed in strategic fire defense locations on lands dedicated or encumbered with easements for such purposes before final plat approval.

7. Areas that have high fire hazard ratings, pursuant to State Forestry, which can be reduced to lower hazard ratings through thinning, or other such fuel modifications, shall be so modified before final plat approval.

Community Fire Education

Community fire education is critical to help enhance fire prevention for three reasons. First, a large number of the County's newer residents live in subdivisions with high fire hazards, and some of these residents lack an understanding of the fire environment they live in, or even realize that a problem exists. Secondly, some of the County's residents are aware of the fire threat but know little or nothing about how to minimize fire hazards. And lastly, the vast area of Mora County and the limited firefighting resources makes it impossible to respond to all fires in a timely manner, or to save all homes or wildlands.

The goal of any County fire education program should be to create an awareness that the fire problem is real, and then to gain community support to implement fire hazard reduction practices. When attempting to communicate a "firesafe" strategy to individuals, it is helpful to work within a social network perspective. This means that people are interlinked to each other, that they have their own agenda, and that they have their own motives and values (Fischer and Arno 1988).

The interlinked component of the social network perspective means that people in the community are linked to each other by interpersonal communication channels. This is especially true in a rural setting like Mora County. Most people do not make important decisions by reading, watching, or listening to the mass media. For example, most people will not replace a shake roof and replace it with a metal roof because of an ad in the newspaper or from watching some television program. When people make those kinds of decisions they typically check with whoever they perceive to be an opinion leader. With respect to fire, an opinion leader would be one who is aware of fire and who understands fire better than the average person in the community. It is this interpersonal communication with friends and neighbors that gets people to change their behavior.

In attempting to communicate a firesafe message, it is important to remember that the people of the community have an agenda which may be quite different from any fire program agenda. People have all kinds of choices, and whether they choose to listen to any message depends on how well that message matches what they need to hear or want to hear. This agenda consideration also relates to the fact that everyone has their own motives and value system. These values influence any individuals' willingness to participate in a program. For example, is clearing the vegetation around a home consistent with a homeowners' values or beliefs, or is that action going to ruin something important to them by removing the brush? In addition, what are the advantages of clearing brush compared to the alternatives? This relates to the values one has for the wild landscape relative to the size of the risk and the potential losses from a fire. The important point here is that any program designed to promote change will be most successful if people have a real and meaningful choice in how that change occurs.

Chapter 4: Management Recommendations

Short-Term Recommendations

Short-term forest management treatment priorities include fuels reduction work aimed at reducing the potential for catastrophic fire. These priorities are based on minimizing the number of homes that might be lost in the event of a fire and are thus focussed on the WUI subdivisions within the County.

Priority One – Subdivision Defensible Space

The top priority for fuels reduction work is to focus efforts on defensible space for individual homes within subdivisions. Defensible space is that area between a home and an oncoming wildfire where the vegetation has been cleared or modified to reduce the wildfire hazard. In some cases, defensible space can also provide an opportunity for firefighters to defend a home. The defensible space recommendation is the top priority because the infrastructure (access, roads, etc.) within most of the subdivisions is partly responsible for the high subdivision fire hazard ratings, and defensible space is lacking around many homes. Modification of these infrastructure "problems" is not very probable due to planning and cost constraints; however, assuming homeowner willingness, defensible space problems can be treated (a New Mexico Harvest Permit Application, discussed in the "Priority Two - Subdivision Fuelbreaks" section, is not required for individual landowner's conducting defensible space treatments). Furthermore, while defensible space is no guarantee that a home will survive a wildfire, studies have shown that when done properly, it significantly improves the odds.

Implementation

Some agency or group, possibly State Forestry, the Mora County Fire Department, or the MCFCA, will need to take the lead and attempt to secure grant dollars for defensible space implementation. These dollars should be targeted for a County fire education program and the actual defensible space fuels reduction work.

The fire education program can be introduced to the community through the mass media (newspaper, radio) and public meetings. These media announcements will generate awareness of the fire hazard problem and serve as the vehicle to announce public meeting dates. At this public awareness stage of the program, remember to involve the opinion leaders in the community, and attempt to generate a positive attitude from them towards the defensible space program. In setting public meeting dates and locations, focus promotion efforts on all the subdivisions identified in the WUIP. This will help to ensure the maximum number of homeowners in the program. When conducting a public meeting, point out that participation in the program is voluntary, and homeowners will have some choice in how the project work is implemented on their property. Finally, pass around a sign-up form to generate a list of homeowners interested in the program.

The homeowner sign-up form should be used to schedule a property site visit. This visit should include an evaluation of the property's current condition, and the development of a defensible space prescription. A standardized site evaluation form should be used in this process to ensure program consistency and a record of what occurred on the ground. As a general guideline, the site evaluation form should include the following:

- Landowner name, project legal description and size
- Landowner objectives and priorities
- Property improvement types and locations
- Elevation, slope and aspect
- Vegetation types, estimated height and diameter size classes
- Forest health – problems, severity, and location
- Crown fire potential
- Soil conditions – erosion, existing and potential as a result of treatment
- Cultural resources
- Presence of threatened and endangered species and habitat
- Aesthetics – impact of treatment
- Treatment prescription – special instructions and slash disposal recommendations
- Property/treatment plan map

In addition to the site visit and evaluation form, flagging on all cut trees is recommended to help ensure that the defensible space goals are met. The value of designating cut trees with flagging cannot be overstated, as no designation of trees places all cut-tree/leave-tree decisions solely upon the cutter.

If program dollars can be secured, a "Request for Proposals" solicitation should be prepared and sent to various consultants and local thinning crews, and a contract drawn up for whoever is awarded the work. If grant dollars cannot be secured, attempts at organizing fire education awareness workshops should be made. Individual homeowners will then need to take responsibility for the work.

General Guidelines

A six-step series of defensible space guidelines taken from the New Mexico State Forestry publication entitled *Living With Fire – A Guide for the Homeowner* (1999), are presented here to guide project work. Step one involves a determination of the defensible space area, and is expressed as a distance extending outward from all sides of a home. This distance varies by the wildland vegetation type growing near the house and the steepness of the terrain.

Wildland vegetation is categorized according to the dominant type within the area, and includes grass, shrubs, and trees. Steepness of terrain is categorized as flat to gently sloping (0 to 20 percent slope), moderately steep (21 to 40 percent slope), and very steep (greater than 40 percent). Once the vegetation type and steepness of terrain have been determined, a defensible space distance can be figured according to table 11.

Table 11. Defensible Space Recommended Distances.

Vegetation Type	Steepness of Slope (percent)		
	0 to 20	21 to 40	<40
	Defensible Space (feet)		
Grass	30	100	100
Shrubs	100	200	200
Trees	30	100	200

Step two involves an assessment of the dead fuels within the defensible space perimeter. In most cases, dead fuels should be removed from the defensible space area. A description of dead fuel types and the recommended treatments for each type are listed in table 12.

Table 12. Dead Fuel Types and the Recommended Treatment.

Dead Fuel Type	**Recommended Treatment**
Standing Dead Tree	Remove all standing dead trees within defensible space area.
Down Dead Tree	Remove tree if recently fallen and not embedded into the ground. Leave embedded down dead if removal will create soil disturbance but remove all exposed branches.
Dead Shrubs	Remove all dead shrubs within defensible space area.
Dried Grasses and Wildflowers	After grasses have dried out and "cured," cut down and remove.
Dead Needles, Leaves, Branches, and Cones on the Ground	Reduce needle layer to approximately 2 inches depth. Do not remove all needles. Do not disturb the dark "duff" layer of decomposing material at the ground surface. Remove all leaves, twigs, cones, and branches.
Dead Needles, Leaves, Branches, and Twigs not on the Ground	Remove all dead leaves, branches, twigs, and needles still attached to living trees and shrubs to a height of 15 feet above the ground. Remove all debris which accumulates on the roof and in the rain gutters as needed.
Firewood and Other Combustible Debris	Locate firewood and other combustible debris a minimum distance of 30 feet uphill from the house, or to the leeward wind side of a home on flat ground.

Step three involves an assessment of the spacing requirements for all shrubs and trees within the defensible space area. The goal here is to break up uninterrupted, dense layers of fuel by providing for a separation between vegetation.

For areas with dense brush, or heavily stocked pinyon-juniper, the recommended separation distance is determined by brush or tree height and steepness of slope. The rule of thumb on flat to gently sloping ground is to separate residual vegetation by 2 times the vegetation height. For example, a home on a 10 percent slope with junipers 8 feet tall would require a separation distance of 16 feet between all residual junipers. On moderately steep and very steep ground the rule is to separate vegetation by 4 times and 6 times, respectively, the height of the residual vegetation. All separation distances are measured between canopies (outermost branches) and not between trunks.

For forested areas, the recommended separation distance between tree canopies is determined by steepness of slope. For flat to gently sloping ground this distance is 10 feet; for moderately steep ground the distance is 20 feet; and for very steep ground the distance is 30 feet.

Step four involves an assessment of the ladder fuels within the defensible space area. Ladder fuels are the small understory trees growing beneath larger trees. These small trees provide for a continuous vertical fuel arrangement that encourages crown fire initiation by carrying surface fire into the crowns of overstory trees. Within the defensible space area, a vertical separation of three times the height of the ladder fuel is recommended. For example, a three-foot oak growing next to a large pine tree should have a minimum separation distance of 9 feet, as measured from the top of the oak to the bottom of the lowest branches on the pine. This could be accomplished by reducing the height of the oak, pruning the lower branches of the pine, or both. Better yet, the oak could be removed.

Step five involves keeping the vegetation in an area extending at least 30 feet from the home “lean, clean, and green”. Lean, clean, and green considerations are listed below.

- Emphasize the use of low growing herbaceous (non-woody) plants that are kept green during the fire season. Examples include lawn, clover, bedding plants, bulbs, perennial flowers, and grasses.
- Emphasize the use of mulches, rock, and non-combustible hard surfaces. Check with your subdivision or community if permits are required.
- Deciduous ornamental trees and shrubs are good landscaping choices if they are kept green, free of dead plant material, ladder fuels are removed, and individual plants or groups of plants are arranged in a manner in which adjacent wildland vegetation cannot convey a fire through them to the structure. Shorter deciduous shrubs are preferred.
- Minimize the use of ornamental coniferous shrubs and trees and tall exotic grasses.
- Most wildland shrubs and trees should be removed from this zone and replaced with more desirable alternatives as described in the first consideration. Individual specimens of wildland shrubs and trees can be retained if they are kept healthy,

free of dead wood, and pruned. All ladder fuels beneath this vegetation should be removed.

- Tree limbs within 15 feet of a chimney, encroaching on power lines, or touching the house should be removed.

Step six involves keeping a defensible space effective by regular upkeep and maintenance. This is critical as the value of all the aforementioned work can be quickly diminished through neglect.

Priority Cut Trees

The highest priority cut trees should include those that are infested/infected with insects or disease. The second priority cut trees should be those exhibiting poor form and/or vigor. Poor form is expressed by forked tops, a crook or sweep in the bole, a non-uniform taper, or some sort of environmental damage. Poor vigor is expressed by a poorly developed dying crown, dead tops, or the presence of insects and disease. Poor form and vigor can be related to a variety of circumstances, including genetics and environmental stresses.

Treatment Methods

The recommended cutting method is to use sawyers to fell, limb, and buck (cut into segments) all trees, and hand crews to carry and stack the cut wood. Trees should be bucked into 4 to 6-foot segments, and then stacked away from the home in a firesafe location. As an alternative for large trees that a landowner might not want, a 4-wheel drive all-terrain vehicle (ATV) fitted with special hitches, a protective cage, and front-end counterweights could be used with a skidding arch to mechanically yard trees to a landing site. However, this will complicate project logistics as a buyer for the material will need to be found, some type of loader will be needed to load logs onto a truck, and an accounting of financial operations associated with the sale of material will be needed.

If an ATV/arch method is employed, cutting should generally start in the back corner of a property and work out towards the front. This minimizes the skidding of trees over slash (tree limbs and tops) and stumps. Care should also be taken to directionally fell trees to provide the easiest access with the ATV. Given a choice, skidding should be done downhill as opposed to uphill.

The ATV/arch method can be expected to handle a 16 to 24 inch diameter tree weighing approximately 2000 pounds; however, ATV traction limitations on steeper ground will limit this pulling capacity when skidding uphill. Chains will help this traction limitation (as well as braking ability), as well as a device called a skidding cone, which is simply a plastic protective cap fitted over the top end of a log. Further information on commercially available ATV arches and skidding cones can be found online at www.rockisland.com/~tom/tools.html and www.novajack.com/.

If decided upon, the advantage of the ATV/arch method is relatively low equipment investment, minimal site impacts, and psychologically unobtrusive equipment in a

residential setting. Disadvantages include limited ability to work on steep slopes, ATV operator safety, and moderately high logging cost as a function of the equipment's inability to move large quantities of material quickly.

Cut trees should be limbed and bucked where felled, and the resulting slash material hand-carried to an on-site chipper. The chipper should be designed to feed material directly into the back of a truck where it can then be hauled off-site. An alternative to chipping would be to simply load slash onto a truck. Regardless of what is done, all slash material generated from treatments should be hauled off-site.

Priority Two – Subdivision Fuelbreaks

The second priority for fuels reduction work is to create fuelbreaks immediately adjacent to a subdivision's outer perimeter of homes. A fuelbreak is a strategically located block or strip of land in which a cover of dense, heavy, or flammable vegetation has been permanently changed to one of lower fuel volume and reduced flammability. Like defensible space, a well-designed fuelbreak may provide an area in which firefighters can attempt to stop an oncoming fire. However, they are not intended to stop all fires. Even with advanced placement of suppression crews, long-range spotting associated with extreme fire behavior may breach the widest of breaks.

Treatment Sites

Fuelbreak treatment site priorities are based on subdivision fire hazard ratings, the number of homes that might potentially be lost in a fire, fire hazards in the WUI area as a function of stand types and attributes, and general WUI area slope and aspect characteristics. The fuelbreak treatment site criteria, and the subdivision fuelbreak priorities can be found in table 13.

In analyzing the data in table 13, two things are immediately apparent. First, the number of homes in the Sierra Bonita, Rincon, and Christmas Tree Canyon area comprise over 91 percent of the County's WUI subdivision homes. Second, the stand and slope characteristics in the WUI areas could support a highly dangerous fire with rapid rates of spread and high fire intensities.

The fuel models in all areas are a 9 or 10. Fuel model 9 fires are typically fast-moving surface fires with concentrations of dead-down that can contribute to torching, spotting, and crowning. Fuel model 10 understories contain significant amounts of dead-down that can also lead to torching, spotting, and crowning. Additionally, the canopy closure in all areas is equal to or greater than 40 percent, meaning the canopies are generally close enough together to sustain a running crown fire. When all this information is combined with the area's moderately steep slopes (fire burns faster upslope), the potential for a real disaster exists, and in some cases could prevent firefighters from safely protecting homes along the subdivision perimeters.
Table 13. Subdivision Fuelbreak Priorities.

Subdivision Priorities (in order)	Subdivision Fire Hazard Rating	Subdivision Number of Homes	WUI Area Dominant Stand Type	WUI Area Dominant Fuel Model	WUI Area Dominant Canopy Closure	WUI Area Slope (%)	WUI Area Aspect
Sierra Bonita/ Rincon	72/75	184/39	Mixed conifer/ Ponderosa pine	10/9	MC8/P5	10-30	West/East
Christmas Tree Canyon	72	41	Mixed conifer	10	MC5	10-30	Northwest / Northeast/ East
Trumbull Canyon	71	17	Mixed conifer	10	MC6	10-30	Variable

Treatment sites should focus on the subdivision priorities in table 13, which places Sierra Bonita/Rincon as the highest priority and Trumbull Canyon as the lowest priority. Cebolla Springs is not recommended for treatment because of lower subdivision hazard, the small number of homes, and lower WUI fire hazard. In general, high per acre costs will preclude the treatment of any subdivision's entire one-half mile perimeter. As such, all treatments should begin immediately adjacent to a subdivision's outer perimeter of homes, and extend 66 feet to 330 feet (1 to 5 chains) onto bordering lands.

Implementation

Grant dollars will probably be required to implement the fuelbreak work because the timber harvested is not likely to cover the treatment costs, and in some cases, the areas treated by ownership will probably be quite small. If these dollars can be found, then a determination of who owns the adjacent lands will be required. Ideally, this would be followed up with a personal visit to the private landowner and/or appropriate agency personnel to present the fuelbreak idea. If permission is granted to go ahead with a fuelbreak, then a site evaluation of the area will be required to determine fuelbreak location(s).

In planning for fuelbreak locations, the following factors need consideration: fuel loading, stand density, canopy closure, topographical features, prevailing wind, access, and proximity to homes. In general, most slopes greater than 40 percent should be excluded because of operating constraints associated with ground-based logging equipment on steep slopes, and the lesser effectiveness of a fuelbreak in these locations as a function of fires tendency to quickly run uphill. In addition, T&E species and archaeological resources will need to be avoided if found. And lastly, if private lands of 25 acres or more are scheduled for treatment, then a New Mexico Harvest Permit Application will be required.

The scope of most of this work is beyond the capability of the MCFCA. As a result, the New Mexico State Forestry Division may be encouraged to help, or if grant dollars can be secured, then a "Request for Proposals" type of solicitation should be prepared and sent to various consultants and loggers, and a contract prepared for whoever is awarded the work.

General Guidelines

In general, the fuelbreak prescription is to selectively "thin from-below," where a majority of the smaller trees should be thinned (cut or "felled") and many of the larger trees left standing. A post-thinning basal area (cross-sectional area of a tree at 4.5 feet above the ground) of approximately 40 to 60 square feet per acre is recommended.

The top priority cut trees should include those acting as ladder fuels. The second priority cut trees should include those that are infested/infected with insects or disease. The lowest priority cut trees should be those exhibiting poor form and/or vigor.

Existing stand structure needs consideration when designating trees for removal. Stand structure cut-tree/leave-tree considerations vary with every stand, but include such factors as prevailing wind direction, shading, slope, and fuel arrangement and continuity.

A leave-tree mark using paint on all leave trees is recommended to help ensure that the fuelbreak prescription is met, and that the desired outcome is achieved. The value of designating leave trees with paint can not be overstated, as no mark places all cut-tree/leave tree decisions solely upon the cutter.

Treatment Methods

A particular harvesting methodology is not addressed due to a lack of knowledge on land ownership patterns, landowner preferences, and detailed stand condition information. However, as a general recommendation, the use of small, mechanized equipment would be more appropriate than larger equipment because of the generally small-diameter timber and relatively small areas to be treated.

With respect to slash material, all felled trees should be limbed and bucked in the woods, and the slash piled and burned. The placement of slash piles is critical, and should be in openings to avoid the scorching of leave trees when the piles are burned. Furthermore, building piles on top of old stumps or logs should be avoided so that both the amount of smoke and the chance for "creep" is reduced when the piles are burned.

Piles should be constructed in tepee-shaped formations a minimum of 5-feet high by 5-feet wide, and a maximum of 8-feet high by 8-feet wide. Opening size should dictate pile size, with larger openings accommodating larger piles. Small material should be placed at the bottom of piles and large material, which should not exceed 6 inches diameter, should be placed on the outside of piles, large end up. Piles should be compacted by standing on or pushing material together to compress it.

Pile burning should occur in the winter when snow is on the ground, or during an extended wet weather period. Pile burning needs to be continuously monitored and as the piles burn down, should be consolidated to help ensure complete and timely consumption. Burned pile sites should be monitored the spring after burning, and seeded with an appropriate seed mix if necessary.

Prior to any pile burning, a burn permit from the New Mexico Environment Department Air Quality Bureau must be obtained. They can be contacted at 505-827-1494. As a courtesy, local fire departments and the Las Vegas Office of the New Mexico Forestry Division should also be contacted. The Forestry Division number is 505-425-7472.

Long-Term Recommendations

Wildland Fire Coordinator

The first, and arguably most important, long-term recommendation includes the hiring of a professional Mora County Wildland Fire Coordinator. This could be funded directly by the County or through a grant, and would enable a coordinated effort at addressing many of the topics discussed in the WUIP. For example, this person could work with County planners and the County Commission to better fire safety, they could write grants to bring additional fire program money into the County, they could work at determining exactly what is needed to increase the County's ISO fire rating, they could initiate a long-term fire education program, and they could coordinate the efforts to bring about the previously discussed fuelbreak thinning. This should be given serious consideration as the uniqueness and beauty of Mora County will ensure steady growth, and the fire "problems" of the County will only increase without solid planning and management.

Fire Departments

Additional fire departments, and the staffing, training, and equipment to enable them to be effective, would go a long way towards improving County-wide fire safety. This effort is currently underway with the addition of one new MCFCA volunteer department. Training and equipment needs are discussed below.

Training

The MCFCA represents a volunteer firefighting entity. As such, some of the volunteers have had little or no formal wildland firefighter training. The SFMO, with assistance and guidance from the New Mexico Firefighters Training Academy (NMFTA) Advisory Committee, has compiled a recommended training curriculum for the position of Firefighter 1. This curriculum is contained in a document entitled *New Mexico Firefighting Qualification System Task Book for the Position of Firefighter I*, and is especially suited to the MCFCA as it covers the basic skill requirements for both structural and wildland firefighters. However, the SFMO-recommended curriculum

explicitly states that local government, in conjunction with the fire departments under its jurisdiction, is responsible for determining local training policy. This local policy in Mora County, if it exists at all, is unknown to SEC. As such, a copy of the Firefighter I Task Book is included in Appendix E, and a recommended list of training courses is provided below.

The minimum recommended training for any wildland firefighter is the National Wildfire Coordinating Group S-130 (Firefighter Training), S-190 (Wildland Fire Behavior), and I-100 (Basic Incident Command System Module 1) series of courses, which are a 16-hour introduction to wildland fire and the formal management structure (Incident Command System, or ICS) used on many fires. These courses are often followed with S-131 (Advanced Firefighter/Squad Boss), which builds on S-130, and I-200 (Basic Incident Command System Modules 2-6) which builds on 1-100. Another good course for all the volunteers is S-290 (Intermediate Fire Behavior), which is a 32-hour course designed to meet the training requirements for any of the single resource boss positions in the ICS operations section. This "skill" course includes topics on the fire environment, weather processes, temperature and humidity relationships, atmospheric stability, general and local winds, topographic influences, fuels and fuel moisture, and environmental factors and indicators influencing fire. The prerequisites for this course are Basic Wildland Firefighting or equivalent (S-130 /S-190/I-100). This course is also required training for any single resource boss position.

For the local fire chiefs of each volunteer department, or for anyone wishing to pursue wildland firefighting in a seasonal or full-time position, S-230 (Crew Boss) is recommended. This is a 24-hour course which provides training for potential crew bosses for supervisory positions in the ICS organization. Subjects include fireline safety duties, placement of the crew in the fireline organization, crew boss or incident commander responsibilities and duties, crew boss or incident commander fireline tactics, fire as a tool of suppression, crew boss duties of a large crew on a complex fire, property accountability, and off shift responsibility. Emphasis is on managing a suppression crew. S-215 (Fire Operations in the Urban Interface) is another good course for those inclined to pursue a career fighting wildland fire. This is a 24-hour course designed to meet the training needs for initial attack incident commanders confronting wildland fire that threatens life, property, and improvements. Subjects include size up, initial strategy and action planning, structure triage, tactics, action plan assessment, public relations, and safety.

Two additional training recommendations relate to the need for first aid and hazardous materials training. Every volunteer should attempt to enroll in a basic cardiopulmonary resuscitation (CPR) class, or better yet, an American Red Cross first aid class. For those considering firefighting as a career, an Emergency Medical Technician (EMT) training course is recommended. Most states divide EMT training into three separate courses including basic, intermediate, and paramedic-level training. A “basic” course is approximately 100 hours of training. Upon completion of the training, a state-administered test for certification may be taken. A hazardous materials (HAZMAT) class is also important because of the potential harm these substances can cause. This is

especially important with structure fires, as hazardous materials are often stored in garages, sheds, and barns.
Lastly, wildland firefighting demands a high level of fitness to safely perform physically demanding work in difficult environments. Physical fitness should be maintained by all firefighters for their personal safety, coworker safety, and improved operations. The standard physical fitness test employed by most, if not all, state and federal firefighting agencies is the "Pack Test." The Pack Test is a work capacity test used to measure aerobic capacity, muscular strength, and muscular endurance; it qualifies individuals to work at three levels of wildland firefighting duty: arduous, moderate, and light. For those agencies requiring the test, an individual fighting fire in the field is required to pass at the "arduous" level. This requires a firefighter to walk with a 45-pound pack over a flat three-mile course in approximately 45 minutes. No jogging or running is permitted and the test is Pass/Fail only.

Training courses are available from various institutions or agencies. The SFMO is responsible for firefighting training, and works in cooperation with the NMFTA, located in Socorro, to conduct a large number of both structural and wildland courses throughout the year. Further information regarding the NMFTA and their programs can be had by calling 505-835-7500. The State Forestry Division also conducts wildland fire training; information regarding their classes or the Pack Test can be had by contacting Eugene Pino at 505-425-7472.

Equipment

Equipment needs include personal firefighting clothing, tools, and engines. Appropriate clothing is the most basic piece of gear required of any firefighter. Wildland fire clothing is very different from that of the structural firefighter, and is referred to as personal protection equipment (PPE). Every firefighter needs a full set of PPE which meets the minimum standards established by the National Fire Protection Association. This PPE gear includes a set of nomex pants and shirt, leather gloves, an appropriate helmet, and a pair of high-topped leather boots with a vibram sole (no steel toe). Additionally, each firefighter needs a fire shelter, which has to be on their person at all times. Training in the proper deployment of the fire shelter is critical, and needs to be practiced periodically as a training exercise.

Other recommended items include a pack to carry a headlamp, sunglasses/goggles, water bottles, food, an emergency first-aid kit, maps, compass, ensolite pads, and sleeping bags. As a bare minimum, every fire department should allocate dollars to outfit each firefighter with the above-mentioned PPE gear (boots are typically bought by the firefighter), and at least a pack, headlamp, water bottles, and a small first-aid kit.

Each fire department also needs pagers and/or cell phones, hand held multi-channel radios, chainsaws, hand tools, and bladder bags. With the exception of the pager and/or phone, these items are the basic tools which allow a firefighter to actually work at wildfire suppression. The pager and/or cell phone is simply recommended so volunteers can be contacted in the event of a fire. Radios are essential to maintain communications between all support staff in the office and firefighting personnel in the field. The number

of radios recommended for each department is a function of the number of personnel responding to and fighting a fire. The rule of thumb is that no firefighter should ever be out of radio contact with others. This means a hand crew of 10 men may be working together with only one radio, but in that situation, those 10 men would stay together. A radio call sheet listing channels and frequencies used, and the call sign for each radio-carrying volunteer needs to be available to all who possess a radio.

Chainsaws are essential for the felling of hazard trees on a fire, and occasionally for the clearing of fireline and roadways. Each engine (discussed below) should carry at least one chainsaw, and have an experienced sawyer assigned to that saw. Associated gear for the sawyer includes earplugs, eye protection, and chaps. Recommended firefighting hand tools include Pulaskis, McLeods, shovels, and flappers; each department should have a minimum of five Pulaskis, McLeods, and shovels, and three flappers. Bladder bags are 5-gallon water bags with an attached hose and nozzle apparatus. They are carried like a backpack and used for hot spots that a hose lay or engine cannot reach. Each department should have a minimum of two bladder bags, and some spare water bag liners.

At least one, preferably two, wildland firefighting engines are recommended for the most active departments and the most remotely isolated departments. A four-wheel drive, Type VI engine is recommended. This engine type is relatively small and maneuverable, and can carry approximately 200 gallons of water. Minimum equipment on a truck should include a multi-channel radio, a water tank and pump, hoses of varying lengths and diameters, various hose adapters/valves, various nozzles, a spanner wrench, and drafting equipment. A hard line hose mounted on a reel and a foam proportioner would also be nice additions. Lastly, a bolt cutter to access locked gates is essential.

Fire department equipment lists sent by the Guadalupita, Mora, and Ocate/Ojo Feliz fire departments can be found in Appendix F.

Subdivisions

Subdivision improvements that could realistically be achieved include improving access so that there is more than one ingress and egress route to and from an area, upgrading (running surface and width) and maintaining roads, posting street signs and home addresses in clearly visible locations, and creating or increasing water supplies to ensure a nearby adequate water supply for suppression. Back-up generators on community wells should also be considered.

Planning and Zoning

Existing fire-related planning and zoning ordinances are quite good and need to be enforced due to the vastness of the County and the correspondingly long time required to respond to fire emergencies. Future subdivision planning should also attempt to integrate the Firewise infrastructure elements that score as a low fire hazard; these are shown on the Wildfire Hazard Rating Forms in Appendix C.

Chapter 5: Management Implementation

Funding Opportunities

Countywide fire hazard reduction programs will often focus on removing small-diameter and underutilized material (SDU) that has been left in the forest because it was not economical to remove, or because local capacity to process it did not exist. In many areas, fire hazard reduction will require mechanical thinning because overstocked forest conditions preclude the safe use of other treatments, such as prescribed fire. Unfortunately, the cost of mechanical thinning typically ranges from $500 to $750 per acre, which is usually more than the value of the thinnings. As such, some grant programs and utilization/marketing ideas are included below to help with project implementation and regional economic development.

National Fire Plan Programs

In response to the severe wildland fire season of 2000, President Clinton directed the Secretaries of Agriculture and Interior to develop a national long-term wildland fire strategy. The result was the National Fire Plan (NFP), which directs federal agencies to cooperate with states and communities to reduce immediate fire hazard in WUI areas, and to ensure sufficient wildland firefighting capacity in the future (National Fire Plan 2002).

To date, a 10-Year Comprehensive Strategy has been prepared and completed, and an implementation plan is scheduled for completion in 2002. Additionally, Congress, through the Interior and Related Agencies Appropriations Act, has demonstrated strong support for the NFP, with fiscal year appropriations in 2000, 2001, and 2002 of over $1.74, $2.88, and $2.26 billion, respectively (National Fire Plan 2002). This funding is appropriated to five program areas, which include:

- Firefighting
- Rehabilitation and restoration
- Hazardous fuel reduction
- Community assistance
- Accountability

The community assistance element of the NFP is the only program area providing aid and/or grants to communities, private lands, and volunteer fire departments; these community assistance programs are discussed below.

Rural Fire Assistance

This is a Department of the Interior (DOI) program focussed on rural fire department training, equipment purchase, and public education. Eligibility requirements include

cooperative agreements with State Forestry or a DOI land agency (in Mora County this includes Bureau of Land Management and National Park Service lands). Alternatively, fire departments that serve a community of less than 10,000 people located near federal land are also eligible. The maximum award value with this program is $20,000. A 10 percent cost share is required, which may include in-kind services. New Mexico 2002 funding for this program was approximately $499,000. For further program information contact Tim Hartzell of the Department of the Interior. His number is 202-606-3211.

State Fire Assistance

This is a Department of the Agriculture, U.S. Forest Service program providing financial and technical support directly to state wildland fire agencies to enhance the firefighting capacity of state, local, and rural organizations. The program also supports community based hazard mitigation and an expanded public service fire prevention program. The various program elements have different eligibility requirements, but in general, state and local matching funds leverage the federal investment for cost-effective results. New Mexico 2002 funding for this program was approximately $2.42 million. Also, the Western Mora/Wagon Mound Soil and Water Conservation District has been awarded $250,000 from this program (personal communication, L. Casaus, New Mexico Forestry Division, 2002) for private lands defensible space thinning; coordination with this agency should be made to attempt to utilize some of these dollars for the recommendations in the WUIP. For further program information contact George Martinez at the Regional Office of the U.S. Forest Service. His number is 505-842-3344.

Volunteer Fire Assistance

This is a Department of the Agriculture, U.S. Forest Service program administered by the State Forestry Division. It provides assistance to volunteer fire departments to improve communications, training, and equipment. Any volunteer fire department serving a community of less than 10,000 people qualifies for the program. The maximum award value with this program is $3,000. A 25 percent cost share is required, which may include in-kind services. New Mexico 2002 funding for this program was approximately 329,000 dollars. For further program information contact Eugene Pino of the State Forestry Division. His number is 505-425-7472.

Economic Action Program

This is a Department of the Agriculture, U.S. Forest Service program providing technical and financial assistance to develop and expand markets for traditionally underutilized wood products. The program also works to support rural communities in the development of skills, networks, and strategies to address social, environmental, and economic changes. Information, demonstrations, application development, and training is available to participating communities. New Mexico 2002 funding for this program was slightly over $1.4 million. For further information call George Martinez at the Regional Office of the U.S. Forest Service. His number is 505-842-3344. Additional information regarding the NFP and its community assistance programs can be found online at www.fireplan.gov/.

Other Programs

Federal Excess Personal Property

This is a Department of the Agriculture, U.S. Forest Service program administered by the State Forestry Division. This program loans Forest Service equipment to the Forestry Division, who then transfers it to volunteer fire departments. Equipment can only be used for fire purposes, and fire departments are responsible for all maintenance, upkeep, and insurance. When the equipment is no longer needed, it is returned to the Forestry Division and either placed with another fire department or advertised by the federal government for transfer or sale through federal auctions. For further program information contact Eugene Pino of the State Forestry Division. His number is 505-425-7472.

Firefighters Grant Program

This is a Federal Emergency Management Agency, U.S. Fire Administration program. It provides assistance to fire departments that lack the basic tools and resources necessary to protect the health and safety of the public and their firefighting personnel. Additional information on this program can be found online at www.usfa.fema.gov/.

Collaborative Forest Restoration Program

This is a Department of the Agriculture, Forest Service program funded through the Community Forest Restoration Act of 2000. It provides cost-share grants for forest restoration projects on public lands in New Mexico. Projects must include a diversity of stakeholders in their design and implementation, and address specified objectives. These include, amongst other things, wildfire threat reduction, ecosystem restoration, reestablishment of historic fire regimes; reforestation, increased utilization of small diameter trees, and the creation of forest- related local employment. The act authorizes statewide appropriations of up to $5 million annually. For further program information contact Walter Dunn at the Regional Office of the U.S. Forest Service. His number is 505-842-3425.

Utilization

Improved utilization of SDU material is currently receiving considerable attention from universities, federal research institutions, nonprofit groups, rural communities, and others. Most of this research and activity is focussed on technology advancements, either through more efficient forest operations, more efficient processing, or achieving higher value for some of the lower-valued SDU material (Levan-Green and Livingston 2001).

Timber Products and Markets

The following are some of the uses being investigated for SDU material, followed by a brief description of each use:

- Dimension and nondimension softwood lumber
- Engineered wood products
- Glue-laminated timber
- Structural roundwood
- Wood composites
- Chips
- Compost, fire pellets
- Energy

Dimension and Nondimension Lumber

There are three general wood use categories for softwood lumber, these include: 1) yard lumber; 2) structural lumber; and 3) factory and shop lumber. Yard lumber use is dictated primarily by appearance, with the higher grades used for flooring, trim, paneling, and siding, and the lower grades used for shelving, sub-flooring, and concrete forms. Structural lumber is evaluated for strength and stiffness, and is used for products like 2 by 4's, joists, I-beams, etc. Factory and shop lumber is usually cut into small pieces and used for manufacturing of secondary products like furniture or crafts.

Many companies are currently processing SDU material into traditional products with conventional sawmills. However, efficiency and economic operation, which often requires retooling or new equipment, are generally necessary to equal or exceed SDU harvest and delivery costs.

Engineered Wood Products

Engineered wood products have experienced rapid growth in the past decade as a function of an abundance of second and third-growth timber, as well as an acceptance of species not considered commercial in the past, such as aspen. Engineered products utilizing SDU material include laminated veneer lumber, wood I-joists, oriented strandboard, and glue-laminated timbers.

The capital costs of an engineered woods product manufacturing facility are high, and unstable timber supply in the West has been a detriment to attracting this type of industry.

Structural Roundwood

Another potential use of SDU material is for structural uses such as roundwood trusses, beam-column elements for post and frame building systems, pile foundations for residential structures, space frame building systems, and a variety of other structures. Advantages of leaving SDU material in the round include less susceptibility to warp,

more dimensionally stable, stronger than most of the lumber that could be sawn from it, and low processing costs.

Other more traditional roundwood uses, at least in New Mexico, include latillas and vigas, posts and poles, decorative residential columns, log home timbers, and firewood. Under the right market conditions, some of these products can command a higher value than sawlogs.

Wood Composites

Wood composites assembled from a variety of tree species' fibers, particles, flakes, and strands can be used to produce particleboard, medium density fiberboard, oriented strandboard, and oriented strand lumber. These products lend themselves well to the utilization of SDU material, but the initial investment in such processing facilities is high and requires a long-term assurance of supply.

Woodfiber mats and blankets, made with a combination of fiber and inorganic compounds, or exclusively from fiber, are another use of SDU material. These products are designed and marketed for erosion control, and include products such as erosion control blankets and wattles.

Chips

Pulp chips used in paper production have always been a viable use for SDU material. However, pulp mills need large quantities of water, and the presence of water is the primary factor dictating pulp mill location. As such, the cost of producing and transporting pulp chips to distant mills makes this SDU use uneconomical for most of the Interior West.

Chips can also be used as a mulch, and in semi-arid regions like the Southwest can be marketed and sold to consumers.

Compost

Compost produced from woody residues is another potential use of SDU material. Traditionally, these residue materials have been allowed to accumulate in huge piles. However, the simple need to dispose of this material, and tighter environmental regulations designed to reduce runoff from organic residues into groundwater, have motivated new utilization ideas. Composting transforms this material into a value-added product that increases soil fertility and can be sold to consumers.

Energy

The use of wood and SDU material for energy production ranges from large-to-small power-generating plants, to relatively simple home heating and electrical systems. Residues from any wood product can be converted into fuels and chemicals through processes that convert wood carbohydrates into sugar, and then sugar into ethanol, lactic

acid, succinic acid, or other high-value products. These products are valuable in that they displace petroleum, and they add one more use for low-grade wood material. Cost of wood-based energy production plants are highly variable, as a function of equipment used, system size, and availability of wood material.

In addition to the high-tech industry of wood-combustion power and electrical plants, firewood has always been an important resource to the residents of Mora County. Firewood can always be marketed and sold from material that cannot be utilized as a value-added product. Lastly, firewood pellets, which are used in wood burning pellet stoves, can be easily produced with the purchase of equipment which compacts wood residues into a small pellet.

Economic Development

SEC is currently coordinating with private landowners in northern New Mexico and southern Colorado to commit to supplying large volumes of SDU timber. However, with few exceptions, current outlets for SDU material are limited to cottage industries that cannot process large volumes. This limited product line problem, along with unquantified barriers in the chain of custody (operational steps involved with converting standing trees into a finished wood product – includes supply owner, harvest contractor, hauling contractor, primary processor, secondary processor, and end-user), are the major constraints to the development of regional non-traditional wood product industries.

To overcome these SDU utilization problems, a study is needed to determine the improvements necessary in the operational steps of converting SDU timber into a finished wood product. The study should involve an assessment of all phases of processing and marketing of SDU products. Current stakeholders, their operational status and costs, and what they need to facilitate processing should be assessed for each component in the chain of custody. Opportunities for product line expansion should also be determined through an analysis of study results and an assessment of preferences and current use trends among end-users. Finally, study results should be published in a publicly available report and presented to key stakeholders.

A study of this depth and scale was beyond the scope of this project, but is necessary to make solid recommendations as to utilization and economic development. However, a local group, the La Jicarita Enterprise Community, has received a $220,000 grant from the Collaborative Forest Restoration Program (personal communication, L. Casaus, New Mexico Forestry Division, 2002). Part of this funding is to go toward marketing of SDU products. Coordination with this group may help to answer some of the economic development questions needed by the community. For further information on this work contact Ben Sanchez at 505-387-2298.

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