LUERA MOUNTAIN

FOREST AND WATERSHED HEALTH IMPROVEMENT MANAGEMENT PLAN

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AUTHORIZATION PAGE

This plan has been reviewed and approved by the following individuals.

SLO Approval

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New Mexico State Forestry Approval

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STATE LAND OFFICE OVERVIEW

The vision of the New Mexico State Land Office (SLO) is to be the nation's model for state trust land management while providing for current and future productivity of state trust lands for the next generation of beneficiaries.

The SLO's mission is to support the beneficiaries of the trust, which include universities; public schools; special schools and hospitals that serve children with physical, visual, and auditory disabilities; prisons; and public buildings at the Capitol complex.

In the past 20 years, state trust lands and the permanent fund have contributed more than $4 billion to education in New Mexico, while generating revenues resulting in the $8 billion Land Grant Permanent Fund. The SLO is responsible for administering 9 million acres of surface land and 13 million acres of subsurface rights for the beneficiaries. Each section of land is designated for a specific beneficiary, with public schools as the designee of the majority of the acreage.

As part of its enabling legislation, the SLO has the authority and responsibility to manage its lands according to the best interests of the trust. In doing so, the SLO has initiated natural resource project activities to improve, restore, and rehabilitate current land conditions. Furthermore, the SLO has been authorized by the New Mexico Legislature to maintain and protect those lands administered by the Commissioner of Public Lands. Revenues from renewable resources, such as agriculture leases, commercial leases, mineral and oil and gas rentals, rights-of-way, and interest on earnings and bonuses, are paid into the Land Maintenance Fund. The activities (project work) associated with the Land Maintenance Fund are intended to restore, rehabilitate, secure, and remediate the land to a more productive and healthy state.

EXECUTIVE SUMMARY

Forest Fitness, LLC (Forest Fitness), in cooperation with Arid Land Ideas, has prepared this Management Plan for the New Mexico State Land Office (SLO) and New Mexico State Forestry (NMSF). The purpose of this report is to provide the agencies with detailed information on current vegetation types and conditions, fire planning tools, and suggested fuel treatment priorities based on surveys of upper woodland and forested vegetation communities. This information is intended to promote a healthy forest environment and improve the overall ecosystem of the Luera Mountain area in east-central Catron County, New Mexico.

Combining field data collection with geographic information technology, Forest Fitness was able to identify existing vegetative communities and locate priority areas. By evaluating both the newly collected data in conjunction with data that has been recorded in the past, as well as reviewing current literature that relates to this project, fuels treatment projects were recommended.

It is Forest Fitness's intent to be actively involved in the fuels reduction projects and assist the SLO and NMSF in any way that relates to these projects. A complete understanding of the fuel conditions within the Luera Mountain area will aid in the implementation of the fuels treatment plan. This plan also suggests collaboration among the various agencies whose involvement is necessary to ensure that any fuel treatment, whether it be mechanized thinning, prescribed fire, etc., is implemented and completed successfully.

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1.0 OVERVIEW

1.1 PURPOSE

The purpose of the Luera Mountain Management Plan is to create a document that will give cooperating agencies the information needed to enact fuel treatments across the Luera landscape in order to restore the resource base to its natural, healthy state.

1.2 GOALS

The primary goal of the project is to better understand fuel conditions and needs within the Luera Mountain area. A fuels treatment management plan has been developed to evaluate the threat of wildfire, analyze vegetation communities, suggest implementation and mitigation techniques, and incorporate the involvement of all affected agencies to carry out a sustainable program for current and future years.

1.3 OBJECTIVES

The New Mexico State Land Office (SLO) and New Mexico State Forestry (NMSF) have established the following objectives:

- Review all available current information about Luera Mountain and develop a plan for gathering further data.
- Use data to provide information on forest, range, wildlife, watershed, cultural, and recreation resources, as well as current infrastructure.
- Conduct baseline surveys of vegetation and associated resources.
- Provide maps reflecting the information mentioned above.
- Develop a comprehensive fuels management strategy.
- Suggest restoration and rehabilitation strategies for selected areas.

2.0 METHODS

In order to develop a field sampling protocol for Luera Mountain that addresses the most current needs, various fuels assessment methodologies were analyzed. The resulting methodology closely followed previous methods used for fuel and vegetation collection, U.S. Forest Service (USFS) Region 3 protocol, and national Fire Effects Monitoring and Inventory System (FIREMON) guidelines. The sampling protocol was designed to efficiently gather relevant fuel information and be easily replicated by personnel from various backgrounds and disciplines.

2.1 FIELD METHODOLOGIES

Following preliminary land cover classification, field crews used a plot-based sampling approach. The plots were randomly chosen throughout the Luera Mountain area based

on the major vegetation groups and fuel models that were identified. The intention was to generate plots that would represent a small sampling of all of the vegetative classes across the mountain. Although plots were completed in a more centralized location on the mountain, geographic information system (GIS) data show that the area in which a plot was completed is indicative of similar areas across the landscape (Figure 2.1).

In the majority of the vegetative types within the Luera Mountain area, surface fuel loading is relatively sparse. Therefore, Brown's (1974) transects were not completed for surface fuel recording. However, ground cover percentages were monitored and recorded.

Data that were collected and each plot include both site characteristics and specific vegetation and fuel parameters. Based on visual analysis and fuel loading information, each plot was assigned a Fire Behavior Fuel Model from the Anderson (1982) 13 fuel models. The vegetation and fuels data collection took place with a fixed plot radius of 37.2 feet (0.10-acre area). This follows similar protocol for USFS fuels monitoring in the region. Also, the national FIREMON protocol considers a 0.10-acre plot the best tradeoff between data value and efficiency (Fluder et al. 2005).

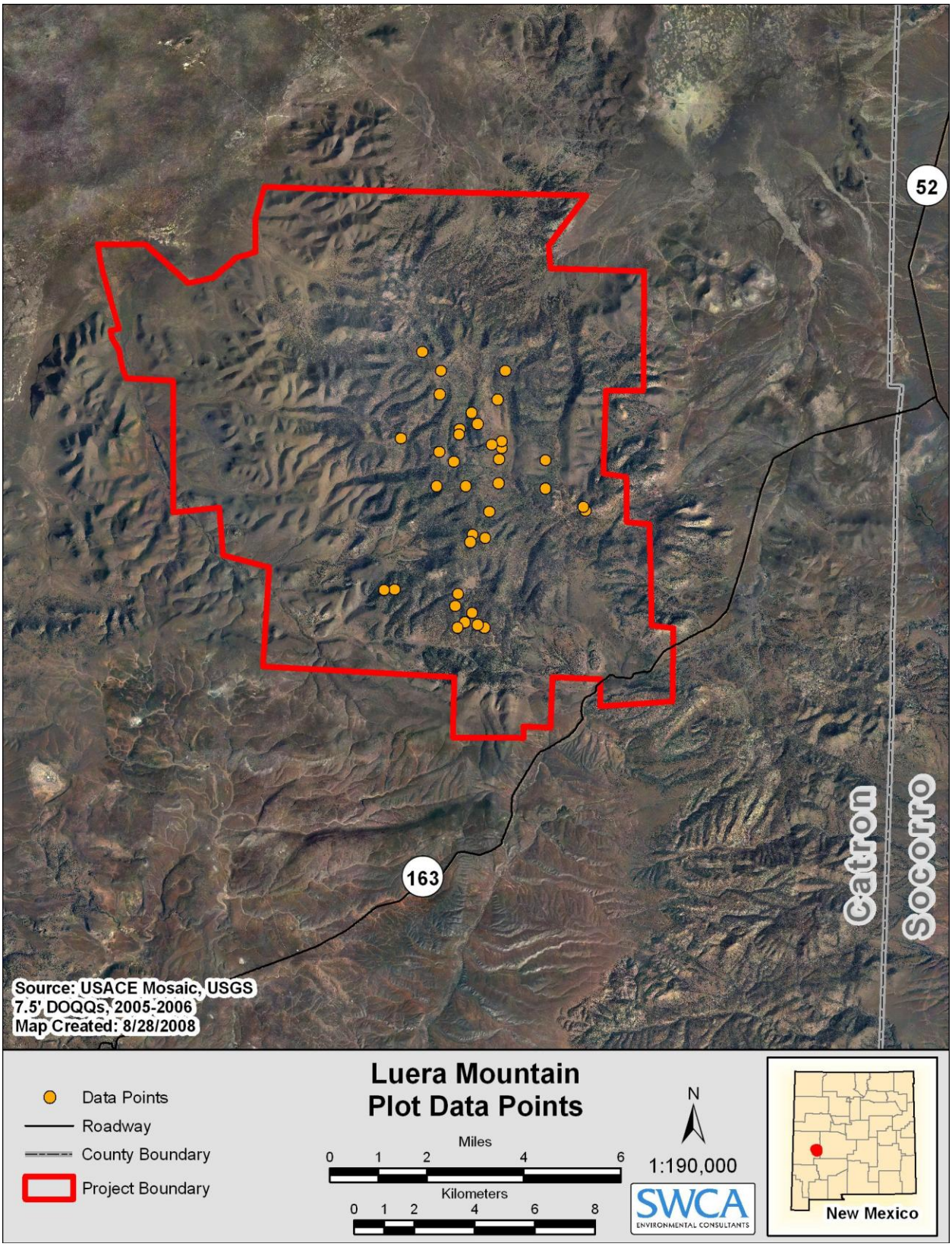


Figure 2.1. Luera Mountain surveyed vegetation plots.

3.0 PROJECT AREA

3.1 LOCATION DESCRIPTION

The Luera Mountain project area is an approximately 58,922-acre block of state trust and private land located in east-central Catron County, New Mexico. Luera Mountain is bordered by state trust, Bureau of Land Management (BLM), and private properties. The mountain range is approximately 34 miles northwest of Winston, New Mexico, and 42 miles southwest of Magdalena, New Mexico (Figure 3.1). The elevation ranges from 7,150 feet at the base of the mountain to 9,482 feet on Luera Peak.

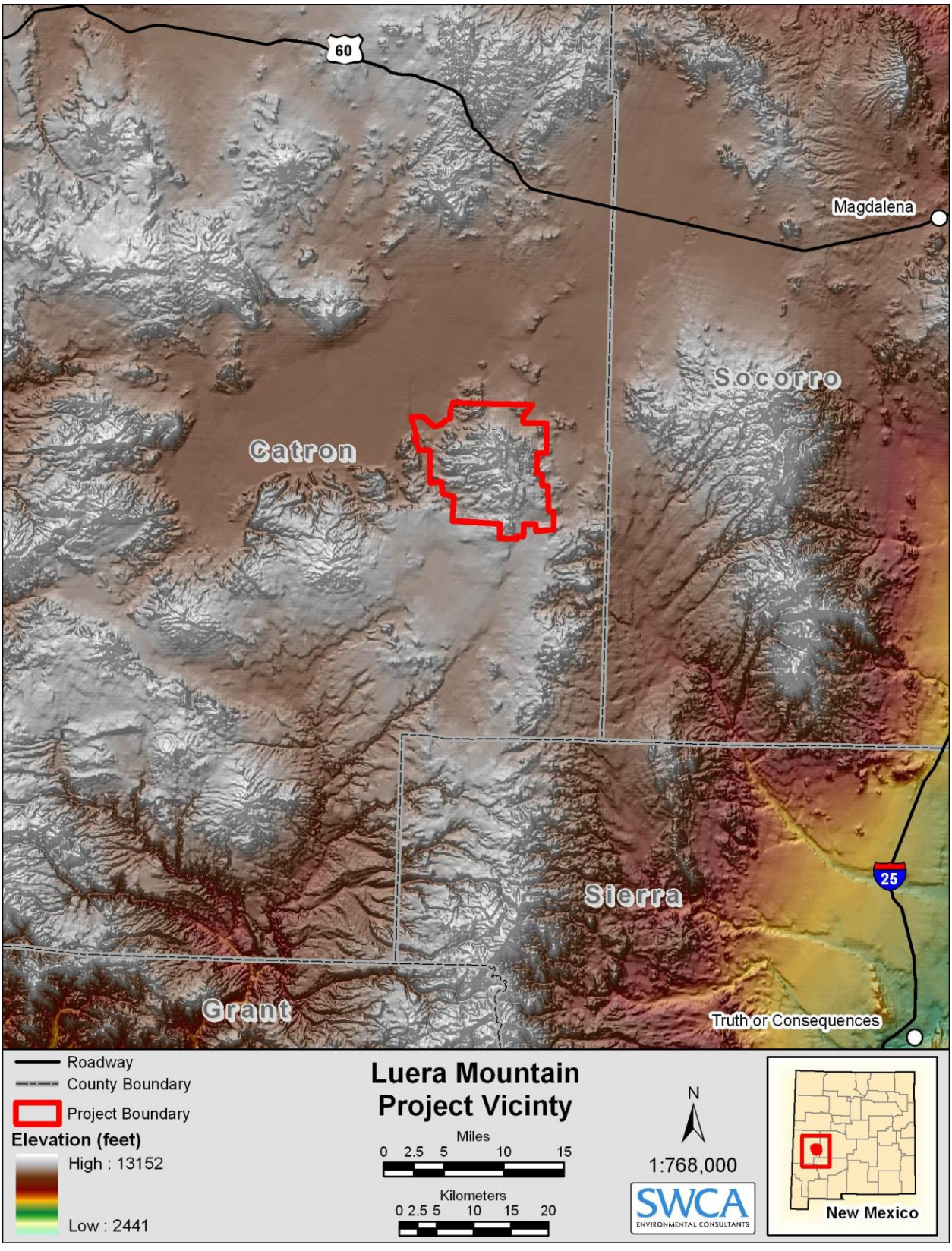


Figure 3.1. Luera Mountain project vicinity.

3.2 HISTORICAL USE

Luera Mountain was established in 1905 as a component of the Datil National Forest. Once established as public domain, Luera Mountain was utilized for timber, mining, agricultural, and hunting opportunities. In 1922, under an act (42 Stat. 465) to consolidate National Forest lands, the Luera Mountain tracts were identified for transfer to the State of New Mexico. In 1925, under an amended act (45 Stat. 1090) 28,370.55 acres were officially conveyed to the State of New Mexico, specifically the SLO. Since then, a search of SLO records indicates that Luera Mountain has been used primarily for grazing, as well as hunting and some timber harvesting, over the last 80 plus years.

3.3 EXISTING USE

Currently, domestic livestock grazing and hunting are the primary activities currently taking place on Luera Mountain. Domestic livestock grazing has helped shape the landscape and has altered the fuel loading, forest stand densities, and wildland fire behavior. Wildfires are able to burn and spread more readily on the Farr Ranch lease area (west side of Luera Mountain), because it is less intensively grazed than the Luera or Harriet Ranch leased areas (east and north side of Luera Mountain). The current lack of fuels in these areas will limit the fire management activities that can be completed.

3.4 PHYSICAL SITE DESCRIPTION

The east boundary starts at the northeast corner of Section 19, Township 5 South, Range 9 West (T5S/R9W) and heads due south until it intersects with the southeast corner of Section 31 (T5S/R9W). The east boundary proceeds west along the southern boundary of Section 31 to the southwest corner of the same section, then proceeds due south along the Range 10 West boundary but also incorporates portions of Section 18 (T6S/R9W), all of Sections 19, 30, 31(T6S/R9W) and portions of Section 32 (T6S/R9W). The east boundary continues south to Section 5 (T7S/R9W) to the south boundary line.

The south boundary incorporates portions of Sections 5 and 6 (T7S/R9W) headed west until the Section 6 west boundary line. The south boundary turns north along Section 6 to southeast corner of Section 36 (T6S/R10W) and then proceeds west. It drops down to include Sections 2 and 3 of (T7S/R10W) and continues west along the northern boundary of Township 7 South. The south boundary ends at the southwest corner of Section 36 (T6S/R11W).

The west boundary proceeds north from the southwest corner of Section 36 (T6S/R11W) to the following Sections of (T6S/R11W): 36, 25, and 23 (south and west boundary), 15 (south and west boundary), 10 and 3. The west boundary turns due west along the southern boundaries of Section 33 (T5S/R11W) and turns north at Section 33 and proceeds through portions of Sections 28 and 21 (T5S/R11W).

The north boundary heads due east at the northwest corner of Section 21 (T5S/R11W) and proceeds through Sections 21, 22, 23 and 24 (T5S/R11W). The north boundary then proceeds north to include Section 13 (T5S/R11W) and heads due east to include the northern boundaries of Sections 18, 17, 16, 15, 14 and 13 (T5S/R10W). The boundary proceeds diagonal to the southwest across Sections 13 and 24 (T5S/R10W), and then turns east along Section 24 to Section 19 (T5S/R10W) to the east boundary of the fuels management plan.

Figure 3.2 displays the project property boundaries.

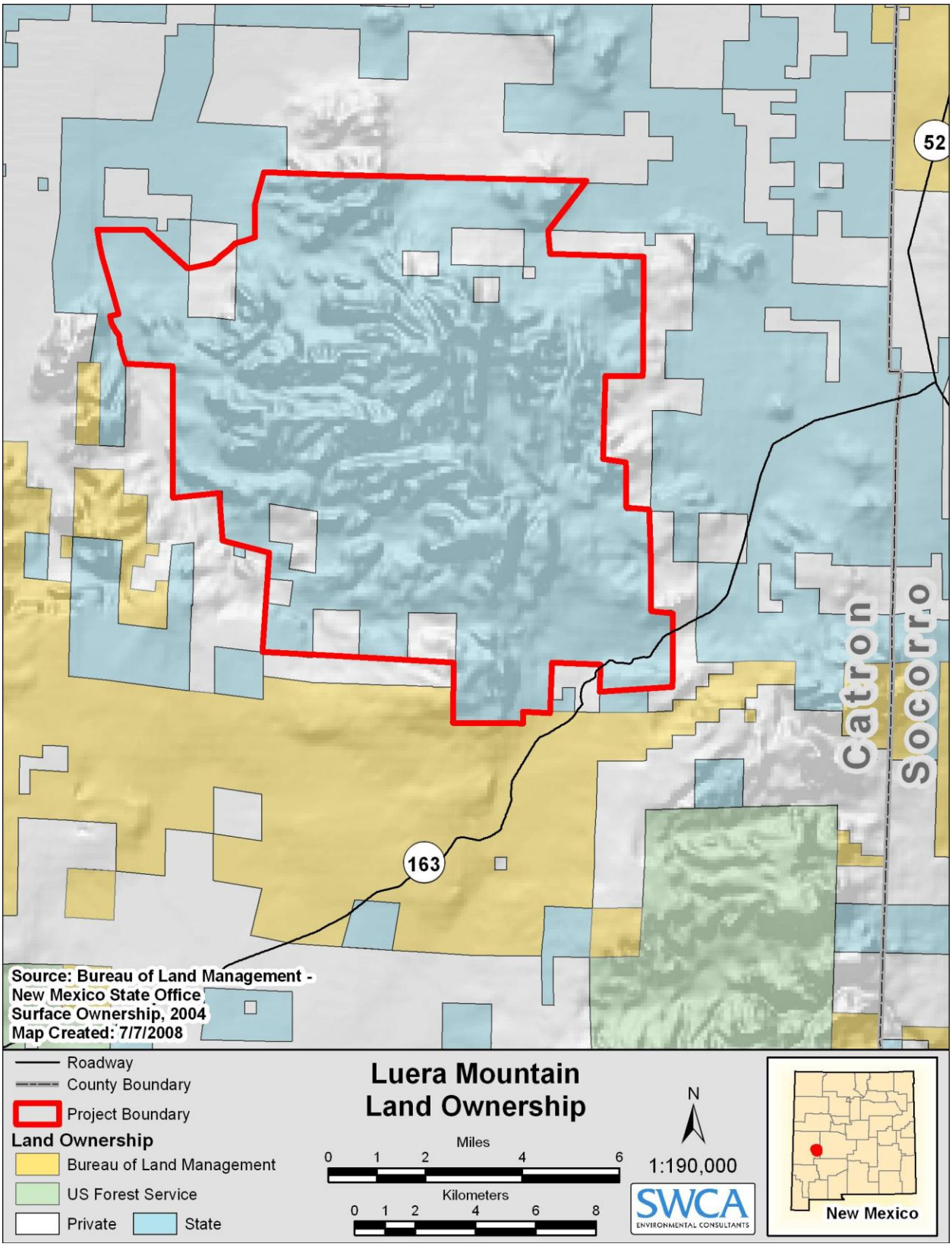


Figure 3.2. Luera Mountain property boundaries.

4.0 LUERA MOUNTAIN RESOURCES

4.1 VEGETATION CLASSIFICATION

The different vegetation types were classified by species composition through previous research conducted on Luera Mountain and is consistent with updated vegetation analysis. The forested areas are further classified by stand density.

Grasslands (GR)	Non-forested areas with less than 10% crown closure of tree species.
Piñon / Juniper (PJ) woodland	A mixture of piñon pine (*Pinus edulis*), one-seed juniper (*Juniperus monosperma*), alligator juniper (*J. deppeana*), and/or Rocky Mountain juniper (*J. scopulorum*), sometimes with small numbers of ponderosa pine (*Pinus ponderosa*), Gambel oak (*Quercus gambelii*), and/or Emory oak (*Q. emoryi*).
Ponderosa Pine (PP) forest	Composed of 75% or more ponderosa pine (as compared to other tree species).
Mixed Conifer (MC) forest	A mixture of Douglas-fir (*Pseudotsuga enziesii*), southwestern white pine (*Pinus strobiformis*), and ponderosa pine.
Oak (O) woodland	Composed of pure stands of Gambel oak and/or Emory oak.

A large amount of vegetation is based on GIS data; however the tree species mentioned above are the dominant vegetation types and are what will be analyzed. The following figures show the vegetation of the project area (Figure 4.1) followed by the four quadrants of Luera Mountain (Figure 4.2–Figure 4.5). Table 4.1 denotes the vegetation types for Figure 4.1–Figure 4.5.

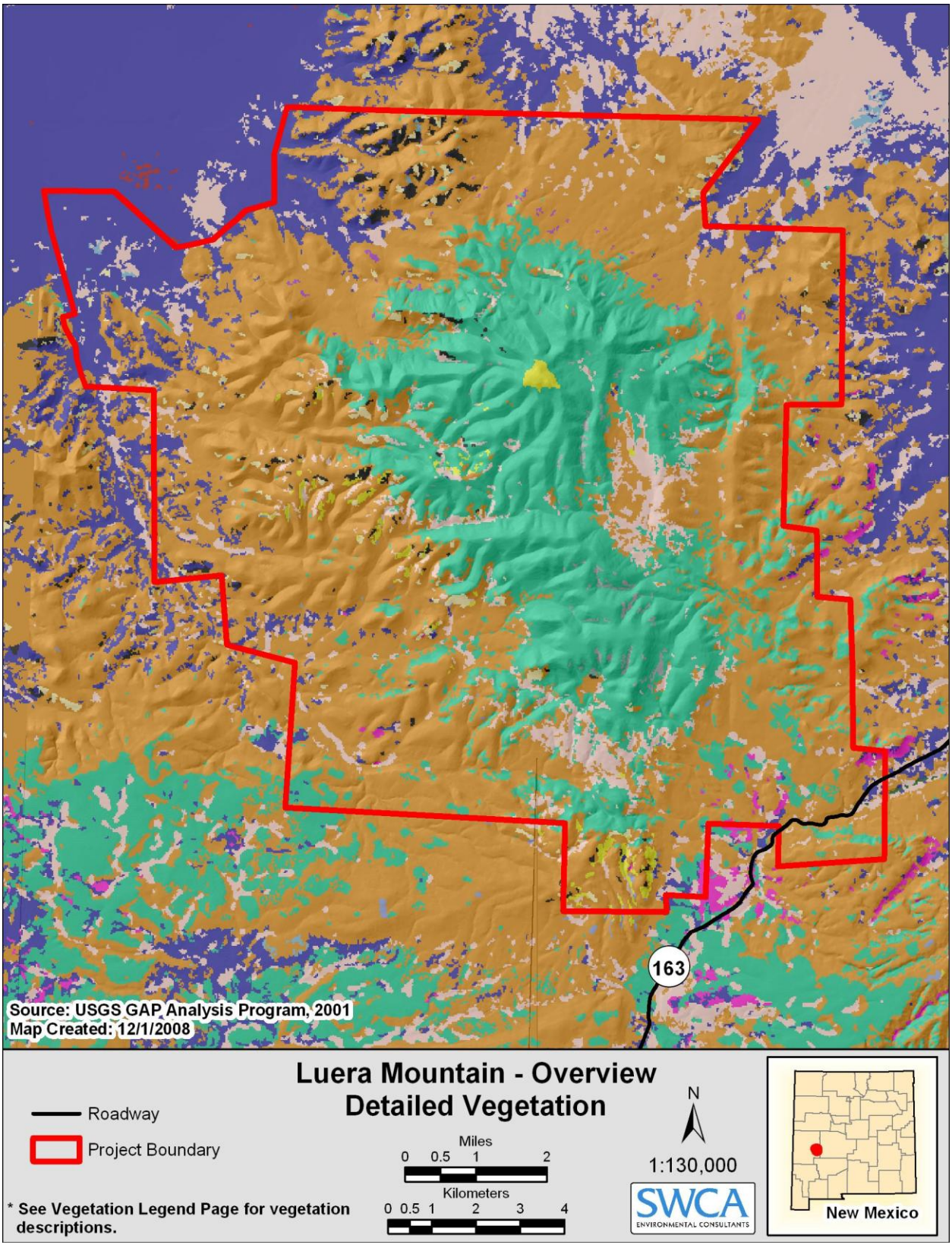


Figure 4.1. Vegetation overview.

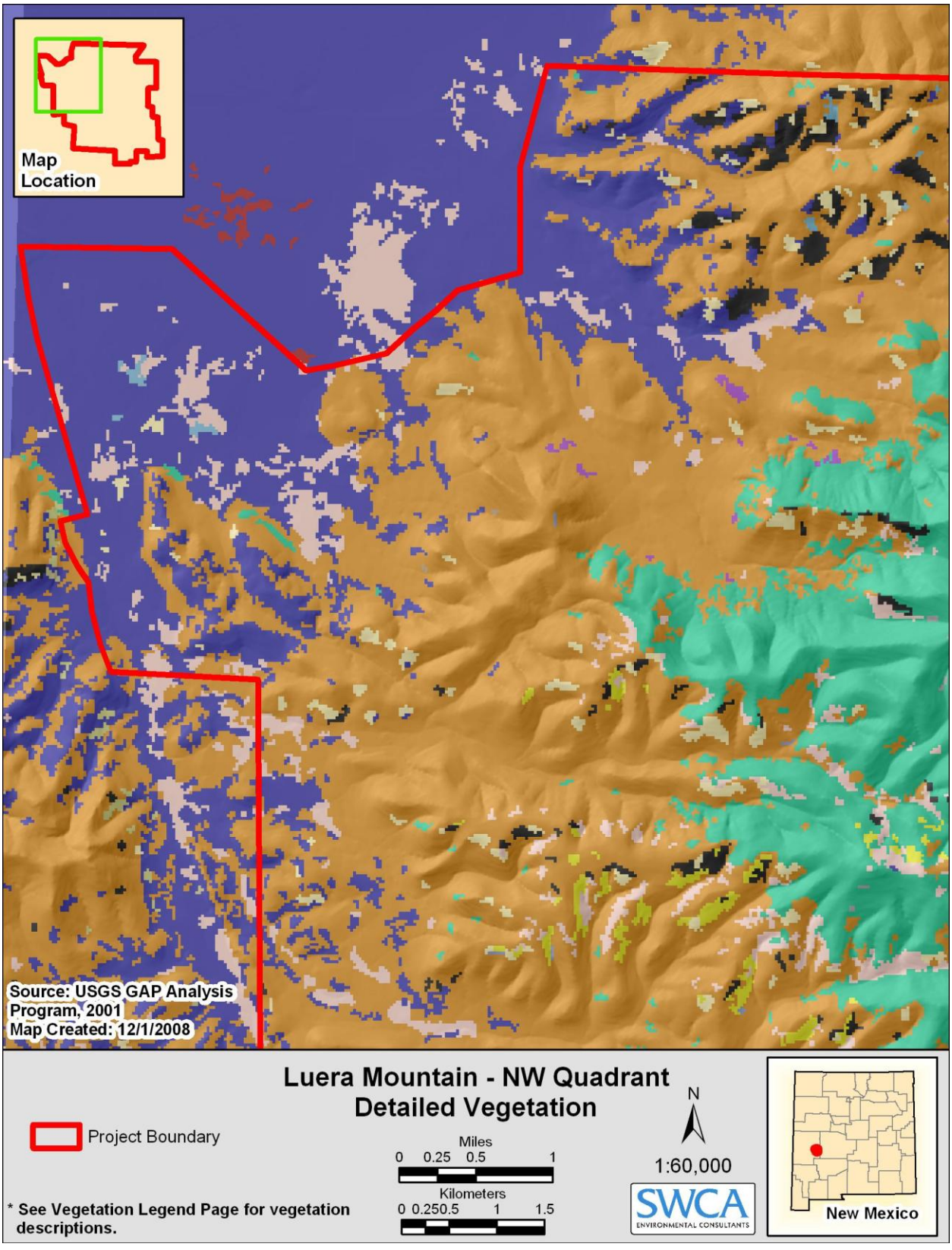


Figure 4.2. Northwest quadrant.

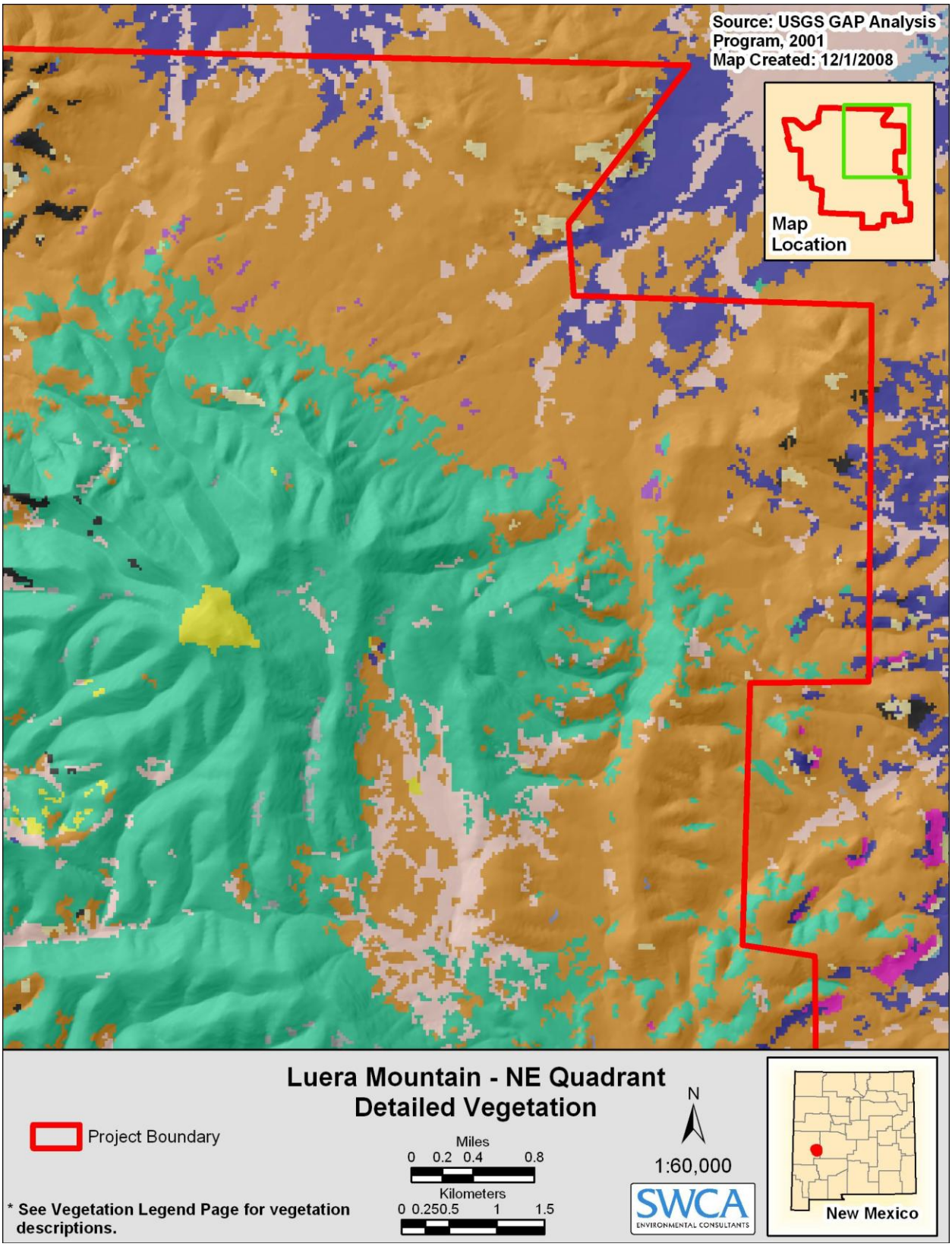


Figure 4.3. Northeast quadrant.

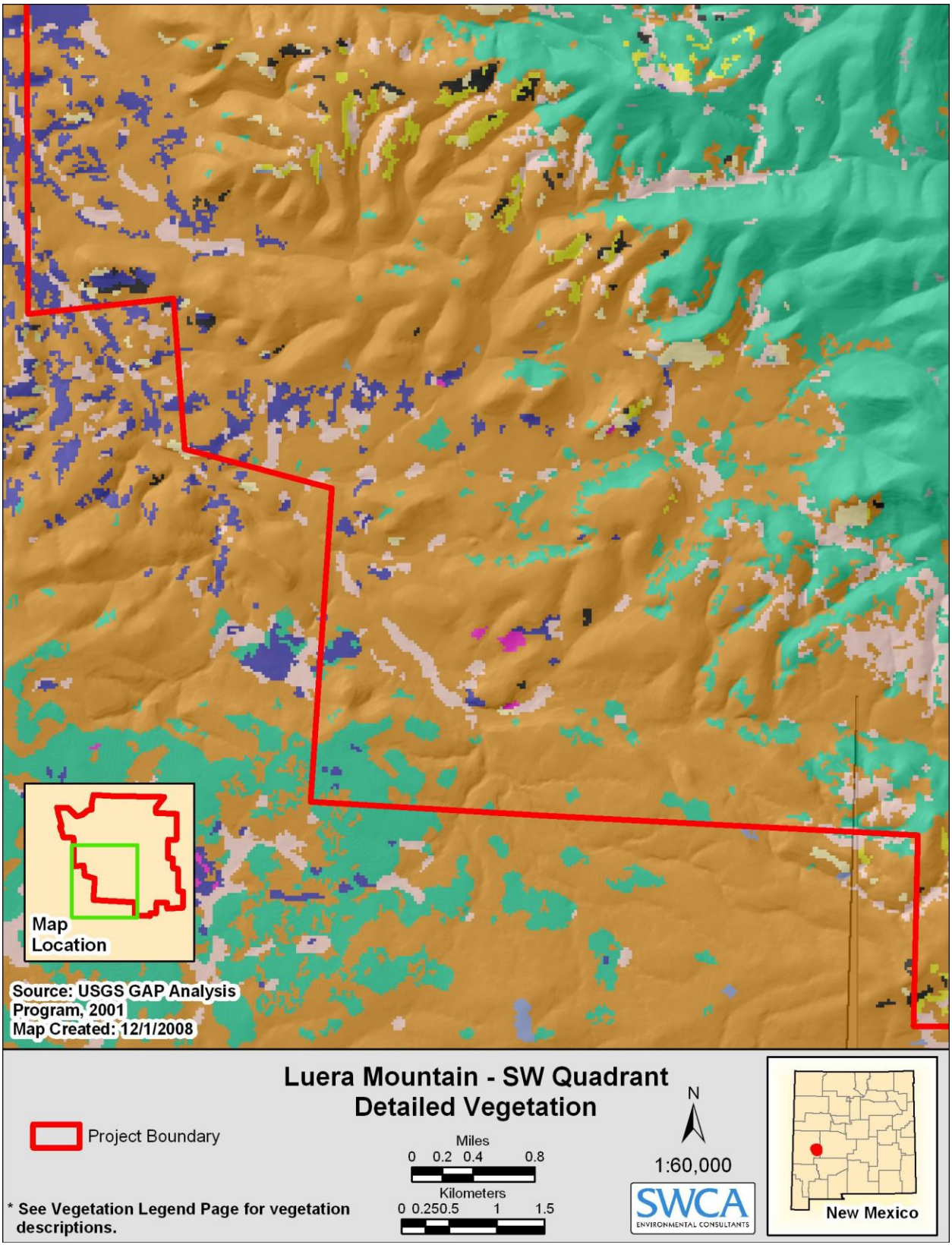


Figure 4.4. Southwest quadrant.

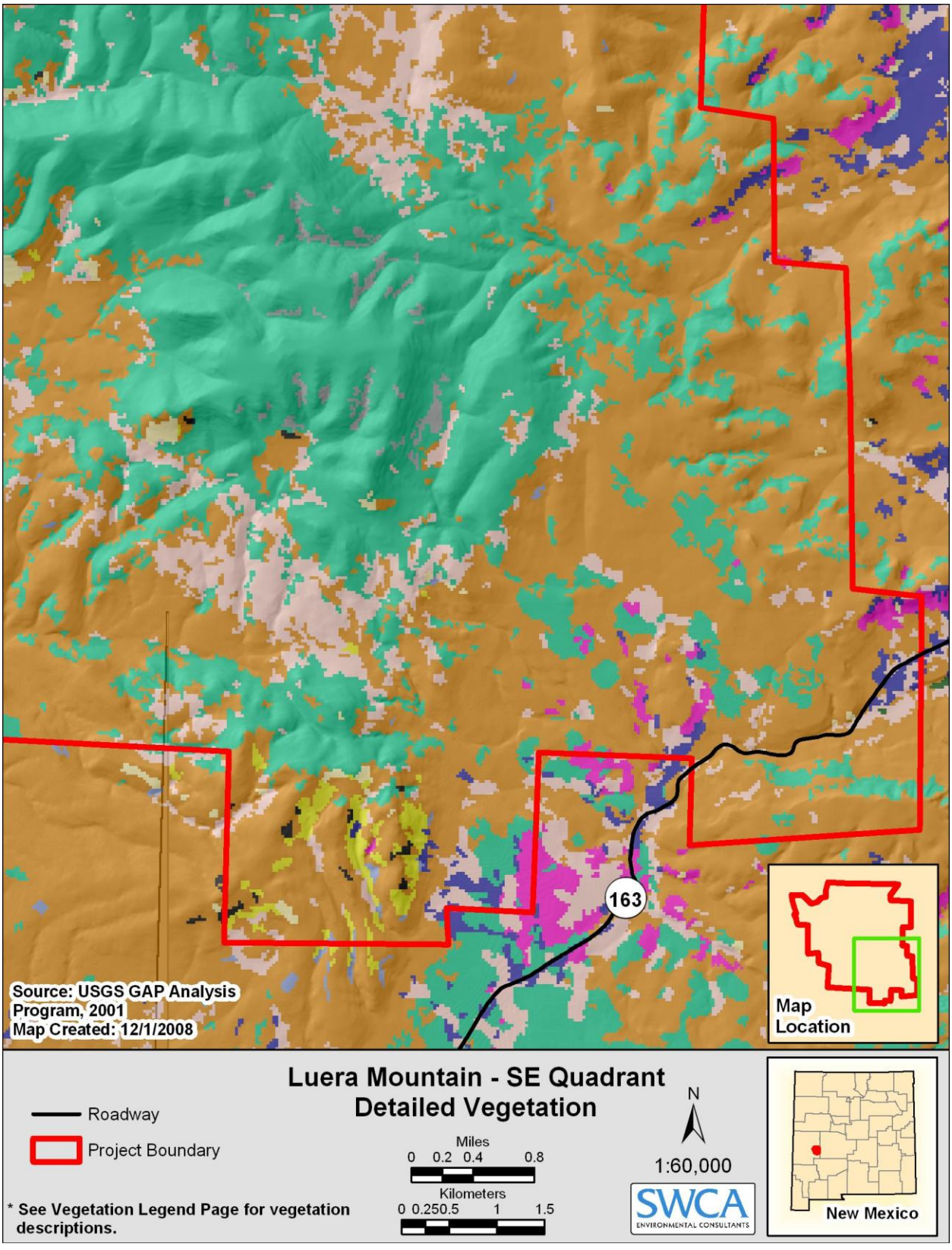
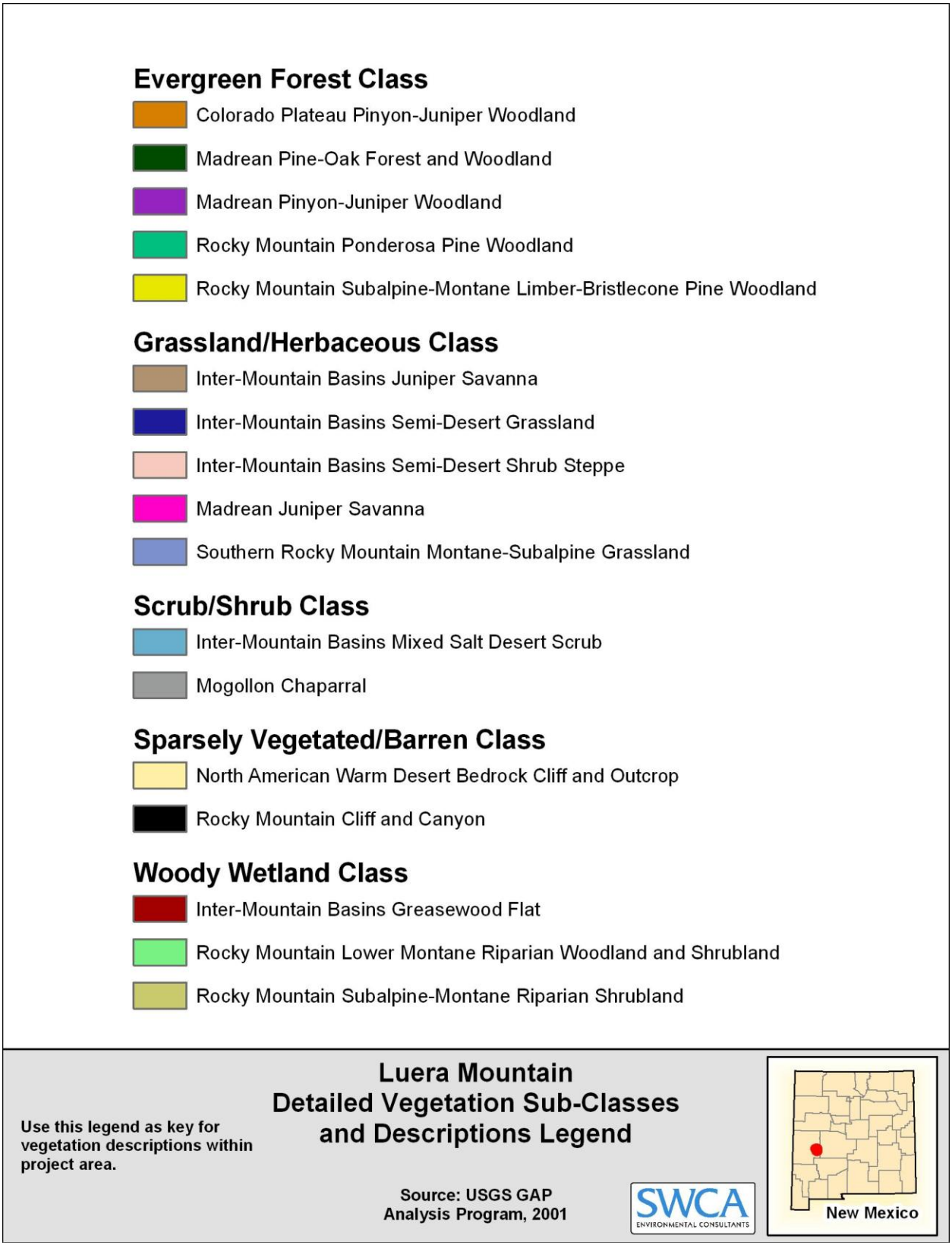


Figure 4.5. Southeast quadrant.

Table 4.1. Legend for Vegetation Map



4.2 FUEL MODELS

Based on GIS data and analysis, six primary fuel models will be used to classify different areas within the Luera Mountain area. These fuel models are consistent with the fixed data plots that were recorded and observed. The following maps (Figure 4.6–Figure 4.10) are broken down along the same lines as the vegetation maps and should be referred to when discussing projects and treatments.

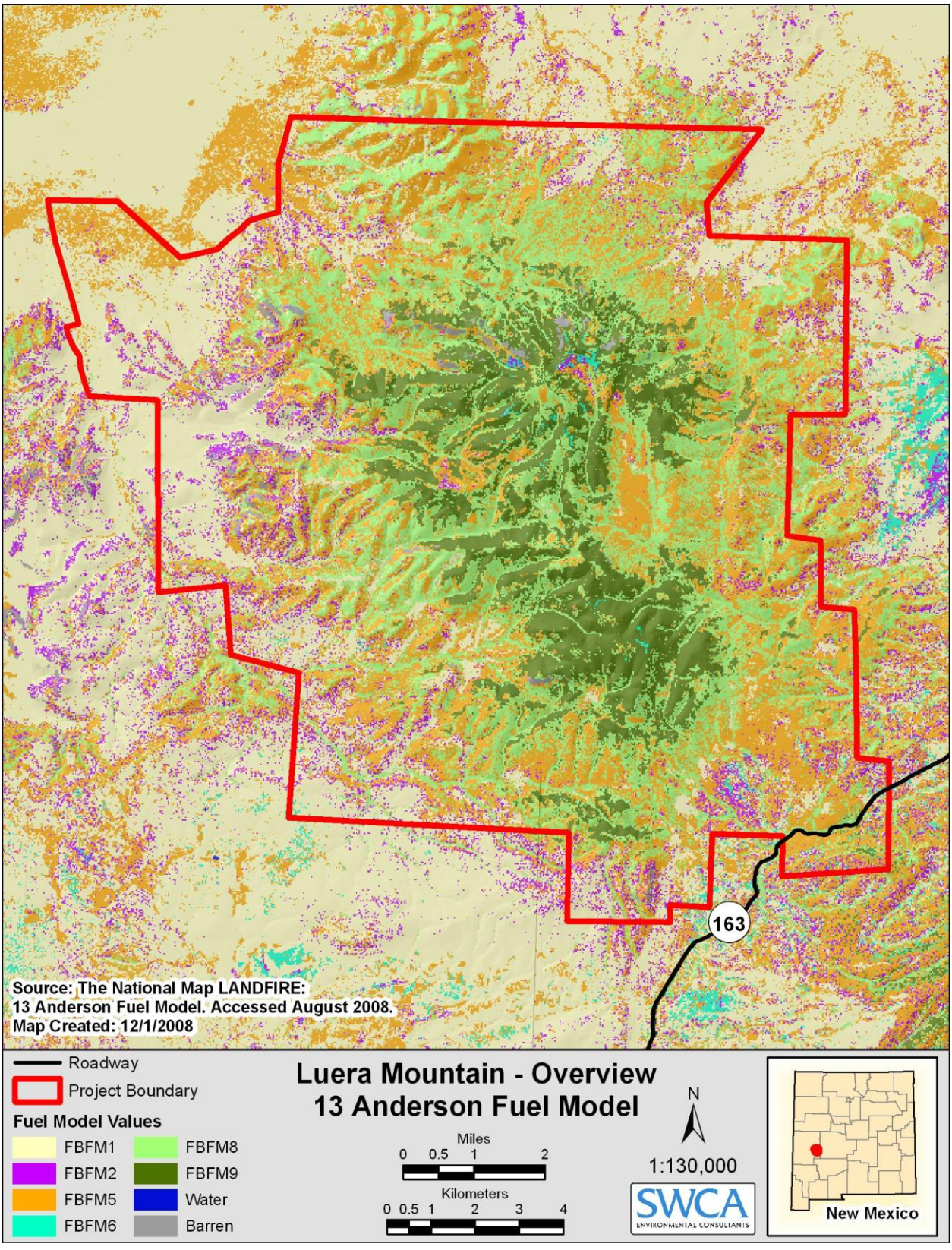


Figure 4.6. Fuel type overview.

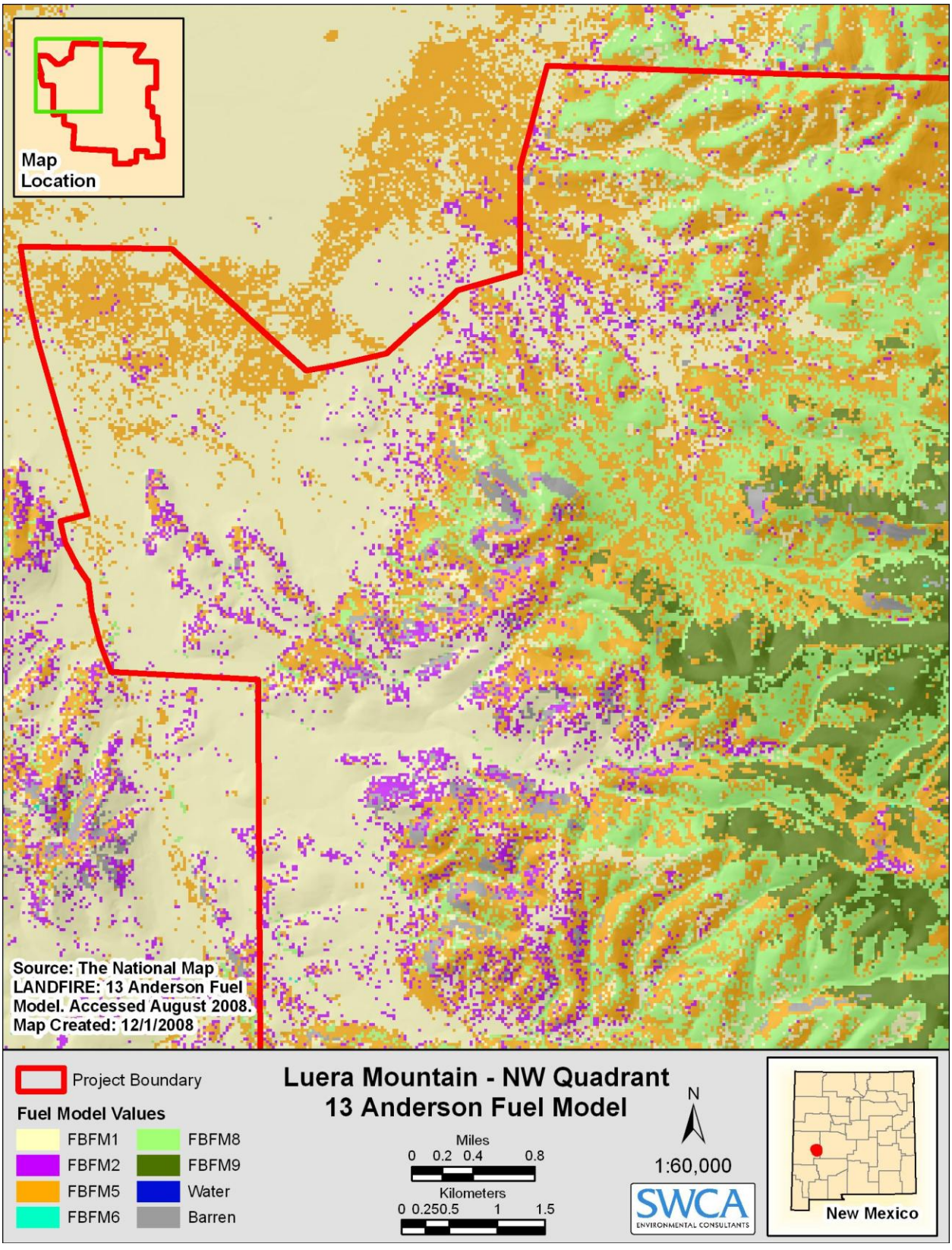


Figure 4.7. Northwest quadrant.

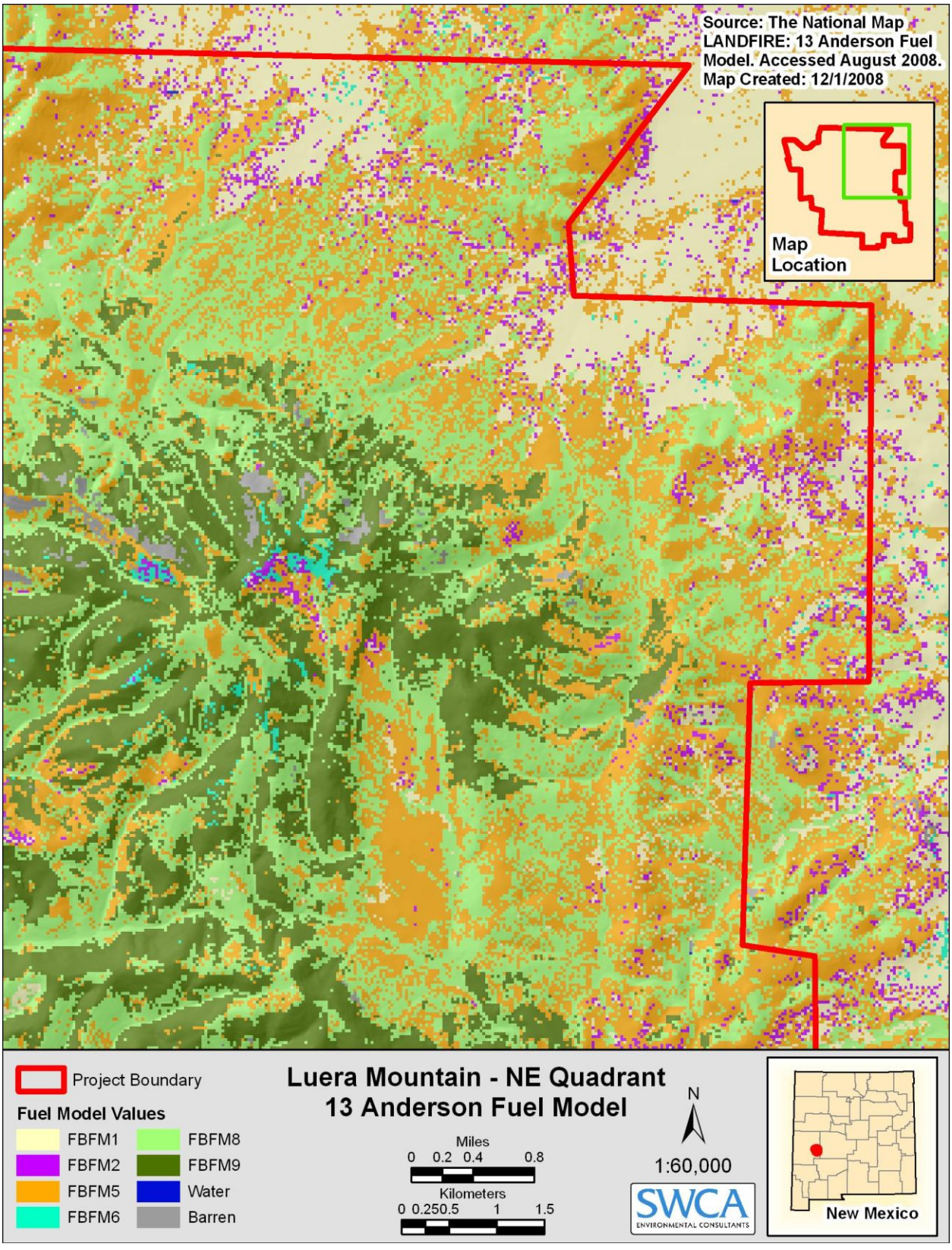


Figure 4.8. Northeast quadrant.

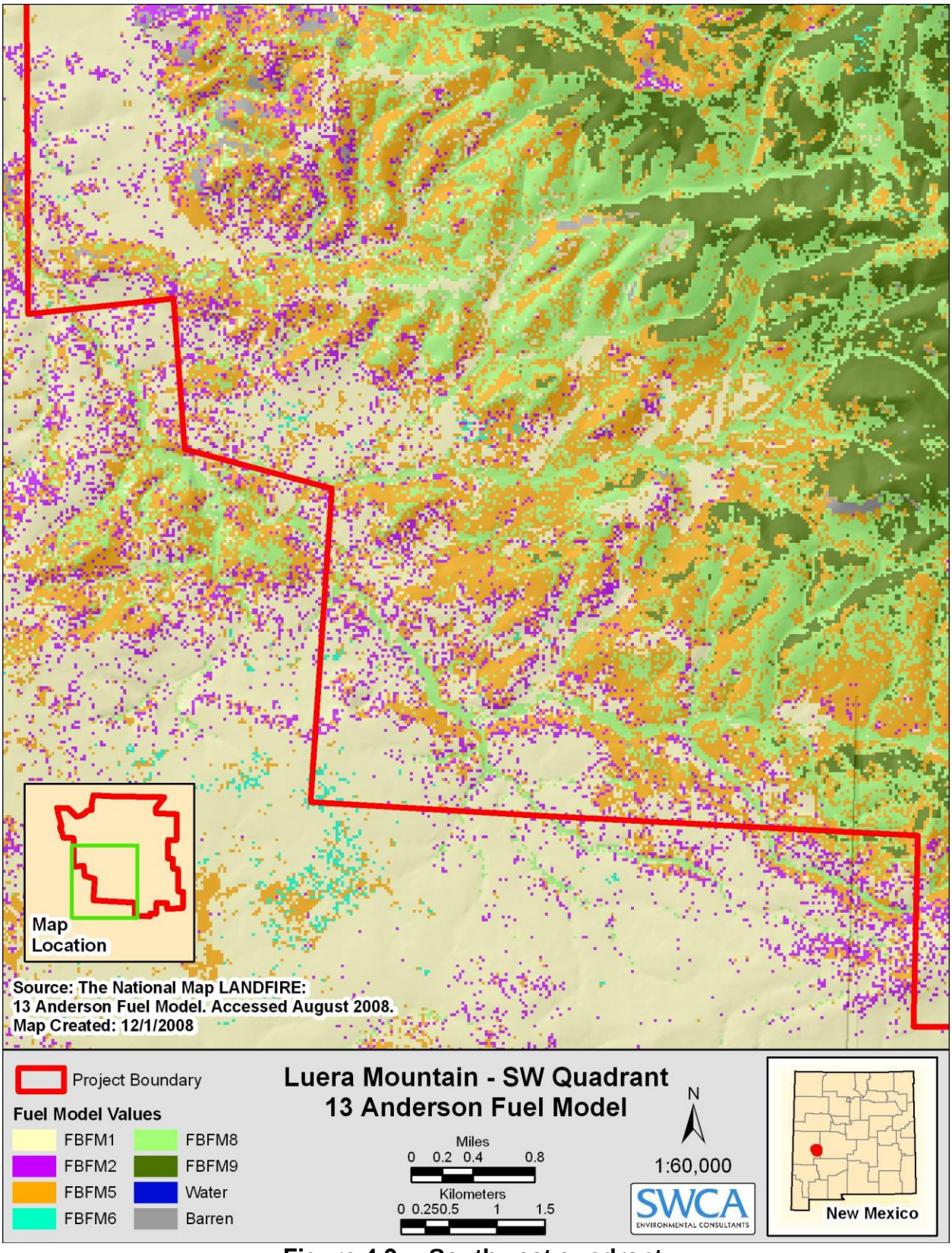


Figure 4.9. Southwest quadrant.

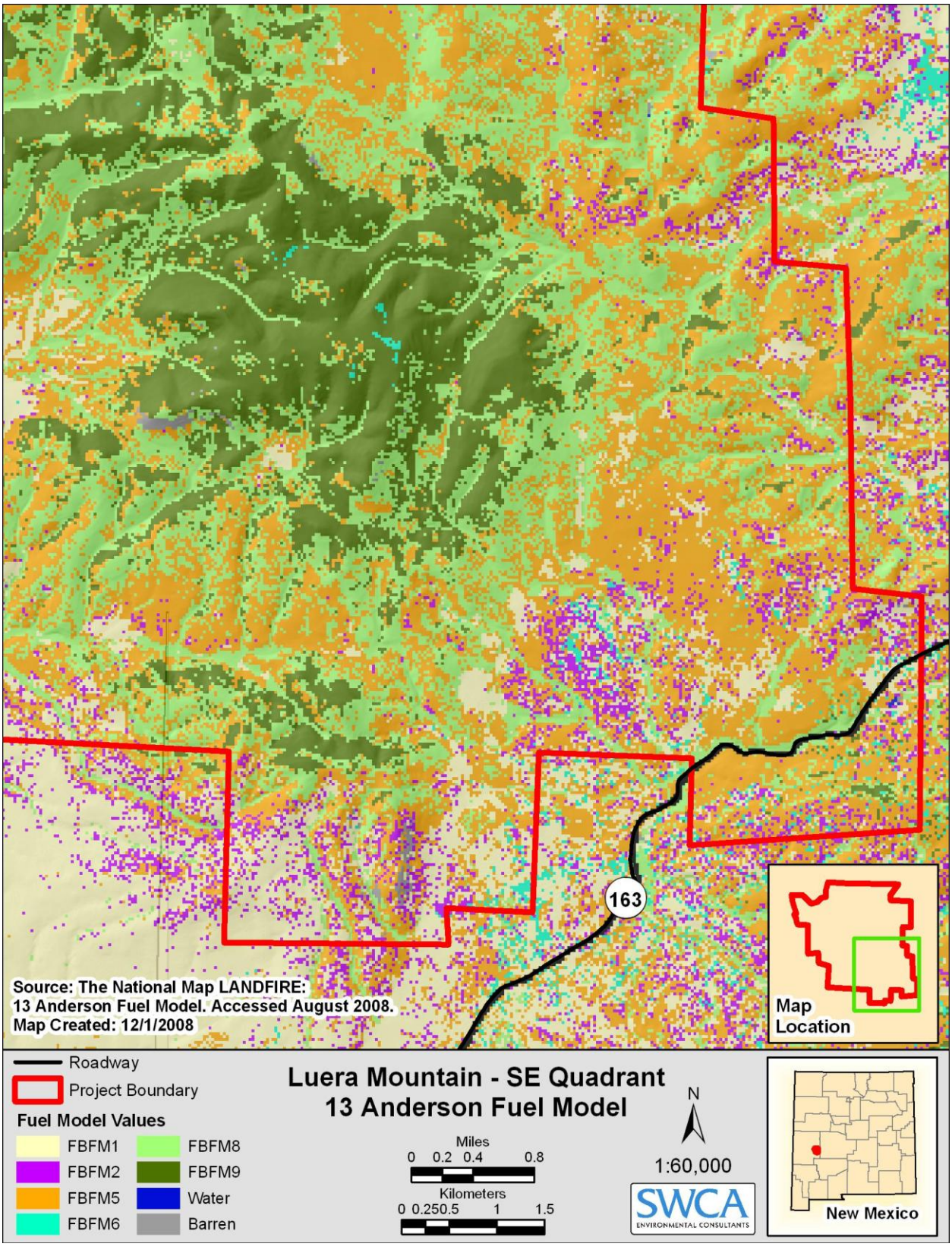


Figure 4.10. Southeast quadrant.

These fuel model descriptions are directly from Anderson's (1982) publication *Aids to Determining Fuel Models for Estimating Fire Behavior***.** Further descriptions will be covered in Sections 6.0 and 7.0 that further justify the chosen fuel models.

Fire Behavior Fuel Model 1
Fire spread is governed by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one-third of the area.

Grasslands and savanna are represented along with stubble, grass-tundra, and grass-shrub combinations that met the above area constraint. Annual and perennial grasses are included in this fuel model.

Fire Behavior Fuel Model 2
Fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and dead and downed stemwood from the open shrub or timber overstory, contribute to the fire intensity. Open shrub lands and pine stands or scrub oak stands that cover one-third to two-thirds of the area may generally fit this model; such stands may include clumps of fuels that generate higher intensities and that may produce firebrands. Some piñon/juniper may be in this model.

Fire Behavior Fuel Model 5
Fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and the grasses or forbs in the understory. The fires are generally not very intense because surface fuel loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material. Usually shrubs are short and almost totally cover the area. Young, green stands with no dead wood would qualify such as, laurel, vine maple, alder, or even chaparral, manzanita, or chamise.

Fire Behavior Fuel Model 6
Fires carry through the shrub layer where the foliage is more flammable than Fire Behavior Fuel Model 5, but this requires moderate winds, greater than 8 miles per hour (mph) (13 km/h) at mid-flame height. Fire will drop to the ground at low wind speeds or at openings in the stand. The shrubs are older, but not as tall as shrub types of Fire Behavior Fuel Model 4, nor do they contain as much fuel. A broad range of shrub conditions is covered by this model. Fuel situations to be considered include intermediate stands of chamise, chaparral, oak brush, low pocosin, Alaskan spruce taiga, and shrub tundra. Even hardwood slash that has cured can be considered. Piñon/juniper shrublands may be represented but may overpredict rate of spread except at high winds, like 20 mph (32 km/h) at the 20-foot level.

Fire Behavior Fuel Model 8
Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional "jackpot" or heavy fuel concentration that can flare up. Fuels pose fire hazards only under severe weather conditions involving high temperatures, low humidity, and high winds. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are white pine, lodgepole pine, spruce, fir, and larch.

Fire Behavior Fuel Model 9
Fires run through the surface litter faster than Fire Behavior Fuel Model 8 and have longer flame height. Both long-needle conifer stands and hardwood stands, especially the oak-hickory types, are typical. Fall fires in hardwoods are predictable, but high winds will actually cause higher rates of spread than predicted because of spotting caused by rolling and blowing leaves. Closed stands of long-needled pine like ponderosa pine, Jeffrey pine, red pine, or southern pine plantations are grouped in this model. Concentrations of dead and downed woody material will contribute to possible torching out of trees, spotting, and crowning.

4.3 RANGE

4.3.1 Vegetation/Species

The major grass species on Luera Mountain are blue grama (*Bouteloua gracilis*), Arizona fescue (*Festuca arizonica*), mountain muhly (*Muhlenbergia montana*), bottlebrush squirreltail (*Elymus scribneri*), three-awn (*Aristada* spp.*)*, pine dropseed *(Blepharoneuron tricholepis)*, western wheatgrass *(Elymus smithii)*, and wolftail *(Lycurus setosus)*. Numerous forbs are also noted scattered throughout the mountain.

The range condition varies from extremely degraded near water sources and salt licks, to excellent on the uplands west of Divide Saddle and near the television/radio towers. The existing meadows have an influx of invading woody species, especially piñon and juniper. Without proactive management of fire and the forest resources, these traditional grassy areas could well be lost to tree invasion in the next 50 years. Many of the areas that are being invaded by trees are also being actively grazed, which reduces the fine fuels to a point that fire will not carry through the area. Prior to initiating any prescribed burn to help maintain meadows, the area to be burned should be rested from grazing for one to two years to help build-up the fine fuel load. One season of rest should also follow any burn (either natural or human-caused) to allow the area to recover.

4.3.2 Agricultural Use

Livestock grazing both on the east and west side of Luera Mountain is the primary agricultural use.

4.3.3 Recommendations

We recommend the following:

- Review historic grazing information and work with SLO lessees and state agencies to plan and implement managed livestock use to maintain or improve range condition/health and improve overall watershed condition.
- Plan and implement brush control where necessary to decrease soil erosion.
- Set up permanent range transects to monitor the condition and trends of the soil, as well as provided carrying capacity data.

4.4 FOREST

4.4.1 Stand Types

The major tree species found on the mountain are piñon pine, one-seed juniper, alligator juniper, Rocky Mountain juniper, ponderosa pine, southwestern white pine (*Pinus strobiformis*), Douglas-fir, aspen (*Populus tremuloides*), Gambel oak, Arizona white oak (*Quercus arizonica*), and emory oak.

The lands on and around Luera Mountain covered by this plan range from open grasslands at the base of the mountain and in the basins to mixed conifer and aspen forests in the canyons and near the top of the mountain. The 27,762 acres of forest on Luera Mountain is dominated by the piñon/juniper woodlands, which cover an estimated 22,317 acres. Ponderosa pine covers an estimated 3,457 acres and mixed conifer covers an estimated 1,988 acres.

4.4.2 Stand Densities

Densities across the Luera Mountain landscape vary considerably between vegetation models. The mixed conifer and ponderosa stands of the higher elevations have higher basal areas than the lower elevation piñon/juniper woodlands. This is to be expected as this is the case when looking at the differences in the vegetation and fuel models. However, the majority of plots within all fuel models have a very high regeneration component that, if not addressed quickly, will continue to invade the grasslands and open stands of ponderosa.

These findings are consistent with data that have been collected in the past across the Luera Mountain area. Piñon and juniper species are invading areas that are historically grasslands (Figure 4.11). In addition, the typical ponderosa pine stands are also being invaded by piñon and juniper, creating an understory that could be catastrophic if a wildfire was to take place. The result of this piñon and juniper component in these areas also leads to a decrease in forage production.

Figure 4.11. Piñon and juniper encroachment within Patrocino Basin.

4.4.3 Grasslands and Upper Woodland

The grasslands and upland areas of the mountain are categorized as Fire Behavior Fuel Model 1 and 2, which are essentially the open woodland models. Although these areas are prevalent at the base of the mountain, within the project area they are going to be non-existent with time because of the high amount of piñon/juniper encroachment that is taking place. Figure 4.12 through Figure 4.17 present piñon/juniper cover type and regeneration information in the project area.

Table 4.2. Tree species

Symbol	Common Name	Scientific Name
QUGA	Gambel oak	*Quercus gambelii*
PIPO	Ponderosa pine	*Pinus ponderosa*
JUDE2	Alligator juniper	*Juniperus deppeana*
JUSC2	Rocky Mountain juniper	*Juniperus scopulorum*
PIST3	Southwestern White pine	*Pinus strobiformis*
ABCO	White fir	*Abies concolor*
PIED2	Piñon pine	*Pinus edulis*

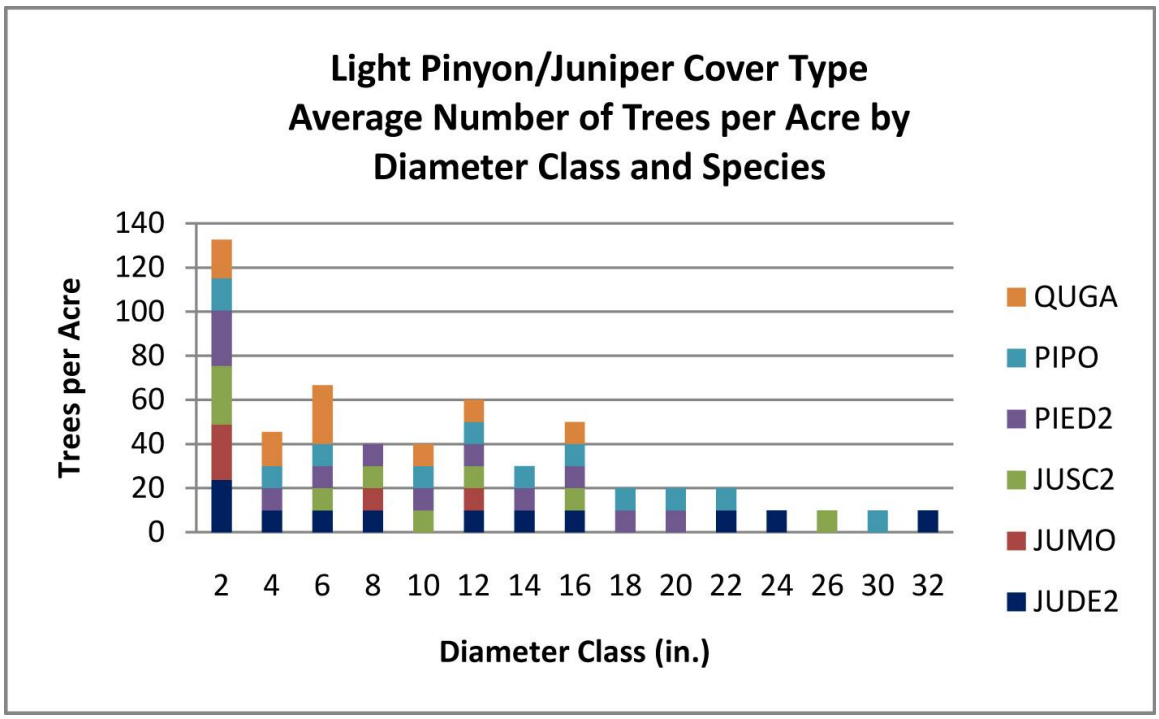


Figure 4.12. Light piñon/juniper cover type by size class and species.

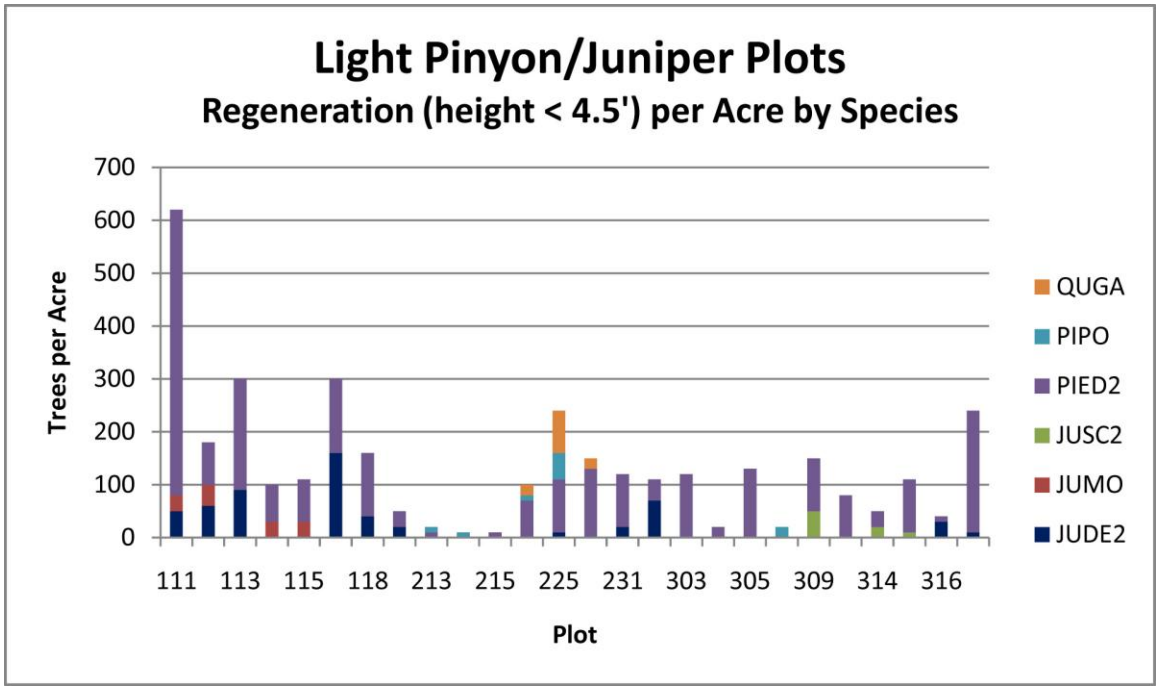


Figure 4.13. Light piñon/juniper regeneration by acre.

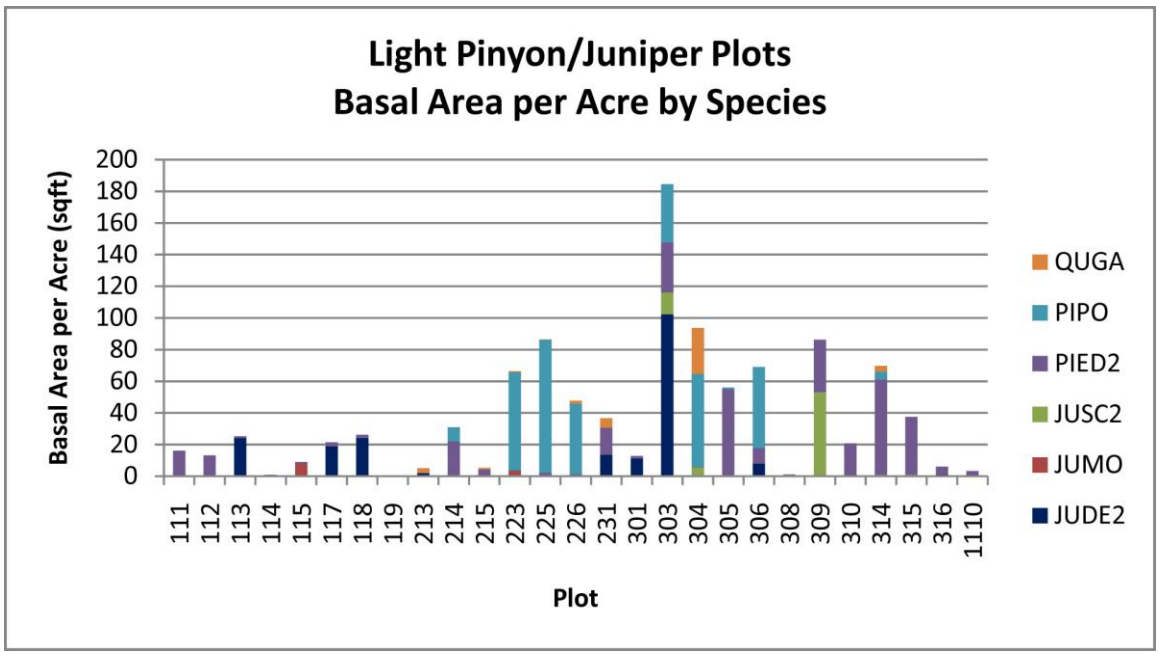


Figure 4.14. Light piñon/juniper basal area per acre.

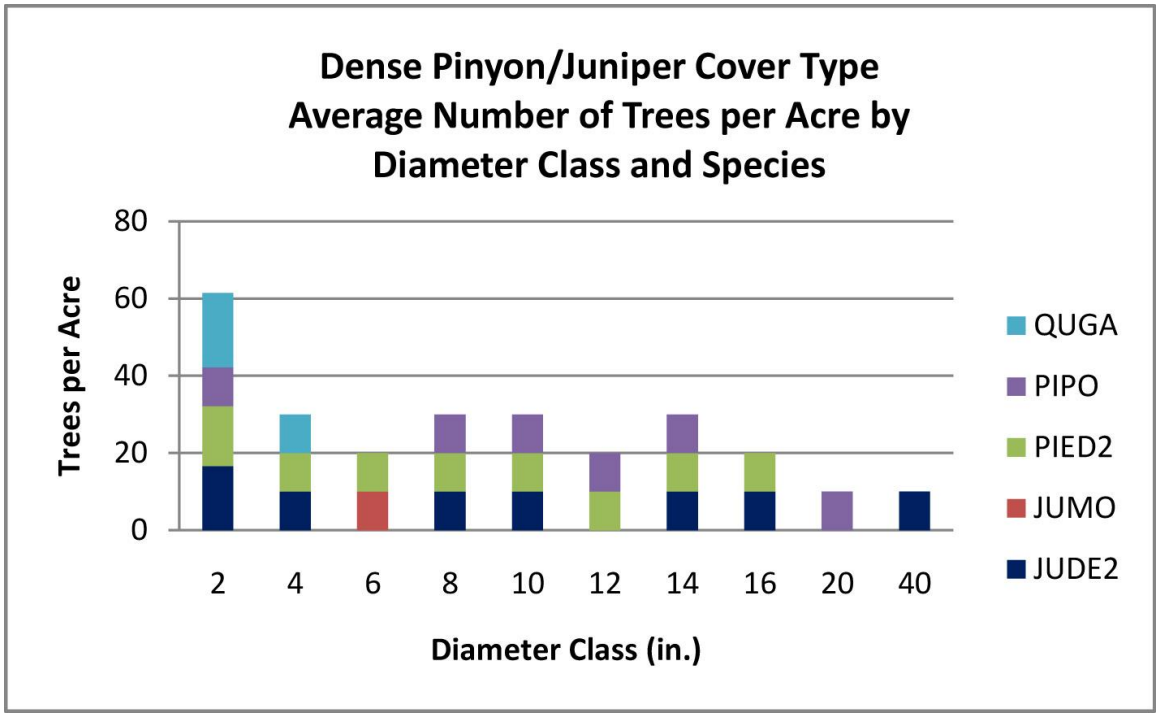


Figure 4.15. Dense piñon/juniper cover type by size class and species.

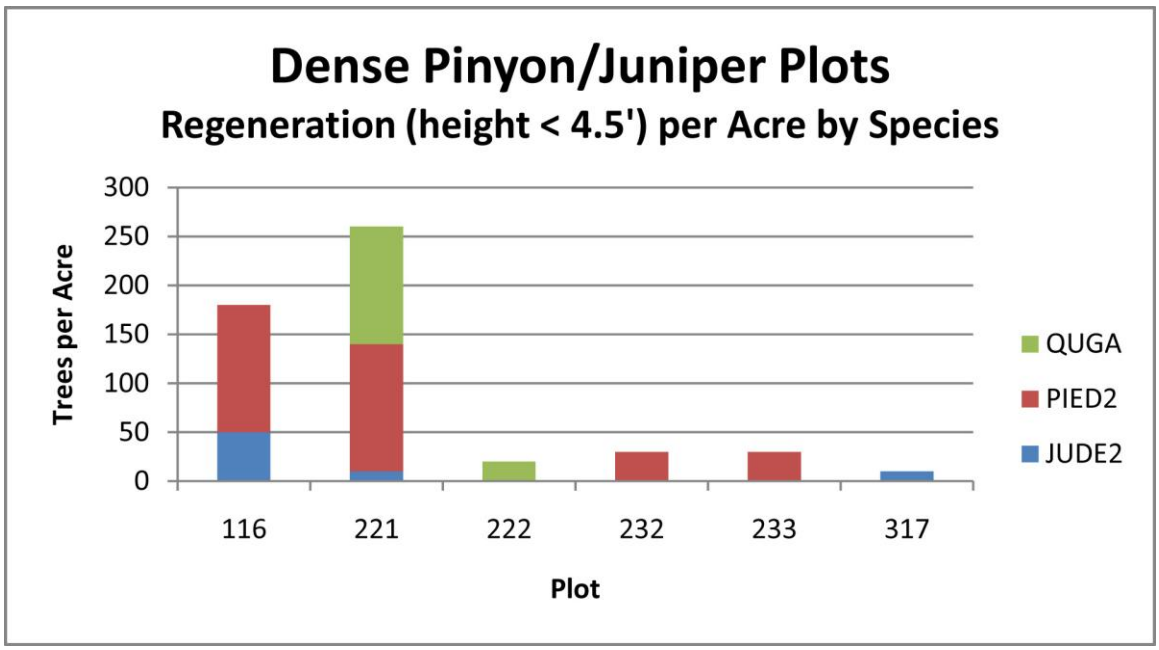


Figure 4.16. Dense piñon/juniper regeneration per acre.

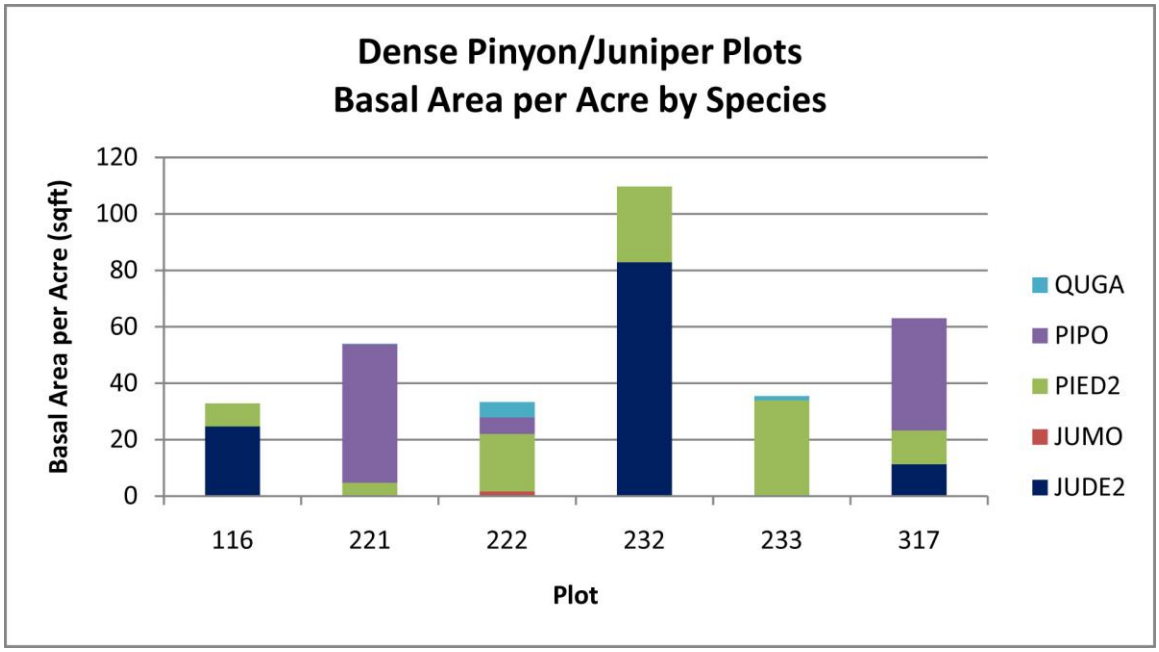


Figure 4.17. Dense piñon/juniper basal area per acre.

In the early 1900s, these areas were primarily savannas or open woodland areas with an understory of mixed grasses. Natural stand-replacing fires had probably occurred at regular intervals of less than 50 years. Subsequent grazing on the Luera Mountain area has reduced or entirely removed the grass component of this ecosystem, which in turn removed the natural fire carrier in these woodlands. This led to fire ignition not being

able to spread for any distance. The lack of these large-scale fires has allowed the piñon and juniper to drastically increase in numbers, resulting in healthy open woodlands becoming overcrowded, thus reducing the health of the trees due to increased competition for available moisture and soil nutrients (Figure 4.18).

Figure 4.18. Piñon and juniper encroachment.

The resulting overcrowded condition favors high intensity, potentially catastrophic wildfire that is difficult to control. The natural piñon/juniper woodland characteristically has very long fire intervals of 200+ years (see Section 6.1). Due to the lack of fuel continuity, it takes a significant wind to drive the fire to burn large acres under this natural condition (Romme, 2007).

4.4.4 Ponderosa Pine and Mixed Conifer

At current stocking levels, the ponderosa pine forest type consists of many acres of healthy forest, particularly around the radio towers to Luera Peak. The majority of plots taken within the ponderosa pine type have relatively low basal areas. However, the transition area between the ponderosa pine type and the piñon/juniper woodland has a large regeneration component of both piñon/juniper and ponderosa pine. In some traditional grassland areas, such as Bathtub Basin, a large amount of ponderosa pine

regeneration is now taking place (Figure 4.19). Figure 4.20 through Figure 4.22 present piñon/juniper cover type and regeneration information in the project area.

Figure 4.19. Ponderosa pine encroachment in Bathtub Basin.

If this encroachment pattern continues, and controlled fire is not reintroduced, densification and homogenization of forest structure will take place. Rather than a predominantly open forest structure with groups and clumps of large trees, we will have dense, continuous canopies devoid of size and age class.

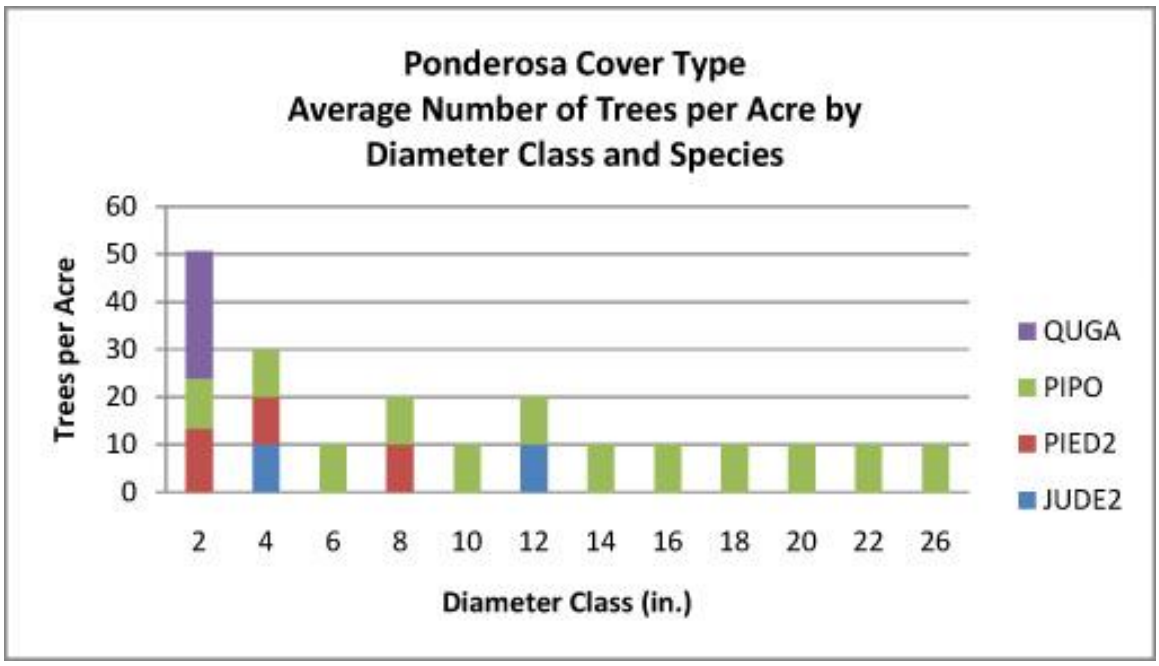


Figure 4.20. Average number of trees per acre with a ponderosa pine cover.

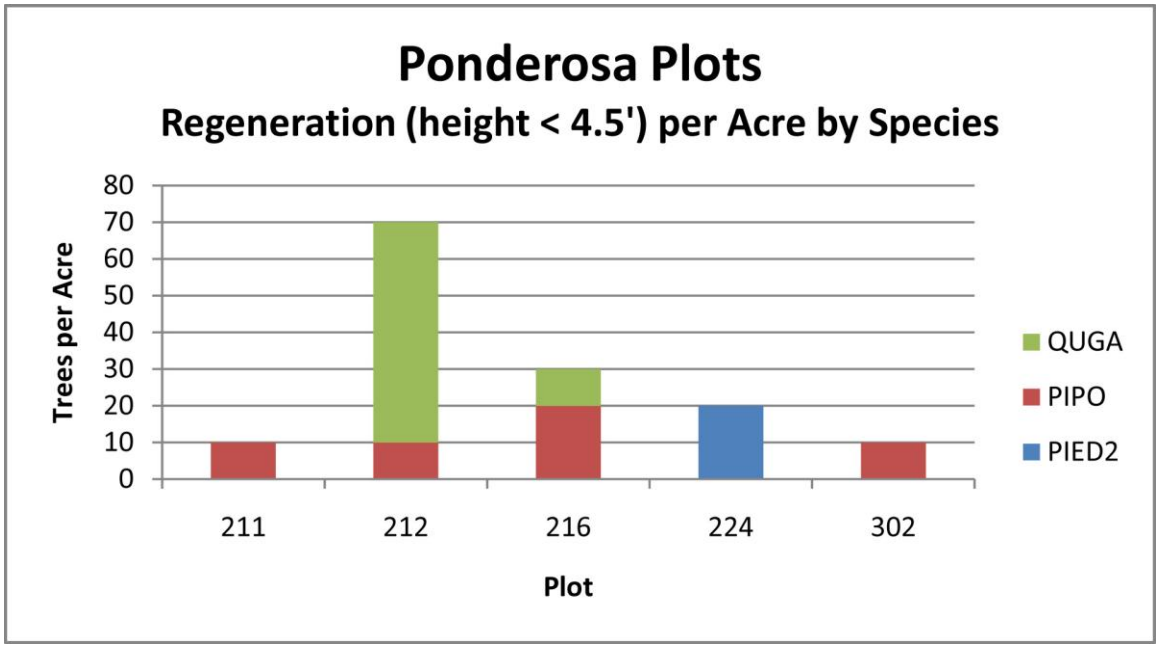


Figure 4.21. Regeneration of trees per acre within ponderosa plots.

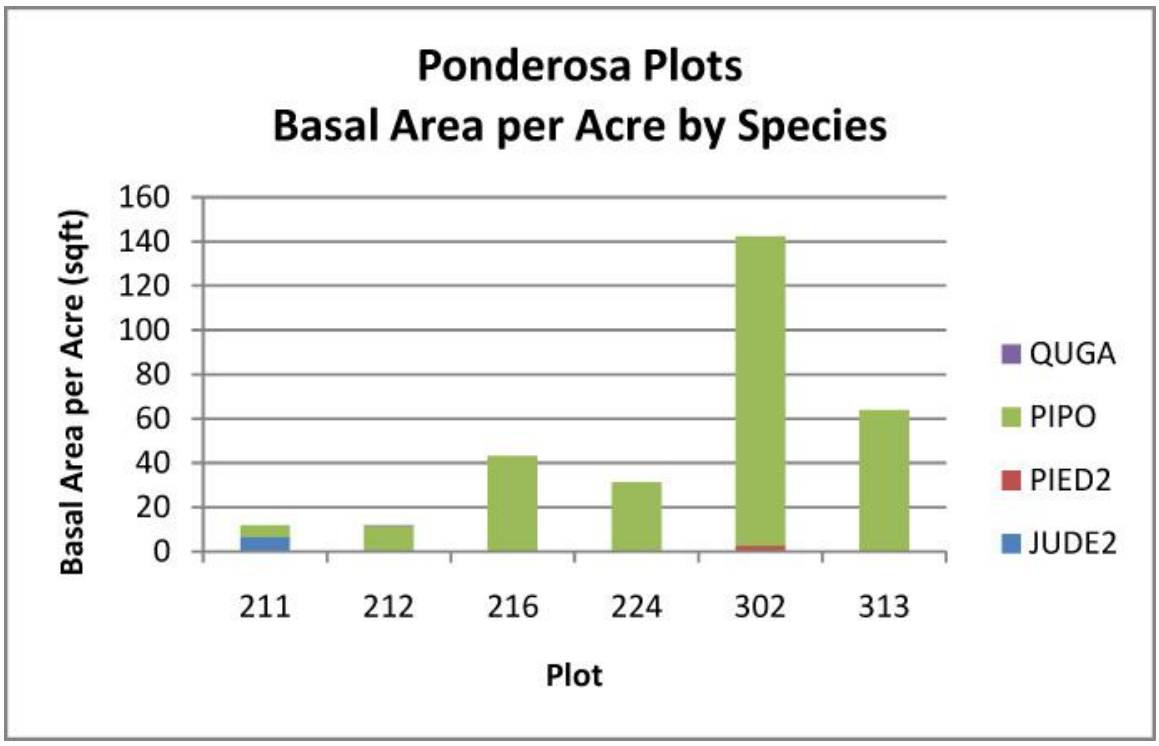


Figure 4.22. Basal area of trees per acre within ponderosa pine dominated plots.

There are very few areas within the mixed conifer vegetation type that are relatively healthy. The timber harvesting that has taken place in the past has helped reduce the stocking levels in some of the ponderosa pine and mixed conifer stands. This is quite evident when traveling up to the Luera lookout. However, the overall health of the trees is very poor due to a high occurrence of mistletoe and overstocking (Figure 4.23).

Figure 4.23. Mixed conifer at Luera Peak.

Because of competing tree species, the complexity of mixed-dry conifer is increased when it relates to fire (see Section 6.1). A lack of fire planning and prescribed fire over the years has caused a shift in tree species domination and density. In the past, ponderosa pine was the dominant tree species. The current trend shows a shift to a more white fir (*Abies concolor*) and Douglas-fir forest. History shows us that ponderosa pine had a competitive edge over other species in mixed-dry conifer (Figure 4.24–Figure 4.25).

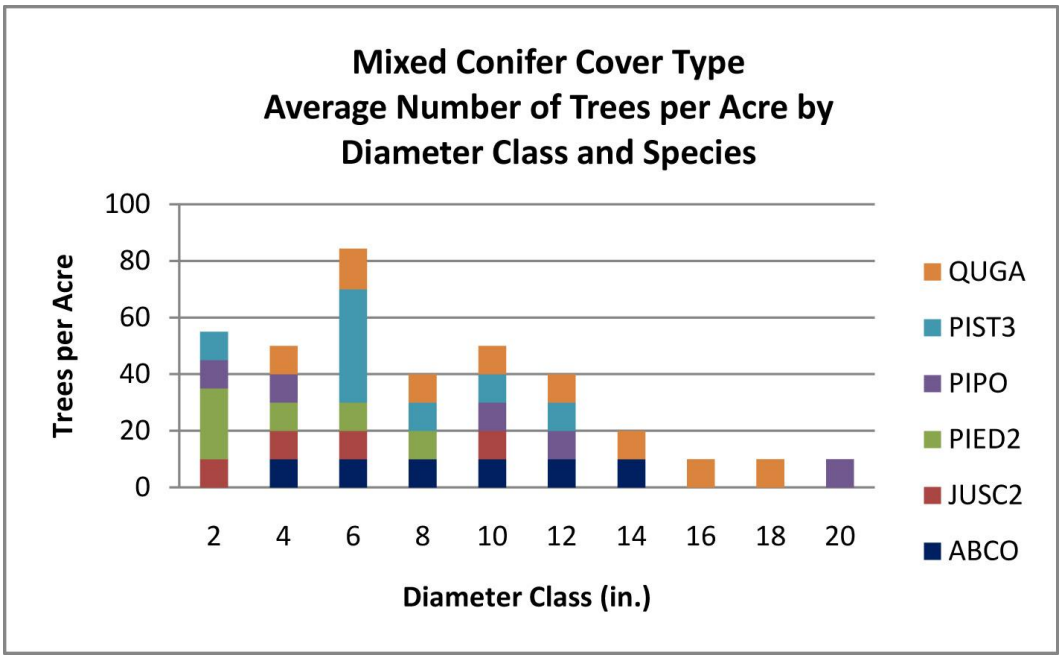


Figure 4.24. Average number of mixed conifer trees per acre.

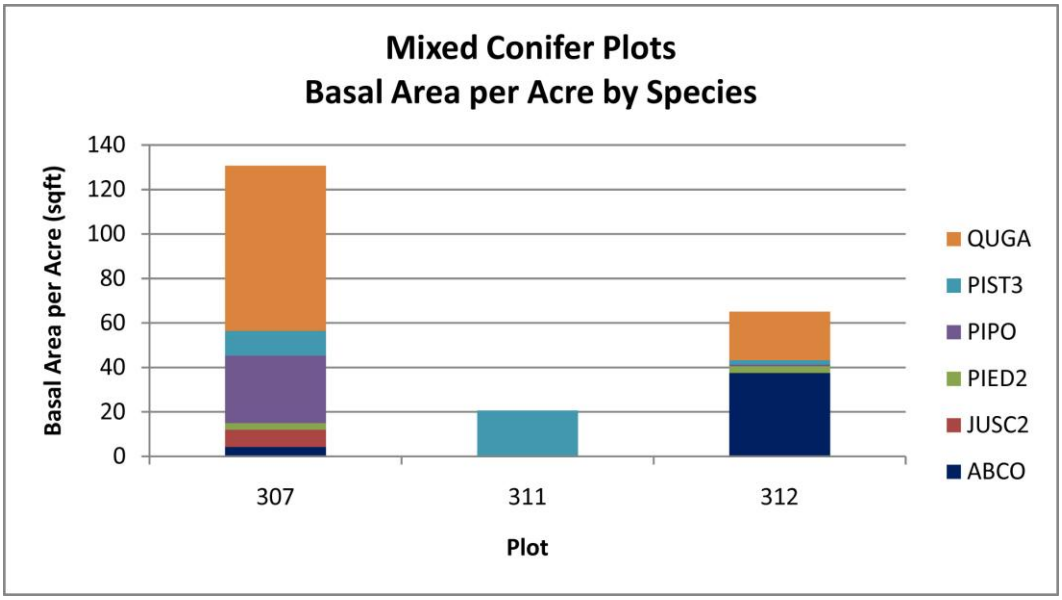


Figure 4.25. Basal area of mixed conifer.

4.4.5 Forest Insects

Forest insects are defined as forest pests that will in some way degrade the overall plant health of the forest (Fluder et al, 2005). Primary insects discussed will be those that attack tree species found on the Luera Mountain area.

- *Ips Beetle (*Ips *sp.)* - Ips beetles, also known as bark or engraver beetles, attack ponderosa pine, piñon pine, and other coniferous species (Figure 4.26). The first beetles that arrive at a tree emit a pheromone, or semiochemical, that attracts other adult beetles. The adults then bore through the bark, mate, and lay their eggs. Once the eggs hatch, the numerous larvae begin feeding on the inner bark, eventually girdling the tree. As the adult beetles colonize the tree, they often introduce a blue stain fungus that blocks the tree's water-conducting cells and prevents water from reaching the crown of the tree. As a result, the foliage begins to fade from green to light green or yellow, and eventually changes to bright red as the needles die. Once the needles begin to lighten, the tree is already dead.

Figure 4.26. Bark beetles within an infested piñon.

A healthy tree's natural defense is to excrete resin into the entrance hole to cover the beetle with the sap and kill the invader. However, as a result of drought and high stand densities, many piñon trees are water-stressed and their ability to produce resin is compromised, making the trees extremely susceptible to the bark beetle.

- *Piñon needle scale (*Matsucoccus acalyptus*)* - The piñon needle scale is a sap-sucking insect native to the Southwest. Feeding by the scale weakens the host tree by killing needles more than one year old. It is common for small trees to be killed by repeated scale feeding, and large trees become weakened and

susceptible to the Ips bark beetle. Repeated, heavy scale infestations leave the trees with only a few needles, clustered at the tips of the branches (Figure 4.27). Needle length is also greatly reduced.

The scale is a small, black, bean-shaped motionless object on the needles of infested trees. These mature scales are approximately 1.5 mm long and 0.70 mm wide. Destroying the eggs before they hatch can drastically reduce potential damage from these pests. Females lay yellow eggs in clusters held together by white, cottony webbing around the root collar on the undersides of large branches, in branch crotches, or in cracks of rough bark. Occasionally, egg masses are found several feet from the base of the tree on a rock or log.

It is possible that needle scales contributed to the initial stress of the smaller-diameter piñon on Luera Mountain. However, because of the damage done by the Ips beetle, it would be very difficult to determine how much mortality has been caused by the needle scale.

Mitigation measures would include removing egg masses from each individual tree or using insecticides that are scale specific, such as acephate. It should be noted that with the large-scale mortality of the piñon from the Ips infestation, competition for resources will be less, and smaller piñon trees should be able to defend themselves more successfully by sap production.

Figure 4.27. A piñon infested with needle scale.

- *Piñon Spindle Gall Midge (*Pinyonia edicola*)* – Piñon spindle gall midge produces a spindle-shaped swelling from the needle base that is about 0.5 inch long. The insect is a common forest pest that rarely causes serious damage. However, in urban settings heavy infestations can cause serious defoliation as galls dry and needles drop prematurely. Controlling this pest usually is not necessary.

- *Piñon Needle Miner (*Coleotechnites edulicola*)* - Piñon needle miners are locally common on piñon and ponderosa pine. Species resemble one another in appearance and damage but have different life cycles. Damage first becomes evident as foliage browns. Closer examination reveals hollowed-out needles. Early needle drop, reduced growth, and tree mortality can all result from needle miner infestation. The severity of the infestation varies significantly from tree to tree suggesting that individual trees have some resistance to these pests. Trees usually recover from needle miner damage without suffering serious injury.

- *Roundheaded (Cerambycidae) and Flatheaded (Buprestidae) Wood Borer* - The roundheaded and flatheaded wood borers attack recently cut or dead or dying trees, often riddling them with tunnels. Roundheaded borers are often the most destructive, tunneling deep into the wood. Fresh cut logs left in the forest or in storage for a year can be seriously damaged. This process, while not necessarily a detriment to the forest, can serve to damage harvested trees left in the forest too long. Adult feeding damage can be heavy along the edges of recent clearcuts, in groups of seed trees left in clearcuts, or in residual blocks of timber left in harvested areas. These borers are most prominent after fires. They may also spread into vigas located in structures in the area.

- *Juniper Borers* - Several roundheaded and flatheaded wood borers are aggressive pests in drought stressed junipers and cypress in New Mexico. Damage can be extensive before symptoms are apparent; usually a large portion of the tree or the entire tree dies before the insects exit holes are noticed. Larvae bore beneath the bark, making very wide, wavy tracks that distinctively score the outer sapwood much like a router. Older larvae excavate tunnels deep in the wood and spend the winter, and adults can emerge throughout the warm months of the year. There is one generation per year. Adult beetles are rather short-horned for cerambycids and dark blue or black. These beetles attack the thin barked portions of seriously weakened and dead junipers. Females lay eggs under bark scales on the branches of living trees.

4.4.6 Forest Disease

Forest diseases can affect the health of the forest. General diseases include parasitic plants, fungi, and bacteria. Forest diseases may impact forest systems by degrading productivity and health of the forest (Fluder et al, 2005). Below is a list of the most likely forest diseases that will be found on Luera Mountain with descriptions of potential effects to the system.

- *Dwarf mistletoe (*Arceuthobium M. Bieb.*)* - One of the most common forest diseases in the Southwest, dwarf mistletoe was found to be quite common on all

juniper species in the Luera Mountain woodlands. Mistletoe is considered parasitic and kills the host over a long period of time by diverting water and essential nutrients to the invading plant (Figure 4.28). The mistletoe also spreads by shooting the berries up to 30 feet from the parent plant.

Eliminating mistletoe in a high-infection area is very difficult. Trees can be removed, although this would increase the spread of the disease. Chemicals such as ethepon are used for mistletoe control in isolated cases, although because of the widespread infestation, its use may not be realistic. Overall, dwarf mistletoe has been a part of the piñon/juniper ecosystem for thousands of years, and treatment for this forest disease would be impractical.

Figure 4.28. Dwarf mistletoe on a one-seed juniper.

- *Elytroderma needle cast (*Elytroderma deformans*)* - Elytroderma needle cast affects piñon and ponderosa in New Mexico. Needle cast can be damaging because it invades twigs and branches and persists for several years. Symptoms occur in spring when all of the year-old needles on an infected twig simultaneously turn reddish brown 6 to 12 mm from the needle base. Infected needles persist on the tree until fall or winter.

  Fortunately incidence of the disease is low because weather conditions favoring its development are rare. Local outbreaks generally start in sheltered humid places, such as bottoms of deep arroyos, sapling thickets, and on north sides of pole-size and larger trees.

Of greatest concern within the Luera Mountain area are the bark beetle and the mistletoe. In the lower foothills, where there is a transition between grasslands and piñon, the piñon has approximately a 35 to 40 percent mortality rate on southern-aspect

slopes, with slightly less on all other aspects. At the transition area from piñon to ponderosa pine, the mortality is significantly less.

In addition, the mistletoe is widespread, particularly in all types of juniper and mixed conifer. This is due to the drought conditions and overstocking of the mixed conifer areas. Large-scale thinning or prescribed fire for stand replacement would be necessary in order to eliminate mistletoe.

4.5 NOXIOUS WEEDS

The following is a list of noxious weeds identified for Catron and Socorro counties, New Mexico (Lee, 1999). The three classes of noxious weeds, termed Class A, B and C weeds, are described by the New Mexico State University cooperative extension services publication *New Mexico's Invasive Weeds*.

Class A Weeds - Weeds that are not native to an ecosystem and have limited distribution within the state are placed in this class. Preventing new infestations and eliminating existing infestations are the highest priority in the management plan. Some species in this class are not presently found in the state but are threatening to invade.

Class B Weeds - Weeds that are not native to the ecosystem and are presently limited to particular areas within the state are listed in this class. The management priority is to contain them within their current area. Preventing new infestations should be a priority for weeds in this class.

Class C Weeds - Weeds that are not native to the ecosystem, yet they are widespread throughout the state. Long-term programs of management and suppression are encouraged.

Below is a list of noxious weeds to be concerned within Socorro and Catron counties.

CLASS A:

Russian knapweed (*Acroptilon repens*)
Field bindweed (*Convolvulus arvensis*)
Camelthorn (*Alhagi pseudalhagi*)
Perennial Pepperweed (*Lepidium latifolium*)
Scotch Thistle (*Onopordum acanthium*)

CLASS B:

Spotted knapweed (*Centaurea maculosa*)
Hoary cress (*Lepidium draba*)
Russian Knapweed (*Acroptilon repens*)
African Rue (*Peganum harmala*)
Musk Thistle (*Carduus nutans*)

CLASS C:

Bull thistle (*Cirsium vulgare*)
Poison hemlock (*Conium maculatum*)

4.5.1 Recommendations

Surveying of noxious weeds did not take place and should be included in any future monitoring projects.

4.6 WILDLIFE

Wildlife is generally broken into game and non-game categories. The most common wildlife species are summarized in Table 4.3. A much larger list of all species found in Catron County compiled by the New Mexico Department Game and Fish (NMDGF) is referenced in Appendix E.

Table 4.3. Wildlife found within and around the Luera Mountain Region

Common Name	Scientific Name
Elk	*Cervis elaphus*
Deer, Mule	*Odocoileus hemionus*
Coyote	*Canis latrans*
Lion, Mountain	*Felis concolor*
Bobcat	*Lynx rufus*
Bear, Black	*Ursus americanus*
Badger	*Taxidea taxus*
Rat, Wood	*Neotoma cinerea*
Mouse, Deer	*Peromyscus maniculatus*
Jackrabbit	*Lepus californicus*
Turkey, Wild	*Meleagris gallopavo*
Jay, Scrub	*Aphelocoma coerulescens*
Tailed Hawk, Red-Tailed	*Buteo jamaicensis*
Owl, Horned, Great	*Bubo virginianus*
Quail, Mearn's	*Cyrtonyx montezumae*
Quail, Scaled	*Callipepla squamata*
Dove, Mourning	*Zenaida macroura*

4.6.1 Threatened and Endangered Species

The NMDGF, on their referenced website (http://www.bison-m.org), has a list of threatened or endangered animal species in Catron County. These species are federally listed, state listed, or both. The listed species in table 4.4 are the most likely to be found on Luera Mountain.

Table 4.4. Listed as threatened or endangered, or a species of concern by the U.S. Fish and Wildlife Service or the NM Game and Fish Department

Common Name	Scientific Name
Falcon, Peregrine	*Falco peregrinus anatum*
Goshawk, Northern	*Accipiter gentilis atricapillus*
Owl, Spotted, Mexican	*Strix occidentalis lucida*
Sparrow, Baird's	*Ammodramus bairdii*
Vireo, Gray	*Vireo vicinior*
Bat, Big-eared, Allen's	*Idionycteris phyllotis*
Bat, Spotted	*Euderma maculatum*
Wolf, Gray, Mexican	*Canis lupus baileyi*

At this time no threatened or endangered species identified in table 4.4 are known to reside on Luera Mountain. If a threatened or endangered species is found on Luera Mountain, mitigation measures will be taken to protect both the species and its habitat.

In addition, there are two flowering plants that occur within Catron and Socorro counties that are considered to be endangered by the U.S. Fish and Wildlife Service.

Table 4.5. Plants listed as threatened or endangered by the U.S. Fish and Wildlife Service.

Common Name	Scientific Name
Pecos sunflower	*Helianthus paradoxus*
Zuni fleabane	*Erigeron rhizomatus*

4.6.2 Recommendations

In order to increase mule deer, turkey and Mearn's quail populations, the installation of wildlife drinkers, applying natural and prescribed fire and enacting forest health projects to increase browse, create wildlife corridors and improve health and condition of ponderosa pine and mixed conifer stands must be done. In order to encompass these wildlife species and more, elk is going to be used as an umbrella species (species which aids in managing other species within an ecosystem). This is because the benefits to Elk habitat will, in turn, benefit many other species.

Elk food habits are strongly influenced by availability of forage species. Grasses and shrubs are the principal winter forage on the Luera Mtn. During the spring, elk prefer grasses and early forbs. As the summer progresses, leaves and shrubs become increasingly important. When the forage species dry out during the fall, grasses and browse material becomes important again (NMDGF, 2008).

Elk use forest stands with less than 40% canopy closure, and all other open habitats as foraging areas. However elk prefer to forage near cover, so open areas need to couple with untreated areas. Elk habitat also includes hiding and thermal vegetative cover. Hiding cover is used all year by elk during resting periods throughout the day, and particularly during hunting season. Vegetation can be considered adequate when it will hide 90% of a standing elk at a distance of 200 feet or less. Shrub habitats, such as oak woodlands and open piñon/juniper woodlands, to denser, mature forest stands are excellent habitat for elk (NMDGF, 2008).

Project specifics such as methods, areas, and actual projects are discussed in detail in Appendix E. Increasing woodland openings will increase the browse and forage production. Several snags per acre should be left, if available, for cavity nesters and bird use. Several down logs per acre should also be left as habitat. The small openings created through treatments provide excellent habitat for turkey.

4.7 OTHER

4.7.1 Soils

There are three major soil components with five additional components that make up the soils in the Luera Mountain area. The primary soil component is 39.1% Tolman-Rock outcrop complex on 25 to 60 percent slopes. The next highest soil component is 22.2% Faraway-Motoqua-Rock outcrop complex on 8 to 30 percent slopes. The third major constituent is 20.6% Parquat-Tafoya association on 5 to 30 percent slopes.

Other soils include 5% Abrazo-Rock outcrop complex on 15 to 50 percent slopes; 5.9% Augustine fine, sandy loam on 1 to 6 percent slopes; 5.2% Datil-Guy association on 3 to 15 percent slopes; 1.3% Motoqua-Rock outcrop complex on 8 to 30 percent slopes; and 0.7% Guy-Gravelly loamy fine sand on 0 to 12 percent slopes. Figure 4.29 presents the soil classes on Luera Mountain.

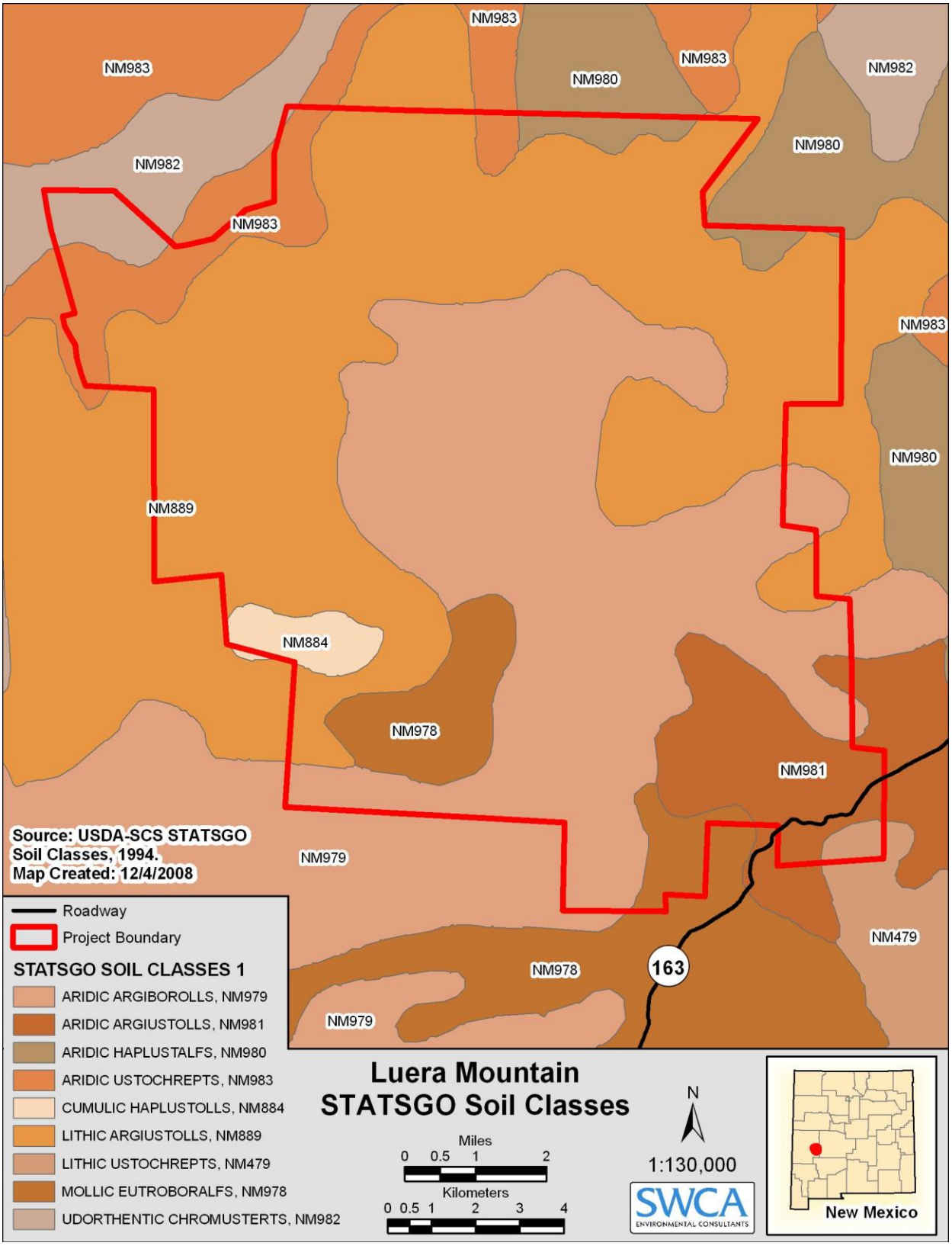


Figure 4.29. Luera Mountain soil classes.

The soil on Luera Mountain has very little water holding capacity and is very susceptible to erosion. Combinations of fire and fuels treatments can help retain water by preventing soil moisture evaporation; organic material introduced into the soil will also increase its holding capacity. In addition, various fuels reduction projects can provide nutrient recycling (see Section 7.2.3).

4.7.2 Watershed

The majority of the water from Luera Mountain drains into the Plains of San Augustine, which is a closed basin. Parts of Sections 1, 2, 3, 10, and 11; Township 7 South; Range 10 West (the area south and west of the Continental Divide) drain into Corduroy Canyon, which is a tributary of Beaver Creek and the Gila River. The remainder of the mountain drains into the Plains of San Augustine (Figure 4.30).

The streams on Luera Mountain are all ephemeral, with running water a result of the summer monsoon rains or spring snowmelt. A number of dirt stock tanks have been constructed at various locations to catch the runoff to supply livestock with water. Wells and storage tanks have been strategically placed to provide a more reliable water source for livestock.

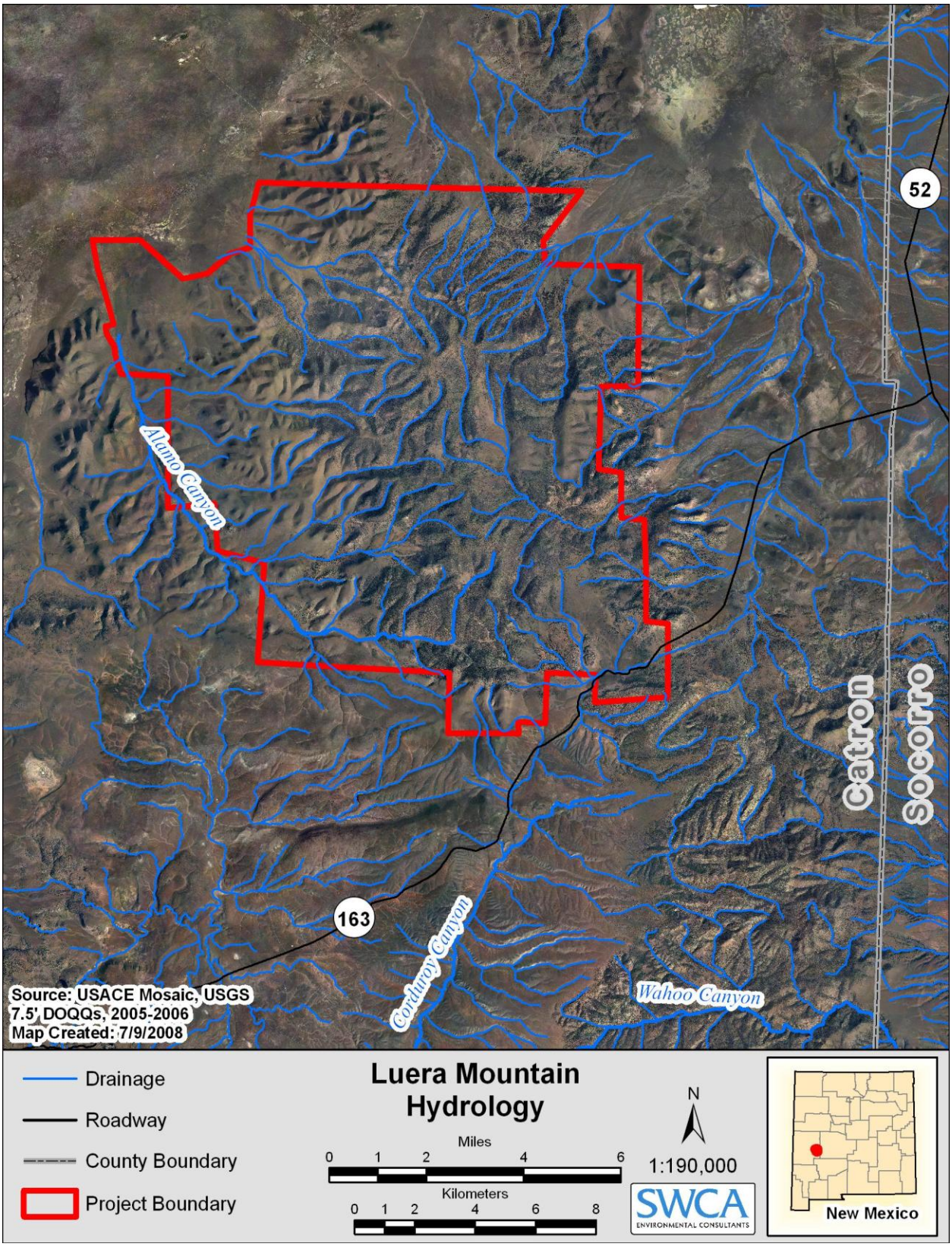


Figure 4.30. Water flow from Luera Mountain.

4.7.3 Riparian/Wetland

None of the canyons on the mountain have any riparian indicator species such as cottonwoods or willows. Water from Luera Spring on the northeast portion of Luera Mountain is piped to a metal tank and used for livestock watering. Portions of Patrocino Canyon and Alamo Canyon have some potential to be riparian areas, but the uncertain nature of subsurface water during the dry periods may preclude riparian vegetation establishment. However, with proper land management, the restoration of riparian areas is possible.

4.7.4 Cultural

According to the official list of registered cultural properties on file with the New Mexico State Historic Preservation Division (HPD), there are two archaeological sites within the Luera Mountain boundary on the southeast side (Figure 4.31). In addition, the tree that acted as a fire lookout on Luera Peak is also considered an archaeological area. If any sites are found during management activities, the SLO and HPD will be notified. In addition, the sites will be protected from damage during any management operations.

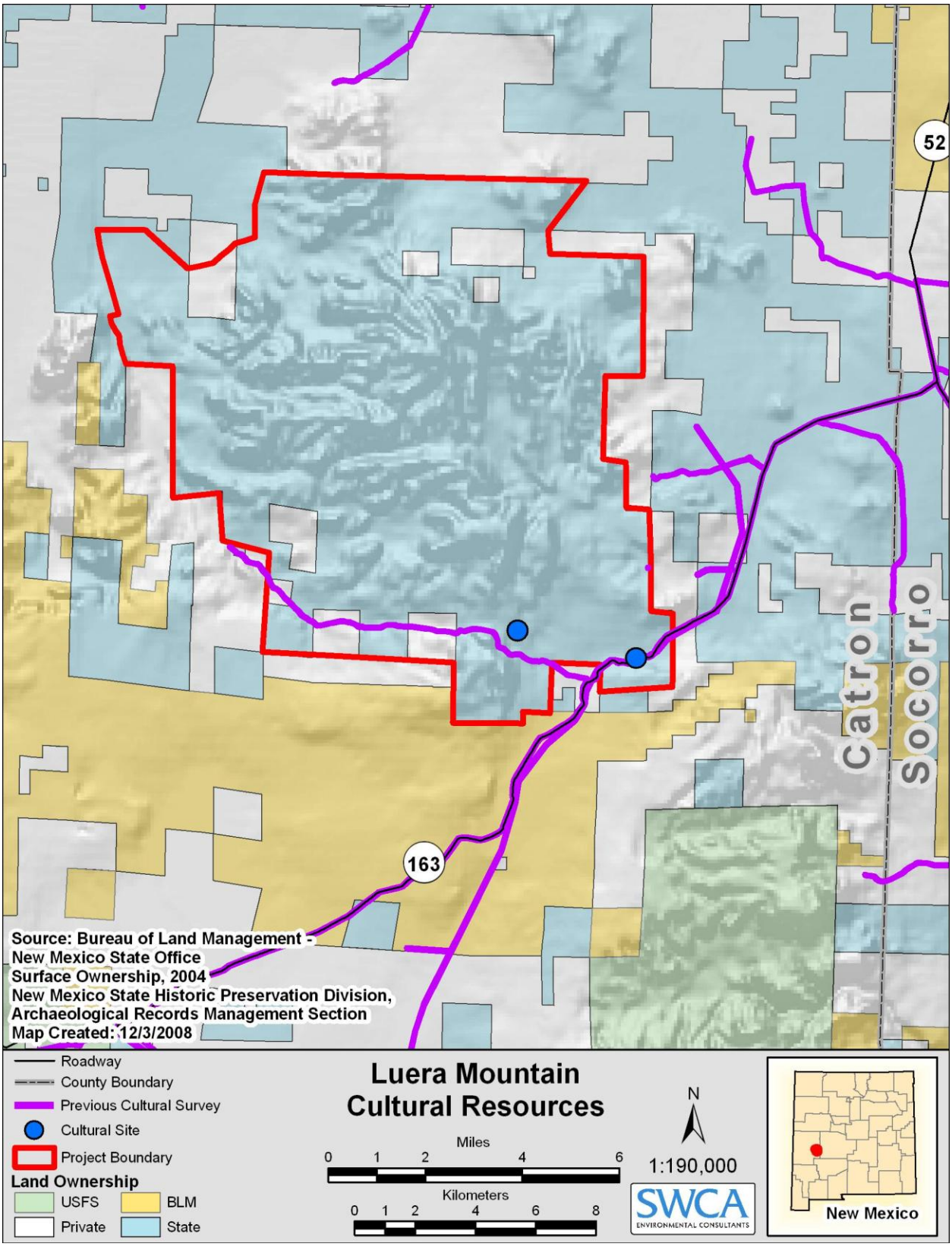


Figure 4.31. Archaeological Records Management Section database cultural sites.

4.7.5 Recreation

Currently, State Trust Lands are not open to the public. The only recreation that takes place on Luera Mountain is tied to a valid permit (hunting license or recreational access permit).

5.0 INFRASTRUCTURE

5.1 INGRESS/EGRESS OR ACCESS

Access into and out of the Luera Mountain area is very difficult. At this point, there are three main roads that lead into the area. One is from the east side, through the Luera Ranch, one is from the west side through the Farr Ranch, and one is a NMDGF road that comes in from the south and was built to allow hunters access to the mountain. All three of these roads are in very bad shape, passable only with four-wheel drive or all-terrain vehicles. Additional areas on the north side of Luera Mountain can be accessed through Harriet Ranch and Travis Kiehne's property on the northeast side; however, all roads are limited because they are all on private land. A permit is also required, either from the NMDGF or the SLO.

5.2 INTERNAL ROADS

In addition to ranch roads mentioned in section 5.1, the SLO allowed the NMDGF to build a road that would allow hunter access from the south on State Rd. 163 (Section 31 and 30, Township 6 South, Range 9 West). Since the road was completed, the NMDGF has not maintained the road. By easement standards, the NMDGF must maintain the road, or it falls into a withdrawn status.

Due to lack of maintenance on the NMDGF road, hunters have created new travel routes around Luera Mountain, causing a great deal of soil and resource damage. In 1996, the SLO contacted the NMDGF and requested maintenance for their road, as well as internal ranch roads that were being damaged. There was no response from the NMDGF, and the internal roads are currently not maintained.

During fire management activities, there will be opportunities for limited repair of various roads. In addition, relocation of certain roads would also be beneficial. This will allow safe access for firefighters and firefighting equipment.

Additional two-track roads exist throughout the Luera Mountain area. Some areas accessible by road are the television towers, lookout and bunk quarters, Luera Spring, and Patrocino Canyon. However, these roads are in various states of disrepair, and access can be difficult depending on the time of year (Figure 5.2).

Figure 5.1. NMDGF access road.

Figure 5.2. Example of a cut-off road within the Luera Mountain area.

5.2.1 Recommendations

Unfortunately, the roads that are within the Luera Mountain area are in very bad shape. An example of this is the road that goes from the Farr Ranch on the east side of Luera Mountain into Patrocino Canyon. This road is approximately five to seven miles, and a large majority of it is located in the bottom of a drainage. Relocation of this road out of the drainage would be very beneficial to wildlife and decrease erosion control, as this is a major corridor where food and water could be readily available.

Another area where the road should be reconstructed is the stretch of road that crosses the saddle between Luera Peak (North Mountain) and the southern part of the Luera Mountain (South Mountain). The current alignment on the east side of the saddle is heavily eroded, has a very steep grade, and cannot be repaired or reconstructed in its present location. In its current state, it is very difficult to traverse in a 4x4 vehicle, and almost impossible in a wildland fire engine. This road also drops into a drainage after going over the ridge, and rerouting this part of the road would help the heavy erosion that takes place there. A project discussed in Appendix E suggest creating a fuelbreak along this particular road to separate the north and south fire subunits, and this would be a great opportunity to reroute various sections of road.

5.3 FACILITIES

Existing facilities as defined by SLO records are minimal in number and impact. There are a total four rights-of-way within the management plan boundaries. Three of those rights-of-way are aboveground electric lines, summarized below:

- R-23604 Socorro Electric Co-op 14.4-kV distribution line – runs along Highway 82 towards Beaverhead. Issued in 1989, this 35-year term line has very little effect on any management actions. Maintenance is responsibility of the Socorro Electric Co-op.

- R-24018 Socorro Electric Co-op – Issued in 1990, 35-year term. This single phase power line provides electricity to livestock tank and parallels existing road.

- R-22759: Socorro Electric Co-op - largest ROW

The other right-of-way is the existing NMDGF road, but it is not considered a facility by SLO standards. Figure 5.3 displays the infrastructure and facilities on Luera Mountain.

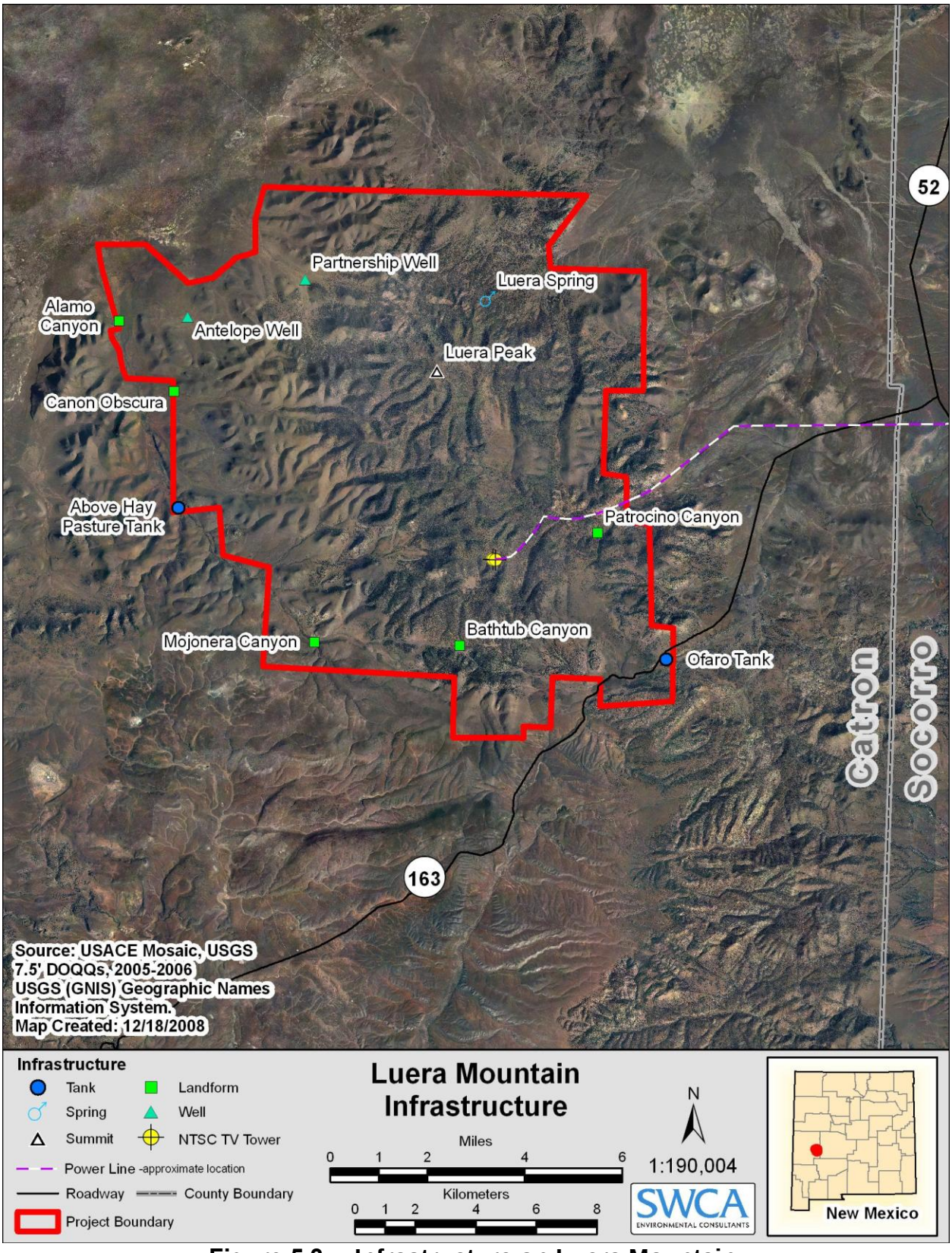


Figure 5.3. Infrastructure on Luera Mountain.

6.0 FIRE PLANNING

6.1 NATURAL FIRE REGIMES

During the twentieth century, the primary factors responsible for determining fire frequency were temperature and precipitation patterns. These are especially evident in ponderosa pine and Douglas-fir forests. Lightning-caused fires were much more frequent during decades of high temperatures and became less frequent during cool periods. This is primarily because warmer periods carried a longer fire season. In addition to temperature, the variation in precipitation affected the availability of grass and herbaceous surface fuel that would help carry the fire in dry years (Hann, 2008).

In the case of the Luera Mountain area, Fire Regime I represents the ponderosa pine and warm-dry mixed conifer forests. This is characterized by localized, frequent surface fires that would occur one or more times in a decade. Larger fires in the fire regime would burn more area but would occur less frequently.

The piñon/juniper woodlands have a much different fire regime. Unlike ponderosa pine and mixed conifer, piñon/juniper has a much longer fire interval and falls under the Fire Regime V classification, or fire intervals of 200+ years. However, because of frequent fires in the ponderosa pine and subsequent grasslands, these fires would reduce the encroachment of piñon and juniper regeneration. Therefore, the piñon/juniper forests were kept in check by the surrounding vegetation and more frequent fire intervals (Hann, 2008).

6.2 HISTORICAL FIRE OCCURRENCES

There have been seven large lightning-caused wildland fires and miscellaneous smaller fires on Luera Mountain since 1987, totaling 10,094 acres burned (Table 6.1). Although fire damage to some stands of trees was noted, the fires were generally beneficial in nature by maintaining and creating vegetative openings, reducing competition among trees, rejuvenating browse species, and reducing ladder fuels and fuel loading. The fires also resulted in increased aspen sprouting in some areas. There are, however, some stands of ponderosa pine and mixed conifer that had greater than desired fire mortality from the Spring Fire in 1995.

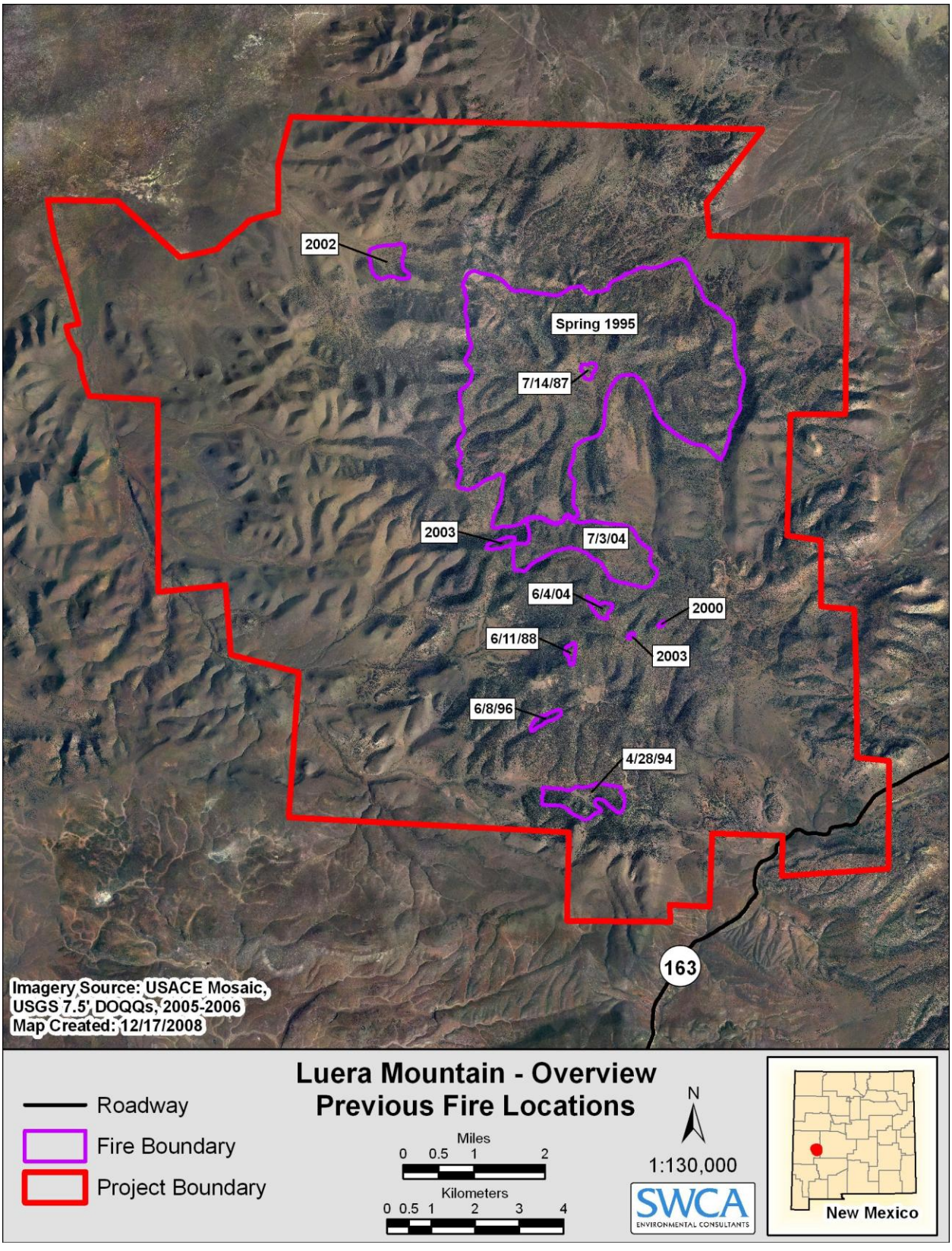


Figure 6.1. Fire occurrence since 1987

Table 6.1. Large Wildland Fire Occurrence on Luera Mountain Since 1987

Fire Name	Legal Description	Fire Date	Fire Cause	Total Acres Burned
Luera	T05S, R10W, Sec 34	07/14/87	Lightning	70
Radio	T06S, R10W, Sec 21	06/11/88	Lightning	64
Luera	T06S, R11W, Sec 33	04/28/94	Lightning	450
Radio	T06S, R10W, Sec 22	06/04/94	Lightning	100
Luera	T06S, R10W, Sec 15	07/03/94	Lightning	725
Spring	T05S, R10W, Sec 27	06/15/95	Lightning	7,610
Plains	T06S, R10W, Sec 28	06/08/96	Lightning	75
Misc	Various areas	–	Lightning	1,000
Total				**10,094**

6.3 VALUES AT RISK

Most of the improvements on Luera Mountain are associated with the ranches that hold the state grazing leases and include the following:

- The wildlife drinker, lookout tree, and sheds on Luera Peak (T5S, R10W, Sec 33).
- The television/radio towers and sheds, and the wildlife drinker south of South Luera Peak (T6S, R10W, Sec 22).
- The ranch structures and corrals in Alamo Canyon (T6S, R11W, Sec 26).
- The headquarters for the Luera Ranch (T6S, R9W, Sec 17), Harriett Ranch (T5S, R10W, Sec 9), and Welty Ranch (T5S, R9W, Sec 23).
- The corrals located in Patrocino Basin (T6S, R10W, Sec 11), Bear Canyon (T6S, R9W, Sec 29), and near Taylor Well (T5S, R9W, Sec 15).

6.4 RECOMMENDATIONS

It is recommended that an active prescribed (Rx) fire and wildland fire use (WFU) program be implemented on Luera Mountain. Areas that are identified for prescribed burning should have an approved site-specific prescribed burn plan developed and should be on file at the SLO and the NMSF offices in Socorro, New Mexico. A smoke permit will be obtained from the New Mexico Environment Department prior to implementing any prescribed fire activities. Smoke management coordination between NMSF, the USFS, and the BLM will occur for all wildland fire activity on Luera Mountain.

The management response to natural fires started on Luera Mountain will be dependent on the time of year, weather conditions, location of start, and suppression resources available to implement the selected wildland fire management activities. If there are inadequate resources to safely suppress a wildland fire, then the preferred alternative will be to locate natural and human-made barriers (e.g., roads) and create a backfire and blackline.

If the decision by state land managers is made to manage a naturally started fire for resource benefits (WFU), then a wildfire situation analysis (WFSA) will be completed to ensure proper management. In addition, a wildland fire implementation plan (WFIP) will be prepared for each WFU fire outlining the objectives, strategy, safety concerns, weather forecast, fire behavior forecast, and organization / staffing needs. If needed, a Type 3 organization will be set up to manage the wildland fire.

As part of the wildland fire management program for Luera Mountain, improvements and identified cultural sites need to be protected. Mechanical fuel treatments prior to prescribed fire and/or WFU implementation may be required around some of the areas requiring protection. The location of water sources, roads, natural barriers, cultural sites, and improvements are identified on the maps throughout the Management Plan. Rx fire details will be outlined in the Rx fire plan, and WFU details will be outlined in the WFSA and the WFIP.

7.0 FUEL TREATMENT PRIORITIES

7.1 DESIRED FUTURE CONDITIONS

There are four primary long-term goals for the management of Luera Mountain:

- Manage natural fire starts in order to re-establish a historic fire regime.
- Re-establish and maintain a healthy rangeland ecosystem in order to create a healthy and balanced watershed.
- Create and improve wildlife habitat.
- Return forests to a balanced, healthy, and historic structure.

7.2 IMPLEMENTATION ACTIONS

There are many different ways to achieve the goals that have been prioritized in the Luera Mountain Management Plan. The following recommendations are broad in scope because of the large amount of area that will be addressed in the future. Each method can be used and expanded upon in order to meet the goals and objectives of the specific project. Three specific recommendations are listed with further explanation of methods to achieve these goals in the following sections.

7.2.1 Reduce Fuel Loading

The first priority for Luera Mountain is to optimize tree stocking to create a healthy forest ecosystem and reduce the chances of a catastrophic stand replacing wildfire. Stocking levels of 30 to 60 square feet of basal area in the ponderosa pine and mixed conifer woodlands is recommended for optimal forest health (Gottfried 2004). Removing the small diameter ladder fuels will help to reduce fuel loading, as well as aid in restoring the historically open grasslands (discussed in Section 4.3).

Reducing the fuel loads will also improve the overall residual tree health and increase resistance to insects and disease. Tree health is directly related to surrounding environmental conditions, such as the tree spacing within the stand, crown spacing, and availability of nutrients and moisture.

7.2.2 Improvement of Wildlife Habitat

The improvement of wildlife habitat is synonymous with the reduction of fuel loading for forest health. The methods discussed in Appendix E create a healthy ponderosa and mixed conifer forest, also will create the foraging areas and the wildlife corridors necessary for populations of mule deer, elk, turkey, and Mearn's quail to thrive. The installation of water sources will also help increase the population of these species.

7.2.3 Range Conservation

There are three main components to ensuring that the Luera grasslands are restored to a healthy state: conserving moisture, increasing the water holding capacity of the soil, and grazing management. This will require cooperating agencies and landowners to work together in order to come up with a managed livestock plan and set up permanent monitoring stations in order to monitor vegetative changes, trends, and conditions.

7.3 FUEL REDUCTION METHODS

7.3.1 Prescribed/Natural Fire

Both naturally managed fire and prescribed fire can be used to accomplish many of the plan goals and would allow large-scale vegetation management projects to be accomplished in a short amount of time. Luera Mountain provides an excellent opportunity for fire use as a vegetation management tool. As the elevation decreases, vegetation and soil types change, causing a distinct break in vegetation continuity and creating natural fuelbreaks. These areas would aid in containment of fire. This is not to say that containment areas would not need to be thinned. In fact, reinforcement of areas that are naturally thin, whether it is a fuelbreak or a large-scale thinning project is highly recommended.

The overall goal in conducting a prescribed burn is to utilize climatic and fuel conditions to generate slow-burning, low-intensity ground fire that consumes understory vegetation. Because areas of vegetation are not consumed by these low intensity burns, the overall result is a mosaic pattern along the landscape. Open areas will be created and maintained by allowing fire to burn in these areas for years to come.

Management of natural ignition fire would be the ideal cost effective method for reducing fuel and re-introducing a natural fire regime to Luera Mountain. Fires that ignite naturally from a source such as lightning can burn in a controlled environment. This would be an extremely cost-effective way of allowing the fire to restore necessary ecological processes and allow land managers to manage fuel treatment in overly

dense areas with nature completing the work as it is supposed to do. This type of fire would be particularly effective because of the lack of urban interface and the risk of losing valuable resources is low to nonexistent.

Luera Mountain is broken into two fire management units: the North Subunit and South Subunit (Figure 7.1). The road and vegetation dividing the North and South subunits provide an ideal fuelbreak location, allowing fire management activities to have a distinct line from which management activities can be conducted.

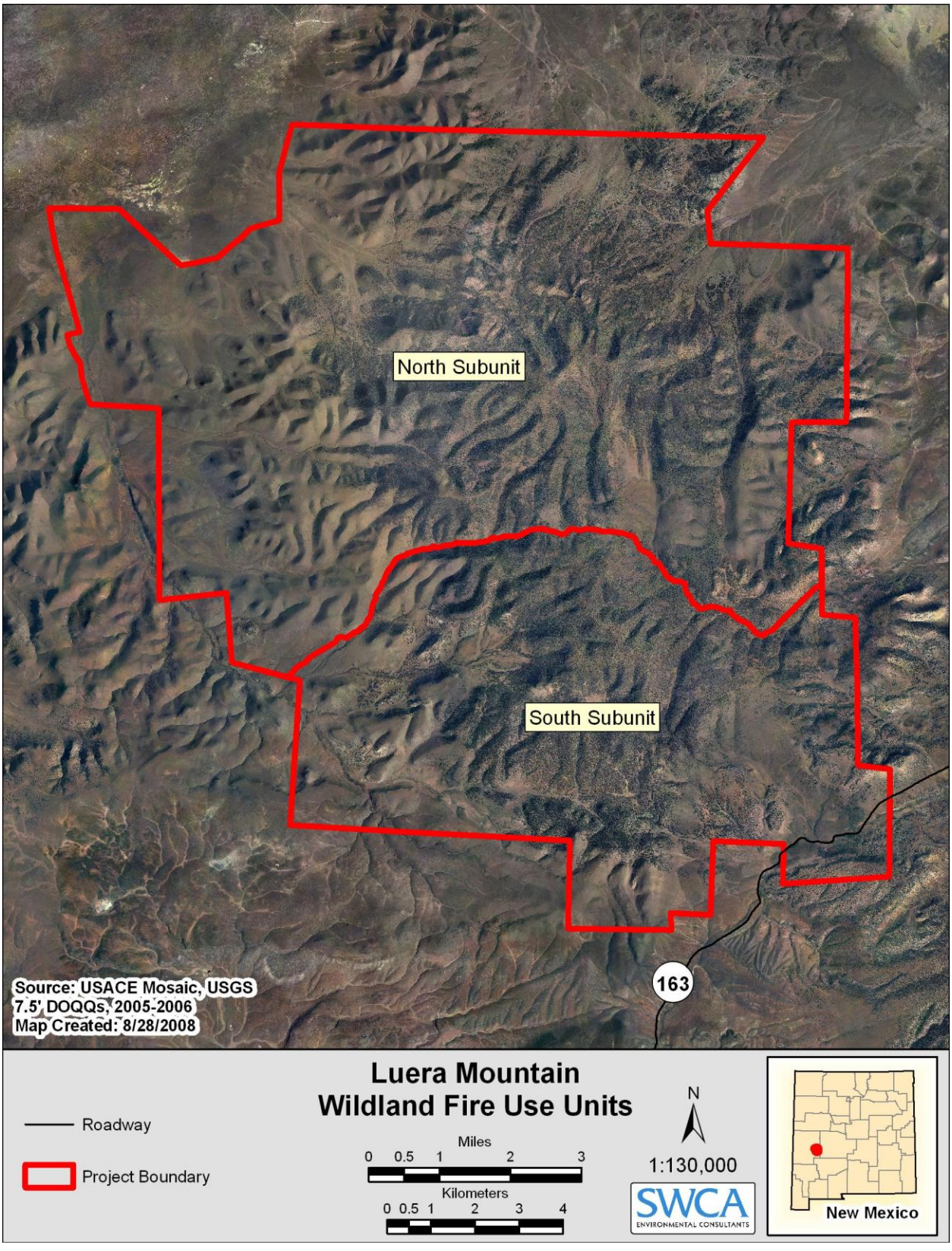


Figure 7.1. Luera Mountain broken into two fire units.

Additional burn projects could also include stand replacement within the piñon/juniper woodland areas. This is much more difficult because of the lack of fuel to carry the fire. Thinning within the proposed burn areas to put fuel on the ground to allow the fire to carry would be one option. Reducing fuel loads and regeneration through various thinning methods and allowing fire to burn in the transition area between grasslands and piñon/juniper areas (Fuel Models 1 and 2) would be another option.

In addition, wildland fire, especially on a larger scale, would benefit most species found on Luera Mountain and improve the overall ecosystem health. Forage and browse are improved, available water is increased, and water quality is improved in the long-term. There should be a huge overall benefit to forest health, especially since Luera Mountain is a wildland fire-adapted ecosystem.

7.3.2 Mechanical Fuel Reduction

There are many mechanical fuel reduction methods to choose from. However, the most cost-effective technique may not be the fastest, and the fastest may be very costly. One major factor in determining which method to be used is the intended purpose for the material after it is cut. If the intention is to reduce the cut slash by the pile and burn method, then it may be beneficial to cut the material by hand and use a bulldozer to pile the material in an open area for later burning. If burning is not an option, then the use of a masticator to not only grind up slash, but to take down trees is a good choice. If utilization of the woody material is a primary concern, then simply cutting the material and feeding the slash into a small chipper may be the best option.

Although not as cost effective as burning, there are quite a few benefits to mechanized fuel reduction. In areas where the target is to create a fuelbreak and the material needs to be removed, then the stump-cut method (chainsaws and chipper) or a masticator would probably be the most efficient. In areas where the primary concern is eradicating all trees with mistletoe, then mechanical fuel treatments would allow selectivity that fire would not afford. The same holds true for eliminating bark beetle killed piñon. A fire may not be as easily controlled with the dead component, whereas mechanical treatment can be much more selective.

One goal that could be very efficiently and effectively reached with mechanical fuel reduction would be the restoration of grasslands. A masticator could easily run through the regeneration, as well as some of the larger trees, depending on the size of the machine, with great ease (Figure 7.2). The masticator head also mixes the woody material in with the nutrient-starved soil. Besides preventing soil moisture loss through evaporation, it is possible to increase the water holding capacity of the soil by the addition of the organic matter. Scattering of chips with a chipper also reduces the evaporation factor from soil.

In June 2008, the SLO funded a project that involved meadow restoration in Patrocino Canyon. A masticator was brought in to reduce the amount of regeneration that had been taking place over the past 20 years. The result was approximately 100 restored

grassland acres that will not need to be treated again for years to come. There is no doubt that there will be an increase in foliage because of the reduced competition for resources.

Figure 7.2. Mastication on right side of two-track.

7.4 POST-THINNING MAINTENANCE

Active post-thinning, vegetative management and maintenance are essential parts of successful projects and ecosystem health. A comprehensive fire use program will allow for efficient, cost-effective maintenance through the use of prescribed and wildfire use fire. Over time, a natural fire regime will again take over and provide natural post-project maintenance.

7.5 FOREST PRODUCTS

Much of the woody vegetation can be utilized for many different uses. In rural communities, fuelwood is the primary source of heat. Therefore, firewood may be a commodity that is left within a project area for local communities to organize to pick up, or project are could be used as a wood-cutting site. This option allows the project to be completed with material removed.

Latillas, vigas, and other small roundwood are very valuable and useable products. These can also be used by the local community for home construction, barns, fences,

etc. The downside to processed wood is that transportation costs have increased significantly in recent years, and there is no outlet or commercial market beyond the local, small community market at this time.

Wood chips are another byproduct of the thinning project. The chips can be used for mulch, landscaping, and bedding. Again, the problem with transportation costs and lack of a feasible market limits the uses of the potential product.

8.0 OTHER

8.1 FUNDING POSSIBILITIES

Numerous possibilities exist for cooperative funding and labor contributions to accomplish designated objectives in this plan. Potential cooperators include the Rocky Mountain Elk Foundation, Mule Deer Foundation, National Wild Turkey Federation, Youth Conservation Corps, New Mexico State University Range and Wildlife Clubs, and state inmate work camp programs. In addition, potential available funds include the Land Maintenance Fund, NMSF Hazardous Fuels Reduction funds, state severance tax funds, Environmental Quality Incentives program (EQIP), Water Trust Board grants, and various other possibilities.

8.2 INDUSTRY POTENTIAL

Due to the isolated location of Luera Mountain and the lack of mills, biomass plants, and any realistic commercial outlet within a reasonable distance, commercial potential for the woody material that would be removed is relatively non-existent. In addition, heavy equipment access into any particular project site where woody product could be removed is virtually impossible.

8.3 PUBLIC INFORMATION

Information on any public project (fuelwood area, wood removal, etc.) can be found by contacting the cooperating agencies (Appendix D).

8.4 POTENTIAL OBSTACLES

The access into the Luera Mountain area is extremely limited. The east and west roads pass through the Luera and Farr ranch, respectively, and the south access road has not been maintained in such a long period of time that it is virtually impassible. Bringing in equipment, crews, etc., can be extremely difficult.

One recommendation would be to close the southern NMDGF right-of-way and reroute a road along the ridgeline to the west of the existing right-of-way. The road can be built with adequate drainage, limiting erosion and increasing water availability to drinkers or irrigation of grasslands. For example, a 2.4-mile road reconstruction project was effectively drained and diverted into the grassland adjoining the road. Thirty drains

were installed, and in an area that receives 15 inches of rainfall a year, this equates to 875,000 gallons of water a year collected from this roadway (Zeedyk 2006). This example shows the amount of water that erodes away at the soil, as well as the road, in any given year. If properly constructed, a rural road can last for quite some time with limited maintenance.

A lack of funding can also be a potential obstacle. Because funding of projects is based on cooperating agencies and their fluctuating budgets, it is hard to determine the amount of money available from one year to the next. In 2008, a significant amount of federal funds that were designated for fuel reduction projects was re-absorbed because of the expense of the extreme fire season.

8.5 MONITORING & ADAPTIVE MANAGEMENT

Monitoring of all projects will be enacted from beginning to end. Utilization of New Mexico State University, Highlands, and various other schools will be used for research and monitoring projects when applicable. Photo points and monitoring stations will be set up in order to accurately record changes in the post-project environment.

9.0 CONCLUSION

This management plan was prepared to provide land managers with the information necessary to make sound land and resource management decisions and create projects to restore ecosystem health while promoting and restoring fire as a resource management tool. Additional benefits to wildlife and livestock operations will occur through creation of new habitat and increased forage production. Healthy, functioning forest, woodland, and range ecosystems are essential to the survival of many wildlife species, as well as for providing increased water yields and soil stabilization. Active management is essential to restore Luera Mountain land and resources that have become degraded and unhealthy from decades of fire suppression.

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APPENDIX A
LEGAL LAND DESCRIPTION BREAKDOWN

Township	*Range*	*Section*	*Acres*	*Ownership*	*Grazing Lease or Owner*	*Grazing Lessee*	*ROWs*
5 South	11 West	**13**	640	SLO	**GM-2560**	**Michel Harriet**	None
5 South	11 West	**21**	640	SLO	**GM-2560**	**Michel Harriet**	None
5 South	11 West	**22**	600	SLO	**GM-2560**	**Michel Harriet**	None
5 South	11 West	**23**	40	**PRIVATE**	**Michel Harriet**	**Not applicable**	N/A
5 South	11 West	**24**	640	SLO	**GM-2560**	**Michel Harriet**	None
5 South	11 West	**25**	640	SLO	**GM-2560**	**Michel Harriet**	None
5 South	11 West	**26**	640	**PRIVATE**	**Michel Harriet**	**Not applicable**	N/A
5 South	11 West	**27**	640	SLO	**GM-2560**	**Michel Harriet**	None
5 South	11 West	**28**	640	SLO	**GM-2560**	**Michel Harriet**	None
5 South	11 West	**33**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
5 South	11 West	**34**	640	SLO	**GM-2560**	**Michel Harriet**	None
5 South	11 West	**35**	640	SLO	**GM-2560**	**Michel Harriet**	None
5 South	11 West	**36**	640	SLO	**GM-2560**	**Michel Harriet**	None
5 South	10 West	**13**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**14**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**15**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**16**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**17**	640	SLO	**GM-2560**	**Michel Harriet**	None
5 South	10 West	**18**	639.90	SLO	**GM-2560**	**Michel Harriet**	None
5 South	10 West	**19**	638.88	SLO	**GM-2560**	**Michel Harriet**	None
5 South	10 West	**20**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**21**	400	SLO	**GO-2158**	**Luera Ranch**	None
			240	**PRIVATE**	**Luera Ranch**	**Not applicable**	N/A
5 South	10 West	**22**	160	SLO	**GO-2158**	**Luera Ranch**	None
			480	**PRIVATE**	**Luera Ranch**	**Not applicable**	N/A
5 South	10 West	**23**	360	SLO	**GO-2158**	**Luera Ranch**	None
			280	**PRIVATE**	**Luera Ranch**	**Not applicable**	N/A
5 South	10 West	**24**	320	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**25**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**26**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**27**	480	SLO	**GO-2158**	**Luera Ranch**	None

Township	*Range*	*Section*	*Acres*	*Ownership*	*Grazing Lease or Owner*	*Grazing Lessee*	*ROWs*
			160	**PRIVATE**	**Luera Ranch**	**Not applicable**	N/A
5 South	10 West	**28**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**29**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**30**	639.10	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**31**	639.58	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**32**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**33**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**34**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**35**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	10 West	**36**	640	SLO	**GO-2158**	**Luera Ranch**	None
5 South	9 West	**19**	321.52	SLO	**GO-2158**	**Luera Ranch**	None
5 South	9 West	**30**	642.30	SLO	**GO-2158**	**Luera Ranch**	None
5 South	9 West	**31**	640.86	SLO	**GO-2158**	**Luera Ranch**	None
6 South	11 West	**1**	480.60	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	11 West	**2**	485	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	11 West	**3**	489.40	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	11 West	**10**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	11 West	**11**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	11 West	**12**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	11 West	**13**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	11 West	**14**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	11 West	**15**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	11 West	**23**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	11 West	**24**	80	SLO	**GM-2524**	**Farr Cattle Co.**	None
			560	**PRIVATE**	**Farr Cattle Co.**	**Not applicable**	N/A
6 South	11 West	**25**	400	SLO	**GM-2524**	**Farr Cattle Co.**	None
			240	**PRIVATE**	**Farr Cattle Co.**	**Not applicable**	N/A
6 South	11 West	**36**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**1**	454.2	SLO	**GO-2158**	**Luera Ranch**	None

Township	*Range*	*Section*	*Acres*	*Ownership*	*Grazing Lease or Owner*	*Grazing Lessee*	*ROWs*
6 South	10 West	**2**	458.6	SLO	**GO-2158**	**Luera Ranch**	None
6 South	10 West	**3**	463	SLO	**GO-2158**	**Luera Ranch**	None
6 South	10 West	**4**	467.86	SLO	**GO-2158**	**Luera Ranch**	None
6 South	10 West	**5**	472.08	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**6**	468.76	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**7**	624.04	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**8**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**9**	480	SLO	**GM-2524**	**Farr Cattle Co.**	None
			160	SLO	**GO-2158**	**Luera Ranch**	
6 South	10 West	**10**	640	SLO	**GO-2158**	**Luera Ranch**	None
6 South	10 West	**11**	640	SLO	**GO-2158**	**Luera Ranch**	None
6 South	10 West	**12**	640	SLO	**GO-2158**	**Luera Ranch**	None
6 South	10 West	**13**	640	SLO	**GO-2158**	**Luera Ranch**	R-22759
6 South	10 West	**14**	640	SLO	**GO-2158**	**Luera Ranch**	None
6 South	10 West	**15**	640	SLO	**GO-2158**	**Luera Ranch**	None
6 South	10 West	**16**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**17**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**18**	623.8	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**19**	623.4	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**20**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**21**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**22**	320	SLO	**GM-2524**	**Farr Cattle Co.**	R-22759
			320	SLO	**GO-2158**	**Luera Ranch**	
6 South	10 West	**23**	640	SLO	**GO-2158**	**Luera Ranch**	R-22759
6 South	10 West	**24**	640	SLO	**GO-2158**	**Luera Ranch**	R-22759
6 South	10 West	**25**	640	SLO	**GO-2158**	**Luera Ranch**	None
6 South	10 West	**26**	640	SLO	**GO-2158**	**Luera Ranch**	None
6 South	10 West	**27**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**28**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**29**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**30**	624.12	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**31**	640	**PRIVATE**	**Farr Cattle Co.**	**Not applicable**	N/A

Township	*Range*	*Section*	*Acres*	*Ownership*	*Grazing Lease or Owner*	*Grazing Lessee*	*ROWs*
6 South	10 West	**32**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**33**	640	**PRIVATE**	**Farr Cattle Co.**	**Not applicable**	N/A
6 South	10 West	**34**	640	SLO	**GM-2524**	**Farr Cattle Co.**	None
6 South	10 West	**35**	640	SLO	**GO-2158**	**Luera Ranch**	None
6 South	10 West	**36**	640	SLO	**GO-2158**	**Luera Ranch**	None
6 South	9 West	**18**	308.04	SLO	**GO-2158**	**Luera Ranch**	R-22759
6 South	9 West	**19**	628.4	SLO	**GO-2158**	**Luera Ranch**	R-22759
6 South	9 West	**30**	631.24	SLO	**GO-2158**	**Luera Ranch**	R-24018
							R-24707
6 South	9 West	**31**	630.44	SLO	**GO-2158**	**Luera Ranch**	R-23604
							R-24707
6 South	9 West	**32**	320	SLO	**GO-2158**	**Luera Ranch**	R-23604
7 South	10 West	**2**	637.64	SLO	**GO-2158**	**Luera Ranch**	None
7 South	10 West	**3**	639.35	SLO	**GO-2158**	**Luera Ranch**	None
7 South	10 West	**10**	160	SLO	**GO-2158**	**Luera Ranch**	None
7 South	10 West	**11**	80	SLO	**GO-2158**	**Luera Ranch**	None
7 South	9 West	**5**	160.23	SLO	**GO-2158**	**Luera Ranch**	None
7 South	9 West	**6**	630.37	SLO	**GO-2158**	**Luera Ranch**	R-23604

TOTAL ACRES	**58922.71**
TOTAL SLO ACRES	**55002.71**
TOTAL PRIVATE ACRES	**3920**

APPENDIX B
LANDOWNERS AND AGENCIES

The landowners below are located within the management plan boundaries.

Agency/Ranch	*Phone #*	*Contact Name*	*Total Acres Owned*	*Acres Leased*
New Mexico State Land Office	575-835-5168 505-827-4453	Willie Lucero Mark Meyers	+/- 55,002	
Farr Cattle Company	575-772-5738	Dave or Roy Farr	2,080	18,331.20
Luera Ranch	225-346-5187	Luera Ranch, LLC	1,160	28,392.73
Harriet Ranch	575-772-5692	Michael Harriet	680	8,278.78
Wetley Ranch (Adjacent)	575-772-5768	Darrel Wetley		

Agency contacts.

Agency	*Phone #*	*Contact Name*
New Mexico State Land Office	575-835-5168 505-827-4453	Willie Lucero Mark Meyers
Bureau of Land Management	575-835-0412	Mark Mathews
USFS-Magdalena Ranger District	575-854-2281	Dennis Aldridge
USFS-Black Range District	575-894-6677	Larry Cosper

APPENDIX C
COOPERATING AGENCIES

The development of this management plan includes two agencies:

Energy, Minerals and Natural Resources Department
NEW MEXICO FORESTRY DIVISION
Socorro District
575-835-9359
Doug Boykin - District Forester

Commissioner of Public Lands
NEW MEXICO STATE LAND OFFICE
Field Operations Division
575-835-5168 Socorro District
505-827-5760 Santa Fe

APPENDIX D
PROJECT RECOMMENDATIONS, LOCATIONS, PRIORITIES

Luera Mountain is a diverse ecosystem with many opportunities for improving wildlife habitat and forest health, and returning the area to a fire-adapted environment. Various methods for fuel reduction have been mentioned in Section 7.3. The following section will address specific projects in specific areas based on vegetation classification.

Grasslands

As mentioned before, the grasslands of Luera Mountain are being encroached upon by piñon, juniper, and ponderosa pine. This is particularly noticeable in the areas of Patrocino and Bathtub basins where once large, open meadows existed are now becoming piñon/juniper woodlands and ponderosa pine forests.

Mastication of Patrocino Canyon would be a very cost effective way to get large amounts of acres treated. In May 2008, approximately 100 acres of Patrocino Canyon was completed in approximately three weeks. Taking into consideration that Patrocino Canyon and the surrounding area totals over 2,000 acres, a large-scale meadow restoration project could feasibly be completed in a few months.

Similar work could be completed in Bathtub Basin, although the vegetation is more of a mix of ponderosa pine and piñon/juniper. The combination of different vegetative components within this area warrants different types of treatments. For example, if the main concern was reducing the number of small diameter ponderosa pine then mastication would work. In addition, if trees are targeted below the driplines of large ponderosa pines and clumps of trees are left for a mosaic effect, then selective tree thinning through the use of handcrews might be an additional option. However, when it comes to removing encroaching trees from grassland areas, handcrews are much slower and more expensive than machines.

Piñon/Juniper Woodland

The piñon/juniper woodland is where the primary focus should be when looking at projects on Luera Mountain. Out of 27,762 acres of forest on Luera Mountain, 22,317 acres is piñon/juniper woodland. Treatment of this area is vital to restoring the health of the forest and creating habitat suitable to the biological species mentioned in this Management Plan.

Various methods can be used for thinning, and all pertinent methods should be mentioned in order to apply one or a combination of them to any thinning project. Selective cutting of trees is broken down into three selection processes. First is single tree selection in which scattered individual trees are marked and harvested. Trees are selected based on many different factors, but the primary goal is to reduce basal area within a given acre. Trees can be selected by diameter, species, disease, etc., but the overall health of the stand is what is important.

The second method is group selection, in which groups of trees are removed, creating a more mosaic look within the area once completed. This allows grasses and foraging

material that are shade intolerant to grow. Group selection also creates wildlife habitat by breaking up the homogenous landscape and opens up the area for foraging, as well as grazing for livestock. The adjacent dense vegetation provides cover from predators.

The third method is called overstory removal or shelterwood cutting. In this method, all of the large trees are removed while leaving the smaller trees for regeneration. There are definitely applications for this type of thinning, but we will focus on this method in the oak woodland fuel type.

Re-introducing fire into piñon/juniper area has already been targeted as a priority. There are various projects that can be completed in order to accomplish this goal. It was mentioned that creating a fuelbreak between the two fire subunits would be beneficial for fire managers in both using the area as a place to either burn out in case of a wildfire or using it as a sectional boundary when using prescribed fire. Again, a masticator would be beneficial is completely breaking down the fuel. However, if land managers wanted to reduce the cost of treatment, cutting and piling or the lop and scatter method would reduce the need for expensive equipment. Burning the piles, or doing a broadcast burn in areas where the amount of fuel that is put on the ground is sufficient to carry fire would be a good opportunity to use fire as a tool. Based on how a land manager writes a project plan, generally fuelbreaks reduce the basal area significantly and provide enough ground fuel to carry a fire.

Fuelbreaks can also be used to transition into a general thinning or create wildlife corridors. An excellent spot for this type of treatment would be the road that begins at the Farr Ranch and ends up in Patrocino Canyon. Because of the high piñon mortality on the south aspect slopes, there is a great deal of potential fuel that will be on the ground within the next couple of years. There are also areas of meadow that are being encroached upon, and it can act as a secondary firebreak for protection of the ranch and other southeastern values at risk. In addition, the road follows a drainage as it moves north towards Patrocino Canyon, and this would provide an excellent wildlife corridor. Equipment can also be moved along this 5-mile stretch, so a complete thinning project would be easy to complete using chainsaws, chipping, and/or masticating. A combination of single tree and group selection can be used in order to create wildlife habitat, restore various grassland areas, and reduce stocking levels within the dense areas of the piñon/juniper woodland.

The vegetation transition areas between the ponderosa pine and piñon/juniper woodlands offer many possibilities for thinning as well. Basal areas are much higher within this zone and significant thinning of the piñon and juniper would benefit the ponderosa pine. These transition zones can be found throughout the mountain, particularly along the ridgelines going from the radio towers to the Luera Lookout, as well as Patrocino Canyon, Bathtub Basin, and the road from the Farr Ranch to Patrocino Canyon.

Treatment in the piñon/juniper woodland anywhere around the perimeter of the mountain would be beneficial. These grasslands are being encroached upon, and if fuel

reduction does not take place in the next 25 years, many of these areas will become woodlands. Reducing fuel loading would restore these grasslands and create a fuel break for the ranches and some of the primary values at risk. In many cases, wood may be utilized by the ranches for firewood, fences, etc.

Ponderosa Pine

The higher altitude ponderosa pine areas on Luera Mountain are in very good shape. Basal areas are low with large ponderosa pine trees spaced far apart with nicely spaced smaller trees growing in to replace the large ones. It appears that low-intensity fires have burned in these areas in the past and have helped maintain a healthy environment.

As mentioned before, the lower elevation ponderosa pine areas are being encroached upon by piñon, juniper, and in the case of Bathtub Basin, other small ponderosa pines. Single tree selection with a combination of hand thinning and mastication would work very well throughout Bathtub Basin. The mastication could take care of the massive regeneration size material, and hand thinners could go in and reduce basal area to a healthy stocking level in other areas. This in turn would create a nice habitat for deer and elk to forage and have cover as well.

Mixed Conifer

The mixed conifer around Luera Lookout is the primary area where mixed conifer is found on Luera Mountain. As mentioned before, the access to the lookout is difficult, therefore creating a real problem when trying to logistically conduct projects here. However, because of the large amount of diseased and dying trees, this would be a good place to use fire as a tool. Whether doing strip clearcuts, group selection, or picking individual trees, thinning with piling or lop and scatter would be an effective way to reduce fuel and begin to restore the mixed conifer. Burning piles combined with small broadcast burns, will clean up the fuel on the ground and begin to establish fire into an ecosystem adapted for a natural fire regime.

Oak Woodland

The benefits to the umbrella species were mentioned in Section 4.6.2. Although the amount of oak woodland acreage is relatively small, it can be excellent wildlife habitat and corridors. The oak is found primarily in the drainages of Luera Mountain and there are different treatments that can benefit the wildlife in the area.

Again, the road from the Farr Ranch to Patrocino Canyon is included in this example because of the large amount of oak that runs along this drainage corridor. However, any oak woodland on the Luera Mountain can benefit from these projects. The two methods that would benefit this area significantly would be the group selection and overstory removal methods. Many areas along this corridor have very large and aged stands of oak. By going through and creating a mosaic through the use of group

selection, habitat for elk and deer is greatly increased, as well as an increased amount of grasses for foraging and browsing species. By using an overstory removal method, the large trees are removed and will allow for sprouting and regeneration of oak.

The problem with having large, established stands of oak is that the forage material is minimal because the leafy material is up high and inaccessible to foraging wildlife. Removing the larger trees will stimulate new growth and re-sprouting from the stumps of the cut trees, as well as opening up the available foraging material for wildlife. Opening up the oak will also allow for wildlife to travel within these areas to reach the water supplies in the form of stock tanks and wildlife drinkers that are available to them.

Overall, the mentioned projects can be used in any variety of ways and in many areas within the Luera Mountain area. The specific areas that were mentioned are examples of what can be done in each vegetative type to improve wildlife habitat and increase the overall health of the Luera Mountain ecosystem. These projects can aid in returning Luera Mountain to its historic, natural state of health.

Restoration Activities and Goals

The following projects are goals to be achieved between 2009-2014. As these projects are completed, adjustments will be made in order to accommodate more projects in the future. The utilization of wildland fire where practical and appropriate is always the primary goal on the Luera Mountain. Figure E-1 illustrates the project areas.

1. Grassland encroachment/meadow restoration in both Patrocino and Bathtub Basin. Removal of encroaching piñon and juniper, as well as ponderosa pine in Bathtub Basin.
2. Fuelbreak/general thinning from Farr Ranch into Patrocino (green line). This would create a vegetation separation between the northern burn unit and the southern burn unit, as well as protect resources on the southeastern corner of the project.
3. Fuelbreak/general thinning from Patrocino to western boundary of project (yellow line). This would complete the fuelbreak between burn units, as well as create a corridor between the eastern and western half of the mountain allowing firefighting equipment and resources access.
4. General thinning within piñon/juniper woodland to ponderosa pine transition zones. This area is not shown due to the extensive area that this covers. Thinning these transition zones supports the fuelbreak and adds to the overall forest health.
5. Oak woodland thinning for wildlife (green line). The road between Farr Ranch and Patrocino Basin can be an excellent wildlife corridor if particular thinning methods are used for wildlife habitat creation.
6. Thinning along private land boundaries and in-holdings for resource protection. This can be in the form of fuelbreaks, general thinning, encroachment/meadow restoration, etc. Fuelbreaks along private land and project boundaries will aid in containment of potential wildfires and prescribed fire.

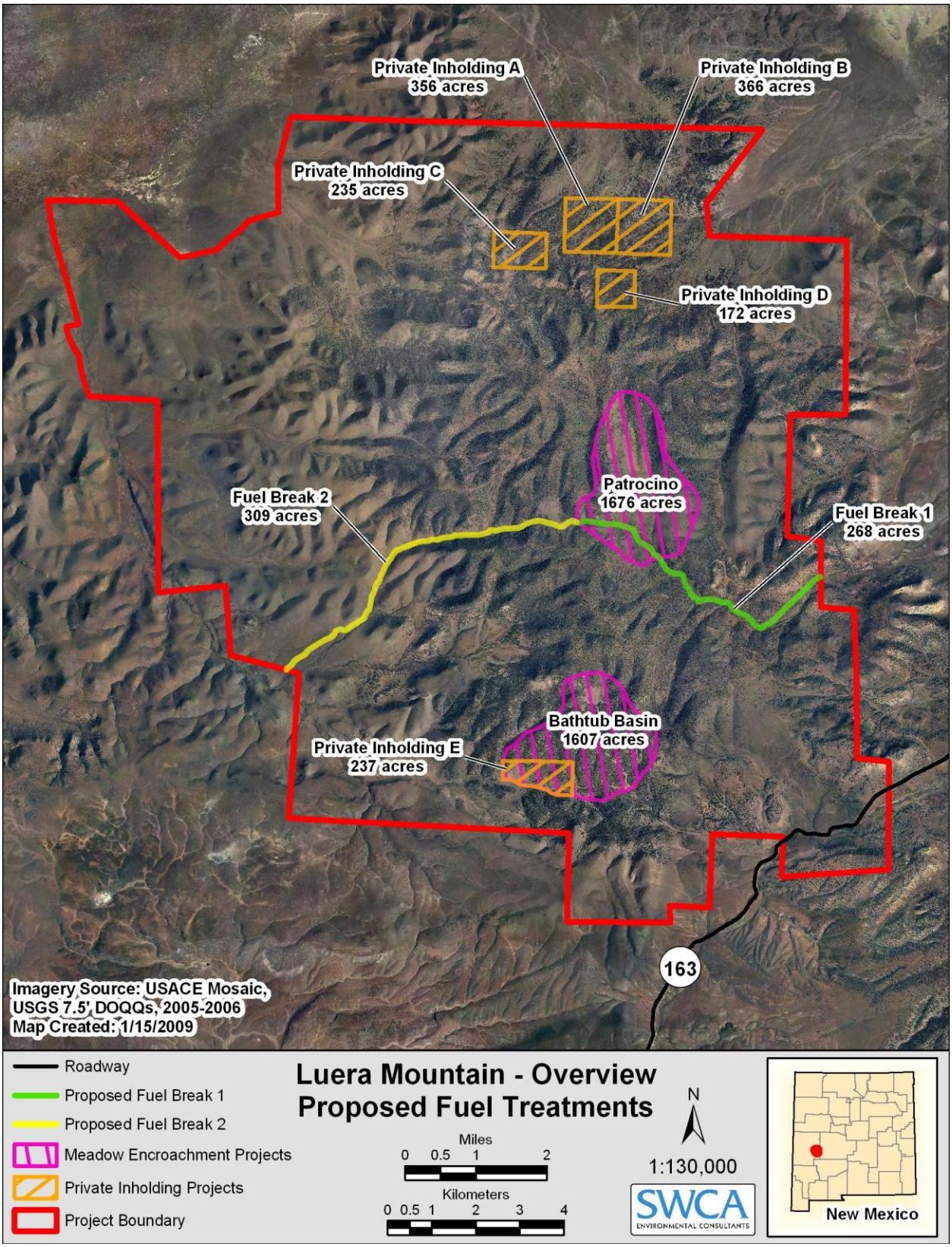

Figure E.1. Proposed restoration projects

APPENDIX E
PROJECT RESOURCES

Fuel Categories

Fire Behavior Fuel Model 1
Fire spread is governed by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one-third of the area.

Grasslands and savanna are represented along with stubble, grass-tundra, and grass-shrub combinations that met the above area constraint. Annual and perennial grasses are included in this fuel model.

Fire Behavior Fuel Model 2
Fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and dead and down stemwood from the open shrub or timber overstory, contributes to the fire intensity. Open shrub lands and pine stands or scrub oak stands that cover one-third to two-thirds of the area may generally fit this model; such stands may include clumps of fuels that generate higher intensities and that may produce firebrands. Some piñon/juniper may be in this model.

Fire Behavior Fuel Model 5
Fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and the grasses or forbs in the understory. The fires are generally not very intense because surface fuel loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material. Usually shrubs are short and almost totally cover the area. Young, green stands with no dead wood would qualify: laurel, vine maple, alder, or even chaparral, manzanita, or chamise.

Fire Behavior Fuel Model 6
Fires carry through the shrub layer where the foliage is more flammable than fuel model 5, but this requires moderate winds, greater than 8 mi/h (13 km/h) at midflame height. Fire will drop to the ground at low wind speeds or at openings in the stand. The shrubs are older, but not as tall as shrub types of model 4, nor do they contain as much fuel as model 4. A broad range of shrub conditions is covered by this model. Fuel situations to be considered include intermediate stands of chamise, chaparral, oak brush, low pocosin, Alaskan spruce taiga, and shrub tundra. Even hardwood slash that has cured can be considered. Piñon/juniper shrublands may be represented but may over predict rate of spread except at high winds, like 20 mi/h (32 km/h) at the 20-foot level.

Fire Behavior Fuel Model 8
Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional “jackpot” or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidity, and high winds do the fuels pose fire hazards. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This

layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are white pine, and lodgepole pine, spruce, fir, and larch.

Fire Behavior Fuel Model 9

Fires run through the surface litter faster than model 8 and have longer flame height. Both long-needle conifer stands and hardwood stands, especially the oak-hickory types, are typical. Fall fires in hardwoods are predictable, but high winds will actually cause higher rates of spread than predicted because of spotting caused by rolling and blowing leaves. Closed stands of long-needled pine like ponderosa, Jeffrey, and red pines, or southern pine plantations are grouped in this model. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning.

Vegetation Types

Grasslands (GR)	Non-forested areas with less than 10% crown closure of tree species.
Piñon / Juniper (PJ) woodland	A mixture of Piñon Pine, One-seed Juniper, Alligator Juniper, and/or Rocky Mountain Juniper, - sometimes with small numbers of Ponderosa Pine, Gambel Oak, and/or Emory Oak.
Ponderosa Pine (PP) forest	Comprised of 75% or more Ponderosa Pine (as compared to other tree species).
Mixed Conifer (MC) forest	A mixture of Douglas-fir, Southwestern White Pine, and Ponderosa Pine.
Oak (O) woodland	Composed of pure stands of Gambel Oak and/or Emory Oak.

Soil Types

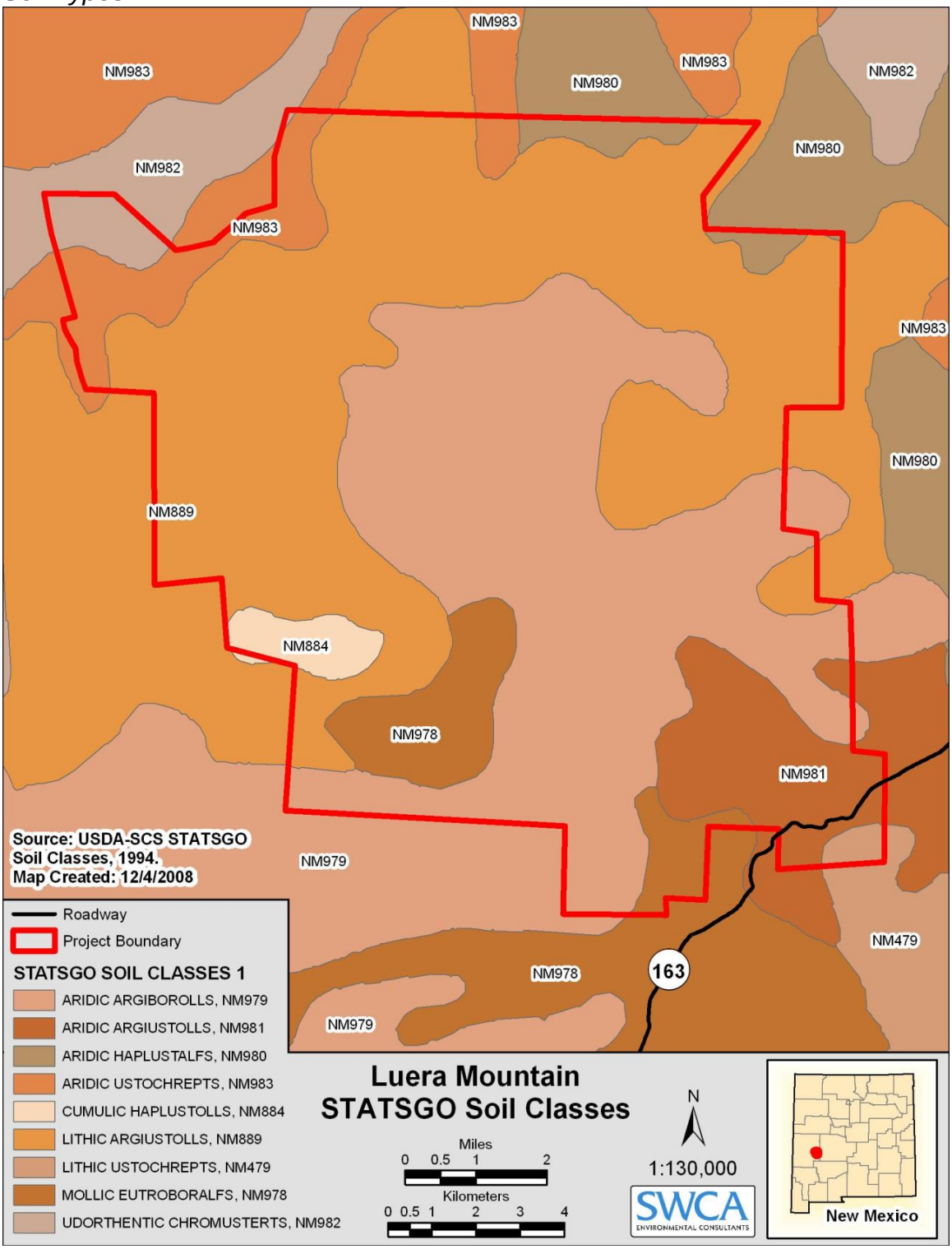

Figure 4.29. Luera Mountain soil classes

* Source: USDA-SCS STATGO

Primary Soil Types
39.1% Tolman-Rock outcrop complex, 25 – 60 percent slopes.
22.2% Faraway-Motoqua-Rock outcrop complex on 8 – 30 percent slopes.
20.6% Parquat-Tafoya association on 5 to 30 percent slopes.

Secondary Soil Types
5% Abrazo-Rock outcrop complex on 15 – 50 percent slopes.
5.9% Augustine fine, sandy loam on 1 – 6 percent slopes.
5.2% Datil-Guy association on 3 – 15 percent slopes.
1.3% Motoqua-Rock outcrop complex on 8 – 30 percent slopes.
0.7% Guy-Gravelly loamy fine sand on 0 – 12 percent slopes.

* Source: NRCS Web Soil Survey

Wildlife

New Mexico Game and Fish provides a database system called the Biota Information System of New Mexico (BISON-M). The search query based system provides specific information based on search criteria, and can be utilized to identify every listed species in Catron County.

http://www.bison-m.org/

Cultural Resources

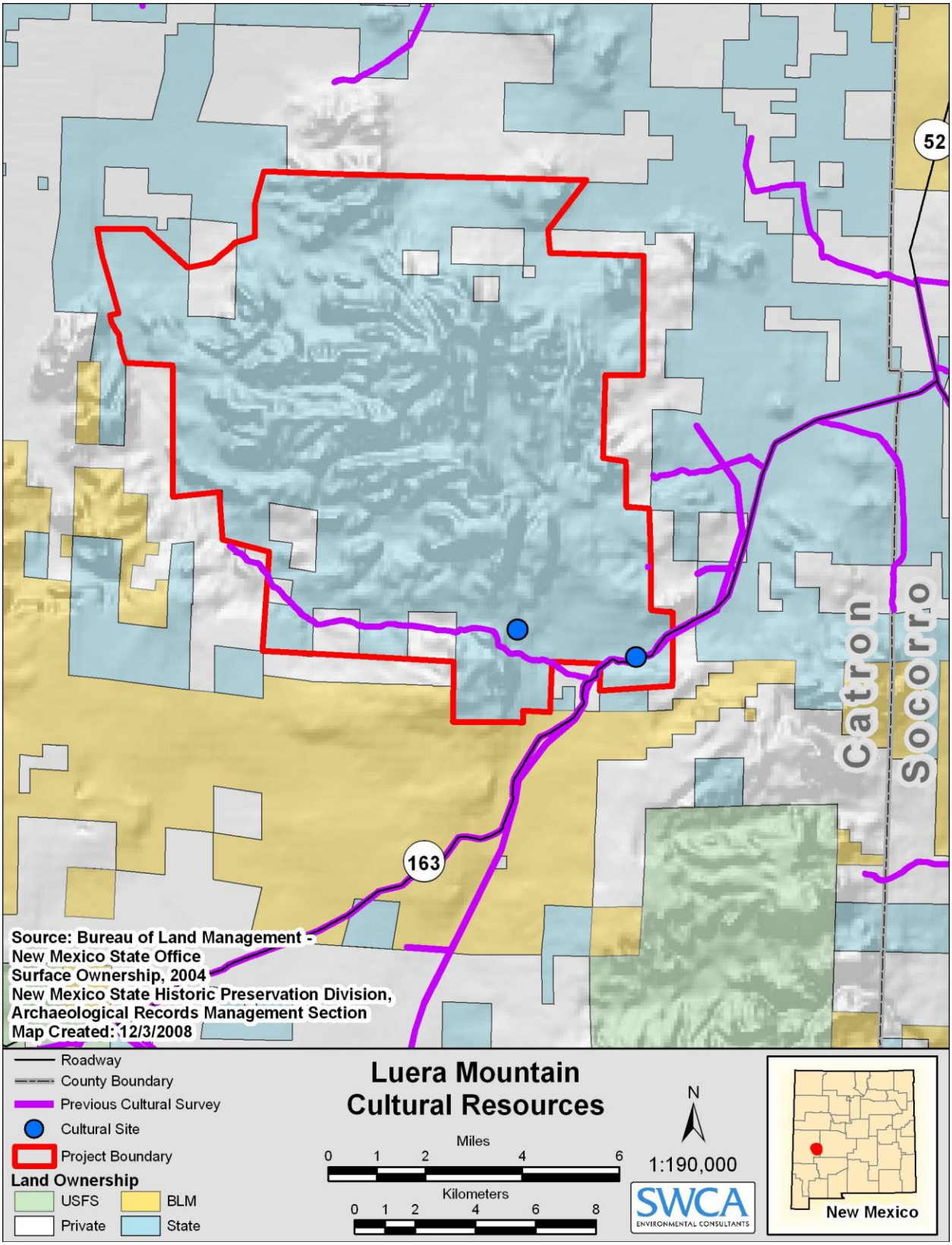

Figure 4.31. ARMS database cultural sites

APPENDIX F
ACKNOWLEDGEMENTS

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Sheri Waldbauer, Senior Editor

Joseph Fluder, Environmental Consultant

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