CHAPTER 3

AFFECTED ENVIRONMENT

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3.1 INTRODUCTION

This Chapter describes the current environment within the Prehistoric Trackways National Monument (PTNM). Many, though not all, of the sections within this Chapter correlate with programs for which the Bureau of Land Management (BLM) intends to make management decisions through the planning process. These resources and uses may be affected by the implementation of any of the management alternatives, but the current environment gives a baseline to which to compare the impacts from the different alternatives.

This Chapter is organized by resources and uses as follows:

Paleontological Resources
Interpretation and Education
Recreation and Visitor Services
Trails and Travel Management
Air Resources
- Air Quality
- Climate

Cultural Resources
Geology/Minerals
Lands and Realty
Lands with Wilderness Characteristics
Livestock Grazing
Research Management
Socio-Economic Conditions
Soils
Special Designations
- Area of Critical Environmental Concern
- Research Natural Area
- Wilderness Study Area

Special Status Species
Vegetation
Visual Resources
Water Resources
- Groundwater
- Surface water

Wildland Fire Management
Wildlife

3.2 RESOURCES AND USES

3.2.1 Paleontological Resources

Secrets of ancient life along a Permian tidal flat are documented in the Monument. The secrets are revealed in a series of sandstone, siltstone, and mudstone red beds sandwiched between the grayish yellow limestone of a Permian sea. These rocks are collectively known as the Robledo Mountain Formation of the Hueco Group. Within the boundaries of the Monument, the sedimentary rocks

Figure 3-1 Amphibian Trace. Illustration by Matt Celeskey, NM Museum of Natural History & Science

containing paleontological resources include the Early Permian red beds and limestone and the Oligocene and Pleistocene basin fill deposits collectively referred to as the Santa Fe Group.

In this area, the movements of animals have been frozen in the sands, silts, and mud of the tidal flat for almost 300 million years. Jumping trails of wingless insects have been preserved. Activities of amphibians (see Figure 3-1), reptiles, a variety of arthropods including horse shoe crabs (see Figure 3-2), and insects are recorded in the red beds. Even impressions of the animals themselves have been documented by recent discoveries of the features of sea anemones and jelly fish.

The fossils at this site are called trace fossils (*ichnofossils*) and can be used to develop a picture of what life was like on the coast of an inland Permian sea 280 million years ago(see Figure 3-3), before the age of dinosaurs. Leaf impressions (see Figure 3-4 and Figure 3-6) and petrified wood (see Figure 3-5) tell what was growing on the landscape; some specimens are new to science. When the sea level rose, the tidal flats were inundated by marine waters, and the limestone was deposited. This marine limestone contains a variety of invertebrate body fossils such as shells of brachiopods, clams, and gastropods (see Figure 3-8).

Sedimentary structures such as ripple laminations and mud cracks along with various trace fossils can be used to define life zones on the tidal flat, shallow water zones, and tidal channels, allowing paleontologists and sedimentologists to refine models of Permian ecosystems. The interesting thing about animal tracks, as opposed to bones or bodies, is that they reveal how an animal lived and what its life was like and, perhaps, who was food for whom.

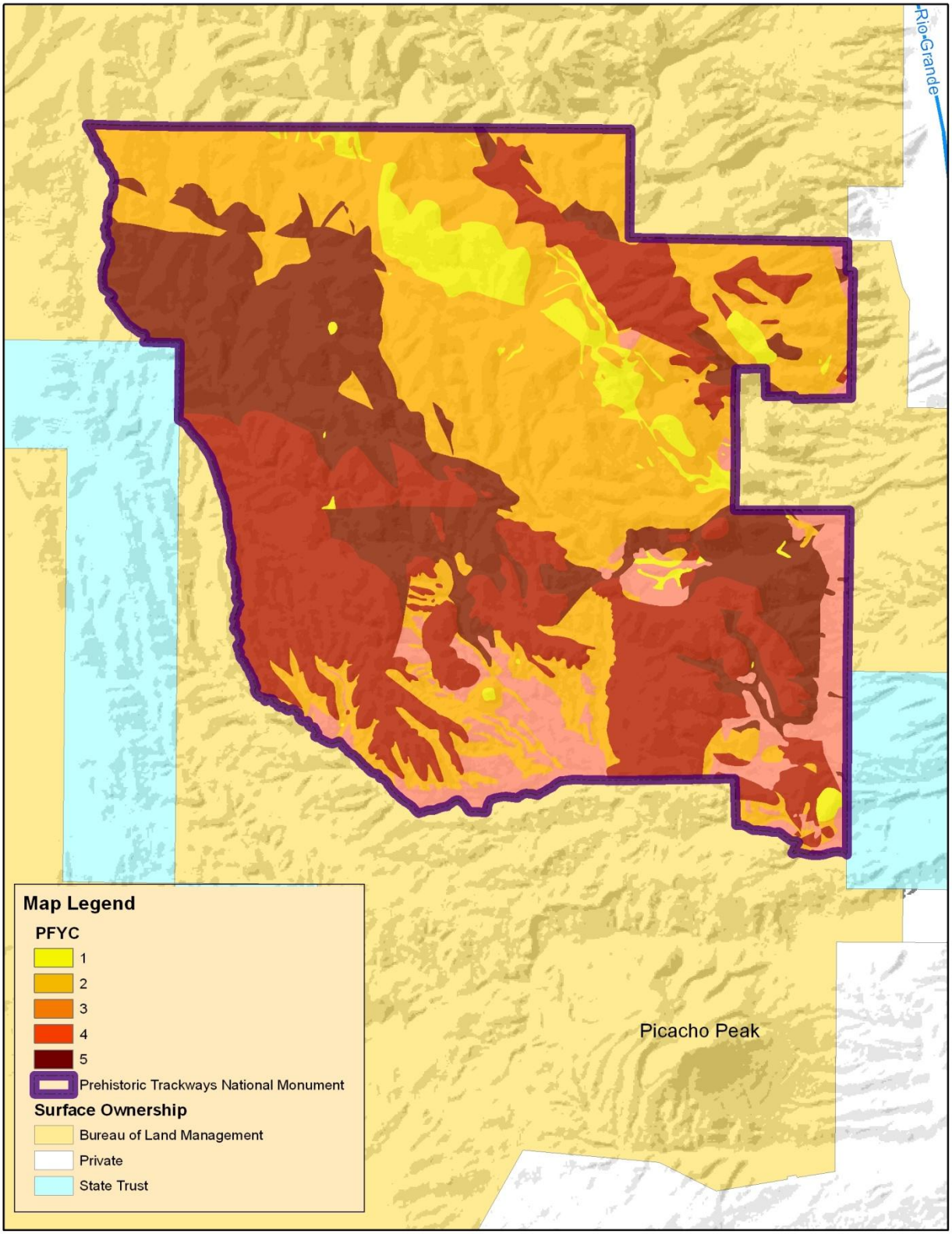
Figure 3-2. Horseshoe Crab Trace. Illustration by Mary Sundstrom.

The BLM is mandated by Section 2103 of Public Law 111-11 to preserve, and conserve the resources and values of the Monument, which would require BLM to stop any use if it is causing damage to sensitive paleontological resources. Paleontological resources collected under a research permit would be stored in a Federally-approved repository for research and for use in exhibits. This allows research to continue on these specimens that are stored away from forces of nature or man. These specimens can be and are exhibited to a wide range of people across the Nation.

Current BLM policy for addressing impact to paleontological resources is based on the Potential Fossil Yield Classification System (PFYC). Impact to paleontological resources from other BLM actions are addressed using this system. Currently, the PTNM has such a system developed that would be used by the BLM when proposing any actions within the PTNM. See Map 3-1 for potential PFYC for the PTNM.

Figure 3-3. Permian Tidal Flat. Illustration by Mary Sundstrom.

Map 3-1 - Potential Fossil Yield Classification System



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data, or for purposes not intended by the BLM. Spatial information may not meet National Map Accuracy Standards. This information is subject to change without notification.

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Las Cruces District Office

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Projection: UTM Zone 13
Datum: NAD 1983

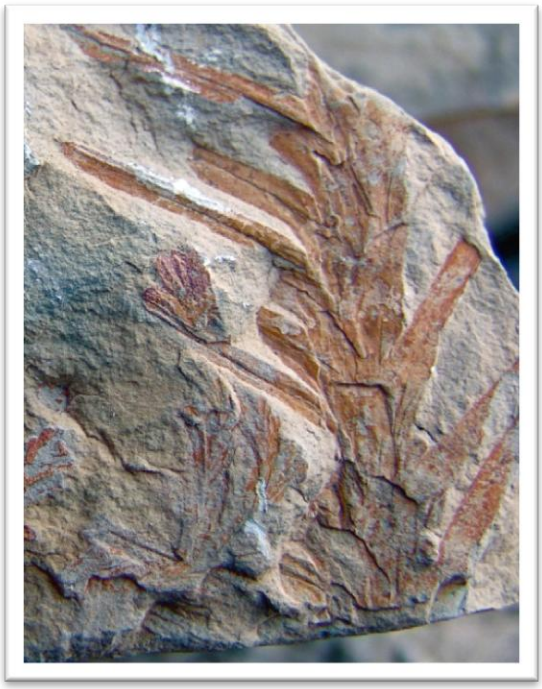


Figure 3-4 Leaf Fossils

PHOTOS COURTESY OF:
JERRY MACDONALD

Figure 3-5 Petrified Wood

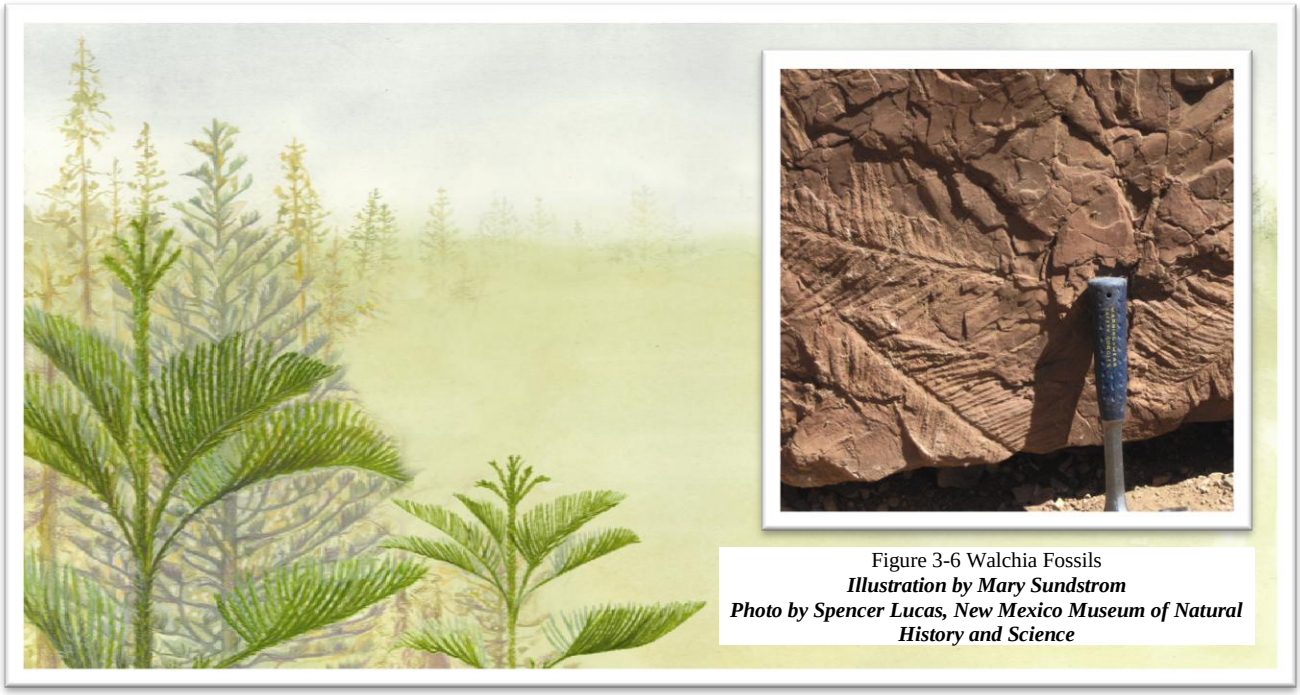


Figure 3-6 Walchia Fossils
Illustration by Mary Sundstrom
Photo by Spencer Lucas, New Mexico Museum of Natural History and Science

Occurrences of paleontological resources are closely related to the geologic units that contain them, and the potential for finding important paleontological resources can be broadly predicted by the presence of the pertinent geologic units at or near the surface. Therefore, geologic mapping can be used as a proxy for assessing the potential occurrence of important paleontological resources. The PFYC System, adopted by the BLM in 2008, uses geologic units as base data. The PFYC System provides a uniform tool to assess potential occurrences of paleontological resources and evaluate possible impacts.

Under the PFYC System, geologic units are classified based on the relative abundance of vertebrate fossils or uncommon invertebrate or plant fossils and their sensitivity to adverse impacts, with a higher-class number indicating a higher potential. This classification is best applied at the geologic formation or member level. It is not intended to be an assessment of whether important fossils are known to occur occasionally in these units (i.e., a few important fossils or localities widely scattered throughout a formation does not necessarily indicate a higher class), nor is it intended to be applied to specific sites or areas. The classification system is intended to provide baseline guidance to assessing and mitigating impacts to paleontological resources. In many situations, the classification should be an intermediate step in the analysis, and should be used to assess additional mitigation needs. Current BLM policy provides for a specific course of action depending on the paleontological resource potential ranked 1 through 5 (see Appendix D for *BLM Washington Office Instruction Memorandum 2009-11*). The PFYC classes are defined as follows:

Class 1: Is composed of geologic units unlikely to contain recognizable fossil remains. This includes units that are igneous or metamorphic in origin (but excludes tuffs), as well as units that are Precambrian in age or older. Management concern for paleontological resources in Class 1 units is negligible or not applicable. No assessment or mitigation is needed except in very rare circumstances. The occurrence of significant fossils in Class 1 units is non-existent or extremely rare.

Class 2: Is composed of sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically significant invertebrate fossils. This includes units in which vertebrate or significant invertebrate fossils are unknown or very rare, units that are younger than 10,000 years before present, units that are Aeolian in origin and units, which exhibit significant physical changes in rock (i.e.,

compaction, cementation, mineral replacement). The potential for affecting vertebrate fossils or uncommon invertebrate or plant fossils is low. Management concern for paleontological resources is low, and management actions are not likely to be needed. Localities containing important resources may exist, but would be rare and would not influence the classification.

Class 3: Is composed of fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential. These units are often marine in origin with sporadic known occurrences of vertebrate fossils. Vertebrate fossils and uncommon invertebrate fossils are known to occur inconsistently, and predictability is known to be low. Surface-disturbing activities will require sufficient assessment to determine whether significant fossil resources occur in the area of a proposed action, and whether the action could affect the paleontological resources.

Class 4: These are Class 5 geologic units (see below) that have lowered risks of human-caused adverse impacts or lowered risk of natural degradation. They include bedrock units with extensive soil or vegetative cover, bedrock exposures that are limited or not expected to be impacted, units with areas of exposed outcrop that are smaller than two contiguous acres, units in which outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic effects, and units where other characteristics are present that lower the vulnerability of both known and unidentified fossil localities.

Class 5: Highly fossiliferous geologic units that regularly and predictably produce vertebrate fossils or uncommon invertebrate or plant fossils, and that are at risk of human-caused adverse impacts or natural degradation. These include units in which vertebrate fossils or uncommon invertebrate or plant fossils are known and documented to occur consistently, predictably, or abundantly. Class 5 pertains to highly sensitive units that are well exposed with little or no soil or vegetative cover, units in which outcrop areas are extensive, and exposed bedrock areas that are larger than two contiguous acres.

3.2.1.1 Non-Marine Fossils

3.2.1.1.1 Plant Fossils

The Robledo Mountains contain several important Lower Permian plant localities.

> *"Plants from the Robledo Mountains are primarily representatives of groups that we believe to have grown in seasonally dry habitats - commonly including conifers and an extinct group known as peltasperms, as well as other less abundant forms. Most of the plants grew along the margins of stream channels or in swampy lowlands, which is what permitted their leaves and branches to be buried quickly and in environments where they were removed from the effects of decay"(*Bill DiMichele, PhD., Curator of Fossil Plants, Smithsonian Institution).

An important locality in Apache Canyon called *Conifer Forest* was studied and named by Jerry MacDonald and then recorded in the 1994 Paleozoic Trackway Report and other localities have now been identified in the Monument during the permitted 2010 inventory. Petrified logs representing conifers and gingko were documented and described by Tidwell (1994). One of the logs was identified as representing the wood of the conifer *Walchia.* Leaves of *Walchia* (see Figure 3-6) are represented at the locality in Apache Canyon identified as the *Conifer Forest*.

3.2.1.1.2 Vertebrate Tracks

The most common ichnotaxon in the Robledo samples is the amphibian tracktype *Anthichnium salamdroide*. A large amphibian ichnogenus *Limnopus* is represented and the diminutive amphibian ichnogenus *Erpetopus* is present. A few specimens suggest the presence of a larger amphibian track maker such as *Parabarpus*.

The most common small reptilian track type is *Dromopus lacertoides*, which occurs in large numbers on some layers at New Mexico Museum of Natural History (NMMNH) locality 846 (also termed the *Discovery Site*) (see Figure 3-7) in the Jerry MacDonald Collection.

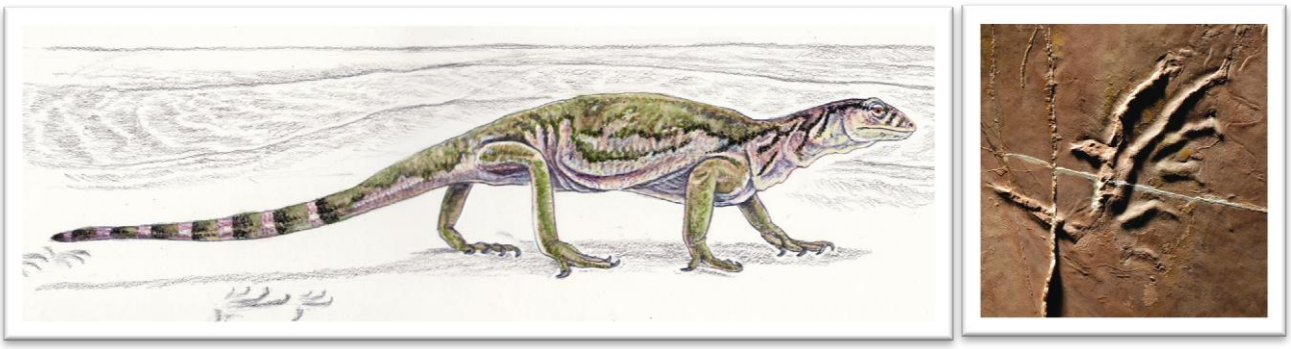


Figure 3-7. ***Dromopus***. Photo by Sebastian Voigt.
Illustration by Matt Celeskey, New Mexico Museum of Natural History and Science

Some of the longest trackways pertain to *Dimetropus*, which represents a pelycosaurian synapsid. A 25-foot long trackway was reposited at the Carnegie Museum in Pittsburg, and a 20-foot long and 12-foot long trackways are reposited at the National Natural History Museum at the Smithsonian Institution and the Las Cruces Museum of Nature and Science, respectively. There are two morphologies/species of *Dimetropus* in the Jerry MacDonald Collection. The size of the footprints is smaller than is typical for Dimetrodon feet and is much closer in size to the feet of Sphenacodon, which is the most common pelycosaur known from bones in New Mexico. The second morphology is larger and is usually preserved in a different (coarser) substrate than the small form.

3.2.1.1.3 Invertebrate Trackways

The invertebrate ichnofauna is particularly diverse and evidently includes many more than the 17 ichnotaxa described by Demathieu et al. (1992) from the Lower Permian of Southern France. Several described genera are present, whereas other morphologies probably represent new taxa.

Minter and Braddy (2009) describe 18 types of invertebrate trace fossils from the Jerry MacDonald Collection.

3.2.1.2 Marine Fossils

Kues and Giles (2004) described and illustrated examples of the marine fauna represented in the Hueco Group. More than 70 of the characteristic taxa are illustrated in the article and include brachiopods, bivalves and gastropods (see Figure 3-8) which are the most diverse elements of the fauna.

Figure 3-8. Marine Fossils. Photo by Scott Elrick.

Additionally, remains of sponges, corals, bryozoans, scaphopods, nautiloids, ammonoids, echinoids, crinoids, trilobites and sharks were found by Kues in the marine sequences. Ostracods are the most common microfossils in the Hueco Group in the Robledo Mountains. Some replacement of original minerals in the fossil shells has occurred and can obscure the original structure in some of the marine fauna.

3.2.2 Interpretation and Education

Currently, there are no on-site interpretive facilities or opportunities within the PTNM such as exhibits, kiosks or signs. There are no formal trails with signs to lead visitors to any location within the PTNM that has interpretable resources. There is an informal trail to the *Discovery Site*. The Site is marked with a sign that offers little in the way of interpretation for the many slabs of mudstone with tracks that can be found scattered on the ground. In addition, an information kiosk was installed on BLM land adjacent to the Monument in the winter of 2011 that offers some orientation and interpretation of the trackways. Hikes, tours, and school programs have been offered for the past couple of years by BLM and other educational entities from Las Cruces. These programs are being conducted within the limited parameters described above. Self-guided activities are no doubt taking place as well, but it is unknown as to how effective these are for the visitor without the benefit of exhibits or signs describing the resources.

3.2.3 Recreation and Visitor Services

The Monument is located adjacent to the City of Las Cruces, New Mexico and provides many opportunities for a variety of outdoor recreational uses. Most visitors currently are local individuals and families out to enjoy the natural resources the Monument has to offer. Some of the more popular recreational opportunities within the Monument include a network of unmaintained, four-wheel drive routes and a challenging mountain bike trail. There are currently no facilities within the Monument to support these uses. As the Monument draws the attention of educators, scientists, and the general public, the need for more facilities is likely if visitation increases.

Based on the field observations on any given weekend throughout the calendar year, Park Rangers have observed anywhere from 10 to 50 people within the Monument – exploring, riding off-highway vehicles (OHVs) and mountain bikes, hiking, etc. Although these are not hard numbers, annual visitation to the PTNM is estimated at between 5,000 and 7,000 based on an estimated average of 30 people per weekend and about 5 people per day during the week (*Note: This estimate includes organized/permitted events, group tours, and range permittees engaged in range improvements and monitoring*). During the cooler months of the year, visitation is probably higher than those months with higher temperatures.

As required by the National Environmental Policy Act (NEPA), the issuance of a Special Recreation Permit (SRP) is a Federal action and subject to NEPA analysis. The BLM currently authorizes SRPs within the Planning Area on a discretionary and case-by-case basis. The decision to grant or deny any application (see 43 CFR 2930) is based on a number of factors that include but are not limited to

conformance with laws and land use plans, the protection of resources, public safety, and conflicts with other uses.

In 1998, the BLM completed an environmental assessment (EA) (NM-036-98-29) to identify and authorize mountain bike trails in Doña Ana County. Among the trails that were approved for development through this analysis was the 4-mile (round trip) route in the southern Robledo Mountains that is popularly known as the "*SST*" Trail. Since 1998, the "*SST*" has evolved to incorporate a portion of a designated OHV trail bringing the total round trip distance to 6.5 miles, of which 5.5 miles are within the Monument.

The area within and around the Monument is rugged terrain and includes 32 miles of designated OHV trails within the Monument that have received National recognition by OHV communities as a prime and challenging place to drive. All of the routes within the Monument require high clearance, four-wheel drive vehicles; with approximately 50 percent of these trails rated as extreme, or difficult, requiring modified vehicles and knowledge and skills. Approximately 45 percent of these trails are rated as easy or moderate but still require a certain degree of skill and four-wheel drive vehicles. Five percent of the trails have no difficulty rating but still require four-wheel drive. Low clearance, two-wheel drive vehicles cannot navigate within this area.

In addition to motorized and non-motorized vehicles, hikers, neighbors, equestrian enthusiasts, recreational firearms users, amateur fossil and rock collectors, geologists, paleontologists, photographers, and dirt bike riders are all attracted to the rustic, yet convenient foothills of the southern Robledo Mountains.

The Planning Area offers a variety of undesignated hiking trails, paths, and canyon bottoms that appeal to outdoor enthusiasts. Foot travel in the Monument can be a rewarding experience but should be approached with a sense of respect for the harsh environment. The area in and around the Monument has been known for many years as a place to collect fossils. Hikers and amateur fossil and rock collectors use the Monument regularly due to its proximity to town. Much like the OHV users, hikers and bicyclists usually follow the arroyos and ridgelines and often use the same trails as do the OHV drivers.

The Robledo Mountains provide a scenic background for naturalists in general. The desert plant life is a wide representation of Chihuahua desert plant life and has a great variety of cacti. Bird watchers can see many types of desert species from eagles to wrens, and also can enjoy seasonal visitors when sandhill cranes fly overhead.

For decades, geology classes from New Mexico State University have conducted field trips to the Robledo Mountains. Local school groups, museums and community groups have also used the Robledos for many years for trips to explore paleontological, environmental and geological resources.

Recreational target shooting and hunting is allowed in the Monument. The area is known and used frequently for target shooting and occasionally for hunting. Debris left over from target shooting, vandalism to BLM signs and property, and destruction to vegetation have been monitored and recorded in and around the Monument. Visitors, educational groups, and staff members have reported safety risks from target shooters. Hunting occurs during deer hunting season and year-round for non-protected species such as jackrabbits and coyotes.

Campfire remains and large amounts of debris associated with partying around the Monument are frequently noted, monitored, recorded, and cleaned up by BLM staff and concerned public.

3.2.4 Trails and Travel Management

The variety of extreme "*rock crawling*" trails coupled with a network of unmaintained two-track routes has made the Robledo Mountains a favorite destination for local OHV use. A majority of this use is confined to the arroyos, which shields the activity from the casual observer.

In 1997, in order to reduce motorized vehicle incursions into the Robledo Mountains Wilderness Study Area (WSA) and in an effort to provide a convenient venue for OHV enthusiasts, the BLM prepared the Robledo Mountains Off-Highway Vehicle Implementation Plan (NM-036-97-083). This trail system is presently open year-around use and has been popularized by the annual Chile Challenge Extreme Off-Road Event. About 32 miles of the Robledo Mountains OHV trails are within the boundaries of the Monument.

The SST, a designated mountain bike trail (NM-036-98-29), winds through about 5.5 miles of the eastern portion of the Monument. There are no organized events associated with this trail, but it is used on a regular basis by local riders.

The PTNM is currently open for casual equestrian use and hiking, although no formal trails are designated for those uses.

3.2.5 Air Resources

3.2.5.1 Air Quality

The Clean Air Act, as amended, requires the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) for six "*criteria*" pollutants including Carbon Monoxide, Lead, Nitrogen Dioxide, Sulfur Dioxide, Ozone, and Particulate Matter (PM). Of these six, only one – PM – is substantially affected by natural resource management activities proposed in the Analysis Area. PM is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

The size of particles is directly linked to their potential for causing health problems. EPA is concerned about particles that are 10 micrometers in diameter or smaller (PM_{10}) because those are the particles that generally pass through the throat and nose and enter the lungs. A separate standard has been set for $PM_{2.5}$, those particles with diameter of 2.5 micrometers or less, because they have been found to cause the most serious health impacts. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. Units of measure for the PM are micrograms per cubic meter of air ($\mu g/m^3$). (http://www.epa.gov/air/criteria.html)

Air quality monitors measure concentrations of PM throughout the country; Doña Ana County currently has several monitoring stations. EPA, state, tribal and local agencies use that data to ensure that PM in the air is at levels that protects public health and the environment. Two monitoring stations for PM_{10} can be considered representative of the Analysis Area. The West Mesa site is located approximately 6 miles south of the Planning Area and the Holman Road Site is approximately 12 miles to the east-northeast. In addition, $PM_{2.5}$ is monitored in Las Cruces approximately7 miles to the southeast. A review of 2010 data indicates that the $PM_{2.5}$ levels have remained well within the standards. PM_{10} levels show occasional spikes above the 24-hour standard but these are likely associated with naturally occurring dust storms.

The New Mexico Environment Department recently published a study showing that in 2008 exceedances of the PM_{10} standards were associated with dust storms and not human activities in Doña Ana County

(NMED 2011). Southern Doña Ana County is also impacted by industrial sources in Mexico and Texas as well as in the Sunland Park and Anthony areas south of Las Cruces. A small area around the community of Anthony, approximately 30 miles southeast of the Planning Area, is designated as nonattainment for the PM_{10} standard. In addition, an area in the corridor from Anthony south to Sunland Park is currently considered a maintenance area for ozone.

3.2.5.2 Climate

The PTNM has an arid subtropical climate with hot summers and mild winters. Summers are known for hot weather, with some extended periods of over 100°F (38°C) and the latter half of the summer seeing increased humidity and frequent afternoon thunderstorms. Autumn brings cooler temperatures, although still warm and with decreased precipitation. Winter conditions fluctuate between warm and sunny to cool and windy. Average winter temperatures range from minimums in the upper 20s to maximums in the mid- to upper 50s. Spring is known for its high winds in the afternoons and warmer weather. Average annual precipitation ranges from 8-14 inches. Most precipitation occurs from mid-spring to mid-autumn. Precipitation mainly comes in the form of thunderstorms associated with the Southwest monsoon in the summer, with showers throughout the year as Pacific weather systems dip south. An average freeze-free period from 200 to 240 days occurs in most of the area. Light snowfall occurs most winters but is usually short-lived.

Table 3-1 shows average monthly temperature and precipitation for 1981-2010 measured at New Mexico State University in Las Cruces, which can be considered representative for the Analysis Area though higher elevations may be somewhat cooler.

Table 3-1 Average Temperature and Precipitation for Las Cruces 1981-2010

TABLE 3-1 AVERAGE TEMPERATURE AND PRECIPITATION FOR LAS CRUCES 1981-2010												
LAS CRUCES	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Average Temperature (^{o}F)	43.8	48.1	54.1	61.4	70.2	78.6	81.4	79.4	73.8	63.0	51.5	43.5
Average Max Temperature (^{o}F)	58.6	63.5	70.1	77.8	86.8	94.8	94.9	92.1	87.7	78.6	67.3	57.8
Average Min Temperature (^{o}F)	29.1	32.7	38.2	44.9	53.7	62.4	68.0	66.8	59.9	47.4	35.7	29.1
Precipitation (inches)	0.51	0.41	0.22	0.29	0.40	0.66	1.53	2.22	1.33	0.94	0.46	0.77
Source: NOAA, 2011.												

3.2.6 Cultural Resources

The cultural resources of the Monument are not well known; less than one percent of the Monument has been inventoried. Only four linear inventories have been conducted for a bike trail and for grazing improvements. Only one archaeological site was identified during these inventories. This site, LA 53790, is described as a lithic scatter of less than 10 artifacts with an unknown time period.

Socio-cultural properties also known as traditional cultural use areas are those places of traditional cultural significance to American Indians and others. Such properties may exist within the boundaries of the PTNM, but no specific place or resource has yet to be identified during formal consultation.

Cultural resources include archaeological, historic, and socio-cultural properties. Archaeological resources generally refer to prehistoric sites while historic resources refer to those for which some form of written record exists. Socio-cultural properties refer to areas of concern to Americans Indians and other cultural groups that are significant to their heritage or spiritual and cultural practices.

There are several distinct periods or traditions that are discernible in the archaeological records for the Analysis Area generally. The earliest occupation occurred from about 9,500 BC to approximately 6,000 BC. This period is known as the Paleo-Indian period. The period is divided into three traditions: Clovis, Folsom, Plano. Each tradition is associated with distinctive projectile points and lithic tool kits. Isolated project points from these traditions have been found within the larger region. Paleo-Indian people are thought to have been mobile hunters and gatherers who focused on migratory big game some species of which are not extinct.

The second prehistoric period is referred to as the Archaic or Desert Archaic. The Archaic cultures are believed to have occupied the larger area from around 6,000 BC to about 100 AD. Archaic cultures are believed to have been non-sedentary, pre-pottery hunters and gatherers with a growing emphasis on territoriality and home bases and plant gathering leading to plant cultivation. The origins of agriculture in the Southwest begin during this period. Here again, the Archaic cultures are known for a suite of projectile points that define sites distinctive to this period as well as other lithic tools and organic remains in the form of basketry, sandals, and other textiles that have survived owing to the dry conditions of this area.

The third period or tradition has been identified as the Mogollon. The Mogollon culture ground has been divided into the Western Mogollon and eastern or Jornada Branch of the Mogollon. This period is also known as the Formative Period. This tradition begins at approximately 200 AD and extends to approximately 1450 AD. Within this time period, several distinct changes begin to occur in the archaeological record:

1. Agriculture becomes the basic element of the economy although supplemented by hunting and gathering in varying degrees;
2. Pottery is introduced and soon divides into technological and distinctive artistic/stylistic traditions;
3. Pithouse hamlets aggregate into sedentary pithouse villages;
4. These communities in turn begin to construct above ground residences known as pueblos of either masonry or adobe; and
5. Interregional contact and trade are more evident, at least in the archaeological record, than heretofore.

The Mogollon Period ends at 1450 to 1500 AD. There appears to be a complete break in occupation although this may be more apparent than real. This period is succeeded by the Protohistoric Period or that period just before and phasing into the Historic Period. The Protohistoric occurs between 1540 and 1680 AD for this area. Several named Protohistoric groups are recorded for the area and appear to have practiced a hunting and gathering economy. During this period, various peoples that would become the historic Apaches move into the project areas from the west and northwest displacing or absorbing the peoples in the path. The Chiricahua Apache occupation of the area continued into the Historic Period until 1890. The Apache were mobile hunters and gatherers and, increasingly during the Historic Period, depended or raiding to supplement the economy.

The Mesilla Valley has experienced the broad trends of the Historic Period but permanent settlement and development only occurred in the 1850s. Fierce Apache resistance to European encroachment inhibited any permanent settlement. However, all broad historic trends are represented in the historical record and include the establishment and use of El Camino Real de Tierra Adento, the founding of towns and agriculture, military forts and the Apache wars, the Civil War, and mining and ranching into the events of the 20th century. The primary historic use of the PTNM was grazing.

One historic feature within the Monument is Apache Dam. Apache Dam was constructed by the Civilian Conservation Corps from Camp BR-39, Las Cruces, New Mexico, in 1936 and was constructed to control arroyo flooding that threatened the Picacho Canal and farmland in the Mesilla Valley. Two other unnamed dams in support of Apache Dam were constructed as well.

3.2.7 Geology/Minerals

The geologic resources of the Monument are best understood within the context of the regional physiography, the mode of formation and spatial occurrence of the various rock types within the area, and the geologic structures and history that combined to produce the geologic conditions that exist in the area. This section discusses the physiography, rock units, geologic structure and tectonic history of the region.

The Monument is situated within the North American Basin and Range Province and the dominant tectonic feature is the Rio Grande Rift The Rio Grande Rift is a geographically extensive extensional basin associated with the most recent phase (late Miocene: ~ 30 million years ago to present) of crustal thinning in the Southwest Basin and Range Province. The closely spaced normal faulting and domino-style block tilting along the north-south rift axis is caused by extension of the upper crust, which is being driven by the plastic flow of hotter rocks at depth (New Mexico Bureau of Geology and Mineral Resources 2003). The rift system is superimposed on a weakened crustal region of faults that were active during Pennsylvanian-age Tectonism (318 to 299 million years ago). Block-faulted, uplifted mountains including the Robledo Mountains are located on both sides of the Rio Grande Rift.

The trackways discovery site and other tracksite locations in the Robledo Mountains are red-colored sandstones referred to as the Abo Formation of the Hueco Group. In the Robledo Mountains, the Hueco Group consists primarily of limestone and fine-grained clastics (sandstones and shales) deposited in a shallow marine environment. Rocks of the Abo Formation contain both fossiliferous marine limestone and shale and red silty-sandstone deposited in a tidal flat environment. It is this sandstone, which hosts the fossil trackways (Kues and Giles 2004). These strata along with an overlying upper member of the Hueco Group represent a regional transition zone between marine limestone of the Hueco Group to the south and non-marine red beds of the Abo Formation to the north. *(The previous paragraph was taken from The Paleozoic Trackways Scientific Study Report by Spencer Lucas, Adrian Hunt and Nicholas Hotton III. 1994. That report contains extensive information on the geology and paleontology of the Planning Area.)*

The Abo Formation and Hueco Group were deposited during the early Permian Period at the end of the Paleozoic Era, over 250 million years ago. Younger rocks are also found in the Robledo Mountains. In the southern part of the Range, conglomerates, gypsiferous sandstones and mudstones occur in association with the Love Ranch Formation and the Palm Park Formation. These rocks were probably deposited during the Eocene Period between 55 and 51 million years ago (Seager et. al. 2008). Volcanic rocks were emplaced in the northern part of the Robledo Mountains during at least two episodes around 35 million years ago and 7 million years ago. The youngest rocks in the Monument consist of landslide deposits, valley-fill deposits and stream-channel gravels in boulders generally deposited less than 5 million years ago (Seager et. al. 2008).

The historical record of earthquakes in the Rio Grande Rift system from 1962 through 1998 lists only four earthquakes of magnitude 3.0 or greater (Sanford et al. 2002). Those earthquakes were located north and east of Las Cruces. Although New Mexico is in a seismically active area, the average earthquake intensity is a moderate 4.5 on the Richter scale. As such, a strong, damaging earthquake is not likely to occur in the Monument. In parts of the Monument, steep slopes and the presence of the friable, easily weathered Abo Formation may create local concerns with slope stability and landslide potential.

Sedimentary-hosted iron deposits were discovered in the southwestern Robledo Mountains (Iron Hill District) in the early 1930s (McLemore 1998; McLemore et. al. 2005). Iron deposits consist predominately of iron-oxide minerals and occur in Hueco Formation Group limestone. Inferred ore reserves are estimated at approximately 15,000 short tons, but future development of these deposits is unlikely due to small tonnages, low grade and inaccessibility (McLemore 1998). Travertine was also mined sporadically from the southwest Robledo Mountains, and gypsum deposits have been found but have not been exploited (McLemore 1998).

Chemical analysis suggests that the Hueco Formation in Apache Canyon may have potential as a source of high-calcium limestone (McLemore 1998). Historically, the most important mineral resource in the Robledo Mountains has been building stone from the south central portions of the Range. A rock quarry outside the eastern boundary of the Monument, known as Community Pit #1,was the source (probably less than a million tons of rock removed) for rock used in retaining walls, decorative walls, and in general landscaping. Community Pit #1 was in production for approximately 40 years and, according to the quarry operators, most of the rock produced was used in the local community. Small volumes of landscape rock were also produced in Apache Canyon just south of the Monument area.

Other than, for building stone, there has not been much interest in the minerals of the Robledo Mountains. There are no existing mining claims within the Monument boundary. The designating Legislation withdrew all Federal minerals within the Monument from mineral entry, which means that mineral exploration or removal is not allowed. In the southern portion of the Monument, there are 368 acres of non-Federal minerals, which the mineral withdrawal does not apply unless acquired by the Federal government and included into the Monument.

3.2.8 Lands and Realty

Public land within the National Monument is withdrawn from entry, appropriation, or disposal under the public land laws as directed by the Legislation.

BLM establishes right-of-way exclusion and avoidance areas to guide decisions about where rights-of-way (ROWs) may be granted. In exclusion areas, no ROWs are allowed unless mandated by law; in avoidance areas, ROWs may be granted only when no feasible alternative route (or designated ROW corridor) is available (BLM 1993). ROW exclusion areas within the Monument include the Robledo Mountains ACEC and Paleozoic Trackways RNA. ROW avoidance areas include Visual Resource Management (VRM) Class II areas. Currently, there are no ROWs within the Monument.

In the 1993 *Mimbres RMP*, acquisition of an easement across private land for public access to public land leading into the Robledo Mountains and the current day Monument is a specific management decision (*Mimbres RMP*, p.2-20).

3.2.9 Lands with Wilderness Characteristics

In accordance with Section 201 of FLPMA, the BLM is required to maintain a current inventory of land under its jurisdiction and identify within that inventory lands with wilderness characteristics that are

outside of the areas designated as WSAs. Through the land use plan, the BLM makes a decision to protect lands with wilderness characteristics, but not in WSAs, or to allocate those lands to other uses.

Currently within the Monument, there are no areas outside of the Robledo Mountains WSA managed to maintain wilderness characteristics; however, the values of naturalness, size, opportunities for solitude, or opportunities for primitive and unconfined recreation, as defined by BLM Instruction Memorandum 2011-154, could still be present. BLM conducted a wilderness inventory of the National Monument in January 2011, which identified 576 acres as having wilderness characteristics (see Map 3-2). None of the lands with wilderness characteristics outside of the Robledo Mountains WSA are currently managed to maintain wilderness characteristics.

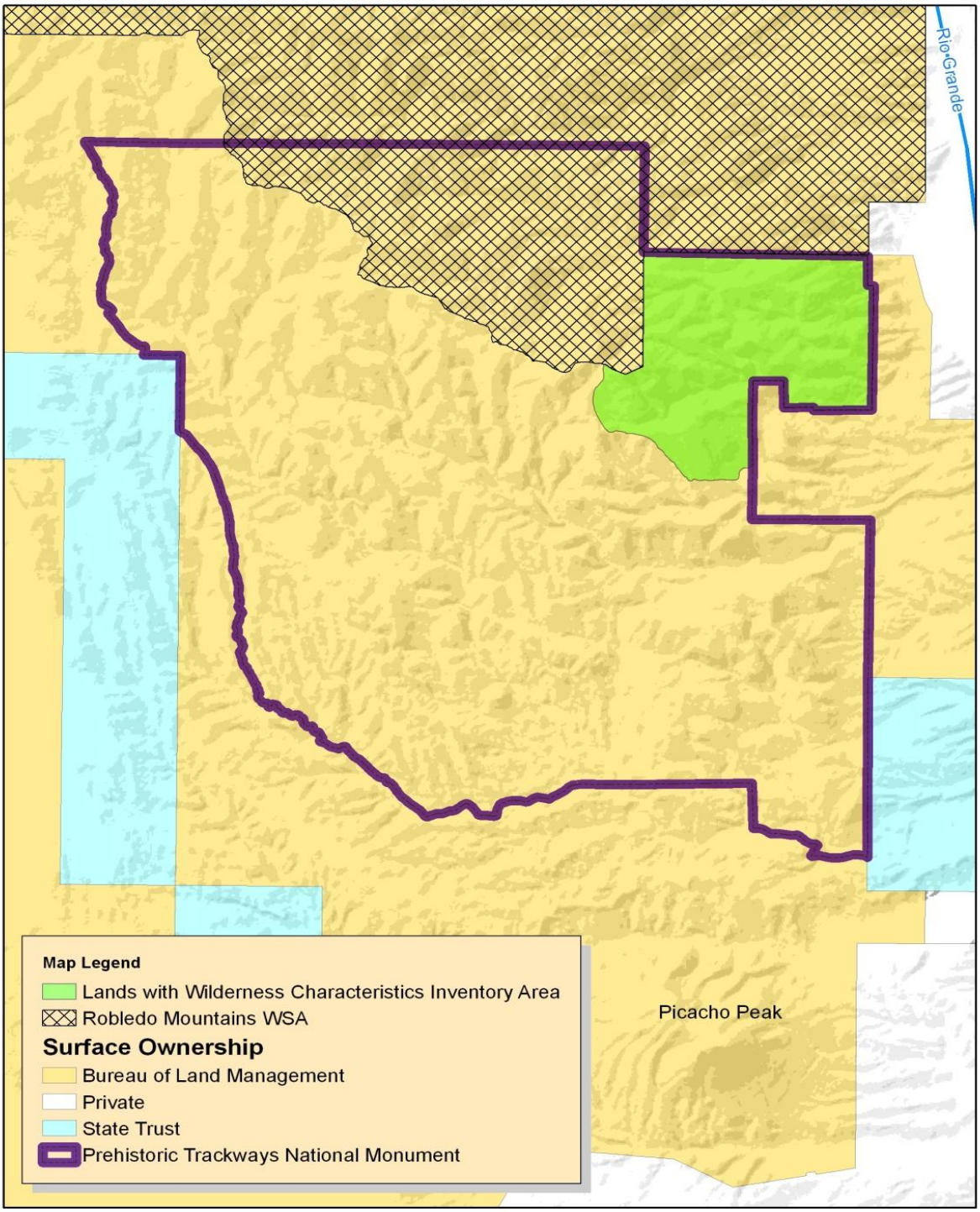
In 2008, the New Mexico Wilderness Alliance (NMWA) submitted comments in regards to wilderness proposals for another planning effort in the Analysis Area. This submittal encompassed the area that BLM identified in 2011 as having wilderness characteristics.

3.2.10 Livestock Grazing

Portions of the Picacho Peak Allotment (03008) and the Altamira Ranch (03040) are within the National Monument (see Map 3-3). Both grazing allotments are administered under Section 3 of the Taylor Grazing Act, as they are within the boundaries of the established grazing district. The Picacho Peak Allotment consists of approximately 14,050 surface acres, of which 11,235 acres are Federal Range, 55 acres are deeded private land controlled by the grazing permittee, 1,047 acres are State trust land leased to the grazing permittee, and 1,713 acres of State trust and private lands that are not under control of the grazing permittee. The Altamira Ranch Allotment consists of approximately 10,503 surface acres, of which 8,988 acres are Federal Range, 74 acres are deeded private land owned by the grazing permittee, and 1,441 acres are uncontrolled State trust and private lands. Approximately 746 acres of the National Monument are within the Altamira Ranch Allotment and the remaining 4,534 acres of the Monument are within the Picacho Peak Allotment. There are range improvements including water developments and fences, which are associated with these allotments (Table 3-2).

The Picacho Peak allotment is permitted to run 89 cattle yearlong, and the Altamira Ranch allotment is permitted to run 54 cattle yearlong for a total of 143 cattle that could potentially graze in the Monument. However, actual use on the Monument is much less than what is authorized under the current grazing permits. Since the revision of the allotment management plan in 1997, the Picacho Peak Allotment has been conservatively stocked at approximately 58 percent of the authorized carrying capacity. Under the current rotation system, cattle graze the Monument from the beginning of April to the beginning of November annually. At the current stocking rate, this results in approximately 272 animal unit months (AUMs) of actual grazing use, compared with 484 AUMs that would be harvested in the north pasture of the Picacho Peak allotment if it was fully stocked. Of those 484 AUMs, approximately 396 AUMs are within the Monument boundary. Quantification of livestock use on the Monument from the Altamira Ranch Allotment is difficult due to the lack of actual use data for the allotment. Conversations with the grazing permittee have confirmed that cattle spend most of the year on the northern part of the allotment, and the southern part, where the Monument is located is seldom used. The main reasons that cattle do not typically use this part of the allotment are the lack of water developments and reliable water sources, and the rugged terrain.

Map 3-2 - Lands with Wilderness Characteristics Inventory Area



No Warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data, or for purposes not intended by the BLM. Spatial information may not meet National Map Accuracy Standards. This information is subject to change without notification.

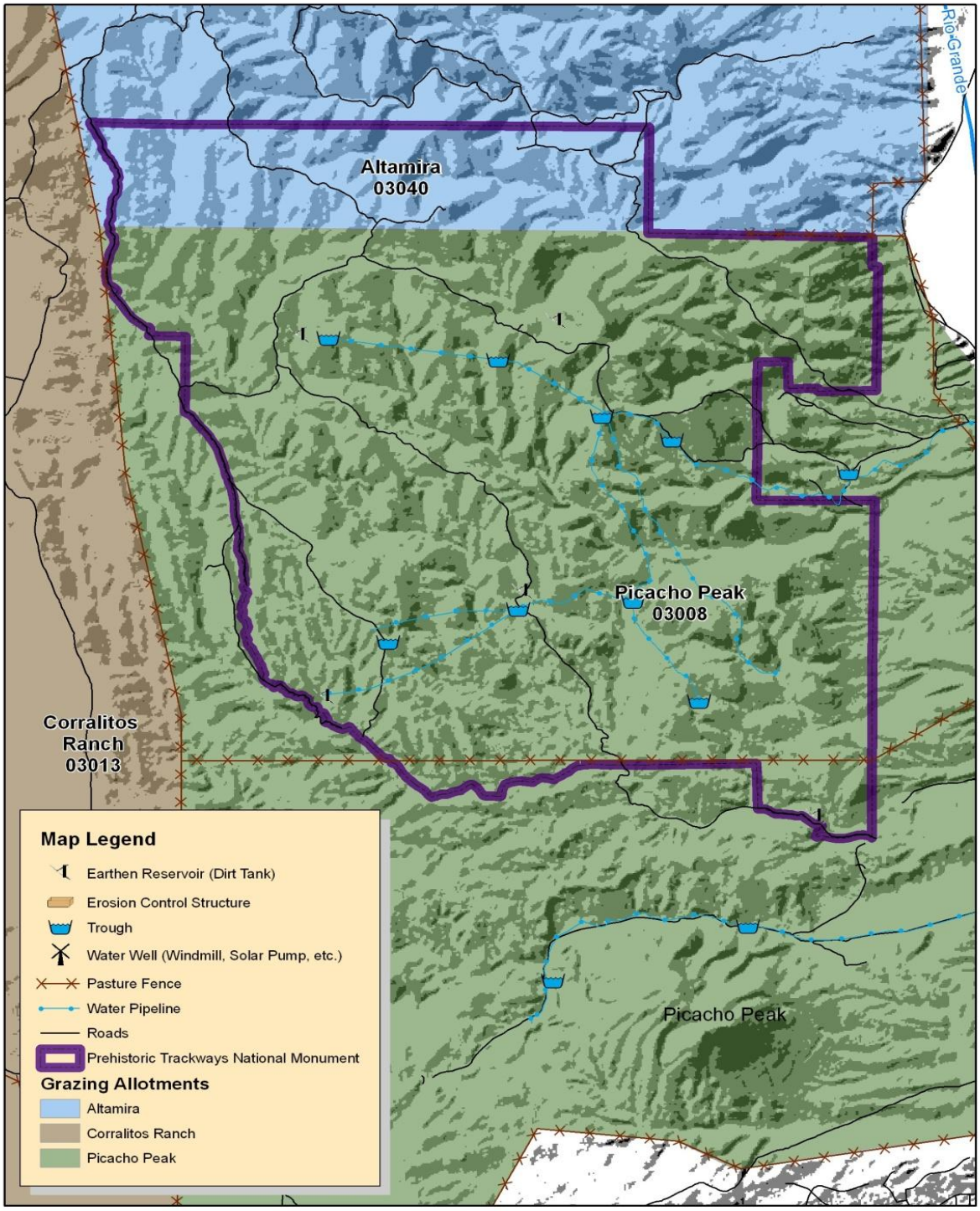
BLM GIS
Las Cruces District Office

N W E S

0 0.5 1 Miles

Projection: UTM Zone 13
Datum: NAD 1983

Map 3-3 - Livestock Grazing Allotments



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BLM GIS
Las Cruces District Office

N W E S

0 0.5 1 Miles

Projection: UTM Zone 13
Datum: NAD 1983

Table 3-2 Range Improvements within the Prehistoric Trackways National Monument

TABLE 3-2 RANGE IMPROVEMENTS WITHIN THE PREHISTORIC TRACKWAYS NATIONAL MONUMENT						
ALLOTMENT	**IMPROVEMENT NAME**	**UNITS**	**LOCATION**	**AUTHORIZATION**	**DATE COMPLETED**	**CONDITION**
PICACHO PEAK	Baker Reservoir 1	1 ea.	T. 22 S., R. 1 W., Sec. 25	Range Improvement Permit	1943	Good Condition
	Robledo Interior Fence	3 mi	T. 22 S., R. 1 E., Sec. 31 T. 22 S., R. 1 W., Sec. 35, 36	Cooperative Agreement	1987	Good Condition
	Burke Tanks	2 ea.	T. 22 S., R. 1 W., Sec. 23 and 24	Range Improvement Permit	1972	Good Condition
	Robledo Pipeline	2.3 miles 1 storage 3 troughs	T. 22 S., R. 1 E., Sec. 19, 20, 29, 30 T 22 S, R 1 Sec. 24	Range Improvement Permit	1984	Good Condition
	Robledo Pipeline Extension 2	0.25 miles 2 troughs	T. 22 S., R. 1 W., Sec 23 and 24	Range Improvement Permit	1991	Trough Maintenance Needed
	Robledo Pipeline Extension 1	4.5 miles 5 Troughs	T. 22 S., R. 1 W., Sec. 24, 25, 26, 35, 36 T. 22 S., R. 1 E., Sec. 30, 31	Cooperative Agreement	1989	Good Condition
ALTAMIRA RANCH	NO PROJECTS					

Currently, there is limited fencing located within the Monument. The Picacho Peak Allotment is divided into two main pastures. The majority of the Monument is located in the northern pasture of the Picacho Peak Allotment, with two small areas in the south separated by the main pasture fence. A Picacho Peak Allotment pasture division fence runs in an east/west direction close to the southern Monument boundary. The allotments do have some boundary fencing which lies close to the Monument; however, as stated above, the allotment boundary between the Picacho Peak and Altamira Ranch Allotments is not fenced. Construction of a boundary fence between the allotments was proposed in the 1980s; however, this project was not funded because it could not meet BLM's benefit/cost requirement due to the expense of building the fence in such rugged terrain. In addition, the terrain in this location is typically too rough for cattle to move freely between the allotments.

The northern portion of the Picacho Peak Allotment contains a network of pipelines, storage tanks, and troughs in order to facilitate cattle distribution helping attain proper forage utilization. Based on the most recent monitoring data, the majority of this northern pasture of the Picacho Peak Allotment is lightly utilized. Watering facilities have not been developed in the southern end of Altamira Ranch Allotment, which is only slightly utilized by cattle due to the rough terrain and lack of water.

Monitoring studies on the Picacho Peak Allotment completed between 1983 and 1995 indicated that this allotment was in fair to good condition. The allotment is managed under an Allotment Management Plan,

dated 1997. Monitoring data collected in 1982 indicated that the Altamira Ranch Allotment was also in fair to good condition.

3.2.11 Research Management

Research projects are approved and conducted on a case-by-case basis. Several research projects have occurred within the Monument that has expanded the scientific information about the Permian Era animal and plant life. Approximately 140 paleontological sites have been documented within the Monument and over 3,000 acres of the Monument have been surveyed for paleontological resources as of fall 2010. The BLM has several partnerships with natural history museums/institutions to increase the research conducted and to educate the public about the scientific findings within the Monument. Currently, these partnerships have been with the New Mexico Museum of Natural History and Science, the Smithsonian Institution, and the City of Las Cruces Museum of Nature and Science. Scientists have explored and studied the Monument for plant, trace, and marine fossils, petrified wood, and the geology of the Robledo Mountains.

There are three types of paleontological permits: the survey and limited collection, excavation, or consulting. BLM can issue these permits for up to 3 years under the authority of 16 USC 470aaa et seq. (Omnibus Public Land Management Act-Paleontological Resources Preservation [OPLMA-PRP]) as well as FLPMA. Prior to authorization, a research proposal must be submitted to the authorizing office in which the proposal must detail the project and if any or how much material is requested for removal. An environmental evaluation under NEPA is required for all excavation permits due to surface disturbance. A Reconnaissance and Survey permit allows for limited surface collection also. A permit for a consulting paleontologist is normally driven by another project that requires a paleontologist on-site during the project or prior to ground disturbance in order to reduce the chance of destroying paleontological resources.

In order to receive a paleontological resource use permit, applicants must be able to demonstrate the following:

> *(a) Professional instruction in a field of paleontology relevant to the work proposed (vertebrate, invertebrate, trace, paleobotany, etc.), obtained through:*
>
> > *(1) Formal education resulting in a graduate degree from an accredited institution in paleontology, or in geology, biology, botany, zoology or anthropology if the major emphasis is in paleontology; OR*
> > *(2) Equivalent paleontological training and experience including at least 24 months under the guidance of a professional paleontologist who meets qualification (1), that provided increased responsibility leading to professional duties similar to those in qualification (1) above; and*
>
> *(b) Demonstrated experience in collecting, analyzing, and reporting paleontological data*
> (BLM Handbook 8270- Paleontological Resource Management).

For excavation and limited collection permits, the permittee must also identify and verify that they have an approved repository willing to curate the paleontological resources that are collected.

3.2.12 Socio-Economic Conditions

Existing social and economic conditions are necessary to establish the baseline from which to estimate potential consequences of management actions. The proceeding section analyzes the current conditions

and trends related to the social and economic environment of the Analysis Area, including population and demographic changes, potential environmental justice populations, and local economic conditions.

3.2.12.1 Population and Demographics

This section highlights population and demographic trends in the Analysis Area. Population is an important consideration in managing natural resources. In particular, population structure (size, composition, density, etc.) and population dynamics (how the structure changes over time) are essential to describing the consequences of land management and planning on a social environment (Seesholtz et al. 2004). Population increases may lead to conflicts over land use, travel management, recreation activities, and values. These are conflicts that BLM managers attempt to balance when making management decisions.

3.2.12.1.1 Population Growth

The Analysis Area is home to 209,233 people (U.S. Census Bureau 2010). Table 3-3 displays U.S. Census Bureau population data for the county, state, and nation in 1990, 2000, and 2010.

Since 1990, population growth in Doña Ana County has occurred at more than double the pace of National population growth. Rapid population growth may signal expanding economic opportunities or desirable amenities. Much of southern New Mexico is occupied by protected Federal land. Department of the Interior (DOI) and National Forest System (NFS) lands provide natural amenities, which may attract new residents to the region.

Table 3-3 Populations 1990, 2000, 2010

TABLE 3-3 POPULATIONS 1990, 2000, 2010					
LOCATIONS	**POPULATIONS**			**PERCENTAGE (%) GROWTH**	
	1990	**2000**	**2010**	**1990 - 2000**	**2000-2010**
Doña Ana County	135,510	174,682	209,233	29	20
New Mexico	1,515,069	1,819,046	2,059,179	20	13
United States	248,709,873	281,421,906	308,745,538	13	10
SOURCE: U.S. Census Bureau, 1990, 2000, and 2010					

3.2.12.1.2 Population Density

Population density can serve as an indicator of a number of socioeconomic factors of interest – urbanization, availability of open space, socioeconomic diversity, and civic infrastructure (Horne and Hayes 1999). More densely populated areas are generally urban and diverse, and offer better access to infrastructure. In contrast, less densely populated areas provide open space offering more natural amenity values to residents and visitors. Table 3-4 displays the number of people per square mile in the Analysis Area.

Table 3-4 Population Density

TABLE 3-4 POPULATION DENSITY	
	PEOPLE/SQ. MILE
Doña Ana County	55
New Mexico	17
United States	87
SOURCE: U.S. Census Bureau 2010	

Despite substantial gains in population since 1990, both Doña Ana County and New Mexico continue to have low population density relative to the nation. However, Doña Ana County is several times more densely populated than the State – largely due to the presence of Las Cruces, the second-largest city in the State, with a 2009 population of 93,680 people. Outside of Las Cruces, most of Doña Ana County is quite rural. Low population density points to high levels of public ownership. Approximately 49 percent of land in Doña Ana County is Federally-owned (DOI 2011).

3.2.12.1.3 Median Age

Table 3-5 lists the median age in the Analysis Area. A high median age generally indicates that a relatively large number of retirees reside in the area. An area with a large percentage of retirees will earn income primarily from investments and transfer payments (e.g., dividends and Social Security), rather than salaries and wages. In contrast, a low median age suggests a large number of families with young children or a concentration of industries that employ large numbers of young workers.
The median age in Doña Ana County is below the State and National medians. The presence of New Mexico State University, with an enrollment of more than 20,000 students, contributes to the relatively low median age in the county (NMSU 2010).

Table 3-5 Median Age

TABLE 3-5 MEDIAN AGE	
	MEDIAN AGE
Doña Ana County	32.4
New Mexico	36.7
United States	37.2
SOURCE: U.S. Census Bureau, 2010.	

Age data may be relevant for land management decisions. A population's age may affect community values and uses associated with public land. For example, older populations may have a greater need for easily accessible recreation opportunities.

3.2.12.1.4 Educational Attainment

Educational attainment, the measure of people with at least a high school diploma or bachelor's degree, is an indicator of an area's social and economic opportunities and its ability to adapt to change. Table 3-6 lists the percentage of the adult population with at least a high school diploma and a bachelor's degree.

Table 3-6 Educational Attainment, Percent of Persons Age 25+

TABLE 3-6 EDUCATIONAL ATTAINMENT, PERCENT OF PERSONS AGE 25+		
	HIGH SCHOOL GRADUATES (%)	**BACHELOR'S DEGREE OR HIGHER (%)**
Doña Ana	74.4	25.0
New Mexico	82.1	25.1
United States	84.6	27.5
Source: U.S. Census Bureau, 2009.		

Approximately three-quarters of adult residents in the Analysis Area are high school graduates. A quarter of study area residents have a bachelor's degree or higher. Although Doña Ana County has lower percentage of high school graduates than either the State or Nation, the County has a similar percentages of residents with a bachelor's degree or higher. These findings suggest that the Analysis Area is split in terms of educational attainment – it has a relatively high proportion of individuals with low educational attainment as well as a relatively high proportion of individuals with high educational attainment (and relatively fewer individuals with moderate educational attainment). Opportunities likely exist for working-age adults with high levels of education. The presence of highly educated adults may be self-reinforcing: a highly educated population is a signal that an area provides economic and cultural opportunities, which attracts additional college educated adults to the area. This process leads to further economic development and job creation. In contrast, areas with low levels of educational attainment have lower levels of human capital, which reduces an area's ability to capitalize on economic change (Florida 2002).

New Mexico State University is located in Las Cruces. Post-secondary institutions improve a county's ability to retain and attract young residents. In areas without higher educational opportunities, young people who wish to continue their education migrate out of the area – a process known as the "*brain drain*."

3.2.12.2 Environmental Justice

In 1994, President Clinton issued Executive Order 12898. This order mandates that all Federal agencies analyze the potential for their actions to affect minority and low-income populations disproportionately. The Council on Environmental Quality (CEQ) issued supplemental guidance to assist agencies' compliance (CEQ 1997). The CEQ suggests the following criteria for identifying potential Environmental Justice populations:

- "*Minority population: Minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis..."*

- *"Low-income population: Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such*

as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect."

The emphasis of environmental justice is on health effects or the benefits of a healthy environment. The CEQ has interpreted health effects with a broad definition: "*Such effects may include ecological, cultural, human health, economic or social impacts on minority communities, low-income communities or Indian Tribes …when those impacts are interrelated to impacts on the natural or physical environment*" (CEQ 1997).

U.S. Census Bureau data (2010) on race and ethnicity is reported in Figure 3-9.

Doña Ana County has a higher concentration of Hispanic and Latino residents than either the State or Nation. Approximately two-thirds of Doña Ana County residents self-identify as Hispanic or Latino. This finding highlights the need to analyze potential environmental justice issues in the Analysis Area.

Table 3-7 reports the percentage of residents living in poverty. Nearly one-quarter of Doña Ana County residents live in poverty.

Table 3-7 Percent of Persons Living in Poverty

TABLE 3-7 PERCENT OF PERSONS LIVING IN POVERTY	
	POVERTY RATE (%)
Doña Ana County	24.6
New Mexico	18.1
United States	13.5
Source: U.S. Census Bureau, 2009	

The incidence of poverty in Doña Ana County is not evenly distributed among racial and ethnic groups. Approximately one-third of Hispanic residents in Doña Ana County live in poverty (U.S. Census Bureau 2000). Based on the minority status and poverty data presented above, Doña Ana County appears at risk for environmental justice issues. The largest minority group in the County – Hispanic and Latino residents – also experiences a very high poverty rate.

3.2.12.3 Employment and Income

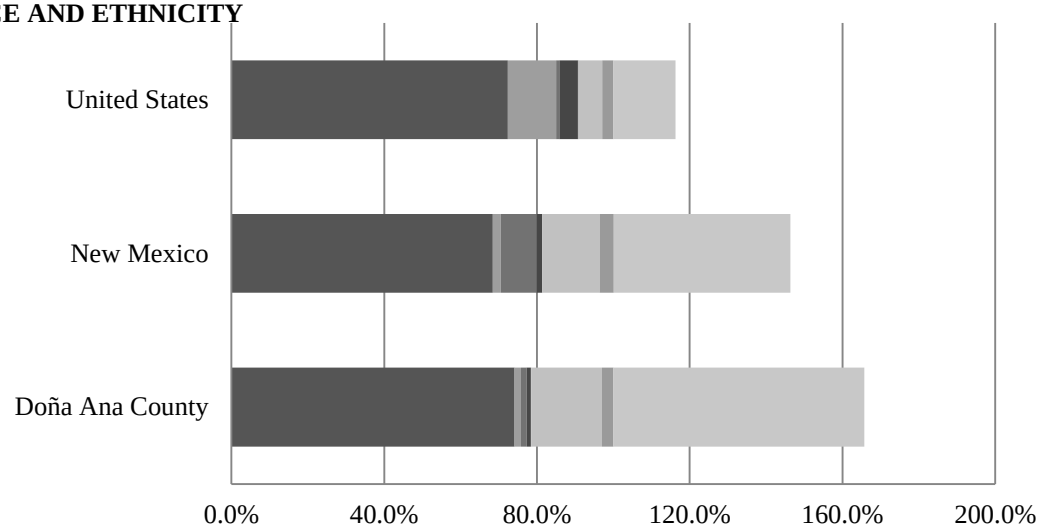
The previous section assessed demographic trends in the Analysis Area relative to State and National trends. This section will focus on economic conditions and trends. This discussion provides additional information on the social and economic environment in the Analysis Area.

3.2.12.3.1 Income and Earnings

Per capita income is a key indicator of the economic well-being of a county. High per capita income may be a signal of greater job opportunities, highly skilled residents, greater economic resiliency, and well-developed infrastructure. However, per capita income offers an incomplete picture of the economic well-being of an area. Average earnings per job provide additional insight into local labor market conditions. Whereas per capita income considers all sources of income (including wage and salary payments, transfer payments, investment earnings, dividends, and rents), median earnings considers only wage and salary earnings.

Figure 3-9 Race and Ethnicity

FIGURE 3-9 RACE AND ETHNICITY



	Doña Ana County	New Mexico	United States
White	74.1%	68.4%	72.4%
Black or African American	1.7%	2.1%	12.6%
American Indian and Alaska Native	1.5%	9.4%	0.9%
Asian	1.1%	1.4%	4.8%
Native Hawaiian and Other Pacific Islander	0.1%	0.1%	0.2%
Some Other Race	18.5%	15.0%	6.2%
Two or More Races	3.0%	3.7%	2.9%
Hispanic or Latino (of any race)	65.7%	46.3%	16.3%

NOTE: Totals sum to greater than 100 percent because Hispanic and Latino individuals may be of any race.

Table 3-8 provides data on per capita income and average earnings per job in 2000 and 2008 for the Analysis Area, State, and Nation.

Table 3-8 Trends in Per Capita Income and Average Earning Per Job

TABLE 3-8
TRENDS IN PER CAPITA INCOME AND AVERAGE EARNINGS PER JOB

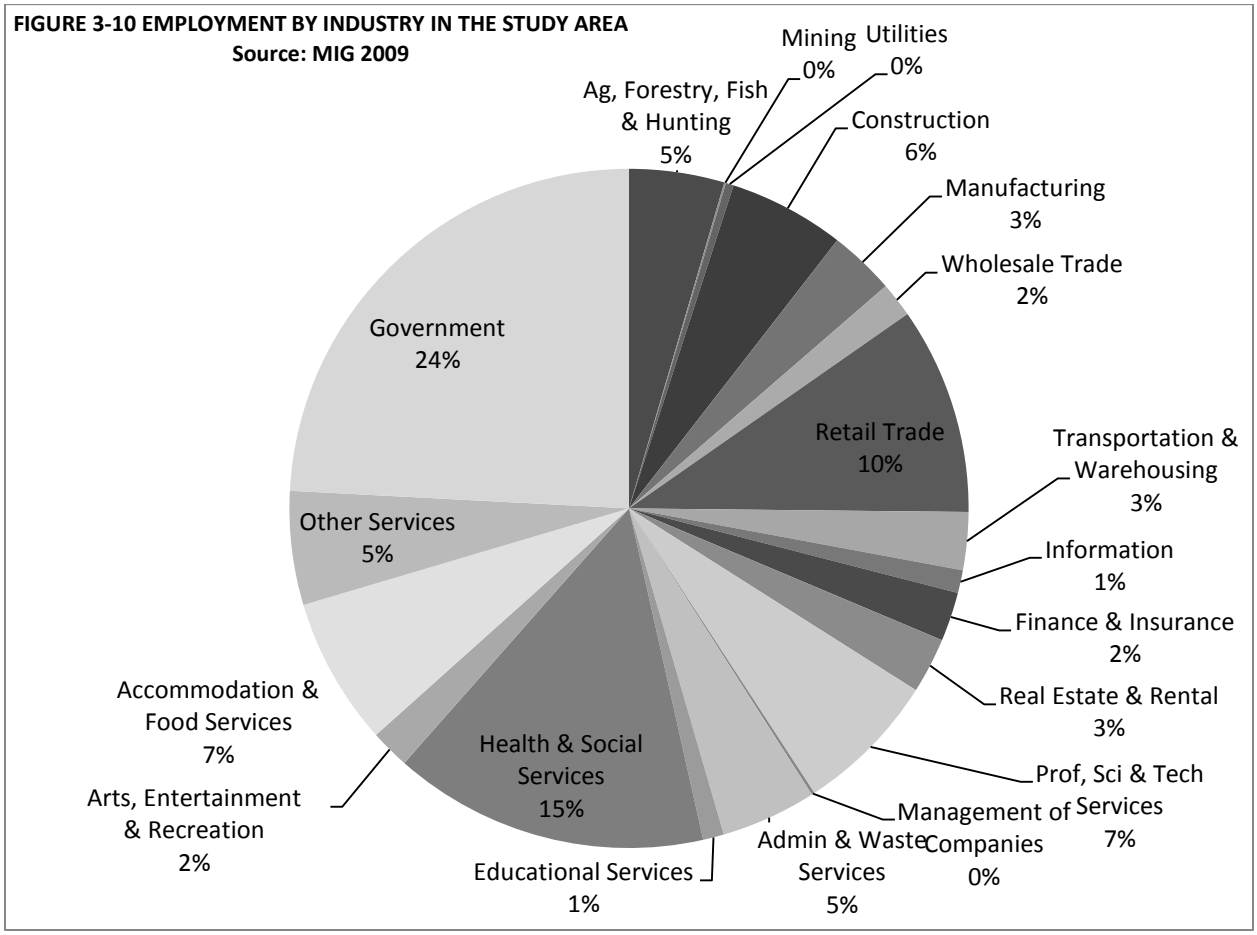
	PER CAPITA INCOME			AVERAGE EARNINGS PER JOB		
AREA	2000	2008	PERCENT CHANGE 2000-2008	2000	2008	PERCENT CHANGE 2000-2008
Doña Ana County	$22,633	$27,848	+23	$29,614	$33,242	+13
New Mexico	$28,446	$33,609	+18	$35,122	$38,680	+10
United States	$37,907	$40,674	+7	$43,828	$45,807	+5

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis 2010 (http://www.bea.gov/regional/reis/action.cfm)
NOTE: Figures are inflation-adjusted to 2008 US Dollars using the Bureau of Labor Statistics CPI Inflation Calculator (http://www.bls.gov/data/inflation_calculator.htm)

Doña Ana County residents have lower per capita income and average earnings per job than other residents of the State and Nation. However, the County experienced more rapid income and earnings growth between 2000 and 2008 than either the State or Nation.

Several factors may be contributing to the relatively lower average earnings per job in the Analysis Area. Most job growth in Doña Ana County has occurred in retail and services employment since 1970 (U.S. Department of Commerce, Bureau of Economic Analysis 2002). Current figures indicate that health care, retail trade, and accommodation and food services are among the largest employers (see Figure 3-10), and these jobs typically pay less than other service jobs, such as those in finance and insurance. As a result, lower wages paid in growing service sectors such as retail are reflected in the overall averages. Data from 2004 that ranked 20 industries in terms of average weekly private-sector wages show that these growing service sectors are in the bottom half of the rankings, indicating lower wages: health care was ranked 12th, retail trade was ranked 17th, and accommodation and food services was ranked 20th (New Mexico Department of Labor 2004).

Figure 3-10 Employment by Industry in the Study Area



3.2.12.3.2 Non-Labor Income

Table 3-9 displays the role of labor and non-labor income in total personal income for 2000 and 2009. Non-labor income is any income derived from investments, dividends, rents, or transfer payments. In

contrast, labor income is salary and wage disbursements from employment. During the past decade, the percentage of total income derived from non-labor sources increased in all considered areas.

Non-labor income is not directly tied to employment; therefore, it can be more resistant to economic downturns. However, as the most recent recession demonstrated, asset markets can be quite volatile, and non-labor income that depends on investment returns may be unstable.

An increase in non-labor income may reflect changing demographic characteristics. Older populations rely largely on non-labor income, including rents, dividends, and transfer payments (e.g., Social Security). High percentages of non-labor income likely indicate higher concentrations of retirees.

Table 3-9 Contribution of Labor and Non-Labor Income to Total Personal Income

TABLE 3-9 CONTRIBUTION OF LABOR AND NON-LABOR INCOME TO TOTAL PERSONAL INCOME				
	2000		2009	
	LABOR	NON-LABOR	LABOR	NON-LABOR
Doña Ana County	64%	36%	61%	39%
New Mexico	66%	34%	62%	38%
United States	69%	31%	65%	35%
SOURCE: U.S. Bureau of Economic Analysis, 2011.				

A slightly higher proportion of total personal income in Doña Ana County derives from non-labor sources compared to the State and Nation. This suggests that Doña Ana County has a somewhat higher concentration of retirees than the State and Nation.

3.2.12.3.3 Unemployment

The unemployment rate provides insight into the correspondence between residents' skills and employment opportunities. The "*natural*" rate of unemployment is said to be around 5 percent. This is the so-called "*natural*" rate because this is a level that allows for movement between jobs and industries, but does not signal broad economic distress. Recently, the National unemployment rate has hovered between 9 percent and 10 percent. Figure 3-11 provides the annual unemployment rates for the counties, State, and Nation from 2001 to 2010.

In recent years, the unemployment rates in both Doña Ana County and New Mexico have been consistently below the National unemployment rate. This suggests that labor market conditions in the Analysis Area are more stable than National labor market conditions.

3.2.12.4 Housing

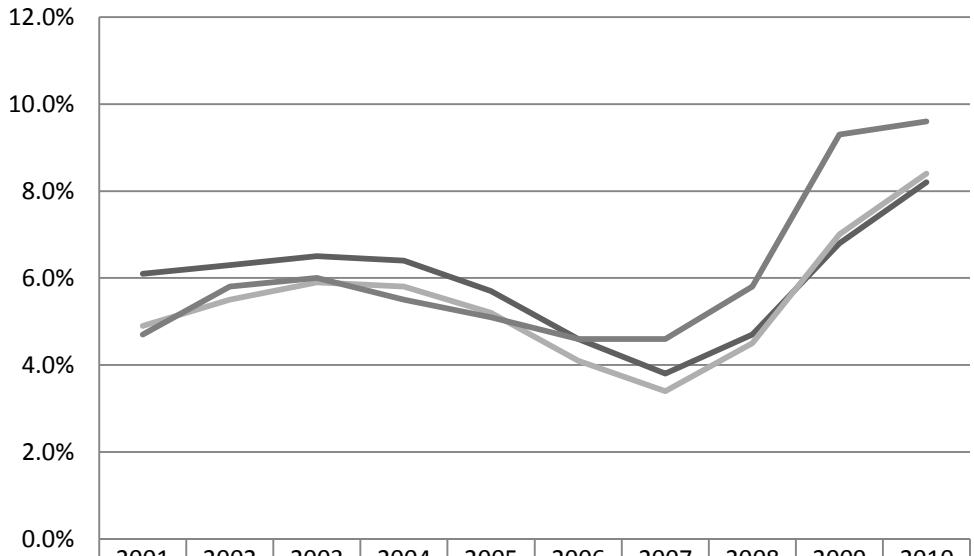
The above comparisons of per capita income and average earnings per job between the Analysis Area, State, and the Nation are incomplete. Data on local cost of living offer additional context. Of the contributions to cost of living, housing costs are among the most substantial. Table 3-10 presents median home values in 2009.

Table 3-10 Median Value of Owner-Occupied Homes

TABLE 3-10 MEDIAN VALUE OF OWNER-OCCUPIED HOMES	
	MEDIAN HOME VALUE
Doña Ana County	$128,500
New Mexico	$150,500
United States	$185,400
SOURCE: U.S. Census Bureau 2009	

Figure 3-11 Annual Unemployment Rate, 2001-2010

FIGURE 3-3 ANNUAL UNEMPLOYMENT RATE, 2001-2010
SOURCE: U.S. BUREAU OF LABOR STATISTICS 2011B



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Doña Ana County	6.1%	6.3%	6.5%	6.4%	5.7%	4.6%	3.8%	4.7%	6.8%	8.2%
New Mexico	4.9%	5.5%	5.9%	5.8%	5.2%	4.1%	3.4%	4.5%	7.0%	8.4%
United States	4.7%	5.8%	6.0%	5.5%	5.1%	4.6%	4.6%	5.8%	9.3%	9.6%

Doña Ana County has lower per capita income and average earnings per job than the State and Nation (Table 3-8); however, the home values in the County are also correspondingly lower than the State and Nation. This finding suggests that Analysis Area residents spend a comparable share of their income on housing.

3.2.12.5 Economic Diversity

Economic diversity generally promotes stability and greater employment opportunities. Highly specialized economies (i.e., those that depend on very few industries for the bulk of employment and income) are prone to cyclical fluctuations and offer more limited job opportunities. Determining the degree of specialization in an economy is important for decision makers, particularly when the dominant

industry can be affected by changes in policy. For BLM decision makers, this is likely to be the case where natural resource-related industries or the tourism and recreation industries, for instance, are reliant on public land.

Figure 3-10 provides a breakdown of employment by industry in the study area. The study area economy is somewhat diverse, with a wide range of employing sectors in the local economy. Nevertheless, government employment accounts for approximately one-quarter of Analysis Area employment. Government, retail trade, and the health and social services sectors are the largest employment sectors in the local economy. These industries are consistent with findings discussed in the demographic section – namely a substantial government presence due to public land management, a large retiree population that consumes health and social services, and amenities that attract tourists who contribute to the retail trade sector.

3.2.12.5.1 Payments to States and Counties

The BLM makes payments to states and counties that contain public land. Federal agencies do not pay property taxes; therefore, payments-in-lieu-of-taxes (PILT) are distributed to counties to compensate for the local services that support activities on Federal land. These services include law enforcement, road maintenance, and fire departments.

Table 3-11 lists the PILT from the PTNM and the payments attributable to all BLM-administered public land in New Mexico.

Table 3-11 Payments in Lieu of Taxes, Fiscal Year 2011

TABLE 3-11 PAYMENTS IN LIEU OF TAXES, FISCAL YEAR 2011	
	PILT
Prehistoric Trackways National Monument	$12,712
BLM New Mexico	$21,596,643
Source: DOI 2011	

3.2.12.6 Key Industries Related to BLM Management in the Analysis Area

3.2.12.6.1 Energy and Mineral Development

Mining provides 73 jobs in Doña Ana County – approximately 0.08 percent of total County employment (MIG 2009). Mining-related employment and income, therefore, play a minor role in the Analysis Area economy. The National Monument designation withdrew the PTNM from mineral entry, which means that minerals exploration and removal are not allowed. Therefore, energy and mineral development is not discussed further as it relates to the social and economic environment.

3.2.12.6.2 Agriculture and Grazing

Agriculture, forestry, fishing, and hunting sector jobs account for approximately 5 percent total employment in the Analysis Area. About 258 of the 4,128 jobs in the agriculture sector relate to cattle ranching.

In 2011, Doña Ana County was home to approximately 7.5 percent of all cattle and calves in New Mexico – placing the County behind only Chaves, Curry, and Roosevelt Counties in terms of the total cattle and calf count (USDA NASS 2011).

The PTNM provides opportunities for grazing at the Picacho Peak Allotment and Altamira Ranch Allotment. The current stocking rate provides 272 AUMs to grazing permittees. The Las Cruces District Office had 388,143 authorized AUMs in Fiscal Year 2011 (BLM 2011). Grazing on the PTNM, therefore, accounts for less than one percent of total public land grazing in the District.

Public land ranchers pay a $1.35 grazing fee per AUM. Fifty percent of all fees collected go to a Range Betterment Fund in the Treasury. This Fund is used for range rehabilitation, protection, and improvement including grass seeding and reseeding, fence construction, weed control, water development, and fish and wildlife habitat enhancement. Under law, one-half of the Funds are to be used as the respective Secretary (Interior and Agriculture) directs, and the other half is authorized to be spent in the district, region, or forest that generated the fees, as the Secretary determines after consultation with user representatives. Agency regulations contain additional detail. BLM regulations provide that half of the Fund is to be allocated by the Secretary of the Interior on a priority basis, and the rest is to be spent in the state or district where derived. The states receive 12.5 percent of monies collected from lands defined in §3 of the Taylor Grazing Act of 1934 (Section 3 Allotments) and the remaining 37.5 percent of the collections is deposited in the Treasury. Section 3 lands are those within grazing districts for which the BLM issues grazing permits. By contrast, states receive 50 percent of fees collected from BLM land defined in §15 of the Taylor Grazing Act (Section 15 allotments). Section 15 lands are those outside grazing districts for which the BLM leases grazing allotments. While the funds are allocated to the states, any state share is to be used to benefit the counties that generated the receipts (Grazing Fees: An Overview and Current Issues, Congressional Research Service – 2005). Table 3-12 shows the distribution of grazing fees among counties, Range Betterment Funds, and the U.S. Treasury.

Table 3-12 Distribution of BLM Grazing Fee Receipts by Land Classification

TABLE 3-12 DISTRIBUTION OF BLM GRAZING FEE RECEIPTS BY LAND CLASSIFICATION				
TYPE OF LAND	**AREA OF LAND**	**PAYMENTS TO COUNTIES**	**RANGE BETTERMENT FUNDS**	**U.S. TREASURY**
BLM Section 3 Permits		12.5%	50%	37.5%
BLM Section 15 Leases		50%	50%	0%
SOURCE: Assessing the Full Cost of the Federal Grazing Program, Karyn Moskowitz MBA,Chuck Romaniello, MS Ag.Econ., Prepared for the Center for Biological Diversity, 2002				

3.2.12.7 Local Expenditures

Recreational visitors to the Planning Area support employment and income in local economies. Recreation opportunities provided on BLM-administered land provide an attraction for visitors to the Planning Area.

The National Survey of Hunting, Fishing, and Wildlife-Associated Recreation completed by the US Fish & Wildlife Service (USFWS) every 5 years, provides a sense of the local expenditures that are associated with those types of recreation. According to the most recent survey, 1,134,000 people enjoyed hunting, fishing, and wildlife-associated recreational opportunities in New Mexico, spending more than $429 million on trip-related expenditures (USFWS 2006). These expenditures include outfitting, retail, food,

and lodging services that support local economies. Recreation-related employment may be seasonal, and can be irregular.

Outside of fee areas, data are not available for visitation to public land in the Analysis Area. Recreational use on BLM-administered public land in New Mexico, however, is estimated to total almost 2.4 million visits and 1.83 million visitor-days. About 52 percent of visits occur in dispersed areas (BLM 2010).

BLM issues Special Recreation Permits (SRPs) in accordance with 43 CFR 2930. Commercial, competitive, and large group activities are among the uses that are likely to require a SRP. Income from these events benefits, but does not consistently sustain, local economies due to the short-term influx of visitors to an area. Currently, active special-recreation permittees include organizers of OHV events, equestrian-endurance rides, motorcycle races, and a mountain-bike race, among other events. These events may bring in visitors from outside the region for short durations, resulting in local expenditures related to food, lodging, equipment, or other services. These businesses provide employment in the local area and generate commercial revenue from the use of public land that will be filtered through the local economies.

3.2.12.8 Non-Market Values

Public land has both market and non-market values. Market values include commodity uses of public land resources, such as timber and minerals. Market values are relatively easy to measure and the economic impact of marketed goods and services are captured in the economic input-output analysis that follows.

Non-market values, however, are more difficult to assess. Non-market values may arise from direct use of the resources (e.g., hunting for personal use and subsistence gathering) or from passive use (sometimes called non-use). Passive use captures the value of knowing that the resource(s) exist, whether or not future direct use is intended. Public land ecosystems provide numerous values that are often of direct use to humans, even if they are not recognized. Clean water, climate regulation, and the research and educational opportunities that unique ecosystems afford are a few of the many ecosystem goods and services whose values are not recognized in traditional economic impact analysis.

Consistent with direction provided in 40 CFR 1502.23, the subsequent analysis of environmental consequences will consider non-market goods and services primarily in qualitative terms. Where appropriate, discussion of how the alternatives may affect non-market values will be presented. However, due to the qualitative nature of these discussions, direct comparisons between changes in market and non-market values are generally not possible.

3.2.13 Soils

The soil resources of the Monument are categorized according to soil associations or in the recent terminology of the Natural Resource Conservation Service (NRCS) surveys, general soil map units. Soils in the Monument are primarily the product of climate, geologic parent material, landscape, and time.

Soils in the Monument are semiarid, young, and poorly developed. Physical, chemical, and biological soil development process, such as rock weathering, decomposition of plant materials, accumulation of organic matter, and nutrient cycling proceed slowly in this environment. Likewise, soil recovery processes from soil disturbances are slow and can lead to long-term changes in ecology and productivity. Areas that currently exhibit extensive degradation to the soils and watershed may recover with proper management practices, but would likely only be noticeable on a geologic time scale.

Five separate soil classifications exist within the Monument boundaries (see Map 3-4). The most dominant soil type is the Rock outcrop-Lozier association. These soils extend the entire length of the Monument from north to south and cover 4,180 acres (79 percent) primarily in the central and northern portions of the Monument. These soils are typically very shallow stony loam with high rock fragment content up to cobble size, overlying bedrock on steep slopes and tops of ridges. Due to slope and particle size, these soils have moderate to high susceptibility to water erosion and surface disturbance. Drainage bottoms are generally composed of large cobbles, boulders, and bedrock with very little soil, soil accumulation, and soil production potential due to high water flows.

The Rock outcrop-Torriorthents association is located in the southwestern portion of the Monument and covers approximately 860 acres (16 percent) within the Monument. These soils are shallow to moderately deep and found on hills and hill slopes with moderate to steep gradient. Composed of gravelly loam and gravelly sandy clay loam, these soils are susceptible to moderate to high amounts of soil loss from water erosion and surface disturbance and to a lesser amount wind erosion.

Nickel-Badland complex soils forming on alluvial fans and escarpments are present in the southeastern portion of the Monument and cover approximately 100 acres (2 percent). Typically, very gravelly sandy loam, interbeds of fine silt and clay may be present in the soil profile. Erosion rates are generally low for these soils, but may vary with changes in particle size, abundance, and slope gradient.

Comprising approximately 3 percent of the Monument is the Bluepoint-Caliza-Yturbide complex (60 acres) and Tencee-Upton association (80 acres) soils formed on alluvial fans along the eastern flank of the Robledo Mountains. Slope gradients range from 5-15 percent in the loamy sand of the Bluepoint, 15-40 percent in the Caliza gravelly sandy loam, and 1-8 percent for the gravelly loamy sand in the Yturbide soils. Slopes for the Tencee-Upton association range from 3-15 percent in gravelly sandy loam and a petrocalcic layer may be present between 7-20 inches in the subsurface. Wind and water erosion is approximated from moderate to high in the Bluepoint soils and low to moderate for the Tencee-Upton soils, respectively.

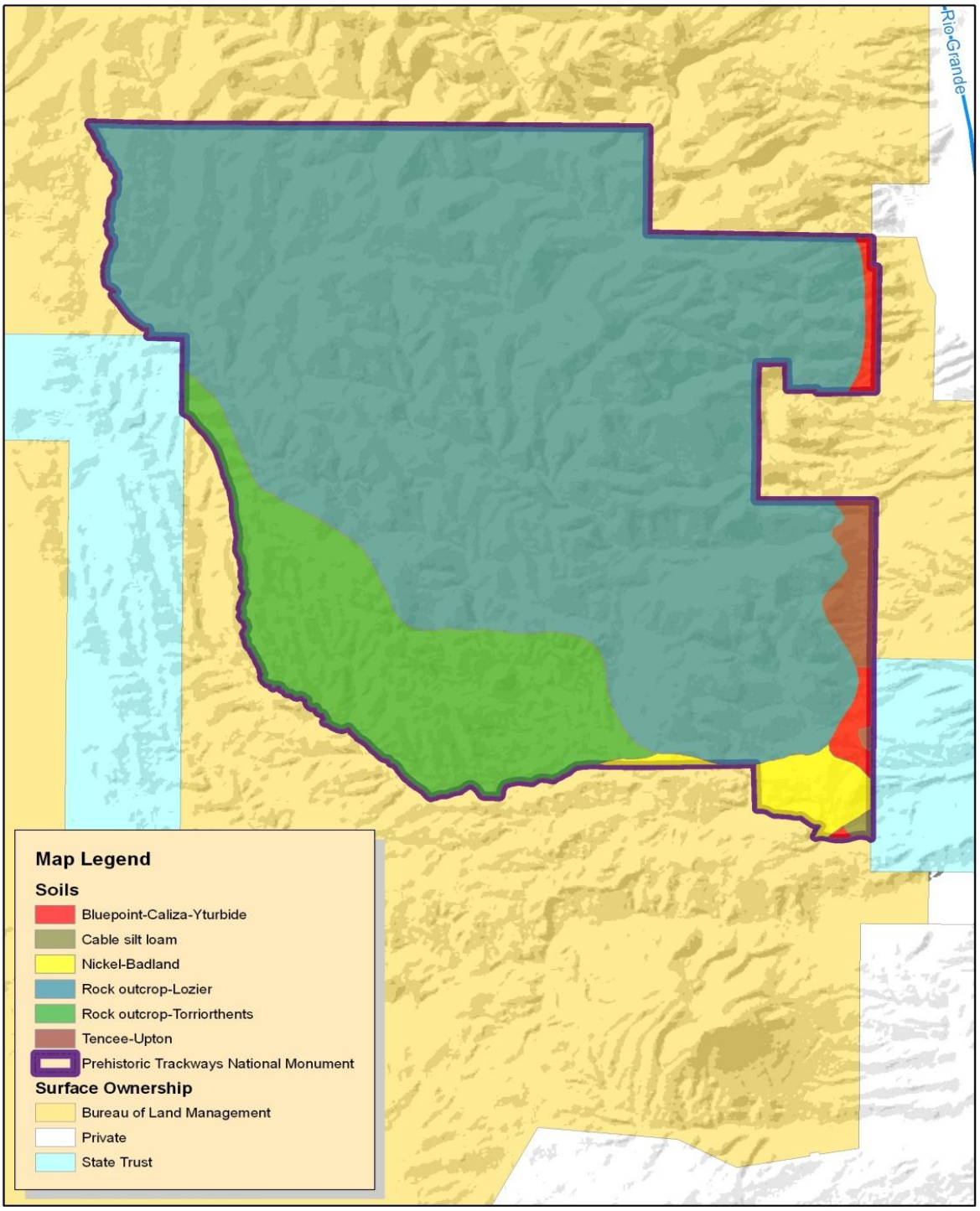
Areas in which the topography is primarily controlled by underlying rock and relatively resistant to erosion such as the Rock outcrop-Lozier soils, significant soil loss would result in decreased vegetation and water infiltration as well as increased surface water runoff. However, with resistant bedrock shallow in the profile, dramatic changes in topography and channel form as well as excessive erosion such as rills and gullies would not be expected. For deeper soils, finer grained soils, and soils that have formed on poorly consolidated and poorly cemented sedimentary layers, such as the remaining four soil types in the Monument, the effects of soil loss is greater. Soils with these characteristics are more susceptible to erosion and impacts from surface disturbances and experience higher erosion rates, accelerated down-cutting, changes in topography, increased sedimentation downstream, and drainage degradation and alteration.

3.2.14 Special Designations

3.2.14.1 Special Designation-Area of Critical Environmental Concern

The Robledo Mountains ACEC consists of 8,695 acres, which includes much of the Robledo Mountains WSA and part of the Monument. The Robledo Mountains ACEC was evaluated for Relevance and Importance in the Mimbres RMP/EIS and meets the relevance criteria of having significant paleontological, cultural, and scenic values and endangered plant species. It meets the importance criteria of more than locally significant resources in terms of scenic quality, which is enjoyed by hundreds of thousands of travelers on I-25 annually, and for preservation of biodiversity, which is distinctive (Mimbres RMP, page 5-43). The Robledo Mountains support a high diversity of cacti including Scheer's

Map 3-4 - Soils



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Projection: UTM Zone 13
Datum: NAD 1983

pincushion cactus and night-blooming cereus. The Robledo Mountains also provide important habitat for uncommon reptiles such as the Madrean alligator lizard and Trans-Pecos rat snake. The Monument encompasses 789 acres of the ACEC (same area as the WSA in the Monument). See Map 3-5.

Planned management actions in the Mimbres RMP (BLM 1993) for the ACEC that apply to the land within the Monument are:

- Retain all public land
- Limit vehicle use to designated roads and trails
- Exclude authorization for new rights-of-way
- Close to mineral material sales
- Close to fluid mineral leasing
- Acquire legal public access
- Maintain current livestock grazing practices
- Allow natural fires to burn under prescribed conditions
- Manage for primitive and semi-primitive recreation opportunities (no developed facilities)
- Manage as VRM Class I
- Manage for recreation opportunity spectrum (ROS) primitive and semi-primitive non-motorized and semi-primitive motorized classes

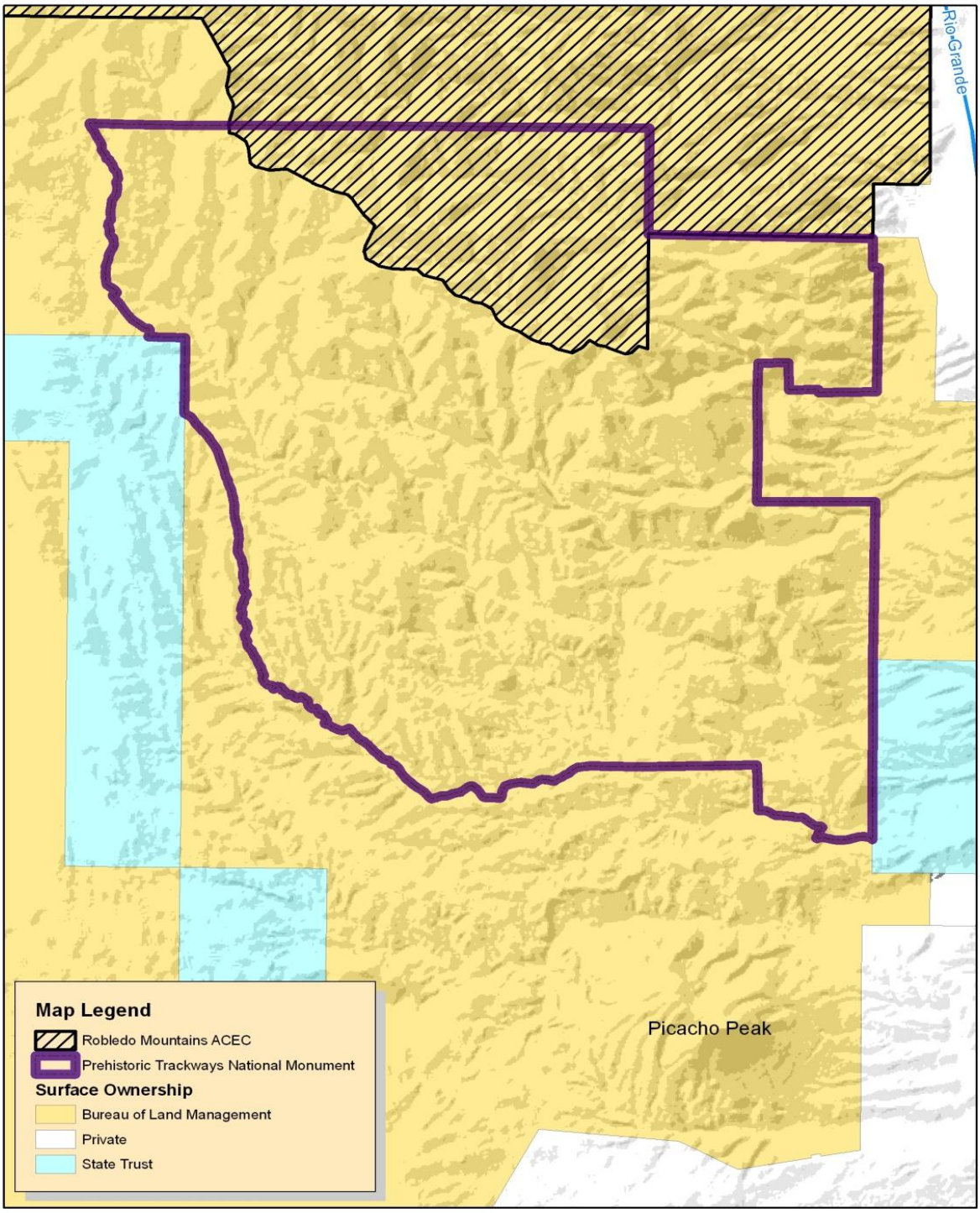
3.2.14.2 Special Designation-Research Natural Area

The Paleozoic Trackways Research Natural Area (RNA) designation was established in the Mimbres RMP (BLM 1993). It establishes 720 acres on the southeast portion of the Robledo Mountains as RNA (see Map 3-6). It was designated in order to protect, research, and interpret paleontological values. Within the 720 acres, footprints and trackways of vertebrate and invertebrate animals from 240 to 280 million years ago are preserved in the siltstone and mudstone. The potential for this site to produce scientific information and specimens is considered high, which reflects the need for the additional protection and scientific study allowed by the RNA designation.

Planned management actions are as follows:

- Retain all public land
- Limit vehicle use to designated routes
- Exclude new ROWs
- Withdraw from locatable mineral entry
- Close to mineral material sales
- Close to fluid mineral leasing
- Acquire legal public access
- Manage according to recommendations in the Trackways Study Legislation (Lucas, Hunt, Hotton III, 1994)
- Manage as VRM Class II
- Manage for ROS semi-primitive, non-motorized class

Map 3-5 - Robledo Mountains ACEC



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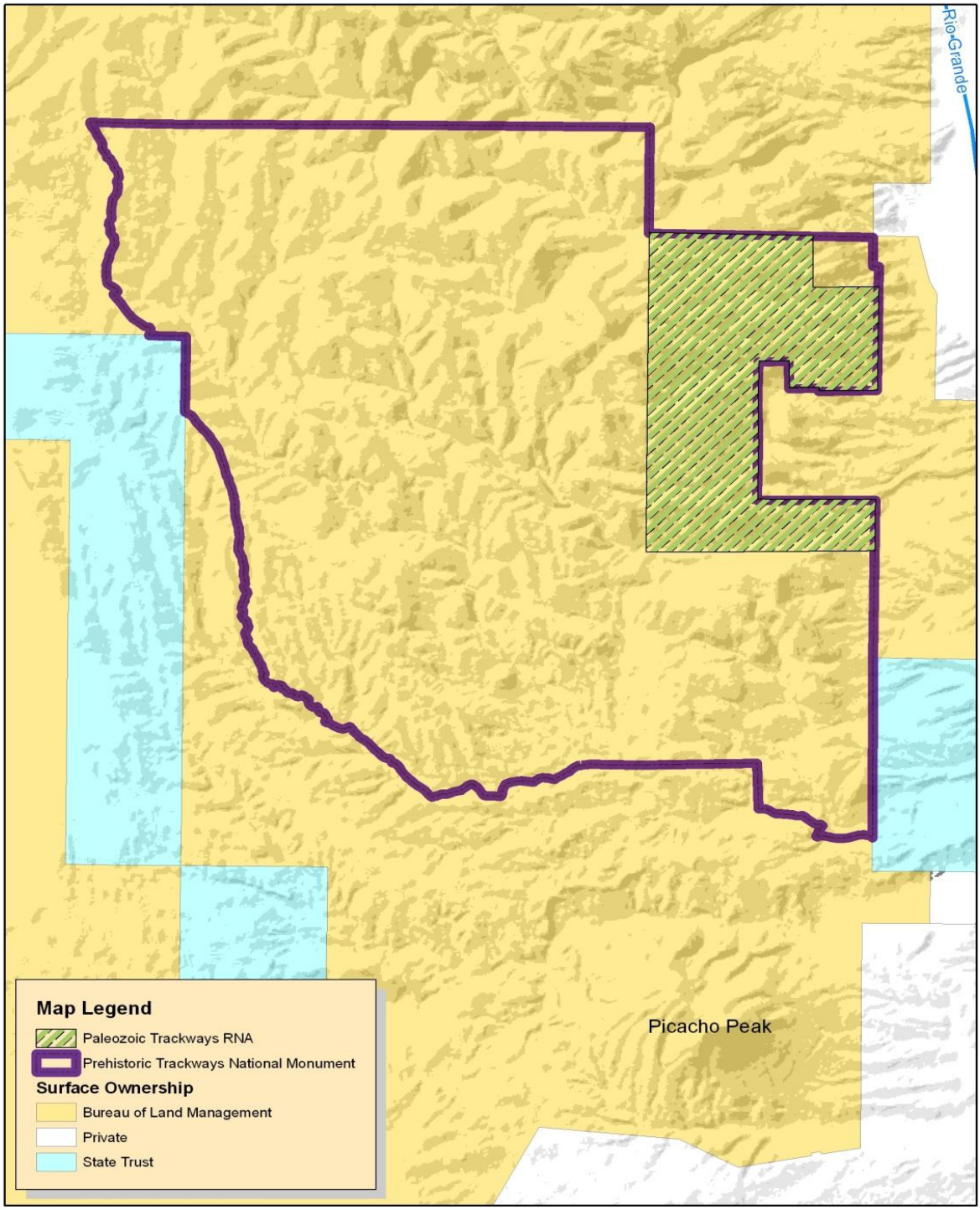
Map 3-6 - Paleozoic Trackways Research Natural Area



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Datum: NAD 1983

3.2.14.3 Special Designation-Wilderness Study Area

Designated in 1980, the Robledo Mountains WSA consists of 13,033 acres. The southern tip of the WSA, approximately 789 acres, extends into the Monument (see Map 3-7). This area has been managed according to Handbook 8550-01 *Interim Management Policy and Guidelines for Lands under Wilderness Review* so the suitability of such an area for preservation as wilderness would not be impaired until designated wilderness or released by Congress.

3.2.15 Special Status Species

The Robledo Mountains contain habitat that is associated with several species of plants and animals that are considered special status. Bureau sensitive species are species that require special management consideration to avoid potential future listing under the Endangered Species Act (ESA) and that have been identified in accordance with procedures set forth in *BLM Manual 6840: Special Status Species Management*. Special status species include animal and plant species that are listed as Endangered, Threatened, proposed, or species of concern by the US Fish and Wildlife Service (USFWS), State of New Mexico, or the BLM. The presence of special status plant species and their habitats in the Planning Area were considered using Las Cruces District species occurrence/habitat records and New Mexico Natural Heritage Program species records. Species descriptions and distributions were derived from Las Cruces District office records and New Mexico Rare Plant Technical Council [NMRPTC 1999: New Mexico Rare Plants. Albuquerque, NM: New Mexico Rare Plants Home Page. http://nmrareplants.unm.edu (Latest update: 11 July 2011)]. Table 3-13 lists the special status wildlife species that may potentially be associated with habitat located in the Robledo Mountains.

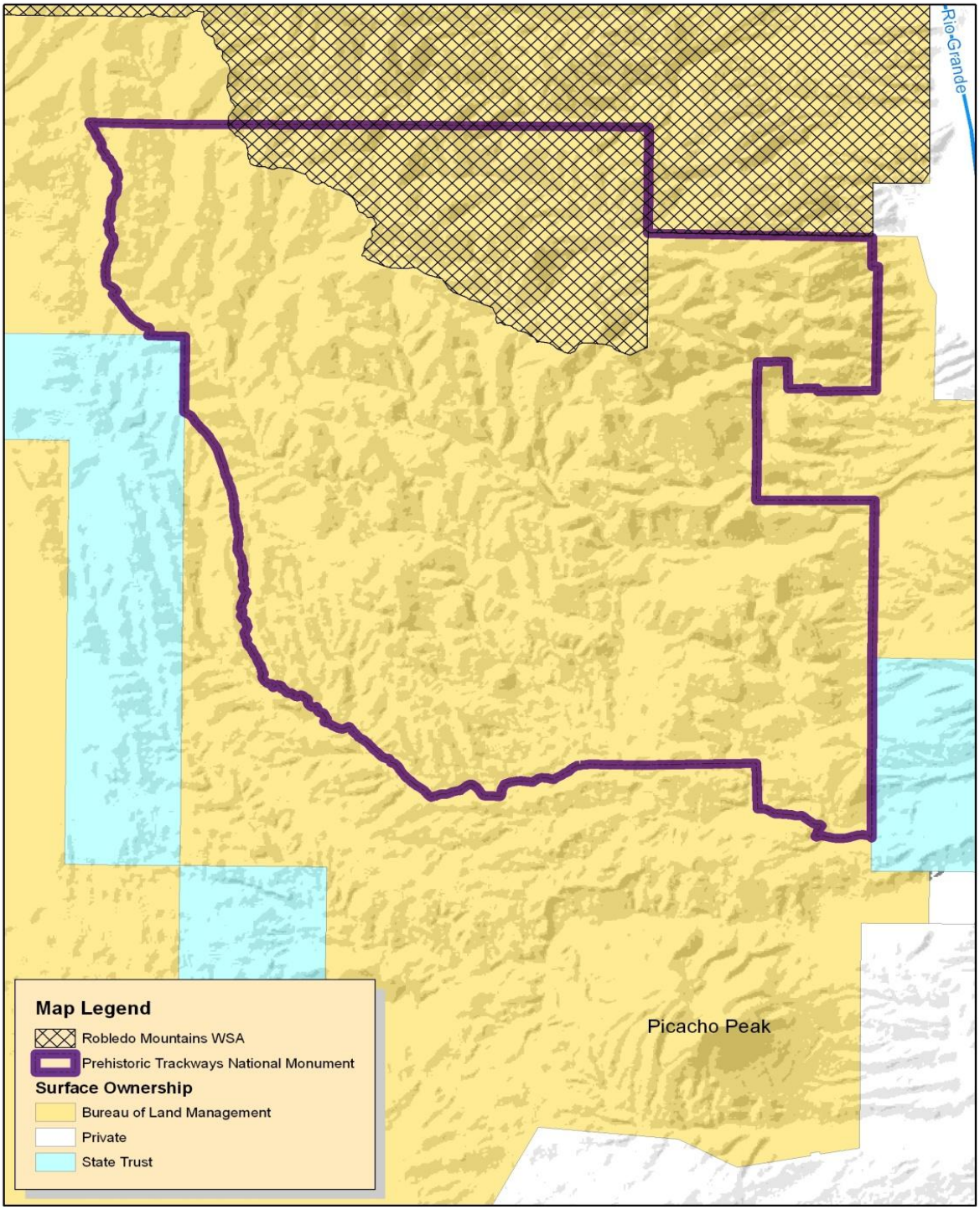
Although BLM does not have a record of specific occurrences and locations of any special status species, suitable habitat does occur throughout the Monument for each special status species.

Table 3-13 Special Status Species

TABLE 3-13 SPECIAL STATUS SPECIES		
COMMON NAME	**SCIENTIFIC NAME**	**STATUS***
Texas horned lizard	*Phryonsoma cornutum*	BLMS
Burrowing owl	*Athene cunicularia hypugaea*	BLMS, FWSS
Loggerhead shrike	*Lanius ludovicianus*	BLMS, NMS
Cave myotis bat	*Myotis velifer*	BLMS, NMS
Long-legged myotis bat	*Myotis volans interior*	BLMS, NMS
Fringed myotis bat	*Myotis thysanodes thysanodes*	BLMS, NMS
Spotted bat	*Euderma maculatum*	BLMS, NMT
Pale Townsend's big-eared bat	*Plecotus townsendii pallescens*	BLMS, FWSS, NMS
Big free-tailed bat	*Nyctinomops macrotis*	BLMS, NMS
Night-blooming cereus	*Peniocereus greggii var greggii*	FWSS, BLMS, NME
NOTE: *CONSERVATION STATUS: FWSS=USFWS Species of Concern, NMT=NEW MEXICO THREATENED, NME= NEW MEXICO ENDANGERED, NMS = NEW MEXICO SENSITIVE TAXA, BLMS=BLM SENSITIVE,		

Habitat descriptions for the special status species that have habitat in the Robledo Mountains are as follows:

Map 3-7 - Robledo Mountains WSA



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Texas horned lizard (*Phrynosoma cornutum*). This species is ubiquitous over southern New Mexico, occurring in a variety of open desert grassland and shrubland habitats. They are common in a range of seral communities.

Burrowing owl (*Athene cunicularia hypugaea*). Burrowing owls are year-round residents of southern New Mexico. Preferred habitat includes open shrubland and grassland. These owls occur in a variety of seral communities ranging from disturbed areas to climax grassland and are tolerant of human activity. They occur in desert scrub dominated by mesquite, yucca and cactus. They use abandoned prairie dog, ground squirrel, fox, badger and similar burrows as well as ground holes in road cuts for nesting.

Loggerhead shrike (*Lanius ludovicianus*). Loggerhead shrikes are a year-round resident of southern New Mexico in open shrub and grasslands. Riparian habitat is an essential environmental component. Nest habitat includes small trees and shrubs.

Cave myotis (*Myotis velifer*). Both subspecies occur in southern New Mexico. These bats are migratory over much of their range, but occur in Southern New Mexico year-round. They occur in arid habitats, preferring desert floodplains and rocky canyon lands. Dense arroyo and riparian vegetation may be important foraging habitat. This species hibernate in caves and roost primarily in caves and mines forming large colonies.

Long-legged myotis (*Myotis volans*). The subspecies for New Mexico is *M. v. interior*. This species is most common in coniferous forest, but is known from high grassland and woodland habitats. They use mines and caves as hibernacula and night roosts. Cracks and crevices in rocks, stream banks, buildings, tunnels, hollow trees and loose tree bark are utilized for day roosts. Summer nursery colonies form in tree hollows, rock crevices, and buildings.

Fringed myotis (*Myotis thysanodes*). The subspecies in New Mexico is *M. t. thysanodes*. This summer resident myotis occurs over most of the western two-thirds of New Mexico, most commonly in grasslands and oak-piñon woodlands. It is also known to occur from desert scrub to coniferous forest. They forage close to the vegetation canopy for moths and beetles primarily, but do take other insects. Maternity and day roost habitat includes rock crevices, caves, mines, snags and buildings.

Spotted bat (*Euderma maculatum*). Spotted bats are year-round residents, ranging widely in New Mexico, but are very rare in occurrence. They are found in a variety of habitats from low desert to conifer forest. Spotted bats forage in habitats such as forests, woodlands, riparian/riverine, as well as, old fields. The most important habitat component is rock and cliff features. They are strongly associated with broken canyon terrain and cliff habitat where day roosts are normally located, most in association with or near open water. Spotted bats are thought to be a non-colony forming species.

Big free-tailed bat (*Nyctinomops macrotis*). This uncommon yet wide-ranging bat occurs in arid, rocky habitats of New Mexico. They have been known to occur in desert shrub, woodlands and as high as evergreen forests near 2.5km in elevation. They are believed to be seasonal migrants, though it is thought that some may hibernate in southern New Mexico. These bats roost and form maternity colonies in cracks and crevices of rock outcrops and cliff faces.

Pale Townsend's big-eared bat (*Plecotus townsendii pallescens*). The Pale or western Townsend's big-eared bat occurs year-round in most areas of New Mexico. They inhabit a variety of vegetation habitats with proximity to rocky, broken expanses as a likely prerequisite. Caves and mines are crucial habitat components and may contain high concentrations of bats during hibernation and while rearing young. This species is highly intolerant of roost site disturbance, which can result in roost abandonment and substantial mortality.

There are no known special status species that are **specific** to the Robledo Mountains nor are the standard habitat sites which occur in the Robledo Mountains habitat obligates for any special status species.

Night-blooming cereus (*Peniocereus greggii* var. *greggii*), which is considered a species of concern by the U.S. Fish and Wildlife Service, a sensitive species by the BLM, and Endangered by the State of New Mexico, may also occur here, but it is widespread in southern New Mexico though not abundant at any location. Night-blooming cereus is usually associated with creosotebush and honey mesquite both that occur in and around the Robledo Mountains. Night-blooming cereus occurs mostly in sandy to silty gravelly soils in the Chihuahuan Desert, shrubland and desert grassland. Night-blooming cereus grows up through and is supported by shrubs like creosotebush and honey mesquite.

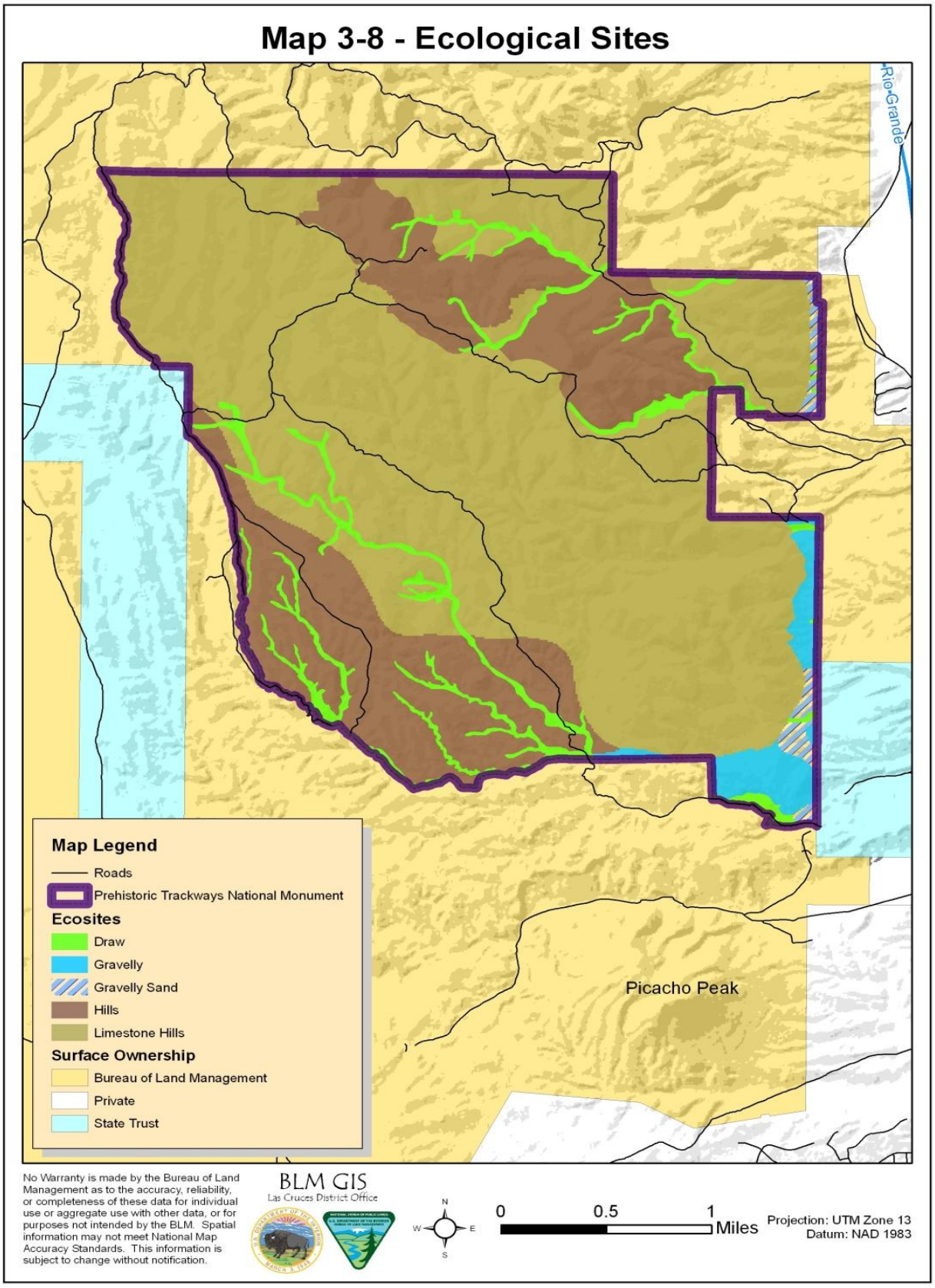
3.2.16 Vegetation

The vegetation in the Monument is a prime example of the Chihuahuan Desert, which consists of grama grasses, agave, yucca, barrel cactus, button cactus, Scheer's pincushion cactus, claret cup cactus, prickly pear, ocotillo, acacia, juniper, and honey mesquite. The Natural Resources Conservation Service (NRCS) identifies large geographically associated land resource units called major land resource areas (MLRAs), which delineate areas with common topography, geology, climate, water resources, soils, biological resources including plant, fish, and wildlife species, and common land uses.

The Planning Area is within the Southern Desert Basins, Plains and Mountains MLRA number 42, land resource unit SD-2. Maps showing MLRA zones can be found at http://www.nm.nrcs.usda.gov/technical/fotg/section-2/esd.html. Elevations within MLRA-42 range from 2,600 to 5,000 feet in basins and valleys, and more than 7,800 feet in the tallest mountains. Broad desert basins and valleys are bordered by gently sloping to strongly sloping fans and terraces. Steep north-south trending mountain ranges and many small mesas occur in the MLRA. Average annual precipitation ranges from 8-14 inches. Most precipitation occurs from mid-spring to mid-autumn. Average annual temperature is between 55-65° F. An average freeze-free period from 200 to 240 days occurs in most of the area. The majority of the Robledo Mountains consists of limestone hills, while the gravelly sites occur mainly on the southern and the eastern edge of the mountain range.

The portions of the Picacho Peak Allotment that are within the PTNM are primarily within the limestone hills ecological site with only a small portion of the area (south and east part of the PTNM) located in a gravelly site. The limestone hills ecological site is in early seral condition with dominant vegetation consisting of an understory of grama grasses, bush muhly, other muhly species, and three-awn species. Shrub species include sumacs, broom snakeweed, acacia, and Apache plume. Scattered mountain mahogany and piñon-juniper may also be found. The gravelly ecological site also in early seral condition class is dominated by creosote with an understory of grama grasses, muhlys, and fluff grass. The southern part of the Altamira Ranch Allotment that is within the Monument is within the limestone hills ecological site and is also in early seral condition. Vegetation is the same as that described for the Picacho Peak Allotment. See Map 3-8.

The combination of the existing soils and the climate lead to a desert grass-shrub vegetation community. Giant dropseed (*Sporobolus giganteus*) and mesa dropseed (*Sporobolus flexuosus*), along with scattered shrubs such as sand sagebrush (*Artemisia filifolia*) and yuccas (*Yucca* spp.), grow on the sandier soils. Creosotebush (*Larrea tridentata*), tarbush (*Flourensia cernua*), and catclaw (*Acacia* spp.) are generally found on gravelly, calcareous foot slopes. Giant sacaton (*Sporobolus wrightii*), vine mesquite (*Panicum obtusum*), desert willow (*Chilopsis* spp.), brickelbush (*Brickellia* spp.), and mesquite (*Prosopis* spp.) grow in drainageways and depressions. A large variety of cacti also reside within the Monument. Scattered junipers (*Juniperus spp.)* occur in the drainage and canyon slopes.


Map 3-8 - Ecological Sites
Rio Grande
Picacho Peak
Map Legend
Roads
Prehistoric Trackways National Monument
Ecosites
Draw
Gravelly
Gravelly Sand
Hills
Limestone Hills
Surface Ownership
Bureau of Land Management
Private
State Trust
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3.2.16.1 Noxious Weeds or Invasive Species

Noxious weed is defined as *any plant at any living stage, which is of foreign origin that can directly or indirectly injure crops, other useful plants, livestock, recreation, wildlife, or other interests of agriculture*. Invasive plants include not only noxious weeds, but also other plants that are not native to this country or to the area where they are growing. The BLM considers plants invasive if they have been introduced into an environment where they did not evolve. As a result, they usually have no natural enemies to limit their reproduction and spread (Masters and Sheley 2001; Westbrooks 1998). The establishment and spread of invasive species can directly affect vegetation by increasing the overall competition with native species for limited resources including water and nutrients (DiTomaso 2000). Over time, invasive species also can alter the structural and functional components of an ecosystem, i.e., soil structure/function, hydrologic function, fire return intervals, energy flow, etc. (DiTomaso 2000) severely enough that reestablishment of native or desirable species is not feasible (Masters and Sheley 2001). Common locations for noxious weed infestations include roadsides, recreation areas frequented by hikers, mountain bikers, ATVs/UTVs, and four-wheel drive enthusiasts, livestock concentration areas, recreational dumping and areas that are highly disturbed or degraded from miscellaneous land uses.

There are no known populations of Class A or Class B noxious weeds or invasive species within the Monument; however, there are known populations of Class C weeds within the Monument.

Classes of invasive or noxious weeds are described below:

- **Class A weeds**--Weeds that are not native to an ecosystem and have a limited distribution within the State are placed in this class. Preventing new infestations and eliminating infestations have the highest priorities in the management plan. Species not presently found in the State but threatening to invade are placed in this class.

- **Class B weeds** -- Weeds that are not native to the ecosystem and are presently limited to a particular area of the State are listed within this class. The management priority is to contain them within their current areas. Preventing infestations in new areas also has a high priority.

- **Class C weeds** -- Weeds that are not native to the ecosystem yet are widespread throughout the State. Long-term programs of management and suppression are encouraged.

Class C weeds present within and nearby the Monument are individual plants and isolated populations of salt cedar (*Tamarix* spp.). Salt cedar is a deciduous or evergreen shrub or small trees, 5 to 20 feet tall. Salt cedar was introduced from Eurasia and is now widespread in the United States. The Tamarisk family, which includes salt cedar was introduced as ornamentals, but has proliferated to become naturalized along streams, canals, and reservoirs in much of the west. Stands form monocultures, which limit native plant and wildlife biodiversity. Large plants of salt cedar can transpire at least 200 gallons of water per plant each day. The locations of salt cedar within the Monument are primarily within Apache Canyon. Isolated individuals and smaller populations can also be found in smaller ephemeral side drainages on Federal, State trust and private lands adjacent to the Monument.

3.2.17 Visual Resources

The PTNM is a very expressive example of the Chihuahuan Desert with its variety of native plant and animal species along with the rugged terrain captured in the Robledo Mountains. A high diversity of cacti provide habitat for many reptiles within the Monument. During the spring and monsoon seasons, flowers abound on the desert plants and cacti. Thousands of residents and travelers on Interstate 25 and Interstate

10 view the Robledo Mountains every day. The adjacent closed Community Pit #1 is a major visual impact and landscape modification. Areas showing major impacts to the line, form, color and texture are clearly evident even from several miles away. These impacts in the Community Pit #1 include areas of vegetation removal, roads, rock piles and landings for stockpiling and loading the excavated rock.

Visual resources include natural and manmade physical features that give landscapes scenic quality and provide scenic views. Visual resources are interrelated with social and economic values, beliefs, and attitudes, lifestyle, quality of life, well-being, and place-based values, which all influence a viewer's perception of the scenic quality and importance of scenic resources.

BLM uses a systematic approach of visual resource inventory (VRI) to measure visual resource values. The results of this inventory provide the basis for considering visual values in the RMP process and assigning visual resource management objectives.

There are three components of a VRI Classification process:

1. ***Scenic Quality Evaluation*** – This is a measurement of the visual appeal of a landscape and is based on seven key factors: landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modification. The Scenic Quality Rating of the Robledo Mountains is *"Class B"*, which indicates a *Medium* rating based on observed characteristics such as highly eroded features with good color and mountain views, sparse vegetation, and cultural modification (the Community Pit quarry site).

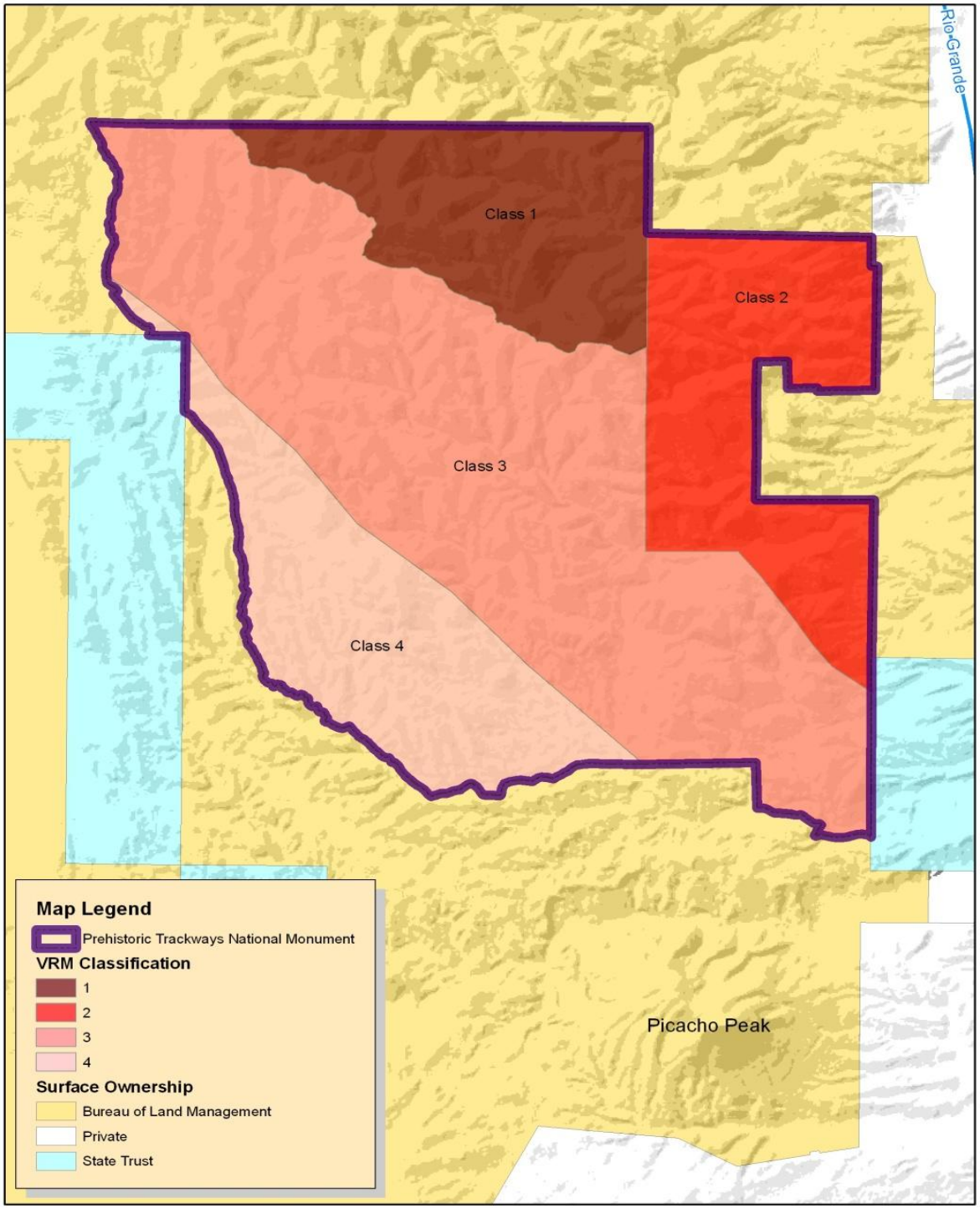
2. ***The Sensitivity Level Analysis*** – This is a measure of public concern for scenic quality. The Robledo Mountains overall rating of *High* is based on a combination of public sensitivity for the WSA, the ACEC, and the PTNM. The Monument is rated *High* for its level of public interest and amount of recreational use.

3. ***Delineation of Distance Zones*** **-** Viewsheds across public land are divided into 3 distance zones based on relative visibility from various travel routes or observation points, they are: (1) the foreground-middleground zone which occurs at 3-5 miles, (2) the background zone which occurs 5 miles and beyond, and (3) the seldom seen zone which occurs in those areas not otherwise visible from commonly travel routes or observation points. The entire PTNM was inventoried within the *Foreground/Middleground* Distance Zone.

As designated in the *Mimbres RMP* (1993), the Monument is designated into all four VRM Classes (See Map 3-9). Table 3-14 displays the total acreage of public land within the Monument per VRM Class.

With the VRI (above) serving as a baseline to quantify visual values, the BLM then considers other RMP decisions and resource allocations that may affect these values to arrive at appropriate visual resource management objectives. These objectives, or classes, are divided into 4 categories:

Map 3-9 - Visual Resource Management



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1. Class I Objective - to preserve the existing character of the landscape. This class provides for natural ecological changes but does not preclude very limited management activity.
2. Class II Objective - to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer.
3. Class III Objective - to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer.
4. Class IV Objectives - to provide for management activities, which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high.

According to the *Mimbres RMP* (1993), the public land within the PTNM falls into the following VRM Class Objectives.

Table 3-14 Visual Resource Management Acreages within the PTNM

TABLE 3-14 VISUAL RESOURCE MANAGEMENT ACREAGES WITHIN THE PTNM	
VRM CLASS	**ACRES**
Class I	789
Class II	907
Class III	2,627
Class IV	932
TOTAL	5,255
SOURCE: Mimbres RMP, 1993.	

Based on the components of VRI identified above and management considerations for other land uses, public land is placed into one of four visual resource inventory classes (VRICs). These inventory classes represent the relative value of the visual resources. Classes I and II being the most valued, Class III representing a moderate value, and Class IV being of least value. Based upon the most recent VRI of the Planning Area that was undertaken in 2009, the entire PTNM Planning Area was rated as a VRIC II.

3.2.18 Water Resources

3.2.18.1 Groundwater

All water rights in New Mexico are acquired in accordance with the State's substantive and procedural law, except where Congress or the Executive Branch has created a Federal reservation with a reserved water right.

The New Mexico Office of the State Engineer (NMOSE), as delineated by statute and judicial decision, has divided the State into declared groundwater basins to assess and adjudicate water resources. The Monument and surrounding area lie within the Mesilla Basin, which is a sub-basin of the Lower Rio Grande Basin. According to NMOSE records, depths to the water table can vary widely throughout the Mesilla Basin. Variations can be from a few tens of feet along the Rio Grande to over 1,000 feet at various locations within the Valley. There are no records of wells or groundwater monitoring sites known to be present within the Monument boundaries.

The Santa Fe Group (Oligocene-Pleistocene) forms the major aquifer in this region and consists of a thick sequences of alluvial, fluvial, eolian, and lacustrine sediments deposited in the intermountain basins of the Rio Grande rift valley. Although the Santa Fe Group is present along the eastern boundary of the Monument, it comprises a very small percentage of the geologic formations located within the Monument boundaries. This equates to a very small percentage of the Monument containing prime aquifer characteristics. Some beds such as sandstones, conglomerates, or dissolved limestone beds within the Hueco Group, may contain some water storage capabilities. However, these beds are relatively thin and can be laterally discontinuous. Additionally, tectonic uplift, volcanism, and intrusive events related to continental rifting have resulted in a structurally complex mountain range. Given the geologic history from deposition, deformation, and alteration of the Hueco Group in the Robledo Mountains, it is unlikely that any significant groundwater or potential aquifers exist in the Hueco Group within the Monument. Should small quantities of groundwater be present in selective beds of the Hueco Group, it would not be expected to have a significant nexus to groundwater in the Mesilla Basin aquifer. However, given the history of the Robledo Mountains, the inferred lack of aquifer potential, and the absence of groundwater data within the Monument, there is still a high degree of uncertainty regarding groundwater throughout the Monument.

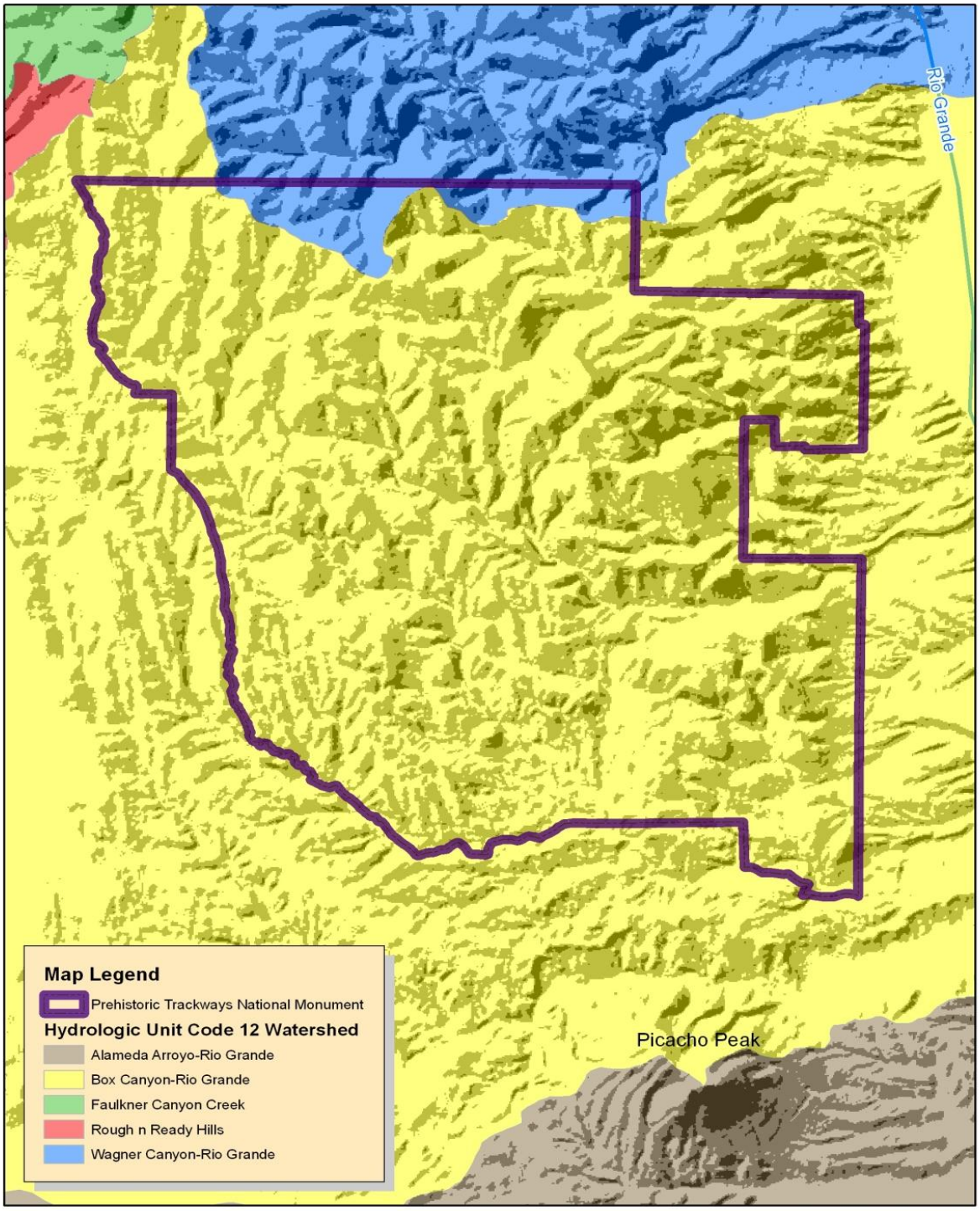
3.2.18.2 Surface Water

There are no perennial surface waters located within the Monument. Surface water is limited to ephemeral and intermittent overland and in-channel flows during rainfall events. Water flows within arroyos primarily flow southeast and east and terminate at the Rio Grande (See Map 3-10). This water is both seasonally common and an essential component of the public land. Desert washes primarily function as areas of overland flow collection and recharge areas for the surrounding watershed. Ephemeral pools, either in-channel or in the uplands, are essential as watering sites for wildlife and livestock.

Water quality analysis in New Mexico is designed to satisfy the statutory requirements of Section 303(d), the reporting requirements of Sections 305(b) and 314 of the Federal Water Pollution Control Act [33 U.S.C. 1251 *et seq.*], commonly known as the Clean Water Act. The New Mexico Environment Department (NMED) Surface Water Quality Bureau's "*2010-2012 State of New Mexico Clean Water Act 303(d)/305(b) Integrated List and Report*" found that the Rio Grande, from the International Mexico Boundary to 1 mile below Percha Dam, exceeds the allowable concentrations of *Escherichia coli* (E. coli). Additionally, the report lists probable sources for E. coli as avian sources (i.e., waterfowl), concentrated animal feeding operations, impervious surfaces/parking lot runoff, municipal point source discharges, on-site treatment systems (i.e., septic systems), rangeland grazing, wastes from pets, and wildlife other than waterfowl. Even though the Rio Grande is located adjacent to and not within the Monument boundaries, watersheds within the Monument drain into the Rio Grande. This provides BLM with the responsibility to mitigate any action that may contribute contaminants into the Rio Grande and to protect the State's water resources. Contaminants not only include E. coli that may further degrade water quality, but rather any contaminants that may lead to an additional impairment(s) of water quality.

The Planning Area receives approximately 9 inches of rainfall annually. Most of this occurs in July and August in the form of thunderstorms. Localized heavy rainfall often results in flash flooding in the arroyos carrying large quantities of sediment and debris.

Map 3-10 Watersheds



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3.2.19 Wildland Fire Management

The existing vegetation within the Monument is not conducive to carrying a fire. As stated earlier in the Vegetation section, the combination of the existing soils and the climate lead to a desert grass-shrub vegetation community. The sparse understory does not lend itself to large wildland fires. Historically, there has not been any known wildland fire event within the area.

A natural *fire regime* is the pattern, frequency, and intensity of the wildfires that prevails across a landscape without the intervention of humans. A fire regime condition class (FRCC) is a classification of the amount of departure from the natural fire regime (see Table 3-15). Historical fire regimes provide a baseline against the current condition of an area and the effects of the change to the ecosystem. Fire is a natural part of a healthy ecosystem and the FRCC helps land managers plan the response to wildfires across the landscape (see Map 3-11). Fire Management Plans (FMPs) develop management responses to wildfire for all Fire Management Units (FMU). These wildfire management strategies take into account: safety, cost, and resource objectives, in that order of prioritization. FMUs are created based on geographic, social, and political characteristics. The FMUs are assigned a fire management category(s) that dictate a management approach for each unit. Public land is assigned to one of the following fire management categories (See Map 3-12):

- Category A: Areas where fire is not desired at all.
- Category B: Areas where unplanned wildfire is not desired because of current conditions.
- Category C: Areas where fire is desired, but there are significant constraints on its use.
- Category D: Areas where wildland fire is desired, and there are few or no constraints on its use.

Three FMUs are found within the Monument (see Table 3-16).

Table 3-16 Fire Management Units within the PTNM

TABLE 3-16 FIRE MANAGEMENT UNITS WITHIN THE PTNM		
FIRE MANAGEMENT UNIT	**ACRES**	**FIRE MANAGEMENT CATEGORY**
Rio Grande Valley Uplands	4,469	C
Robledo Mountains WSA/ACEC	782	D
Rio Grande Corridor	4	B

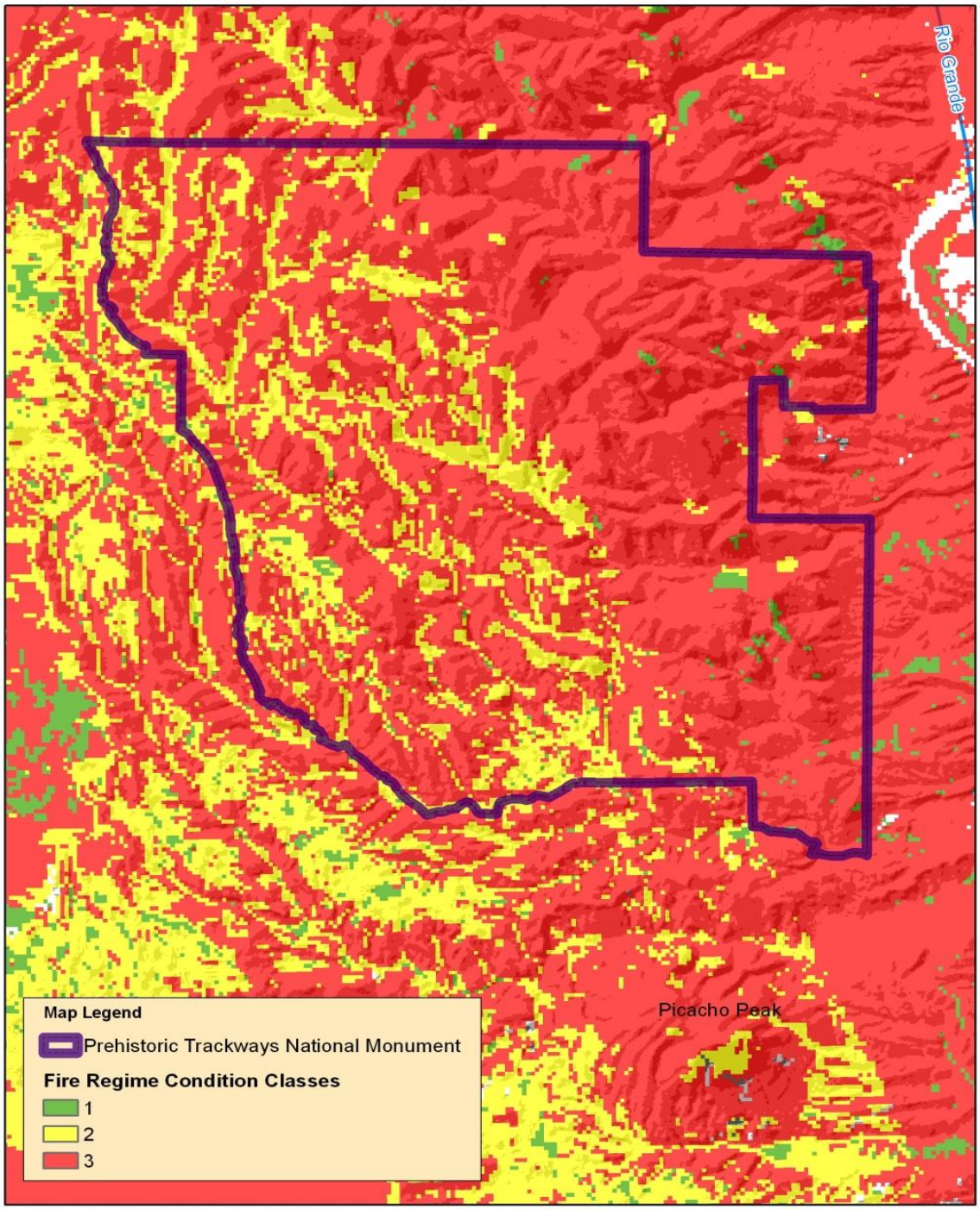
The FMU categories are show on Map 3-12. These categories allow management to prioritize resources if there are multiple wildfires occurring at the same time.

Where necessary, emergency stabilization treatments would be implemented and completed within one calendar year from the date of the control of wildland fire. Rehabilitation of non-emergency actions due to wildland fires must be completed within 3 years of the date of the control of fire with funding for rehabilitation prioritized using common criteria (BLM 2005). Wildland and prescribed fires are monitored according to variables described in the *Resource Management Plan Amendment for Fire and Fuels Management on Public Lands in New Mexico and Texas* (BLM 2004a). Fuel treatment and fire suppression activities would be consistent with the *New Mexico Standards and Guidelines*.

Table 3-15 Fire Regime Condition Classes

TABLE 3-15 FIRE REGIME CONDITION CLASSES		
CONDITION CLASS	**ATTRIBUTES**	**EXAMPLE MANAGEMENT OPTIONS**
Condition Class 1	Fire regimes are within or near a historical range. The risk of losing ecosystem components is low. Fire frequencies have departed from historical frequencies by no more than one return interval. Vegetation attributes (species composition and structure) are intact and functioning within a historical range.	Where appropriate, these areas can be maintained within the historical fire regime by treatments such as prescribed fire and allowing lightning fires to burn.
Condition Class 2	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components has increased to moderate. Fire frequencies have departed (either increased or decreased) from historical frequencies by more than one return interval. Results are moderate changes to one or more of the following: fire size, frequency, and intensity, severity, or landscape patterns. Vegetation attributes have been moderately altered from their historical range.	Where appropriate, these areas may need moderate levels of restoration treatments, such as prescribed fire and hand or mechanical treatments.
Condition Class 3	Fire regimes have been significantly altered from their historical range. The risk of losing ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals and results in dramatic changes to one or more of the following: fire size, frequency, intensity, or severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range.	Where appropriate, these areas may need high levels of restoration treatments, such as hand or mechanical treatments. These treatments may be necessary before prescriptive fire treatments are used to restore the historical fire regime.
SOURCE: Bureau of Land Management, 2004a.		

Map 3-11 - Fire Regime Condition Classes



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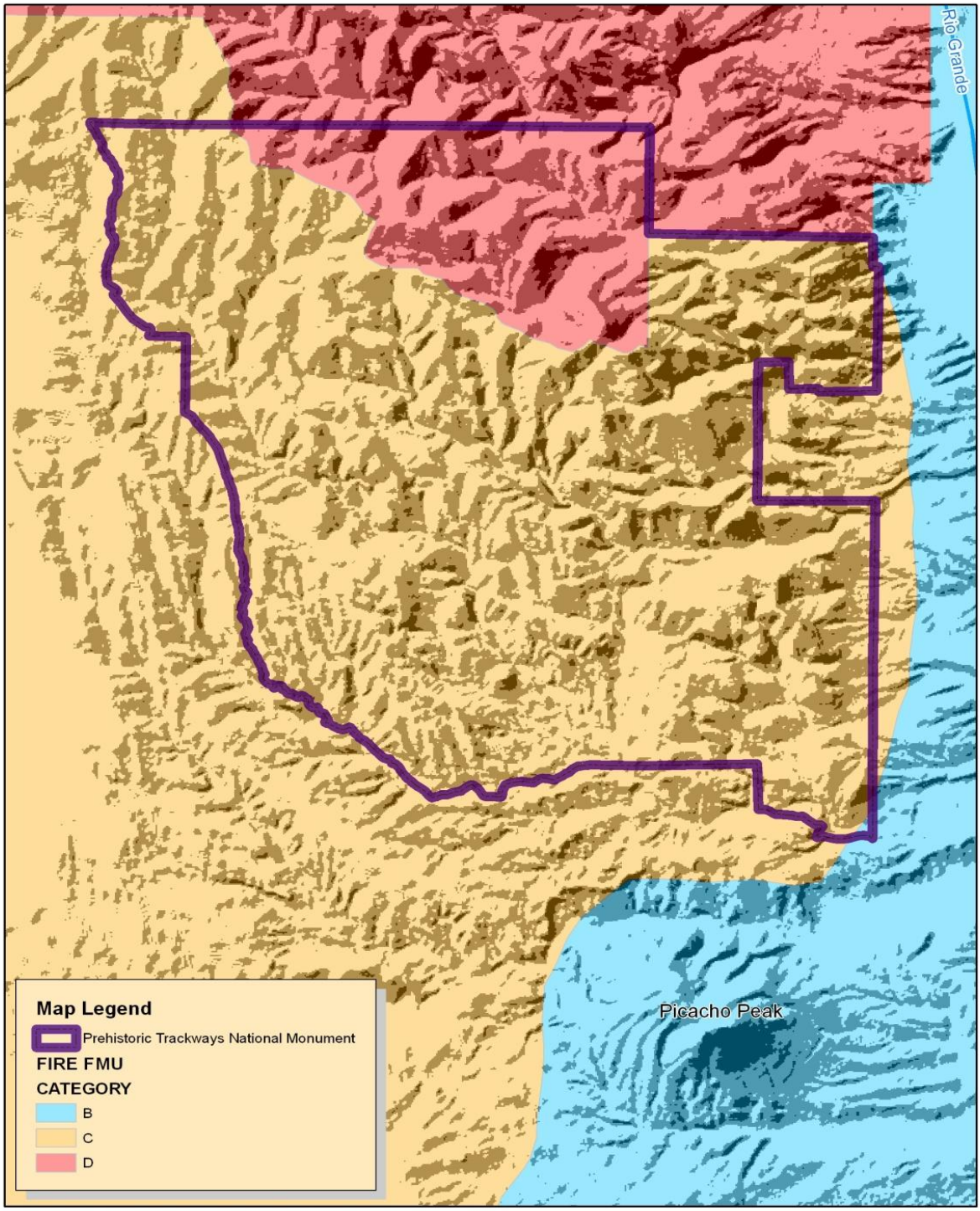
Map 3-12 - Fire Management Units



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3.2.20 Wildlife

BLM Standard Habitat Sites (SHS) are the primary indicators for wildlife and habitat to assess habitat quality. This also allows for identification of and monitoring of specific issues at the landscape level in the Planning Area. The SHS system was designed by the BLM to assist in accumulating, storing, retrieving, and analyzing data on wildlife, vegetation, and other ecosystem determinants as they relate to wildlife resources. The BLM-based SHSs are used as indicators because they provide the best available data on current condition, trends, and forecasts of wildlife and habitat.

The Planning Area is comprised primarily of two SHSs: Mixed Shrub Mountain and Grass Mountain with a small area of Creosote Breaks along the eastern edge. See Map 3-13.

3.2.20.1 Mixed Shrub Mountain

Shrub species dominate the vegetation composition of this SHS along with an understory of grama grasses (*Bouteloua* spp.), bush muhly *(Muhlenbergia poteri)*, slim tridens (*Tridens muticus*), and three-awn (*Aristida* spp.). Characteristic shrubs are broom snakeweed *(Gutierrezia sarothrae)*, whitethorn acacia *(Acacia constricta)*, catclaw mimosa (*Mimosa aculeaticarpa*), Apache plume *(Fallugia paradoxa)*, skunkbush sumac *(Rhus trilobata)*, and mountain mahogany *(Cercocarpus montanus)*. This SHS is located between surrounding uplands and below the piñon-juniper vegetative community. Species diversity is high for mammals, moderate for herptiles, and low for birds (USDI BLM 1983).

Typical wildlife species of the mixed shrub mountain habitat type include tree lizards, Chihuahuan whiptails, Great Plains skinks, rock rattlesnakes, canyon wrens, white-throated swifts, rock squirrels, javelina, and mule deer.

3.2.20.2 Grass Mountain

This SHS occurs on slopes of mountain ranges above the surrounding uplands. It typically supports a high percentage of grama grasses (*Bouteloua* spp.) with inclusions of tobosa grass *(Pleuraphis mutica)*, Kentucky bluegrass (*Poa pratensis*), June grass (*Koeleria cristata*), and bluestems (*Bothriochloa* spp.). Shrubby vegetation is widely scattered and represented by banana yucca (*Yucca baccata*), Engelmann prickly pear *(Opuntia engelmannii*), mountain mahogany (*Cerococarpus montanus*), ocotillo *(Foquieria splendens)*, oaks (*Quercus* spp.), beargrass (*Nolina* spp.), Apache plume *(Fallugia paradoxa)*, rabbitbrush (*Chrysothamnus* spp.), and fringed sage (*Artemisia frigida*). Species diversity is moderate for herptiles and mammals, and low for birds (USDI BLM 1983).

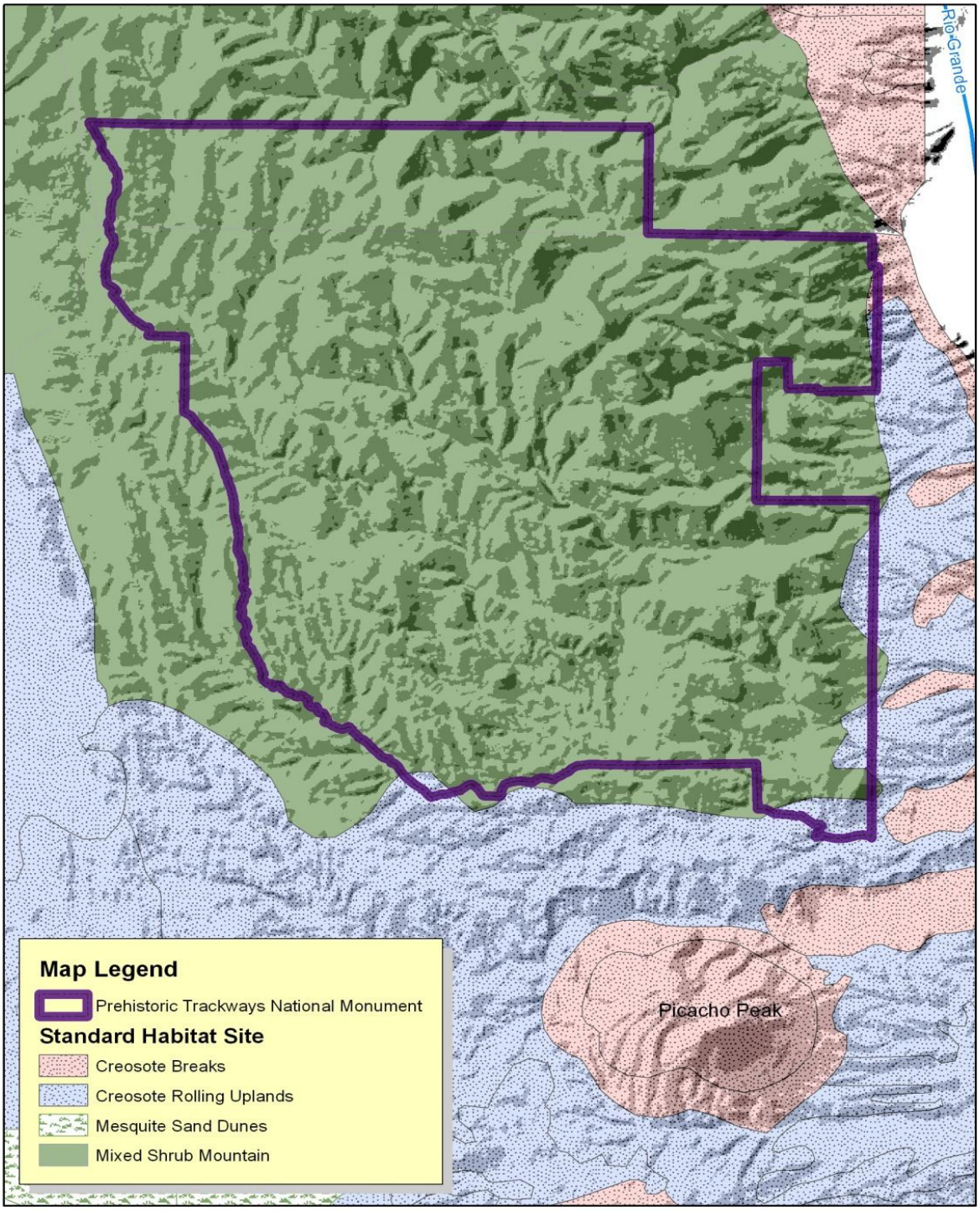
Typical wildlife species of the grass mountain areas include eastern fence lizards, tree lizards, black-tailed rattlesnakes, mountain patch-nosed snakes, scaled quail, desert cottontails, and mule deer.

3.2.20.3 Creosote Breaks

Vegetation in this SHS is dominated by creosotebush (*Larrea tridentata*) found on steep slopes and gravel ridges. This SHS experiences a high degree of soil erosion. Ecological condition and species diversity has not been identified for this SHS.

Typical wildlife species of creosote breaks include Couch's spadefoots, western whiptails, side-blotched lizards, western diamondback rattlesnakes, cactus wrens, Merriam's kangaroo rats, and black-tailed jackrabbits. Because of proximity to the Rio Grande, this is an important wildlife habitat.

Map 3-13 - Standard Habitat Sites



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