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SANDOVAL COUNTY, NEW MEXICO WILDLAND URBAN INTERFACE (WUI) AREA INVENTORY ASSESSMENT

SWCA Environmental Consultants
and
Wildland Fire Associates

January 29, 2004

SANDOVAL COUNTY, NEW MEXICO, WILDLAND URBAN INTERFACE (WUI) AREA INVENTORY ASSESSMENT

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EXECUTIVE SUMMARY

SWCA Environmental Consultants (SWCA), in cooperation with Wildland Fire Associates, has prepared this report to assist Sandoval County, New Mexico, in assessing hazards within the wildland urban interface (WUI) under the SPS7-Community and Private Land Assistance–Multi-Resource Stewardship Grant Program. The purpose of the report is to identify specific hazards associated with communities that are located at the WUI within Sandoval County. This document addresses potential hazards, natural and anthropogenic, in individual communities that may be at greater risk if a large wildfire were to occur within or around Sandoval County. Causes of existing and potential hazards include natural vegetation (fuels), fire spread and topography, accessibility and road conditions, and human-related risks such as hazardous yard features. Fire environment, fire defensibility, and potential mitigation techniques are discussed, and impact avoidance and minimization measures are presented for each community at risk.

Using geographic information techniques (GIT), predominantly within a geographic information system (GIS), SWCA was able to model the hazards associated with each community. An evaluation of the application of GIS methods to modeling the risks within the WUI was based on a review of literature pertinent to these elements. Certain communities not located within the WUI were removed from the model.

As detailed in this report, some communities are at much greater risk than others. Therefore, this report concludes with recommendations for Sandoval County and the communities that are at greatest risk of being negatively influenced by wildfire.

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INTRODUCTION

Sandoval County, New Mexico, has undertaken assessment of potential hazards to communities in the wildland urban interface (WUI) within the County. The various fire services that are responsible for protection of wildlands and communities within and around Sandoval County recognize the potential for catastrophic wildland fires that could pose serious threats to human safety and structural values. The national attention given to the 2000 Cerro Grande fire and the resulting destruction of homes and watershed values in and around Los Alamos, New Mexico, typify the concerns in Sandoval County and throughout the Southwest.

Many homes built with flammable materials in heavy concentrations of fuels on steep terrain without adequate defensible space are at risk from wildland fire. To complicate matters, drought conditions combined with a widespread epidemic of bark beetles throughout New Mexico have (1) increased laddering potential and aerial fuel flammability and (2) increased the potential for extreme fire behavior such as crownfire, blowups (sudden increase in fire intensity), and spotting (firebrands igniting flammable fuels ahead of the main fire) under the high-wind conditions typical of the region during fire season.

To begin mitigating these conditions, Sandoval County initiated an agreement with SWCA Environmental Consultants (SWCA), in association with Wildland Fire Associates (WFA), to conduct a medium-scale field assessment survey of all WUI areas in the County under the SPS7-Community and Private Land Assistance–Multi-Resource Stewardship Grant Program. The focus of the work was on five previously identified regions that combine communities by geographic location: the Cuba Corridor, Jemez Corridor, Jemez Mountains, Rio Grande Corridor, and Sandia Mountains. The hazards associated with each region were modeled in a geographic information system (GIS), and mitigation recommendations were developed for both the selected regions and the individual communities comprising each region. This report presents the results of the work performed and the recommendations made.

SWCA and WFA were asked to perform the following tasks:

- Identify all wildland urban interface areas in Sandoval County
- Analyze vegetation types and characterize terrain
- Record road conditions and accessibility, water resources, forest health, proximity to emergency services, housing density, and other special concerns within the WUI
- Assign a hazard rating of Low, Moderate, High, Very High, or Extreme to each community based on quantitative and qualitative data gathered in the field and generated within a GIS
- Produce county and regional maps that include hazard rating, land ownership, road and drainage networks, and shape of each interface area
- Illustrate current conditions by taking representative photographs of each community
- Suggest mitigation techniques, short-term and long-term, for communities that have the most hazards

PURPOSE

As communities grow and new communities develop, urban areas begin to impinge upon wildland environments, creating a hazardous situation where natural forest processes such as wildfire affect residents at a heightened level (Figure 1). The term for the boundary where the forest meets residential areas is generally referred to as the wildland urban interface, or WUI. In these areas, urban fuels directly meet forest fuels. The WUI is primarily within 20–60 m (66–200 feet) of houses, where fires most directly threaten homes—and where a defensible zone can be developed (Firewise Program [Firewise] 2000). The term *urban* can be used to describe either low-density development of a few intermittently spaced structures or a mosaic of high-density homes (Slaughter 1996).

Increased public and governmental concerns between 1910 and 1978 led to a strict policy to suppress all wildfires in the western United States. This change in fire management policy caused an alteration in the structure of fire-prone ecosystems, primarily in vegetation composition. This "suppression era" was followed by a new paradigm focused on prescribed fires and fuel management rather than suppression of wildfires (Arno and Allison-Bunnell 2002). As a result of years of suppression, wildland fires tend to burn larger and at greater intensities than those in the past and now possess an increased risk to humans and wildland ecosystems.

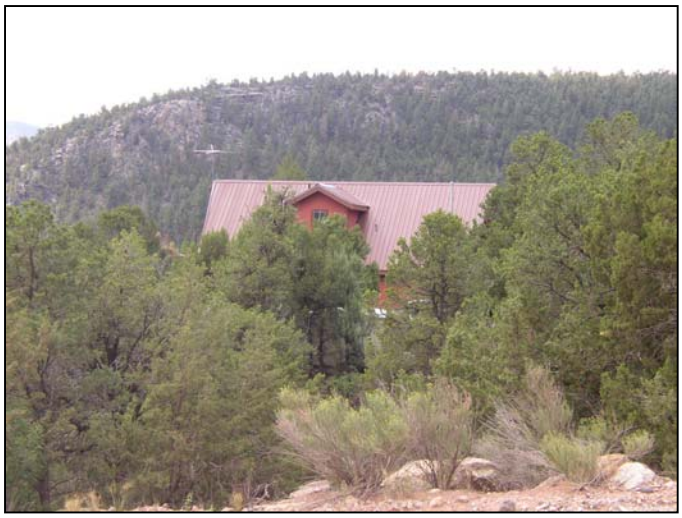

Figure 1. A Jemez Springs house within the wildland urban interface.

Wildfires represent a potential threat to both established and newly constructed communities within the WUI. Some of these communities are nearly inaccessible by emergency service vehicles such as fire engines. For this reason, communities cannot depend entirely on local or state firefighters to save their homes. To alleviate some of the hazards associated with living in the WUI, residents can help protect their property and community by taking educated steps before and during the fire season to make their properties defensible from the threat of a surrounding wildland fire. It is important that members of a community work together so that the community as a whole is defensible.

GEOGRAPHIC SETTING

Sandoval County is in north-central New Mexico and occupies approximately 3,717 square miles (9,625 km²). The elevation in the County ranges from 1,532 m to 3,431 m (5,026–11,257 feet) (Figure 2). Landowners are the U.S. Forest Service (USFS), the Bureau of Land Management (BLM), numerous Native American tribes, the National Park Service (NPS), the Department of Defense, and private and state entities (Figure 3).

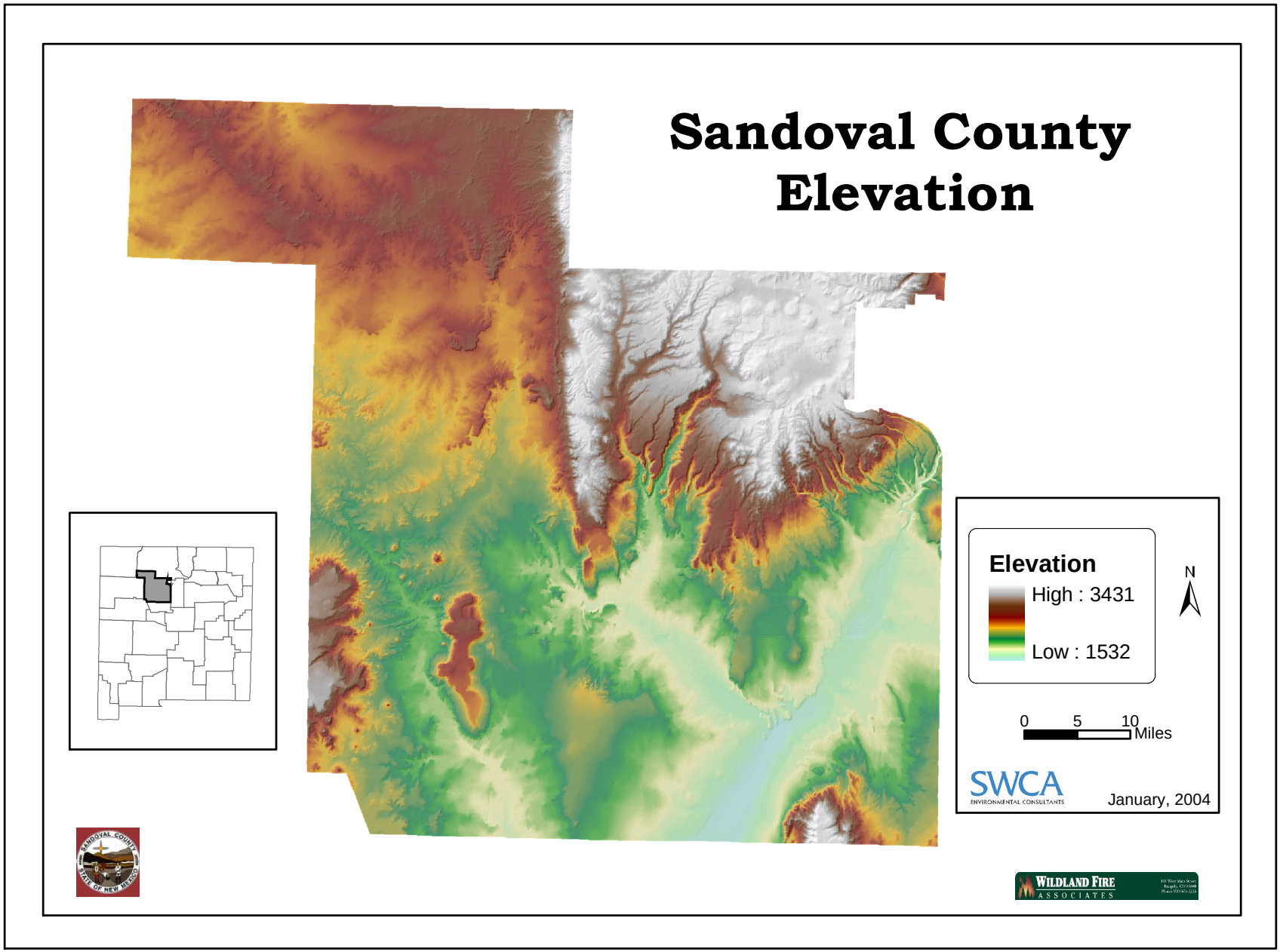

Figure 2. Sandoval County elevation map.

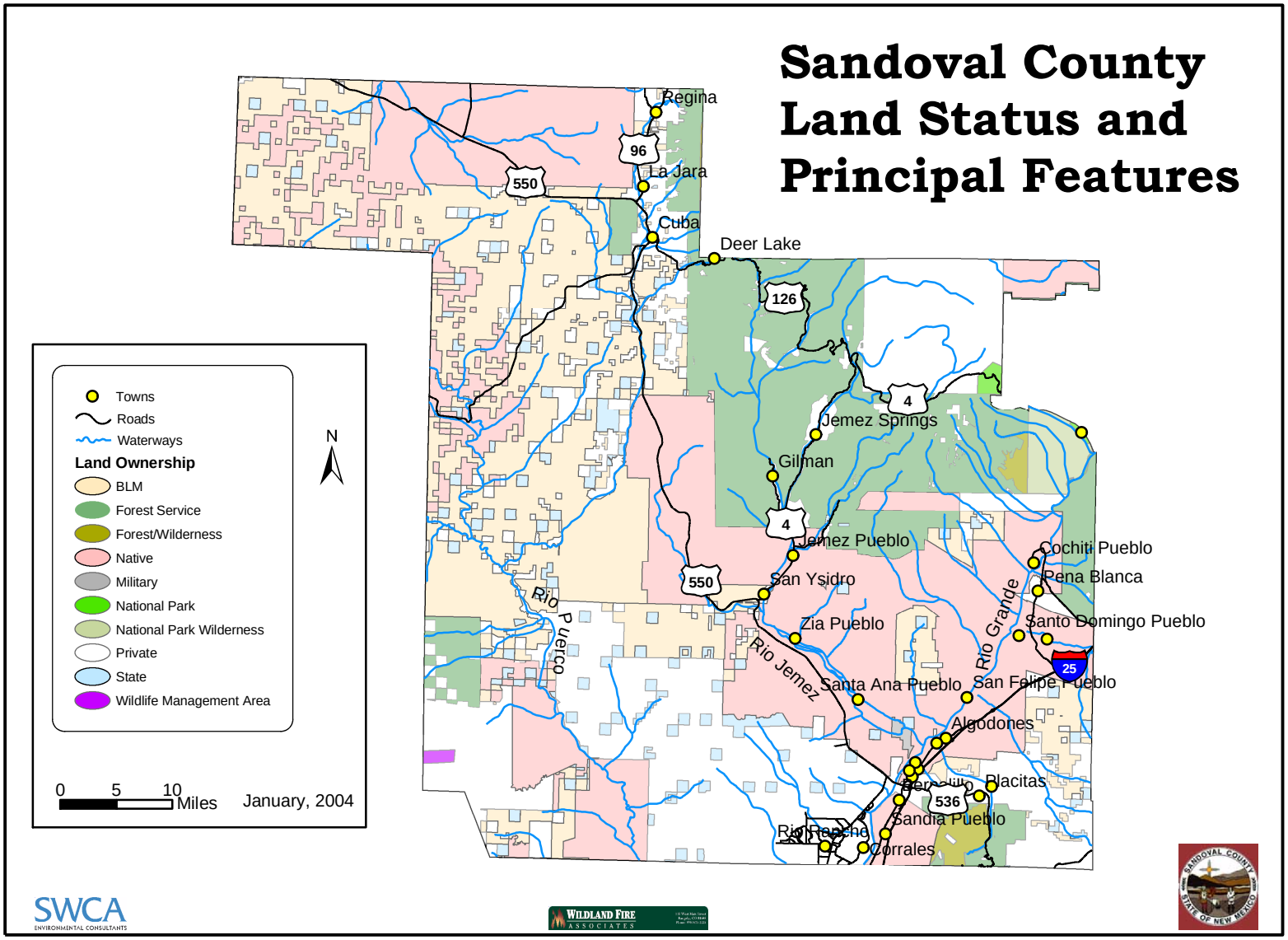

Figure 3. Sandoval County land status and principal features.

CLIMATE

Sandoval County has an arid to semi-arid climate, with montane uplands dominating parts of the County. The average wind speed for the County is between 5.0 and 9.0 mph. Four locations with differing average annual temperature and precipitation were selected as examples of Sandoval County climatic regimes: Bernalillo (54.6°F, 8.9 inches); Cochiti (54.7°F, 12.1 inches); Cuba (46.1°F, 13.1 inches); and Jemez Springs (51.7°F, 17.3 inches). All data are from the Western Regional Climate Center (WRCC) (2003).

TRANSPORTATION AND DRAINAGE NETWORKS

Some communities in Sandoval County are easily accessible off main routes such as Interstate 25 (I-25), U.S. Highway (US) 550, and State Route (SR) 4 (Figure 3). Many other communities are located off of secondary dirt and gravel roads. Three major river systems—the Rio Puerco, the Jemez River, and the Rio Grande—run through the County (Figure 3), although the Rio Puerco is not in proximity to any communities within the WUI. A number of other ephemeral streams or arroyos are scattered throughout the County.

FIRE STATIONS AND EMERGENCY SERVICES

A number of both volunteer and established fire stations are within Sandoval County (Figure 4). Most of the established fire stations are near the large urban areas in the southern part of the County, while the volunteer fire stations tend to surround smaller communities and subdivisions. Figure 4 shows available emergency service districts throughout the County; hospitals, police stations, and safety areas such as schools are not shown.

FIRE HISTORY

The majority of the Sandoval County forested land comprising the WUI is in the Jemez Mountains. According to McCarthy (2003), the following historical fire regimes have been defined for this area:

- **Montane mixed-conifer**, watershed-wide low intensity surface fires and patchy high-intensity crownfires; 3- to 32-year return interval (Mean Fire Interval [MFI] 12 years)
- **Ponderosa pine woodland** (Figure 5), low-intensity surface fires, watershed-wide to regional; 1- to 51-year return interval (MFI 6 years)
- **Piñon-juniper woodland** (Figure 6), low-intensity surface fires, tens to thousands of acres; 15- to 40-year or more return interval (depending on elevation, aspect, soils, vegetative cover, tree stem density).

The once-natural fire regimes are now moderately to severely altered across the project area. Fire suppression, overgrazing, habitat fragmentation, and their interactions with variability in climate have changed the pattern of fires across the landscape. Most of the historical fire return interval has been surpassed, often by several decades. Many areas have not burned in over 100 years. This departure from historical, low-intensity regimes has caused recent wildland fires to burn with extreme intensity in many areas of the Jemez Mountains, a trend that has potential

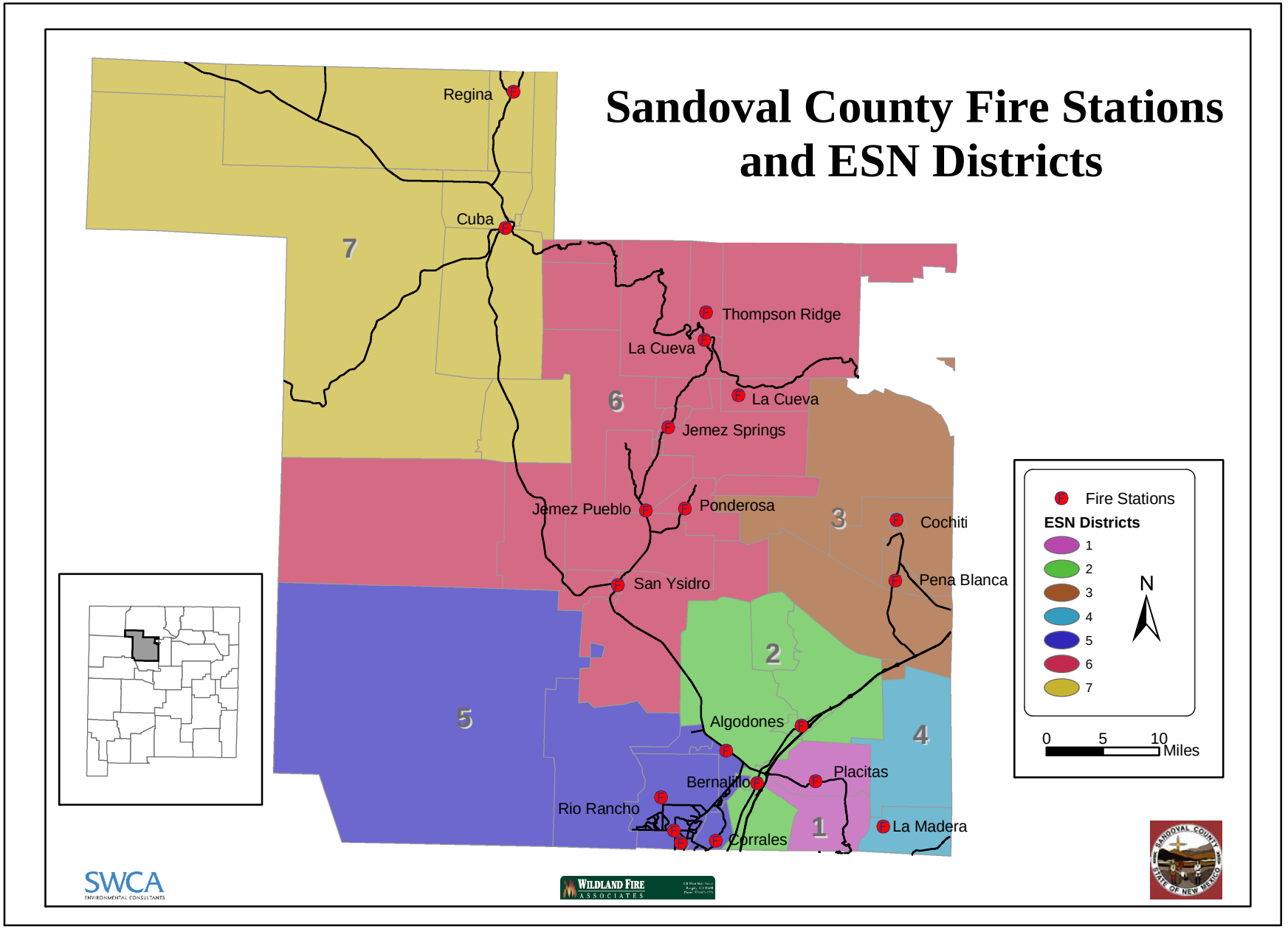

Figure 4. Sandoval County fire stations and emergency services network (ESN) districts.

Figure 5. Ponderosa pine woodland near Chaparral Girl Scout Camp.

Figure 6. Piñon-juniper woodland near Evergreen Hills.

consequences for land-management agencies and private homeowners alike. Most important to the growing number of residents in the forested areas of the County is the risk of wildland fires in nearby ponderosa pine forests, which has increased markedly. The Cerro Grande fire was one example of this disturbing trend.

METHODS

John Lissoway of WFA and David Barz, Joseph Fluder, and Leif Bang of SWCA completed fieldwork for this project during August 2003. The study team collected data pertaining to each community at risk, incorporating field data collection and pre-existing datasets for analysis. Two analysis sheets were used to record field data: The data collection sheet used was similar to the Firewise Communities data sheet (Firewise 2000), which provides field technicians with the appropriate means to assemble a working database. WFA provided the rating criteria and numerical hazard assessment form (Appendix A). Since the Firewise data sheet is tailored to individual subdivisions and communities, SWCA created a different form to meet the County's assessment requirements. The WFA form was derived from a thorough review of existing assessment protocols and models tailored to conditions unique to Sandoval County (listed in the References section). The field form was developed from a combination of factors, which considered together yield an overall rating for a community group. As this was a medium-scale field assessment survey, numerical ratings were based on averages. For example, numerical ratings for a given criterion (e.g., fuels) were assigned to each community, then averaged for the group surveyed. The two major criteria rated in the field assessment were fire environment and defensibility. An understanding of Sandoval County geography and historic fire regimes was also necessary in building an understanding of hazards within the WUI. It must be emphasized that the methodology used and the ratings assigned were based largely on subjective judgments provided by the author based on his wildland fire expertise.

FIELD DATA FORM

The SWCA field data form focused on vegetation types, road conditions, individual house features such as type, defensible space, and yard features, and additional hazards such as aboveground power lines.

- *Vegetation Types*. Individual species were identified as dominant or secondary within the communities. Open meadows, or swales, were also recorded.

- *Slopes*. SWCA identified areas where accessibility issues might arise due to slope conditions within a community or leading into the community. Slope and aspect were generated within a GIS to give a more accurate representation of elevational variation.

- *Road Conditions*. The number of ingress/egress routes for a community was recorded, as well as overall width of roads/rights-of-way and type or road (gravel, dirt, asphalt).

- *Power lines*. Whether power lines and other cables were aboveground or belowground was recorded. Aboveground power lines that were too close to trees were also noted.

- *Water Sources*. Water sources such as tanks, wells, creeks, streams, hydrants, and bodies of water were identified. The type of hydrant (e.g., dry) was recorded.

- *Typical House Type*. Typical house types defined for this study were: adobe, frame/stucco, brick, frame/siding, manufactured, and mobile. The dominant types were recorded for each community.

- *Typical Roof Type*. Typical roof types were: flat, tar and gravel, metal, shingle, tile, and wood shake. The dominant types were recorded for each community.

- *Defensible Space*. Defensible space was the average amount of space between the homes of the community and the wildlands. Defensible space for each community was categorized as urban, barren, large yards, trees present, wooded, or densely wooded. The dominant types were recorded for each community.

- *Yard Features*. Elements within yards that are considered to contribute to the spread of wildfire include wood outbuildings, woodpiles, propane tanks, and wood fences, among others. The presence and location of such features was noted.

- *Specific Hazards*. Specific hazards included any additional hazards within a given community.

DATA COLLECTION FORM

The first major criterion on the WFA data collection form is wildland *fire environment*, normally comprising fuels, weather, and topography. However, the weather component was not included in the assessment because of its wide variability in the survey area. Part 1 of this form included the following rating criteria:

- *Fuel Hazard.* Wildland fuels are considered the variable most critical to the fire hazard assessment process, and are also the most difficult to describe.

Fuels were recorded as one of the 13 fire behavior fuel models defined by the National Forest Fire Laboratory (NFFL) in Missoula, Montana. Photos of the models represented in the assessment are included. It should be noted that the assessment considers these fuels under "worst-case" conditions, or in terms of the worst conceivable impact to human safety and property resulting from a wildland fire in the WUI. The models encountered in the field survey are described in Table 1.

- *Slope.* Wildland fires tend to spread faster uphill due to factors such as pre-heating of fuels upslope by bending flames. Therefore, steepness of slope was rated, expressed in percent and described generally as flat to mild (0–9.9%), mild to medium 10–19.9%), medium to moderate (20–39.9%), and moderate to extreme (40% +).

Table 1. NFFL Fuel Models

FUEL GROUP/ NFFL FUEL MODEL	DESCRIPTION	POTENTIAL FIRE BEHAVIOR
Light NFFL 1, 2, 5, 8	1=Grass; 2=timber/grass/litter understory; 5=low shrubs; 8= short-needled conifer litter	Surface fire, low-moderate intensity
Medium NFFL 9	9=Long-needle conifer/needle litter	Surface fire to intermittent crownfire, moderate-high intensity with spot fires
Heavy NFFL 4, 10	4=Large dense brush, insect-killed closed-canopy stands, Rio Grande Bosque (high-wind); 10= heavy dead-down woody material under conifer canopy	Low to high intensity surface fire to sustained crownfire, numerous spot fires

- *Special Hazards.* Condition of the vegetation (drought, diseased, or insect-killed trees) was rated, along with special topographical features affecting fire behavior, such as steep canyons, chutes, and chimneys (very steep and narrow drainages).

Part 2 of the field form is *Defensibility,* which describes the relative difficulty that firefighters would encounter while attempting to defend a house or group of houses. Four conditions considered as key to defensibility were rated:

- *Access.* This criterion describes the relative length of dead-end road encountered by fire agencies, from less than 600 feet to more than 1,320 feet, and incorporates such special factors as road width, turnouts, bridge condition, etc.

- *Structure Type.* This criterion includes a general overview of roof and siding flammability, averaged for a community. A large variation in types would be expected.

- *Clearance/defensible space.* Subjective ratings were assigned based on whether there was adequate clearance between structures and flammable vegetation. Such clearance would reduce the potential for a crownfire to reach the structure and reduce the potential for firebrands to ignite the house or set significant fires near the house.

- *Water Availability.* This factor relates to types and amounts of water available to adequately defend a structure and suppress wildland fire. Well water is generally not as efficient or plentiful as water from a community water system.

SWCA also used GIT applications to assist in hazard assessment development. GIS datasets consisting of house locations, roads, vegetation, and land use were consulted to help define the areas deemed necessary to visit during the field investigation. All communities, regardless of size, were evaluated in the analysis, and all were visited with the exception of private property exclusions. Field maps detailing the vegetation communities present and an aerial photograph were prepared for all communities. These maps also served as field forms, as features and comments were noted on them to reflect field observations.

Once in the field, fire stations and other pertinent features were recorded using a global positioning system (GPS), which was entered into the overall database. The GPS was also used to help define observed vegetation patterns that differed from those provided on the field maps. This information was then used to adjust the vegetation database and thus fine-tune the coarse vegetation dataset that was originally collected at a 1-km scale. Thus, in the vicinity of communities, the GIS models will benefit from a more detailed description of the vegetation layer, whereas the unoccupied portions of the county will continue to be modeled using the original information on the vegetation layer. The land use dataset was adjusted in a similar way, to better reflect developed areas and riparian vegetation.

FIRE RISK AND ENVIRONMENT

For a given community or group, numerical hazard ratings were assigned for each of the criteria described above. Any extenuating circumstances were factored in, with explanations, to arrive at a total. The two parts were totaled and the result was assigned a hazard class rating (low, moderate, high, very high, extreme). The highest rating, or worst case, was selected by WFA to represent the community group. The numerical and corresponding hazard class rating system designed for this project is shown in Table 2.

Table 2. Fire Environment and Defensibility Ratings

Hazard Class RATING	Part 1 Fire Environment	Part 2 Defensibility
Low	0–4	0–6
Moderate	5–8	7–9
High	9–12	10–11
Very High	13–16	12–13
Extreme	17–20	14–16
Total Points Possible	**20**	**16**

FINAL WUI MODELS

GIS can be used to map and analyze relationships between communities and vegetative fuels, topography, weather, and individual hazards such as defensible space. This process can be completed accurately on various scales; the models for this project were generated at the county level. A complete literature search was conducted to construct a foundation for all GIS applications, including modeling. Models were developed for each of the five regions of interest: Cuba Corridor, Jemez Corridor, Jemez Mountains, Rio Grande Corridor, and Sandia Mountains.

Four input models, based on fuels, topography (spread), access, and community hazards, were developed for each region and ultimately combined to form an overall hazard assessment model showing areas of Low, Moderate, High, Very High, and Extreme risk (Table 3). Previous GIS-based WUI models used only pre-existing datasets to analyze potential hazards and impacts of wildfire within a given area (Caprio et al. 1997; Pratt 2000; Montague 2003; Price 2003). SWCA's GIS models also include modifications of existing datasets and datasets generated from information collected in the field.

Table 3. Summary of Fire Risk Ratings

Community Group	Average Rating			Remarks
	Fire Environment	Defensibility	Hazard Class	
• La Madera, Puertocito 1 and 2, Vista Bonita	8	6	M	Under high wind conditions
• Placitas/Tecolote, Las Huertas	7	5	M	Light fuels
• Bernalillo, Corrales, Rio Rancho	6	1	M	Most fires confined to Bosque
• Algodones, San Felipe Pueblo, La Angostura, Budaghers, Santo Domingo, Iyanbito, Domingo, Peña Blanca, Sile, Cochiti Pueblo, Cochiti Lake, Cañada	6	4	M	Most fires confined to Bosque areas
• San Ysidro/Parada, Vallecitos/Ponderosa, Christian Camp, Gilman/Cañones	4	4	L	Christian Camp Moderate
• Jemez Springs Corridor	17	12	E	Extreme in upper corridor under severe fire weather conditions
• La Cueva, Sierra Los Pinos, Valle Grande, Las Conchas, Rancho La Cueva, Thompson Ridge	13	11	VH	Under high wind conditions
• Seven Springs, Rio Las Vacas, Taylor/Cutty, Deer Lake	14	12	VH	Deer Lake Extreme under severe fire weather conditions
• Cuba	7	6	M	
• La Jara, Regina	8	9	M	
• Evergreen Hills Subdivision	12	8	H	Under high wind conditions

L=Low; M=Moderate; H=High; VH=Very High; E=Extreme

DEVELOPMENT OF FIRE HAZARD MODELS

SWCA's goal was to develop unique fire hazard models. Each model was generated using both field-collected data and pre-existing GIS data. The pre-existing data were altered to best represent data collected in the field, allowing accurate data representation for each community. Once the datasets were altered, an arduous process of testing and weighting different variables in the model was attempted. Using existing fire modeling literature and input from fellow professionals, SWCA devised equations suited for each model. Fire hazard models were then generated for the five selected regions (Figure 7). The components of the four models are:

Fuels Model

- *Purpose*: to determine risk based on vegetative fuel datasets
- *Datasets*: pre-existing vegetative datasets (GAP and Dick-Peddie), U.S. Geological Survey (USGS) land use/land classification, and vegetative data collected in the field
- *Process*: model included an updated GAP vegetation dataset modified to accurately portray each community and the USGS land use/land classification dataset; shapefiles were then converted to grids to be incorporated into the model
- *Final equation*: [(GAP vegetation × 0.70) + (USGS land use/land classification × 0.30)]

Spread Model

- *Purpose:* to determine areas where fire is most likely to spread
- *Datasets:* slope and aspect (grids) generated using a USGS digital elevation model (DEM); weather variables included evaporation, storm events, wind power (shapefiles)
- *Process:* slope and aspect created using Spatial Analyst in ArcGIS 8.x, weather datasets clipped to Sandoval County and reclassified before being converted to grids; slope reclassified based on percent slope, aspect reclassified based on Mattson and Thoren (2003)
- *Final equation:* [(evaporation × 0.05) + (aspect × 0.25) + (wind power × 0.05) + (storm events ×0.05) + (slope × 0.60)]

Access Model

- *Purpose:* to determine areas where road conditions and accessibility may hinder evacuation or emergency services assistance
- *Datasets:* field-generated datasets included road accessibility, road conditions, and distance buffers generated from a modified fire station shapefile
- *Process:* road accessibility and road conditions were shapefiles generated based on information collected in the field, then reclassified and converted to grids; buffers were 5, 10, and 15 miles from fire stations to determine a community's proximity to fire stations
- *Final equation:* [(fire station distance × 0.30) + (road access × 0.35) + (road conditions × 0.35)]

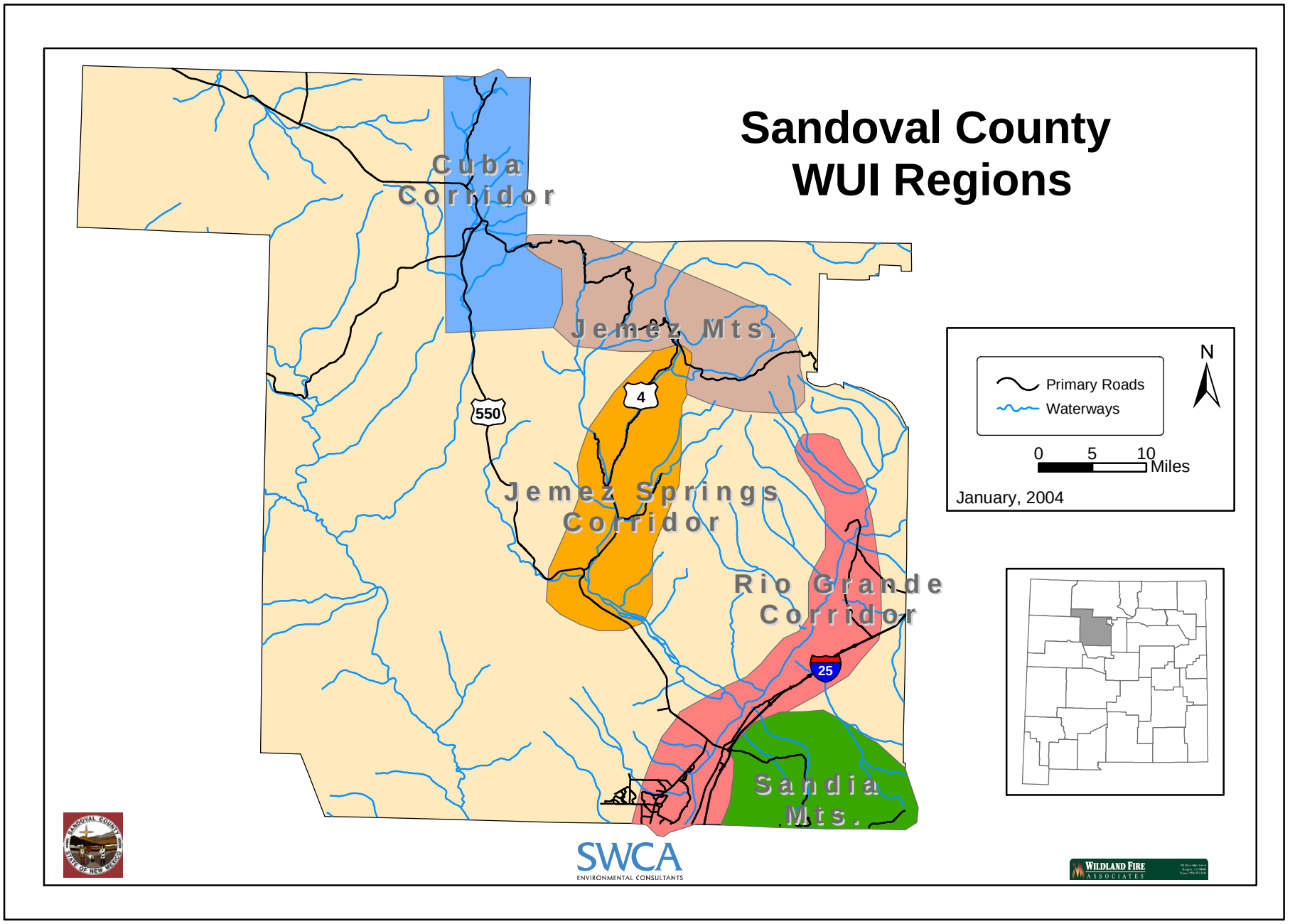

Figure 7. Sandoval County wildland urban interface regions.

Hazards Model

- *Purpose:* to determine individual community hazards and the likelihood of future fires
- *Datasets:* both field generated and pre-existing; field-generated datasets included fire environment, defensibility, roof type, and house type, pre-existing datasets were fire frequency, fire acreage, housing density
- *Process:* field-generated datasets were based on information collected in the field; shapefiles were reclassified, then converted to grids; fire frequency and fire acreage put through a kernel density calculation that determines areas of risk; the E-911 shapefile of houses was converted to a density grid, showing areas of density from high to low
- *Final equation*: [(roof type × 0.10) + (house type × 0.05) + (fire environment × 0.15) + (housing density × 0.15) + (fire history by acreage × 0.15) + (fire history by frequency × 0.15) + (defensibility × 0.25)]

Combined Model

- *Datasets:* all variables from Fuels, Spread, Access, and Hazards models
- *Process:* each model included in a weighted equation to create final model
- *Final equation:* [(Fuel × 0.35) + (Spread × 0.20) + (Hazards × 0.30) + (Access × 0.15)]

APPLICATION OF MODELS TO THE WUI SURVEY AREA

In the following pages we describe the communities that were classified as High, Very High, and Extreme based on the Fuels, Spread, Access, Hazards, and Combined WUI models. For each region there are two maps: one showing land status, location, and the input models, and one showing combined hazards based on the four input models. The photos in Figures 8–20 illustrate the general characteristics of the vegetation in and around the affected communities.

Figure 8. Road conditions east of Cuba.

Figure 9. Home in community of Jemez Springs. Note wood buildings and overhanging trees.

Figure 10. San Ysidro home near the Jemez River.

Figure 11. Vegetation near the Christian Camp.

Figure 12. Conditions near the Girl Scout Camp.

Figure 13. A home in Seven Springs.

Figure 14. Volunteer fire station and swale at Thompson Ridge.

Figure 15. Evidence of the Cochiti Mesa fire in the spring of 2003.

Figure 16. Bosque near Corrales and Rio Rancho.

Figure 17. Locked fence on Cochiti Mesa.

Figure 18. View overlooking Placitas.

Figure 19. View overlooking Evergreen Hills.

Figure 20. Vegetation around La Madera.

CUBA CORRIDOR

Communities within the Cuba Corridor include Regina, La Jara, and Cuba. Figure 21 shows the location of the Cuba Corridor, land status within the Corridor, and the input models for this region. The Fuels model indicates that areas close to the San Pedro Mountains and the Sierra Nacimiento, which includes the eastern edge of all three communities, are classified as Very High to Extreme. Most of this area is east of US 550 and SR 96. Only a few areas in the Spread model, most likely steep canyons near the two mountain ranges, are classified as Very High to Extreme. These areas are east of the Cuba Corridor, with High to Very High conditions persisting along canyons and arroyos within the communities. The Access model shows only one area of concern (Very High), north of La Jara and south of Regina. This area was classified as Very High because of its distance from fire stations. Very High to Extreme conditions were identified by the Hazards model in many areas throughout Cuba and La Jara, especially east of US 550 and SR 96.

The Combined WUI model (Figure 22) identified several areas within the Cuba Corridor as hazardous. These areas are almost exclusively east of the three communities within the Corridor. Areas classified as Very High to Extreme are along SR 126, north and east of Cuba, south and east of La Jara, and east of Regina.

JEMEZ CORRIDOR

Communities within the Jemez Corridor include Jemez Springs, Cañones, Cañon, Gilman, Ponderosa, Jemez Pueblo, and Zia Pueblo. The Christian Camp was also included in this region. The Fuels model (Figure 23) shows the fire risk for almost all areas north of Cañon as High to Extreme, with the majority of the area dominated by Extreme fuel hazards. The Spread model indicates that areas surrounding Jemez Springs are at Very High to Extreme risk. The rest of the Corridor is Low to Moderate risk. The community of Jemez Springs was given a hazard rating of Very High by the Access model, due to road accessibility and poor road conditions, especially west of SR 4. Jemez Springs was the only community with this high a rating; all other communities were classified as Low or High. The Hazards model classified all of Jemez Springs as Very High to Extreme, and the northern extent of Ponderosa and parts of San Ysidro as Very High. All other communities were given a Low to High Hazard rating.

The Combined WUI model (Figure 24) identified the Jemez Springs community as Extreme. Areas surrounding Jemez Springs were classified as Very High, as were parts of San Ysidro, the Christian Camp, Ponderosa, and riparian areas near Cañones and Gilman. Zia Pueblo and Jemez Pueblo had Low to Moderate hazard ratings.

JEMEZ MOUNTAINS

Communities within the Jemez Mountains region include Seven Springs, Rio Las Vacas, Taylor, Deer Lake, La Cueva, Sierra Los Pinos, Thompson Ridge, Valle Grande, and the Girl Scout Camp. The Fuels model (Figure 25) indicates that almost the entire region, except for Valles Caldera, is classified as High to Extreme risk. Meadows and swales within communities have a rating of low to moderate. The Spread model shows scattered areas near canyons as Very High

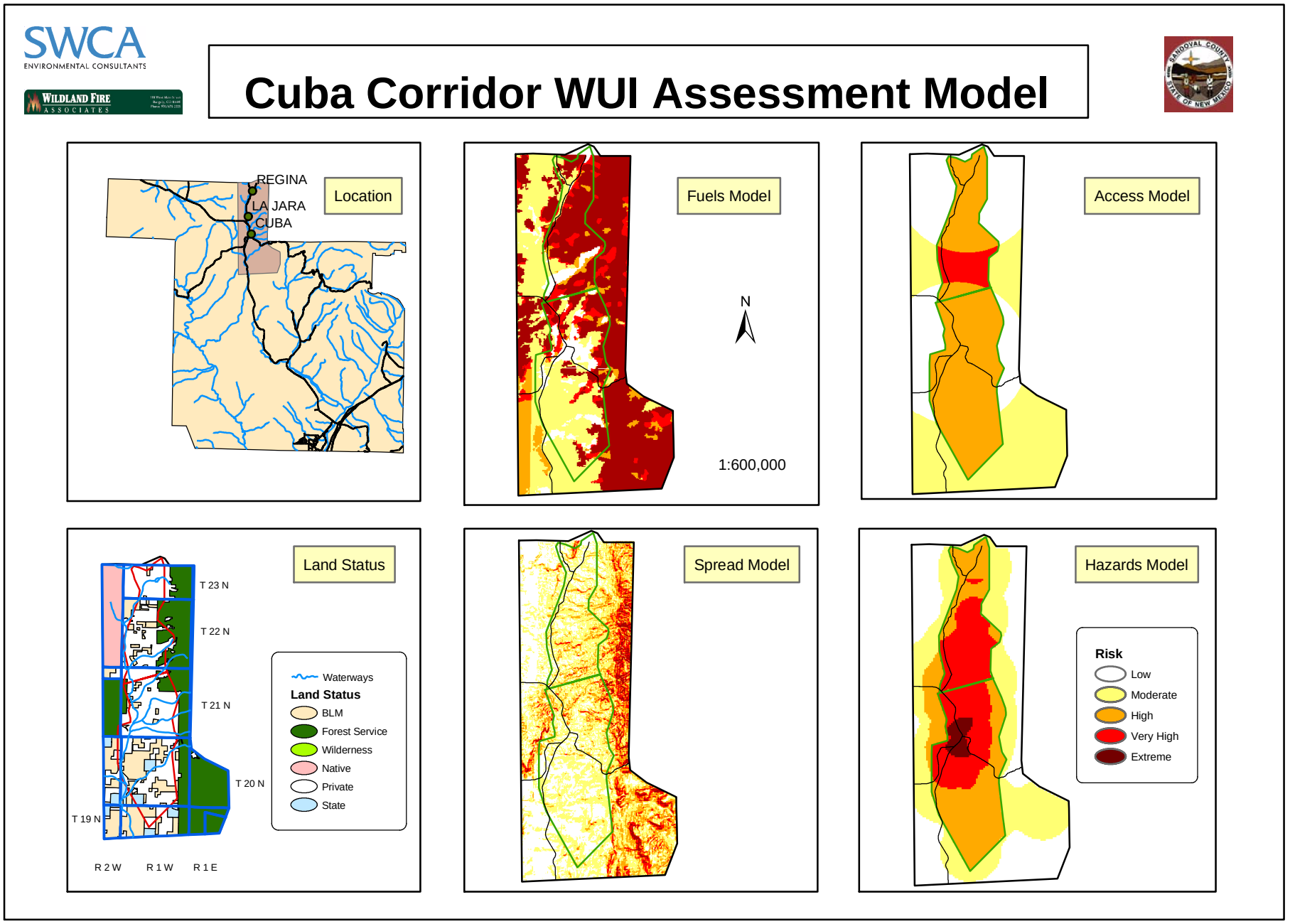

Figure 21. Cuba Corridor WUI assessment model.

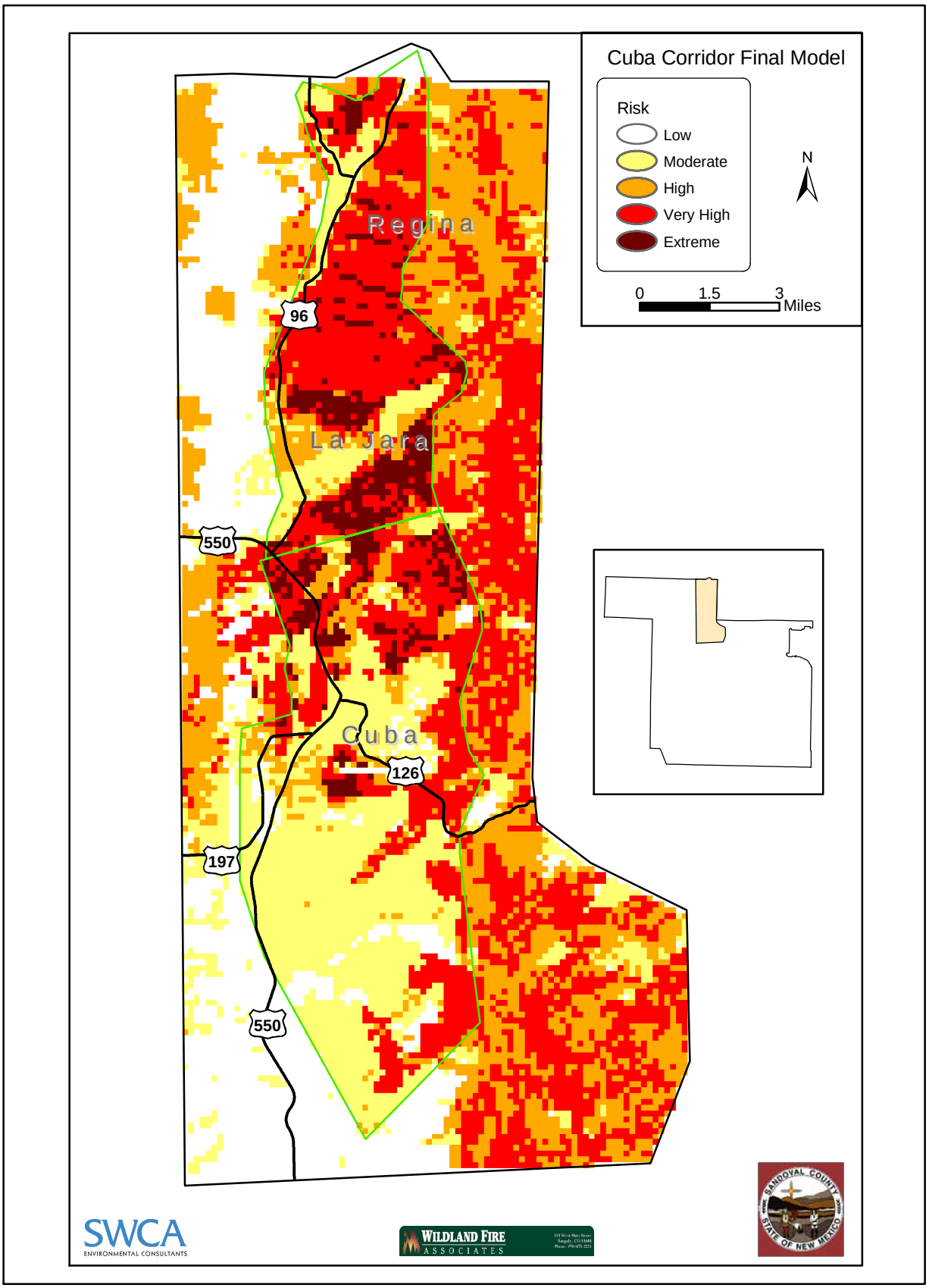

Figure 22. Cuba Corridor combined WUI model

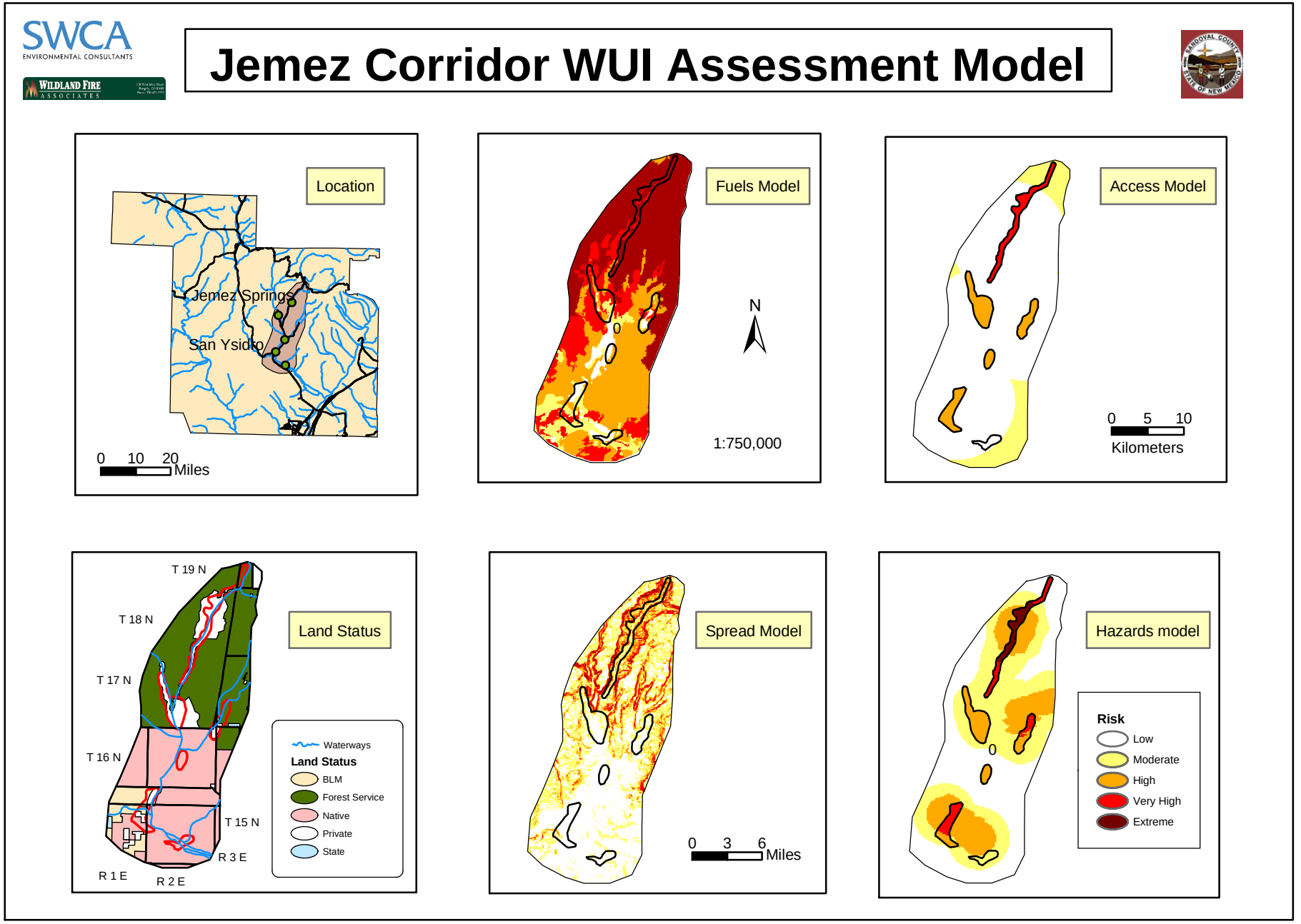

Figure 23. Jemez Corridor WUI assessment model.

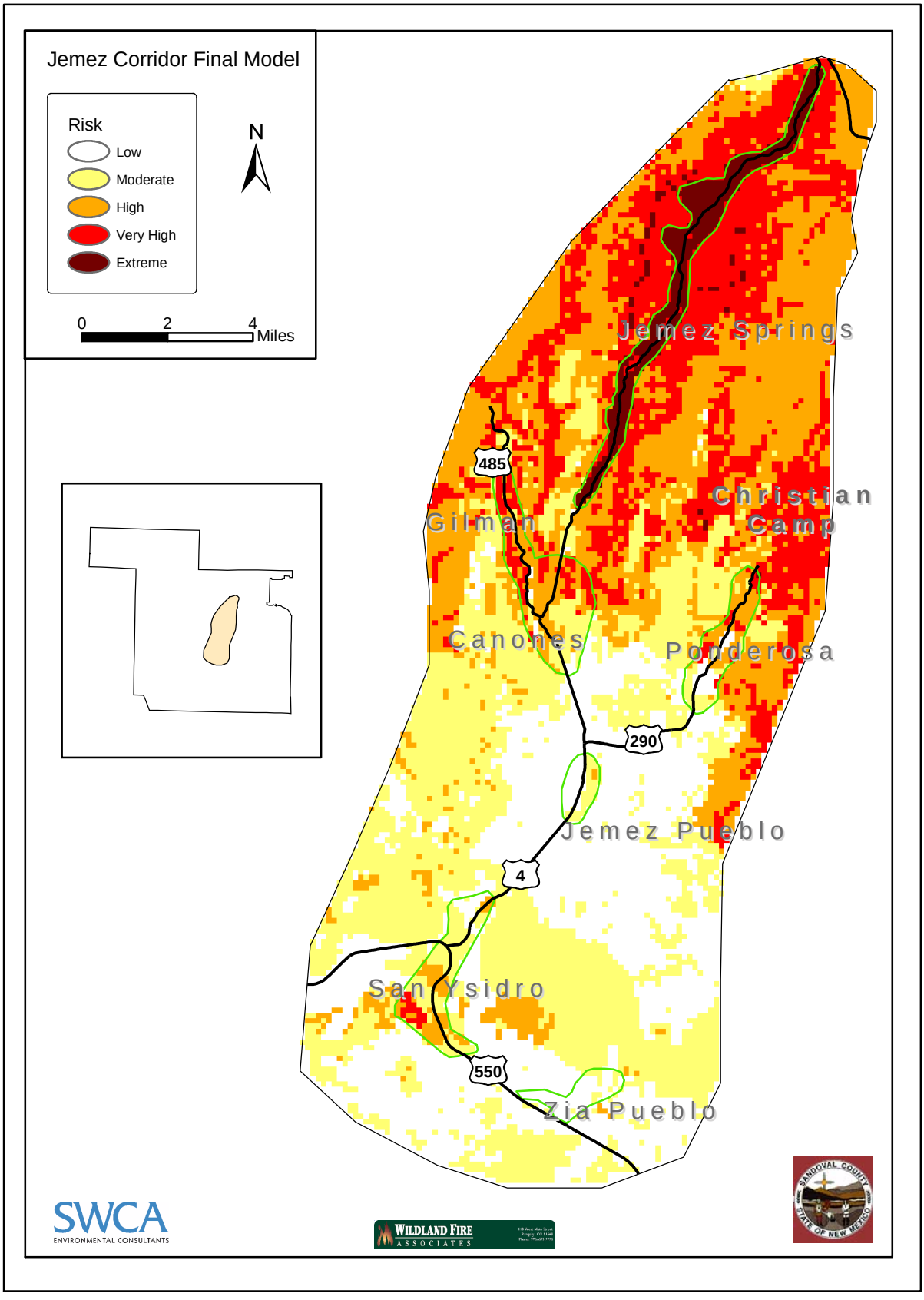

Figure 24. Jemez Corridor combined WUI model.

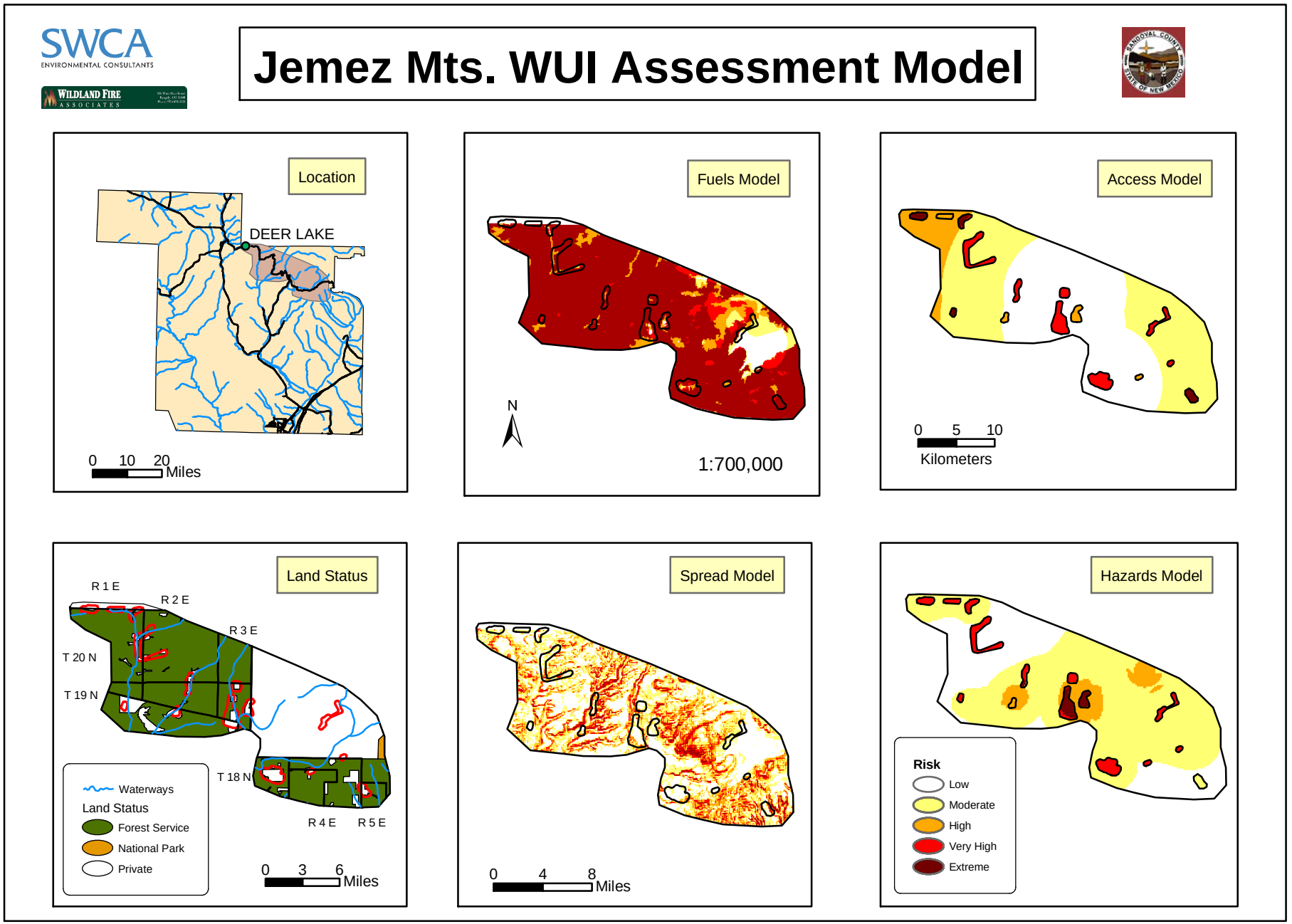

Figure 25. Jemez Mountains WUI assessment model.

to Extreme. Areas in and around Seven Springs, Rancho de la Cueva, Thompson Ridge, and Deer Lake are at greatest risk. Every community within the Jemez Mountains region was classified as High to Extreme by the Access model, due primarily to road conditions, accessibility, and proximity to fire stations. The Hazards model shows that almost every community was given a Very High to Extreme rating.

The Combined WUI model (Figure 26) identified almost the entire region as High to Extreme. Communities with an Extreme rating were Deer Lake, Rio Las Vacas, Thompson Ridge, Seven Springs, and Rancho de la Cueva. Parts of Taylor, La Cueva, Sierra Los Pinos, and the Girl Scout Camp had Very High and Extreme ratings. Valle Grande was classified as Moderate to High.

RIO GRANDE CORRIDOR

Communities within the Rio Grande Corridor include Bernalillo, Corrales, Rio Rancho, Cochiti Pueblo, Town of Cochiti Lake, Cañada, Algodones, San Felipe Pueblo, Angostura, Budaghers, Santo Domingo Pueblo, Peña Blanca, and Sile. The Fuels model (Figure 27) indicates High to Extreme risk for communities along the Bosque and north of Cochiti Lake. The most extreme conditions surround Cañada. The Spread model generated Low to Moderate risks for most of the Corridor, although Cañada and Cochiti Mesa have very high to extreme values. The communities of Cañada, Cochiti Pueblo, and Budaghers were given a hazard rating of Very High to Extreme in the Access model, while all other communities received ratings of Low to High. The Hazards model indicates parts of Corrales, Peña Blanca, Bernalillo, and Algodones as having Very High risk. There were no communities with extreme conditions; most were Moderate to High risk.

The Combined WUI model (Figure 28) identified areas along the Bosque near San Felipe and Peña Blanca as Very High risk, and areas surrounding Cochiti Mesa and Cañada as Very High to Extreme. All other communities were Low to High risk.

SANDIA MOUNTAINS

Communities within the Sandia Mountains region include Placitas, Puertocito, La Madera, and Evergreen Hills. The Fuels model (Figure 29) indicates Very High to Extreme conditions for Evergreen Hills and the western edge of La Madera; Moderate to High for Puertocito, Low to Extreme for the large area encompassing Placitas, and Moderate to High for the rest of La Madera. The Spread model generated Moderate to High values for each community, although Very High to Extreme risks surround Evergreen Hills and parts of Placitas. The community of Evergreen Hills was given an Extreme risk rating by the Access model, while La Madera and Puertocito were given Very High risk ratings. The Hazards model indicates that only parts of Placitas have a Very High risk, while all other communities classified as Moderate to High. There were no communities with Extreme conditions.

The Combined WUI model (Figure 30) identified areas in Placitas, Evergreen Hills, and La Madera as Very High to Extreme risk, although a large portion of both Placitas and La Madera was classified as Moderate. Areas surrounding Puertocito varied from Low to Very high.

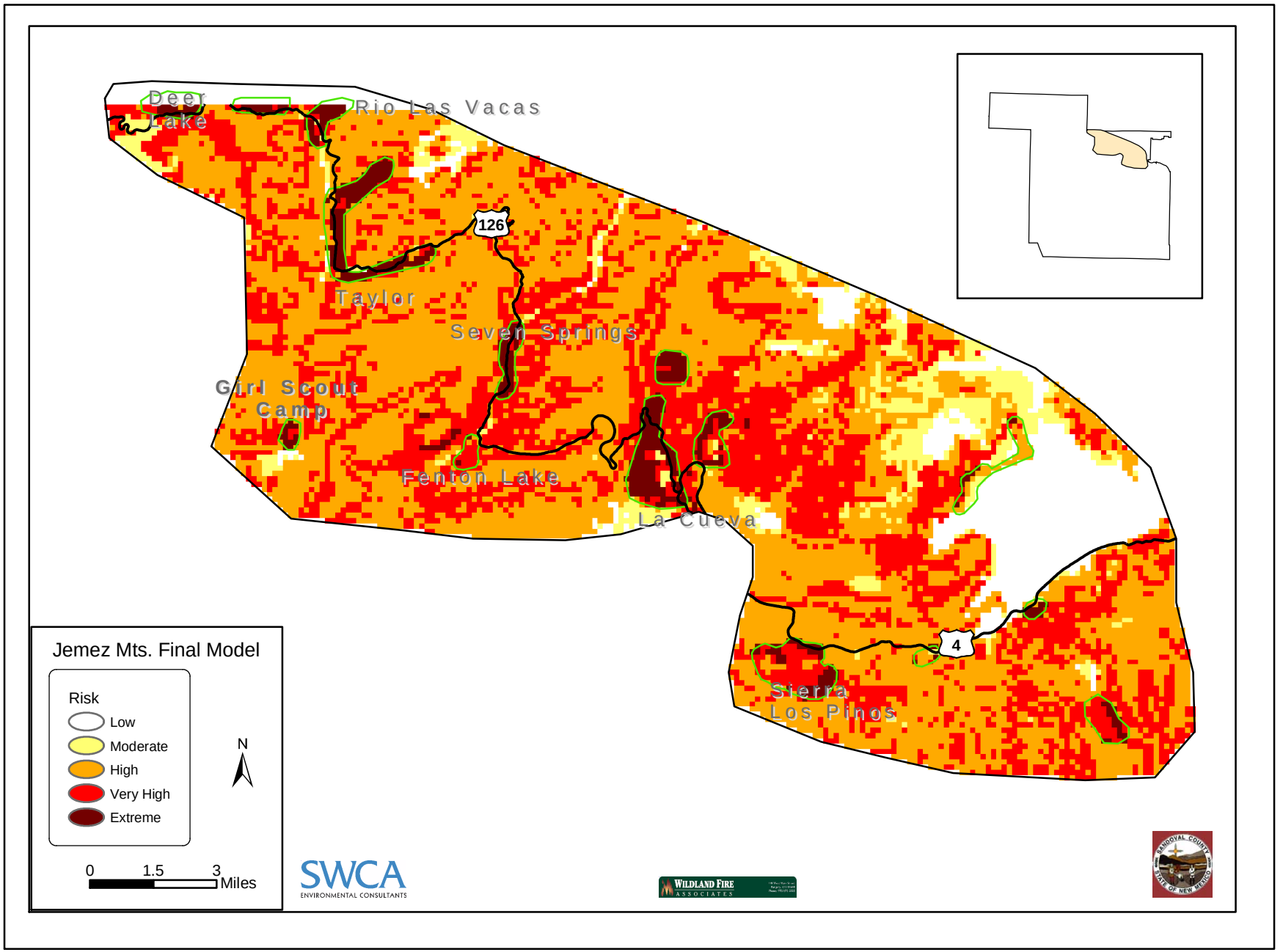

Figure 26. Jemez Mountains combined WUI model.

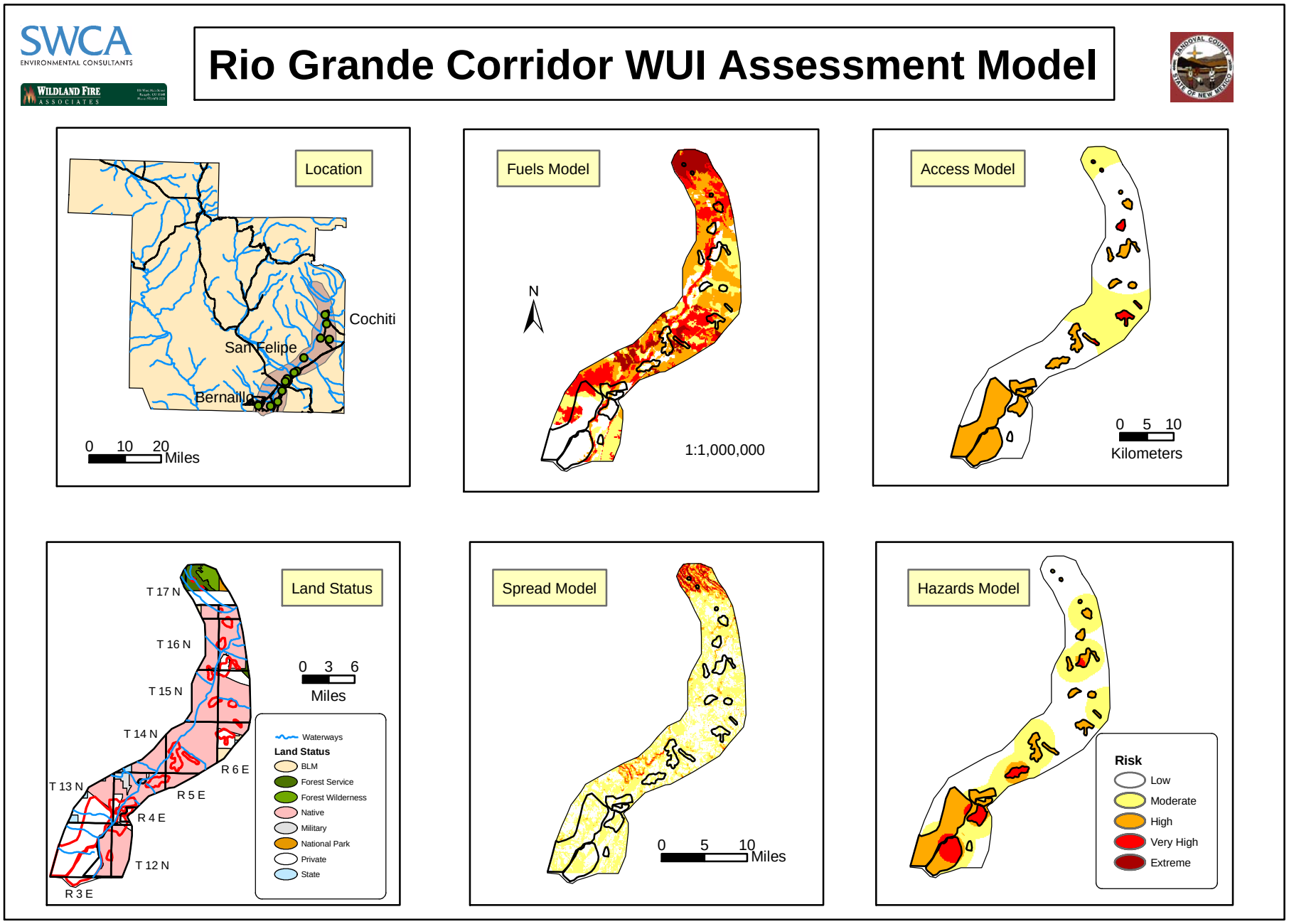

Figure 27. Rio Grande Corridor assessment model.

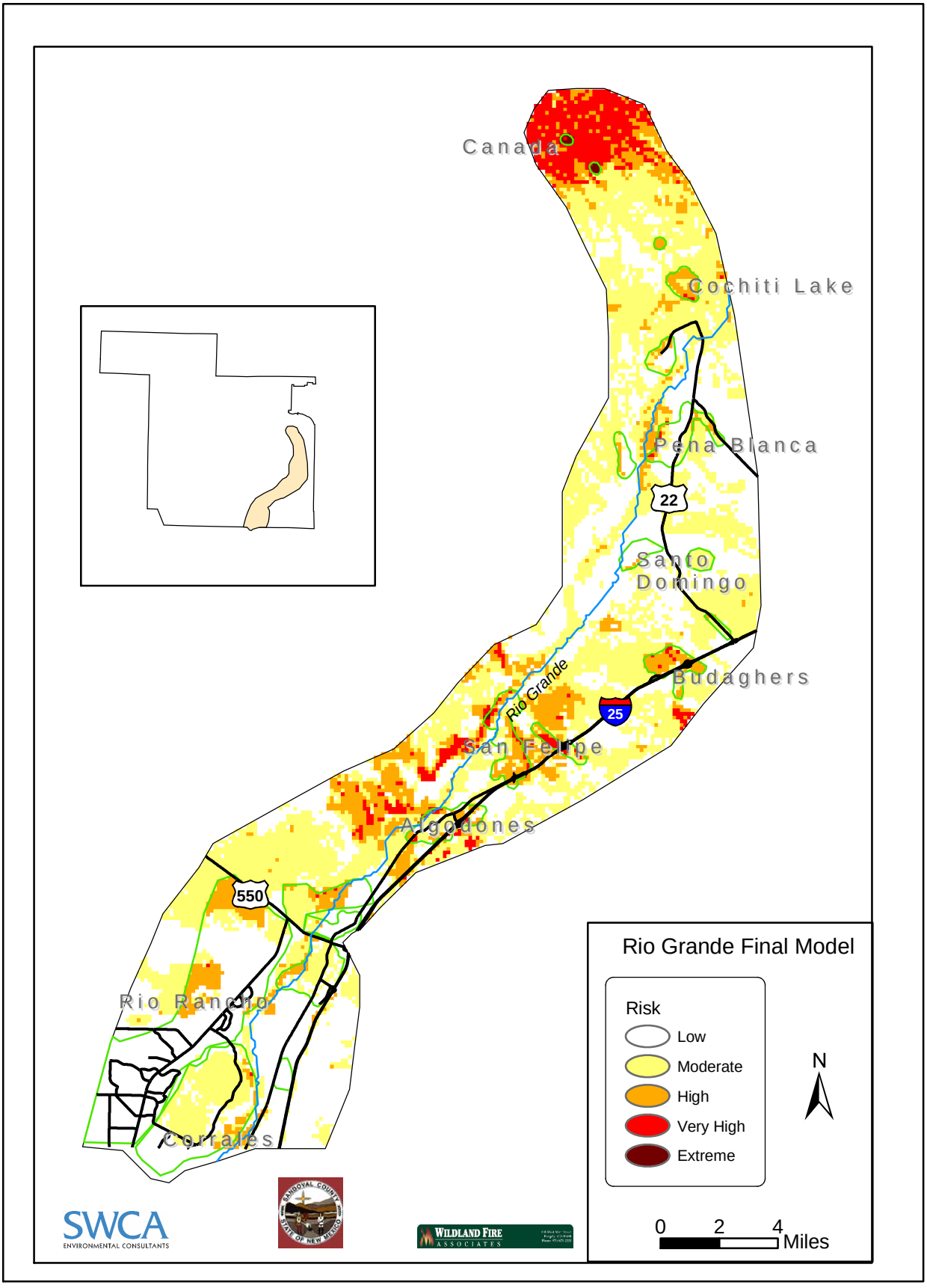

Figure 28. Rio Grande Corridor combined WUI model.

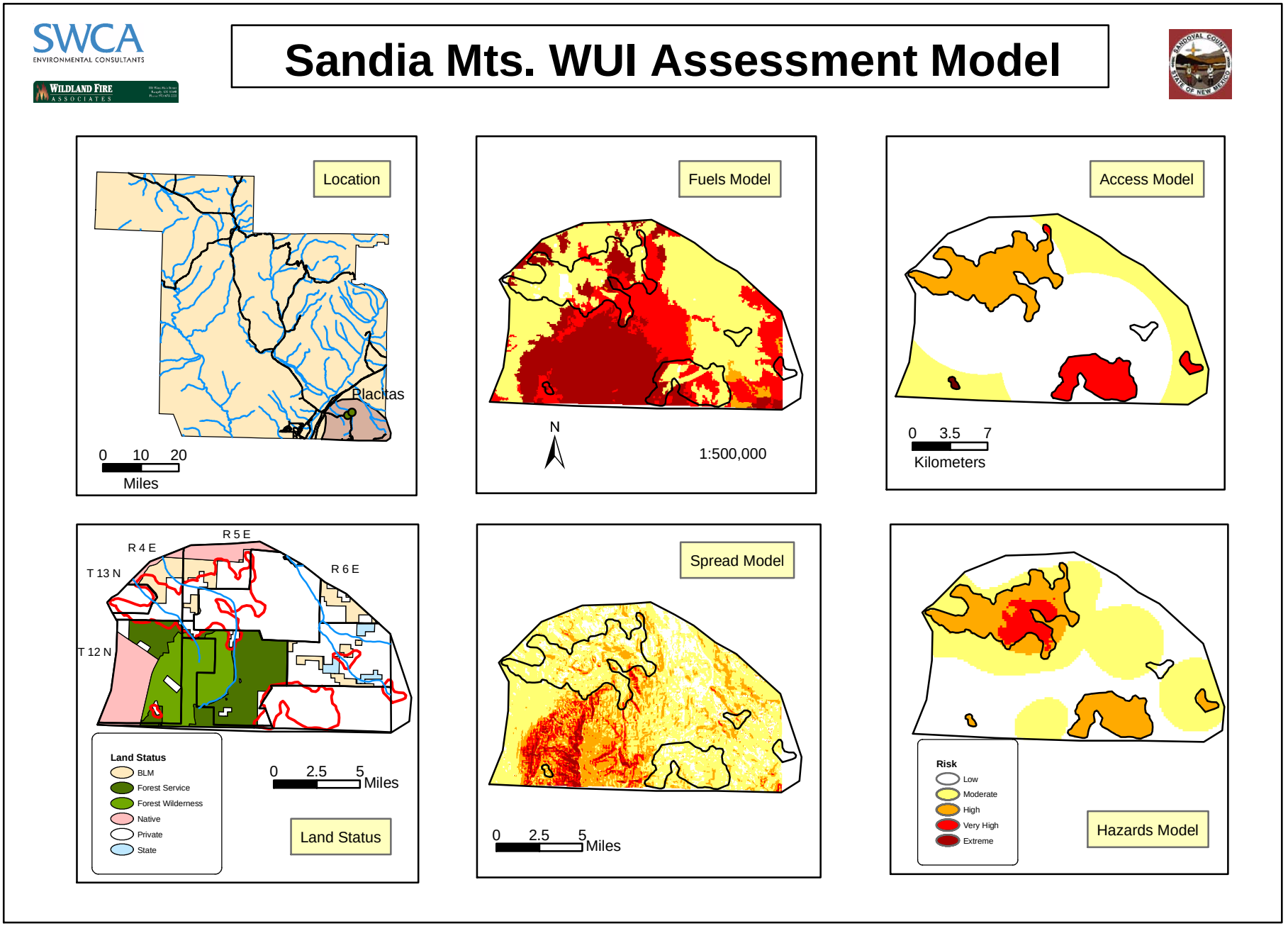

Figure 29. Sandia Mountains WUI assessment model.

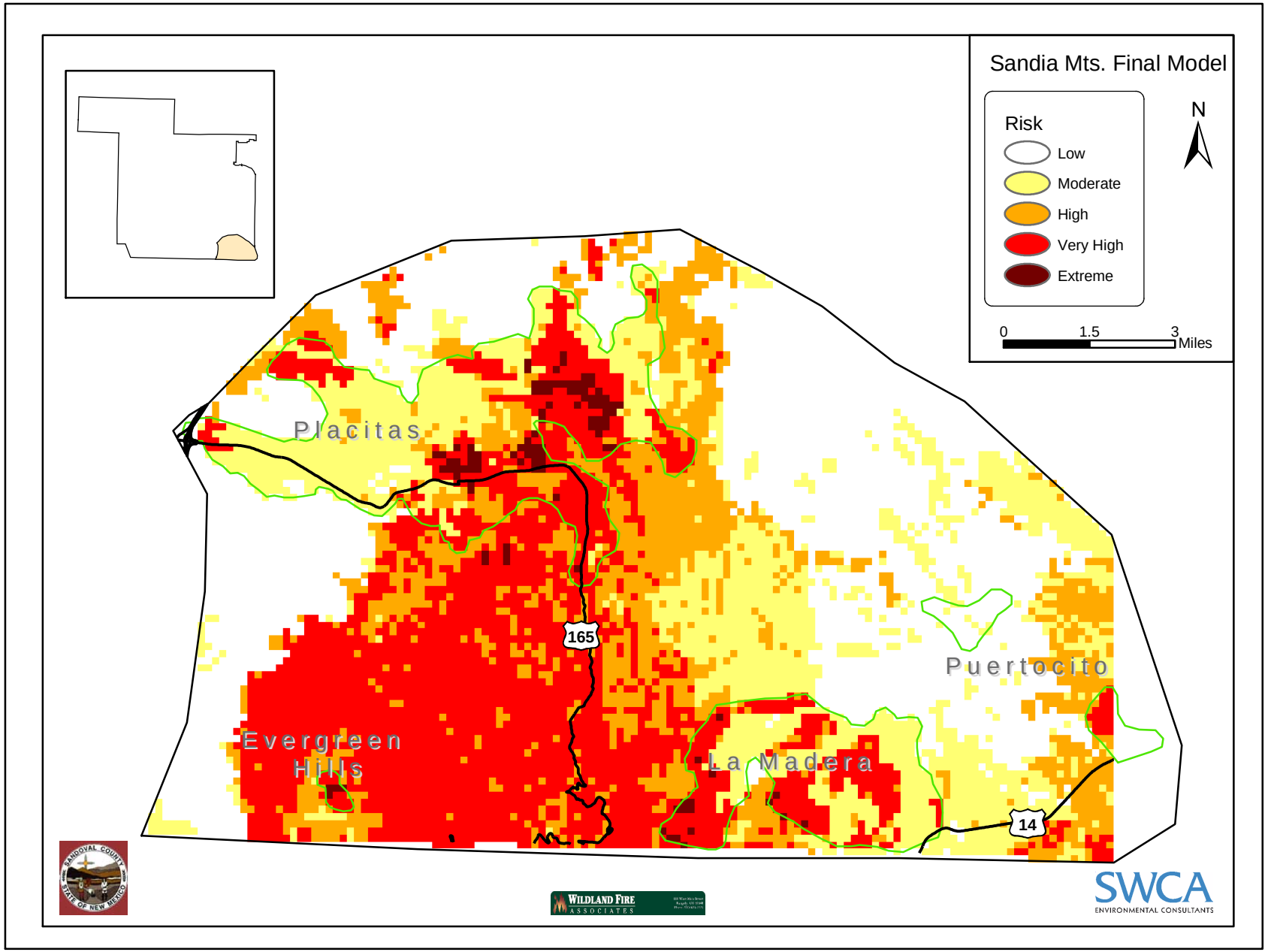

Figure 30. Sandia Mountains combined WUI model.

COMMUNITY EVALUATIONS

WUI HAZARD ASSESSMENT NARRATIVES

Specific communities were grouped by geographic location and evaluated based on the information collected by SWCA and WFA during field visits. The groupings were: Bernalillo, Corrales, and Rio Rancho; Cochiti Pueblo, Town of Cochiti Lake, and Cañada; Cuba; Seven Springs, Rio Las Vacas, Taylor, and Deer Lake; Evergreen Hills; Jemez Springs Corridor; La Cueva, Sierra Los Pinos, Valle Grande, Las Conchas, Rancho de la Cueva, Thompson Ridge, and the Girl Scout Camp; La Madera and Puertocito; Placitas, Tecolote, and Las Huertas; La Jara and Regina; Algodones, San Felipe Pueblo, Angostura, Budaghers, Santo Domingo Pueblo, Peña Blanca, and Sile; and San Ysidro, Ponderosa, Gilman, Cañones, and the Christian Camp. The narratives that follow, based on these groupings, include summary information in 11 categories:

- ***Vegetation***: dominant and secondary vegetation types, canopy conditions
- ***Fuels/Expected Fire Behavior***: based on NFFL classification scheme and variation among topographic areas
- ***Accessibility***: road conditions, ingress/egress routes, emergency service accessibility
- ***Housing Density***: model-based assessment and ground truthing
- ***Water Resources***: location of hydrants, wells, and tanks, or lack thereof
- ***Fire Resources***: proximity to volunteer and/or established fire stations
- ***Defensibility***: defense conditions surrounding homes in communities
- ***Terrain Characterizations***: slopes, aspects, chimney features
- ***Forest Health***: identification of any infestation or mortality
- ***Special Concerns***: additional concerns that may cause further risk to residents or emergency teams
- ***Overall Hazard Rating***: ratings based on field observations by WFA and GIS-based models developed by SWCA

BERNALILLO, CORRALES, RIO RANCHO

***Vegetation**:* Ranges from heavy agricultural, light grasslands, discontinuous sagebrush, to Rio Grande Bosque vegetation (cottonwood, tamarisk, willow, Russian olive, grama and bunchgrasses, sage)

Fuels/Expected Fire Behavior: Fires moving through the Bosque (NFFL 4), with few exceptions, will remain confined to the Bosque due to bordering agricultural land and fuel breaks established by private landowners. NFFL 1 and 5 are represented elsewhere. Expected fire behavior other than in the Bosque would be surface, low intensity, and short duration.

***Accessibility**:* Bernalillo and Rio Rancho roads are mainly asphalt with some narrow and sinuous secondary roads. Corrales has numerous narrow side roads that are dirt and gravel. Fire engines may have difficulty traveling down these roads near the Bosque and turning around. Residents can easily flee Bosque fire areas in Bernalillo and Rio Rancho, whereas traffic congestion in Corrales could prove difficult in an evacuation

Riparian area near Rio Rancho

Gate near the Bosque in Corrales

***Housing Density**:* Moderate to high

***Water Resources**:* Hydrants, close proximity to the Rio Grande

***Fire Resources**:* Bernalillo, Rio Rancho, and Corrales fire departments

***Defensibility**:* Most housing areas have adequate defensible space. Housing near the Bosque is much more wooded than in other areas, especially in Corrales.

***Terrain Characterization**:* Flat to mild except leading from bottomland to benches occupied by subdivision houses

***Forest Health**:* Upland forest health is not an issue. Dense stands of invasive species (*Tamarix* spp.) may pose a problem when fighting fire in the Bosque.

***Special Concerns**:* The Bosque presents High to Extreme conditions, particularly under high winds. Power lines are aboveground in most areas, belowground in some areas of Rio Rancho.

***Overall Hazard Rating**:* WFA fire environment rating is Moderate. The SWCA GIS model generated a rating of Low to Moderate for Bernalillo and much of Rio Rancho, whereas areas closer to the Bosque were at higher risk.

COCHITI LAKE, COCHITI PUEBLO, CANADA

***Vegetation**:* Open piñon-juniper (P-J), semi-arid grasses, and low shrubs. Density of coniferous vegetation increases throughout area.

Fuels/Expected Fire Behavior: Similar to Bernalillo/Corrales/Rio Rancho. Mostly NFFL 1, 5. Bosque is Model 5, or Model 4 with high winds.

***Accessibility**:* Access to the Town of Cochiti Lake is adequate. Cañada has a series of gravel and dirt roads that are narrow. There is also a one-lane bridge that may be problematic. Residents can easily be cut off during fire events. Cochiti Pueblo has decent roads that are mostly paved, but large engines may have difficulty maneuvering.

Road by Dixon Ranch

***Housing Density**:* Moderate

***Water Resources**:* Pond near Cañada, hydrants and water tank at Cochiti Pueblo, and large tanks and hydrants at Town of Cochiti Lake

***Fire Resources**:* Town of Cochiti Lake has its own fire department.

***Defensibility**:* Varies greatly, from Town of Cochiti Lake (adequate) to homes near Cochiti Mesa and Cañada (poor).

***Terrain Characterization**:* Mild to medium (10–15%), with steep slopes surrounding areas near Cañada and Cochiti Mesa

***Forest Health**:* Piñon pine mortality exceeds 90% around Cochiti Lake and Pueblo. The area was recently burned (spring 2003).

***Special Concerns**:* Aboveground power lines (Cañada and Cochiti Pueblo); road conditions north of Cochiti Lake; recent fire occurrence; response time.

***Overall Hazard Rating**:* WFA fire environment rating is Moderate to High. The SWCA GIS model generated a rating of Moderate to High for Cochiti Lake and Cochiti Pueblo and Very High to Extreme for Cañada.

CUBA

***Vegetation**:* Varies from agricultural (30%), to open piñon-juniper and ponderosa stands with sparse grass understories (20%), to sagebrush flats (50%).

Fuels/Expected Fire Behavior: NFFL 2, 5, and 9. Little or no crownfire expected. Short, intense surface-fire runs with moderate winds through Model 5 sage. Surface fire expected in timber litter Model 9. Resistance to control expected to be low.

***Accessibility**:* Most roads are asphalt with good access, although there are some secondary dirt roads. Valley bottoms provide safe areas during fire events. Isolated homes in forested areas can become cut off.

Housing structure and road conditions near Cuba

***Housing Density**:* High to very high

***Water Resources**:* Water tanks, wells, hydrants

***Fire Resources**:* Cuba Fire Department

***Defensibility**:* Established for many areas. Many yards are large or barren, with scattered trees.

***Terrain Characterization**:* Flat to mild-medium, average 10%

***Forest Health**:* Approximately 30% bark beetle mortality in P-J

***Special Concerns**:* Aboveground power lines, propane tanks; response time east of town

***Overall Hazard Rating**:* WFA fire environment rating is Moderate. The SWCA GIS model generated a rating of Moderate to Very High.

SEVEN SPRINGS, RIO LAS VACAS, TAYLOR, DEER LAKE

***Vegetation**:* Mostly forested, ponderosa pine–mixed conifer, with understory grasses and oak brush

Fuels/Expected Fire Behavior: Seven Springs area is NFFL 10, with crownfire potential where canopies are closing. Deer Lake is NFFL 4 where oakbrush-shrub canopy is closing together with coniferous stands. Rio Las Vacas/Taylor Ranch area is NFFL 1, 2.

***Accessibility**:* Deer Lake access is decent (NM 126), but secondary roads will be difficult for some engines. Rio Las Vacas has gravel and dirt roads, with bridges and locked gates. Seven Springs has a narrow road and a one-lane bridge. Taylor has a well-maintained gravel road with some bridges. Dependence on a single highway can prove dangerous during large fire events. Escape is possible to south and west, but road is threatened along its entire length. Streams along valley swales will serve as emergency safety zones.

Deer Lake structure and vegetation

***Housing Density**:* Low to moderate

***Water Resources**:* Deer Lake has a hydrant at the lake; Rio Las Vacas has a creek and wells; Seven Springs has close access to resources at Fenton Lake and Rio Cebolla; and Taylor has a creek and wells.

***Fire Resources**:* La Cueva VFD, Sierra Los Pinos and Thompson Ridge firehouses

***Defensibility**:* Fair to poor on average. Seven Springs and Deer Lake have very poor defensible space.

***Terrain Characterization**:* Deer Lake is medium to moderate on west aspect, with long, west-east-trending canyon leading to developed area. Other areas have mild to medium slopes on west-southwest aspects.

***Forest Health**:* Upland forest health is not an issue.

***Special Concerns**:* Long response times; weak bridge in Taylor Ranch; flammable roofing in Seven Springs and Deer Lake; aboveground power lines; and distance to emergency services and fire stations.

***Overall Hazard Rating**:* WFA fire environment rating is Very High. The SWCA GIS model generated a rating of High to Extreme.

EVERGREEN HILLS

***Vegetation**:* Piñon -juniper, oakbrush, mountain mahogany

Fuels/Expected Fire Behavior: Under high upslope winds, closing canopy P-J may behave as NFFL Model 4 (heavy brush), showing sustained crownfire and spotting in continuous fuels with high resistance to control. Without winds, expect a low-intensity fire in needle litter with occasional torching and low resistance to control.

***Accessibility**:* Access is difficult, by narrow and sinuous dirt/gravel roads. Evacuation concerns due to risk to single access road.

Housing structure in Evergreen Hills

***Housing Density**:* Low to moderate

***Water Resources**:* Limited water supply; one well was identified.

***Fire Resources**:* None seen

***Defensibility**:* Adequate overall

***Terrain Characterization**:* Moderate to high (20–30%) with a south aspect

***Forest Health**:* Moderate insect mortality and moderate infestations of dwarf mistletoe in piñon pines

***Special Concerns**:* Roofing material extremely flammable; propane tanks; homes under construction; ingress/egress route and difficult access.

***Overall Hazard Rating**:* WFA fire environment rating is Extreme. The SWCA GIS model generated a rating of Very High to Extreme.

JEMEZ SPRINGS CORRIDOR

***Vegetation**:* Lower Jemez Springs is predominantly riparian vegetation (grasses, low shrubs, cottonwoods and willows), open piñon-juniper on slopes. Upper Jemez Springs has closed canopy P-J, oakbrush, sagebrush.

Fuels/Expected Fire Behavior: Lower Jemez Springs (NFFL 5) around Rio Jemez, surface fire behavior where continuous fuels occur. Upper Jemez Springs has NFFL 5 in riparian bottomlands and NFFL 4 under windy conditions on south and north aspects. Expect moderate to extreme fire behavior from canyon bottom, including upslope runs, crowning, and spotting.

***Accessibility**:* Access is poor on many private driveways, with potential for firefighter and resident entrapment. Main road (SR 4) is in good condition, but many secondary roads are steep and sinuous.

Housing structure in Jemez Springs

***Housing Density**:* High to very high

***Water Resources**:* Hydrants, wells, access to river

***Fire Resources**:* Jemez Springs VFD

***Defensibility**:* Fair to poor, depending on weather conditions and fire behavior. Some structures not easily defended and may be passed up by crews under severe conditions.

***Terrain Characterization**:* Moderate to extreme (20–40%) on south and north aspects with steep, narrow canyons and chimney features.

***Forest Health**:* Moderate to heavy mortality (>50%), especially upper Jemez Springs

***Special Concerns**:* Roofing vulnerability to ember wash; aboveground power lines; proximity of wood outbuildings, wood piles, and propane tanks to structures; ingress/egress routes into some subdivisions (engine access); status of hydrants

***Overall Hazard Rating**:* WFA fire environment rating is Extreme. The SWCA GIS model generated a rating of Extreme.

LA CUEVA, SIERRA LOS PINOS, VALLE GRANDE, LAS CONCHAS, RANCHO DE LA CUEVA, GIRL SCOUT CAMP, THOMPSON RIDGE

***Vegetation**:* Mostly forested with ponderosa pine, mixed conifer with understory needle litter, forbs and grasses.

Fuels/Expected Fire Behavior: Thompson Ridge and portions of Sierra Los Pinos are in closing canopy NFFL Model 9 and 10 (where heavy surface woody debris has accumulated). La Cueva is a mix of NFFL Models 1, 2, and 9, as is the Valles Grande area. Open swale (meadow) at La Cueva.

***Accessibility**:* Difficult access to Girl Scout Camp (GSC); gravel/dirt road at La Cueva with a passable bridge; well-maintained gravel road at Las Conchas; narrow graded dirt road at Rancho de la Cueva and Sierra Los Pinos; steep gravel road (106a) to Thompson Ridge. Valley swales can serve as emergency evacuation sites, but roads are at risk for larger evacuations.

Sierra Los Pinos structure

***Housing Density**:* Moderate to very high

***Water Resources**:* Water tanks, firehouse, and wells for GSC; creek and pond at La Cueva; stream at Las Conchas; wells at Thompson Ridge

***Fire Resources**:* La Cueva VFD, Sierra Los Pinos and Thompson Ridge firehouses

***Defensibility**:* Fair to poor on average. GSC does not have much defensibility.

***Terrain Characterization**:* Mild to medium, 10–20%

***Forest Health**:* Upland forest health is not an issue.

***Special Concerns**:* Flammable roofing and siding; ingress/egress (5 miles long), cul-de-sacs, and large rocks near roads at Thompson Ridge; aboveground power lines; evacuation for GSC; wood outbuildings and propane tanks; evacuation for certain communities

***Overall Hazard Rating**:* WFA fire environment rating is Very High. The SWCA GIS model generated a rating of High to Extreme.

LA MADERA and PUERTOCITO

***Vegetation**:* Piñon-juniper, semi-arid grasses, low shrubs. Barren areas also visible.

Fuels/Expected Fire Behavior: Variable, light to moderately heavy in closed-canopy P-J, producing running surface fire, with intermittent crownfire only under high wind conditions (NFFL 1, 5). Short-range spotting can also occur and may be expected in receptive fuels (litter, logs, etc.).

***Accessibility**:* Generally good access. Road conditions vary with narrow, poorly maintained roads in some areas and paved roads in private areas (Via Entrada). Many La Madera roads are sinuous. Note: some areas are closed off from the general public by gates.

La Madera Volunteer Fire Department

***Housing Density**:* Low to moderate

***Water Resources**:* Most houses lack readily available water supplies. There are fire station tanks at La Madera.

***Fire Resources**:* Volunteer fire and rescue facility in La Madera (at far end of community)

***Defensibility**:* Some houses lack defensible space. Intermittent barren to wooded areas, with large yards

***Terrain Characterization**:* Flat to mild

***Forest Health**:* Bark beetle infestation noted near Vista Bonita.

***Special Concerns**:* Aboveground power lines; wooden outbuildings; woodpiles close to homes; propane tanks

***Overall Hazard Rating**:* WFA fire environment rating is Moderate. The SWCA GIS model generated a rating of Moderate for Puertocito and Moderate to Very High for La Madera.

PLACITAS, TECOLOTE, LAS HUERTAS

***Vegetation**:* Open juniper woodland and sporadic semi-arid grasses, with shrubs in drainages. Some deciduous vegetation in riparian areas.

Fuels/Expected Fire Behavior: Beetle infestation does not contribute to overall fuels problem. NFFL 1, 5; surface fire with some torching in heavier-fueled ravines only.

***Accessibility**:* Roads are mostly asphalt, but there are some sinuous secondary dirt roads. Engines may have difficulty in certain areas. US 165 serves as sole access, but nearby scrublands can serve as evacuation zones

Overlooking Village of Placitas

***Housing Density**:* Moderate to high for the area

***Water Resources**:* Limited water supply may tend to complicate suppression operations locally.

***Fire Resources**:* Fire station in Placitas

***Defensibility**:* Varies greatly, ranging from barren areas to trees growing extremely close to houses.

***Terrain Characterization**:* Mild to medium, generally 10–15%, with several steep canyons that could be hazardous under high-severity conditions.

***Forest Health**:* Light beetle infestation

***Special Concerns**:* Aboveground power lines

***Overall Hazard Rating**:* WFA fire environment rating is Moderate. The SWCA GIS model generated a rating of Moderate to Very High.

LA JARA and REGINA

***Vegetation**:* La Jara is primarily agricultural and grassland, while Regina is piñon-juniper and oak woodland.

Fuels/Expected Fire Behavior: La Jara is NFFL Model 1, Regina is Model 8, 9, where primary fire carrier is needle litter.

***Accessibility**:* Most roads are asphalt with good access, although there are some secondary dirt roads. Some Regina driveways are narrow with fuels on both sides. Roads around and in Regina may be difficult during inclement weather. Large swales around town centers can serve as evacuation points for residents in surrounding forested hills.

Regina Fire Department

***Housing Density**:* Moderate

***Water Resources**:* Hydrants in Regina; hydrant, plug, two tanks in La Jara; acequias in La Jara.

***Fire Resources**:* Cuba Fire Department

***Defensibility**:* Established for many areas, with large yards or barren areas and scattered trees. Some areas in Regina are wooded.

***Terrain Characterization**:* Flat to mild-medium, average 15%

***Forest Health**:* Upland forest health is not an issue.

***Special Concerns**:* Roofing in Regina is flammable; aboveground power lines; proximity of propane tanks, wood outbuildings, and woodpiles to structures.

***Overall Hazard Rating**:* WFA fire environment rating is Moderate. The SWCA GIS model generated a rating of High to Very High.

ALGODONES, SAN FELIPE, ANGOSTURA, BUDAGHERS, SANTO DOMINGO, PEÑA BLANCA, SILE

***Vegetation**:* Mostly barren or agricultural land, some low sagebrush and herbaceous benches above the Rio Grande. Some open piñon-juniper to heavy Bosque vegetation (deciduous).

Fuels/Expected Fire Behavior: Similar to Bernalillo, Corrales, and Rio Rancho. Mostly NFFL 1, 5. Bosque is Model 5, or Model 4 with high winds.

***Accessibility**:* Primary roads are asphalt with secondary gravel offshoots. Some side roads are very narrow, engines may have difficulty turning around.

Landscape near Budaghers

***Housing Density**:* Low to moderate

***Water Resources**:* Wells in Peña Blanca; proximity to Rio Grande; irrigation ditches

***Fire Resources**:* Peña Blanca VFD

***Defensibility**:* Adequate defensible space along Bosque through San Felipe Pueblo, Angostura, etc., due to agricultural fields and spacing between continuous fuels and structures. Barren areas to large yards.

***Terrain Characterization**:* Flat to mild (less than 10%)

***Forest Health**:* Upland forest health is not an issue.

***Special Concerns**:* Aboveground power lines; homes encroaching trees; aboveground propane tanks; response time

***Overall Hazard Rating**:* WFA fire environment rating is Moderate. The SWCA GIS model generated a rating of Moderate, with Budaghers classified as High.

SAN YSIDRO, PONDEROSA, CHRISTIAN CAMP, GILMAN, CAÑONES

***Vegetation**:* Agricultural, open piñon-juniper, riparian grasses, forbs, shrubs, ponderosa pine, tamarisk

Fuels/Expected Fire Behavior: Fuels are largely discontinuous and light (NFFL 1, 5), except at Christian Camp northeast of Ponderosa, which is surrounded by ponderosa pine (NFFL 9). Some spotting can be expected in the Christian Camp area; otherwise, low-intensity surface fire with frequent fuel breaks.

***Accessibility**:* Two-lane asphalt highways through Gilman and Cañones, with some bridge driveways that may be problematic; road to Christian Camp may be problematic; decent roads, but narrow, in San Ysidro.

Gilman/Cañones conditions

***Housing Density**:* Moderate

***Water Resources**:* Wells and tanks near Cañones and Gilman; tanks, large irrigation pond, hydrants at Ponderosa; wells and hydrants at San Ysidro

***Fire Resources**:* Fire station at San Ysidro and Ponderosa. Jemez Springs VFD is not far from Gilman and Cañones.

***Defensibility**:* Good, except at Christian Camp. Large yards with some trees present.

***Terrain Characterization**:* Flat to medium

***Forest Health**:* Forest health is not an issue.

***Special Concerns**:* Aboveground power lines; propane tanks; wood outbuildings; accessibility to some structures in Gilman/Cañones; evacuation from Christian Camp

***Overall Hazard Rating**:* The WFA fire environment rating is Low for the entire area except Christian Camp, which has a High rating. The SWCA GIS model generated a rating of Low for San Ysidro and High for Ponderosa, Gilman, and Cañones.

MITIGATION RECOMMENDATIONS

The following mitigation strategies are intended only as recommendations. Measures to be implement should be designed on the ground by a person(s) with expertise in the wildland urban interface hazard mitigation field. General suggestions for short-term and long-term hazard mitigation are also included for areas rated High (H), Very High (VH), and Extreme (E):

- Jemez Springs Corridor (E)
- La Cueva, Sierra Los Pinos, Valle Grande, Las Conchas, Rancho La Cueva, Thompson Ridge (VH)
- Fenton Lake, Seven Springs, Rio Las Vacas, Taylor/Cutty, Deer Lake (VH)
- Evergreen Hills Subdivision (H)

The first priority under any mitigation strategy, whether short term or long term, is human safety. All County firefighters should receive at least 8 hours of safety training (Standards for Survival) annually. Wildland firefighter certification (redcard) should also be a minimum requirement. This training is coordinated through New Mexico State Forestry.

MITIGATION: SHORT TERM

1. Print "red-sheet" notices for structures judged to be undefensible and list reasons, such as:

   • No adequate clearance
   • No safe access
   • Woodpile too close
   • Insufficient water
   • Flammable roof materials
   • Special conditions

   The intent here is to focus the homeowner on lowering the ignitability of the house by removing fuels or changing to materials that would resist firebrands landing on the roof or in the yard. The presence of ignitable materials in these areas is a major cause of ignitions that may consume the structure. regardless of proximity to the main fire.

2. Another mitigation strategy is to reduce the intensity of an approaching wildfire, preferably reducing it to a surface fire through creation of a "sheltered fuel break." This is accomplished by thinning the canopy, removing ladder fuels, and reducing the surface fuel load. The treated area can serve as a defensible space, a fuel break, and a potential fireline.

3. The following recommendations, related to item 1 above, generally apply to structures and surrounding vegetation, usually the area within 66–200 feet of the house:

   • Move firewood away from the house and remove flammable woody debris
   • Prune lower limbs of trees adjacent to the house

- Thin dense groups of trees within 200 feet of the house (distance varies with slope)
- Mow grasses, rake needle litter, prune ornamental shrubs

4. Where feasible, access routes to at-risk structures should have adequate turnouts and turn-around space for equipment such as engines, dozer lowboys, and water tenders.

5. In communities of highest hazard ranking, the County should, when possible, begin to establish partnerships with homeowners' associations and individual owners. Homeowners should be informed of the "Firewise" program (see References) and encouraged to become involved in the mitigation process described above.

6. The protection of ecosystems and wildlife habitat must be considered an integral part of any WUI fuels treatment program.

MITIGATION: LONG TERM

While projects that directly protect houses and communities have a relative urgency, longer-term restoration work in forested areas around the WUI should proceed where feasible. The prevailing wind direction throughout much of the region is from the southwest, so the western and southwestern edges of communities are often considered more vulnerable.

A recommended long-term action when considering the use of wildland fuel hazard reduction for protecting homes would be an analysis specific to home ignitability (item 1 above). Such an analysis may help determine long-term effectiveness of possible treatments.

Another strategy would be a light thinning treatment for 0.25 mile into the forest, depending on topography, existing natural barriers, and adjacent fuels reduction work, that would eventually allow prescribed fire to be utilized to maintain lowered fire potentials. The objective of thinning is to break crown continuity and thus discourage sustained crownfire.

Again, homeowners should take the principal responsibility for assuring adequately low home ignitability. The fire services would become community partners, providing homeowners with the technical assistance needed for reducing home ignitability. This strategy will require a change in the current relationship between fire agencies and homeowners from "protector-victim" to one partnership (Cohen and Saveland 1997). If a WUI fire occurs with such a partnership in place, low home ignitability and community awareness will increase firefighter effectiveness in reducing loss and optimizing human safety.

Residents of each community must be aware of the risks of living in a WUI and must not be parsimonious when thinning and creating defensible space.

MITIGATION: SPECIFIC IDENTIFIED RISKS

Community involvement and education are extremely important in increasing awareness about wildfire issues. Community education should focus on topics that increase the safety of homes within the community in case of wildfire. This can be the best mitigation tool. The following mitigation recommendations address specific risks for individual communities that were identified during field data collection and are based on information provided at www.Firewise.com. Cost and time of implementation of these recommendations are not addressed.

1. Improve Roads

   Adequate road access and conditions are necessary within communities and are important to how fire response vehicles are able to access structures and how residents are able to flee the community when necessary. The following communities have high accessibility risks:

   • Jemez Springs: some secondary roads are steep, narrow, and gravel-based. Fire response vehicles may have difficulty turning around in these areas.

   • Deer Lake: narrow secondary roads with vegetation overhanging roads.

   • Thompson Ridge: community access by narrow, steep, 5-mile road (106a); large boulders near main road; small cul-de-sacs in some parts of the community.

   • Taylor/Cutty: bridges questionable if large response vehicles need to access homes in the community.

   • Evergreen Hills: narrow, sinuous roads; one main ingress/egress route; access may be difficult for some large response vehicles.

   • Rancho de la Cueva: narrow road and right-of-way.

   • Seven Springs: questionable one-lane bridge and narrow road.

2. Improve Defensible Space

   Inadequate defensible space around individual structures is a significant risk to communities. Creating defensible space around individual homes will benefit the entire community. The following communities were identified as having poor defensible space: Jemez Springs, Sierra Los Pinos, Thompson Ridge, Seven Springs, Rancho de la Cueva, Evergreen Hills, and Deer Lake. Improving defensible space should be a community-wide effort.

3. Alter or Change Location of Hazardous Yard Features

   Woodpiles, propane tanks, and small wooden structures may act as fuels and allow wildfire to spread toward homes. Residents living in areas of High to Extreme risk need to be cognizant of where yard features are located. The following communities were identified as having hazardous yard features that may propagate the spread of fire: Jemez Springs, La Cueva, Sierra Los Pinos, Las Conchas, Thompson Ridge, Deer Lake, Evergreen Hills, Rancho de la Cueva, and Seven Springs.

4. Thin Vegetation

   Some areas surrounding communities support vegetation types with a High to Extreme fire hazard rating. Reduction of vegetative fuels around the perimeter would greatly reduce the threat for many communities, especially near homes on the periphery of the interface. An effective fuel break is created through selected tree removal and thinning or removal of understory vegetation (ladder fuels). A fuel break will slow the spread of wildfire and generally force the fire to the ground. Areas that are thinned can be re-vegetated with fire-resistant plant materials. Wildland fire fighters can also use fuel breaks in an effort to stop the spread of the fire.

5. Improve Roofing

   For a home, the roof is the most common structural fuel bed for ignition by firebrands or fire sparks. For this reason, the type of building materials used in the construction of the roof is of great importance to the home. Homeowners need to be aware of the dangers associated with having shingle-based rather than metal roofs in a potentially hazardous area. Communities of concern include La Cueva, Sierra Los Pinos, Thompson Ridge, Evergreen Hills, Rancho de la Cueva, Seven Springs, and Taylor. All newly constructed homes should be required to construct Class B roofing or better (www.Firewise.com).

A WORKING GRAPHICAL USER INTERFACE

SWCA has created a working Graphical User Interface (GUI) for Sandoval County to assist with future analyses and alterations. The ArcGIS 8.3–based GUI was created by SWCA to allow County employees access to the data collected and created by SWCA and WFA to allow for future updating of the database within a GIS.

Components of the GUI are: Arc shapefiles (.shp extension) created or altered by SWCA; raster grids (.aux) generated by SWCA; and Arc maps (.mxd) developed by SWCA. The datasets and maps in the GUI cover the entire County as well as the five previously identified regions.

Development of a GUI allows SWCA to provide a unique service to clients and supply a working GIS database that can easily be updated. SWCA can also provide future assistance through additional contract work.

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Appendix A: Sample Data Forms

APPENDIX A

HAZARD ASSESSMENT FORM

WILDLAND FIRE ASSOCIATES

COMMUNITY/AREA_____
DATE_____

1. FIRE ENVIRONMENT

A. FUEL HAZARD (NFPA 299) – (Averaged)	POINTS
No Fuels = 0	
Light fuels (Grass, Low Shrubs) - NFFL 1,2,5,8 = 1	
Medium Fuels (Brush, Large Shrubs, Small Trees) – NFFL 9 = 3	
Heavy Fuels (Timber, slash, Large Brush, Bosque) NFFL 4,10 = 5	
B. SLOPE HAZARD (NFPA 299, FEMA) – (Averaged)	
Flat to Mild Slope (0-9.9%) = 1	
Mild to Medium Slope (10-19.9%) = 2	
Medium to Moderate Slope (20-39.9%) = 3	
Moderate to Extreme Slope (40% +) = 5	
ASPECT (N & E = 1; S & W = 2)	
C. SPECIAL HAZARDS (Averaged)	
Insect kill (Pinyon, ponderosa pine), mistletoe = 0-2	
Chimney, Steep Canyon, Saddles = 3-6	
Other (describe)	

Total

2. DEFENSIBILITY

A. ACCESS - Length of Dead-End Road (consider bridges, turnouts, bordering fuels, turnaround space, etc)	**POINTS**
Less than 600 feet 0 Points	
600 to 1,000 feet 1 Point	
1,000 to 1,320 feet 3 Points	
Greater than 1,320 feet 5 Points	
B. STRUCTURE TYPE – (Averaged)	
Flame-resistant roofing/siding = 0	
Flammable roofing/siding = 1-3	
C. CLEARANCE/DEFENSIBLE SPACE (Averaged)	
Fuel Break > 30 ft. (trees pruned 6 ft., firewood >10 ft. away) = 0 - 3	
Fuel Break < 30 ft. (defensibility marginal) = 4-6	
D. WATER AVAILABILITY (Averaged)	
Well Water only – limited water source = 2	
Community Water – uninterruptible water source = 0 -1	
	Total

Sandoval County WUI Field Sheet
SWCA

Community: _____ **Name:** _____ **Date:** _____

Vegetation Types: _____

Slopes: _____

Road Conditions: _____

Power Lines: _____

Water Sources: _____

Typical House Types: adobe frame/stucco brick frame/siding manufactured mobile

Typical Roofs: flat/tar+gravel metal shingle tile wood slake

Defensible Space: urban barren large yards trees present wooded dense

Yard Features: wood outbuildings woodpiles aboveground propane tanks wood fence

Percentage of Community at Risk: _____**Overall Hazard Rating**: _____

Specific Hazard Ratings(mark on maps):

Description:

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Appendix B: Glossary

APPENDIX B

GLOSSARY

Bark Beetle – An insect that bores through the bark of forest trees to eat the inner bark and lay its eggs.

Canopy/Crown - The more or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees.

Conifer – A tree that produces cones, such as a pine, spruce or fir tree.

Crown – The part of a tree, or other woody plant, bearing live branches and foliage.

Crown Fire - A fire that advances through the crown fuel layer normally in direct conjunction with a surface fire. Three categories of crowning are recognized (passive, active, and independent); they are determined by three crown fuel properties (live crown base height, foliar moisture content and bulk density) and two characteristics of of fire behavior (spread rate and surface intensity). Alexander, Martin E. "Help With Making Crown Fire Hazard Assessments", 1987.

Density (Stand) – The number of trees growing in a given area usually expressed in terms of trees per acre.

Diameter Breast Height (DBH) – Tree diameter, measured 4.5 feet above ground.

Direct Attack - Line is constructed adjacent to the fire perimeter: usually the preferred method, because of immediate access to escape routes and safety zones. Used when fire behavior, weather and fuel permit. Directly related to individual experience, escape routes and safety zones. Usually involves burnout of interior fuels as the line construction progresses or the fire is allowed to burn into the fire line.

Ecosystem – A functional unit consisting of all the living organisms in a given area, and all of the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size, but it always functions as a whole unit.

Ember Wash – A mass of firebrands blown ahead of the main fire; could ignite multiple spot fires.

Escape Route - A means to access a safety zone.

Extreme Fire Behavior - "Extreme" implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, strong

convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.

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

Fire Behavior – How fire reacts to the influences of fuel, weather and topography.

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

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

Fire Risk – The probability or chance of fire starting determined by the presence and activities of causative agents.

Fire Severity – A relative measure of the post-fire appearance of vegetation as it relates to the intensity of the fire and the consumptive effects on vegetation.

Fire Suppression (Fire Control) - All of the work and activities connected with fire extinguishing operations, beginning with discovery and continuing until the fire is completely extinguished.

Firefighter Safety - A work environment where foreseeable risks have been minimized through the mitigation of known hazards associated with wildfire suppression.

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

Forest Health – The condition in which forest ecosystems sustain their complexity, diversity, resiliency, and productivity while providing for human needs and values.

Fuel - Combustible material that includes vegetation such as grass, leaves, ground litter, plants, shrubs and trees. (See Surface Fuels.) Includes both living plants; dead, woody vegetative materials; and other vegetative materials which are capable of burning.

Fuel Break - A zone in which fuel quantity has been reduced or altered to provide a position for suppression forces to make a stand against wildfire. Fuel breaks are designated or constructed before the outbreak of a fire. Fuel breaks may consist of one or a combination of the following: Natural barriers, constructed fuel breaks, man-made barriers. Refer to FRZ- Fuels Reduction Zone.

Fuel Loadings - The oven dry weight of fuels in a given area, usually expressed in tons per acre. Fuel loadings may be referenced to fuel size or time lag categories; and may include surface fuels or total fuels. The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area.

Fuel Management – Manipulation or reduction of flammable matter for the purpose of reducing the intensity or rate of spread of a fire, while preserving and enhancing environmental quality.

Fuel Reduction - Manipulation, including combustion or removal of fuels, to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control.

Geographic Information System (GIS) – Computer software that provides database and spatial analytic capabilities.

Ground Fuels - All combustible materials below the surface litter layer. These fuels may be partially decomposed, such as forest soil organic layers (duff), dead mosss and lichen layers, punky wood, and deep organic layers (peat), or may be living plant material, such as tree and shrub roots (Miller 1994).

Hazard - Any real or potential condition that can cause injury, illness, or death of personnel, or damage to or loss of equipment or property.

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

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

Initial Attack – An aggressive suppression action consistent with firefighter and public safety and values to be protected.

Ladder Fuels - Fuels which provide vertical continuity between strata. Fire is able to carry from the surface fuels by convection into the crowns with relative ease.

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

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

Native Species – Species that are indigenous to a region: not introduced or exotic.

Overstory - The portion of the trees that form the uppermost canopy layer in a forest of more than one story.

Prescribed Fire - The intentional application of fire to wildland fuels in either their natural or modified state under such conditions as allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further certain planned objectives (i.e., silviculture, wildlife management, etc.). Any fire ignited by management

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

Project – An organized effort to achieve an objective, identified by location, activities, outputs, effects, and time-period and responsibilities for execution.

Riparian – A geographic area containing an aquatic ecosystem and adjacent upland areas that directly affect it. This includes floodplains, woodlands, and all areas within a specified distance from the normal line of high water of a stream channel, or from the shoreline of a standing body of water.

Safety Zone (SZ) - SZ are areas that are fuel free zones that are incapable of burning. They afford a very high degree of firefighter safety from advancing wildfire. They can be natural or person made fire resistant areas such as lakes, dirt, gravel or asphalt parking lots, roads and areas burned to secure line.

Spot Fire – A fire ignited by firebrands landing in flammable fuels, usually ahead of the main fire.

Suppression – The act of extinguishing or confining a fire.

Understory - The portion of vegetation that is underneath the dominate tree canopy.

Watershed – The drainage basin contributing water, organic matter, dissolved nutrients and sediments to a stream, lake or river.

Wildland Fire - A non-structure fire, other than prescribed fire, that occurs in the wildland. Any fire originating from an unplanned ignition.

Wildland Urban Interface (WUI) - Includes those areas of resident human population at imminent risk from wildfire, and human developments having special significance. These areas may include critical communications sites, municipal watershed, high voltage transmission lines, observatories, church camps, scout camps, research facilities, and other structures that if destroyed by fire, would result in hardships to communities. These areas encompass not only the sites themselves, but also the continuous slopes and fuels that lead directly to the sites, regardless of the distance involved.