Chapter 3
Affected Environment

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Chapter 3. Affected Environment

3.1 Introduction

Chapter 3 describes the existing conditions and future trends for resources and resource uses within the Planning Area. Where appropriate, indicators are identified for each resource to further describe current conditions. Information from this chapter will be used to analyze the potential effects of the proposed alternatives in **Chapter 4**, Environmental Effects.

Available data have been gathered from various sources (e.g., the BLM, other agencies, published and unpublished reports, databases, and maps) and compiled to create an inventory. Condition will be determined by comparing the value of the indicators to an established standard (current plan goal or objective) and/or benchmark. The condition assessment will relate to Land Health Standards as appropriate. The scale of the analysis may extend beyond the immediate Planning Area boundary and encompass a logical landscape (the analysis area) to support certain land uses.

3.1.1 Ecoregions of the Planning Area

The public land acres in the Planning Area make up portions of four of the Environmental Protection Agency's (EPA) Level III ecoregions (Omernik 1987). Level III mapping describes smaller ecological areas nested within Level II ecoregions. At Level III, the continent currently contains 182 ecological areas. These smaller divisions enhance regional environmental monitoring, assessment, and reporting, as well as decision-making. Because Level III ecoregions are smaller, they allow locally defining characteristics to be identified and more specifically oriented management strategies to be formulated.

Over 85 percent of the public lands in the Planning Area are in the Arizona/New Mexico Plateau ecoregion, and the rest are in the other three ecoregions: the Arizona/New Mexico Mountains, the Southern Rockies, and the Southwestern Tablelands (**Appendix S**, **Map 3-1**, Level III Ecoregions, and **Table 3-1**, Acres of Level III EPA Ecoregions within the Rio Puerco Planning Area). The Arizona/New Mexico Plateau represents a large transitional region between the semiarid grasslands and low-relief areas of the Southwestern Tablelands. The Arizona/New Mexico Mountains are distinguished from neighboring mountainous ecoregions by their lower elevations and associated vegetation, indicative of drier, warmer environments, due in part to the region's more southerly location. The Southern Rockies are composed of steep, rugged mountains with high elevations. Although coniferous forests cover much of the region, as characteristic of most of the mountainous regions in the western United States, the ecoregion's vegetation, soil, and land use follow a pattern of elevational banding. The Southwestern Tablelands flank the High Plains with red-hued canyons, mesas, badlands, and dissected river breaks (EPA 2020a).

Table 3-1: Acres of Level III EPA Ecoregions within the Rio Puerco Planning Area

Ownership/Management	Ecoregion Acreage[a]				
	ANMM	ANMP	SR	ST	Total
BLM-administered Surface[b]	1,561,425	5,418,600	591,767	1,935,298	9,507,090

Source: BLM GIS 2020

[a]ANMM—Arizona/New Mexico Mountains; ANMP—Arizona/New Mexico Plateau; SR—Southern Rockies; ST—Southwestern Tablelands

[b]The acreages calculated with the BLM's geographic information system are used because they allow for production of maps and easier analyses, based on computerized data.

3.2 AIR RESOURCES

3.2.1 Air Quality

Air resource indicators can be both monitored (measured by an instrument) and modeled (estimated by a computer model). Monitoring is used to measure actual values in a specific place and time, while modeling is used to estimate values in areas without monitoring and to estimate potential future values.

National Ambient Air Quality Standards

The EPA has established the National Ambient Air Quality Standards (NAAQS) for six criteria pollutants. The State of New Mexico also sets standards for criteria and hazardous air pollutants. See **Table 3-2** for a comparison of the EPA and New Mexico ambient air quality standards.

Table 3-2: National and New Mexico Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards		New Mexico Standard
		Primary	Secondary	
Ozone	8-hour	0.070 ppm[1]	Same as primary	—
Carbon monoxide	8-hour	9 ppm	—	8.7 ppm
	1-hour	35 ppm	—	13.1 ppm
Nitrogen dioxide	Annual (arithmetic mean)	53 ppb	Same as primary	0.05 ppm
	24-hour	—	—	0.10 ppm
	1-hour	100 ppb	—	—
Sulfur dioxide	Annual (arithmetic mean)	—	—	0.02 ppm
	24-hour	—	—	0.10 ppm
	3-hour	—	0.5 ppm	—
	1-hour	75 ppb[2]	—	—
Particulate matter (PM_{10})	24-hour	150 µg/m^3	Same as primary	—
Particulate matter ($PM_{2.5}$)	Annual (arithmetic mean)	12 µg/m^3	15 µg/m^3	—
	24-hour	35 µg/m^3	Same as primary	—
Lead[3]	Rolling 3-month average	0.15 µg/m^3	Same as primary	—
Hydrogen sulfide (H_2S)	1-hour (statewide)	—	—	0.010 ppm
	0.5 hour (within 5 miles of municipalities > 20,000)	—	—	0.003 ppm
Total reduced sulfur	0.5 hour	—	—	0.003 ppm

Sources: EPA 2019a; New Mexico Commission of Public Records 2019a

Cells with a dash (—) indicate that there is no standard for that pollutant or averaging time.

[1]ppm—parts per million. Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) ozone standards additionally remain in effect in some areas. Revocation of the previous standards and transitioning to the 2015 standards will be addressed in the implementation rule for the current standards.

[2]ppb—parts per billion. Final rule signed June 2, 2010. The 1971 annual and 24-hour sulfur dioxide standards (0.03 ppm annual and 0.14 ppm 24-hour) were revoked in that same rulemaking; however, these standards remain in effect until 1 year after an area is designated for the 2010 standard. One exception is in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

[3]µg/m^3—micrograms per cubic meter. Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m^3) remains in effect until 1 year after an area is designated for the 2008 standard. The one exception is in areas designated nonattainment for the 1978 standard, where the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

The NAAQS is applied for outdoor air throughout the country. States and tribes submit recommendations to the EPA as to whether or not an area is attaining the NAAQS for a criteria pollutant. The states and tribes base these recommendations on air quality data collected from monitors at locations in urban and rural settings, as well as on other information characterizing air quality, such as modeling.

After working with the states and tribes and considering the information from air quality monitors and/or models, the EPA will designate an area as attainment or nonattainment for the standard. If the air quality in a geographic area meets or is cleaner than the national standard, it is called an attainment area (designated "unclassifiable/attainment"); areas that do not meet the national standard are called nonattainment areas.

In some cases, the EPA is not able to determine an area's status after evaluating the available information. Those areas are designated unclassifiable. Measurement of values nearing or exceeding these standards is an indication of the air quality conditions that need to be addressed. Currently, all areas meet the NAAQS standards for all six criteria pollutants.

Air Quality Design Values

A design value is a statistic that describes the air quality status of a given location relative to the level of the NAAQS. The EPA reports air quality design values for designated areas of the US. A design value describes the air quality status of a given location relative to the level of the NAAQS. Design values are typically used to designate and classify nonattainment areas, as well as to assess progress toward meeting the NAAQS. The only design values reported for locations within the six-county Planning Area in 2018 were in the Albuquerque Area for 1-hr and 8-hr carbon monoxide. These values were 1.8 ppm and 1 ppm, respectively, for the designated area, which met the NAAQS in 2018 (EPA 2019b). Design values for counties north of the Planning Area are available for the 8-hr ozone standard; these values were 0.067 ppm in Rio Arriba County, 0.068 ppm in Sandoval County, and 0.070 ppm in San Juan County in 2018 (BLM 2019b).

Air Quality Index

The air quality index (AQI) is used for reporting daily air quality. It describes how clean or polluted the air is by geographic area and what the associated health effects may be. The EPA calculates the AQI based on concentrations of criteria air pollutants measured at air monitoring stations.

The AQI is divided into six categories. Each category corresponds to a different level of health concern, as follows (EPA 2014):

- Good AQI is 0 to 50. Air quality is considered satisfactory, and air pollution poses little or no risk.
- Moderate AQI is 51 to 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.
- Unhealthy for Sensitive Groups AQI is 101 to 150. Although the general public is not likely to be affected at this AQI range, people with lung disease, older adults, and children are at a greater risk from exposure to ozone. People with heart and lung disease, older adults, and children are at greater risk from the presence of particles in the air.
- Unhealthy AQI is 151 to 200. Everyone may begin to experience some adverse health effects, and members of the sensitive groups may experience more serious effects.
- Very Unhealthy AQI is 201 to 300. This would trigger a health alert signifying that everyone may experience more serious health effects.
- Hazardous AQI greater than 300. This would trigger health warnings of emergency conditions. The entire population is likely to be affected.

Table 3-3 shows the annual AQI for the Planning Area counties of Bernalillo, Sandoval, and Valencia for the last 3 years of complete data; AQI is not calculated in Cibola, McKinley, and Torrance Counties. As shown in this table, the number of days classified as good or moderate as a proportion of all days has decreased in all three counties over the last 3 years; Bernalillo County consistently had the highest number of days classified as unhealthy or unhealthy for sensitive groups. In 2018, air quality in Bernalillo County was classified as good or moderate for 346 days, compared with 342 days in Sandoval County and 354 days in Valencia County.

Table 3-3: Air Quality Index Summary Report (2016–2018)

Year	No. of Days with AQI	Good Days	Moderate Days	Unhealthy for Sensitive Groups Days	Unhealthy Days	Very Unhealthy Days	Hazardous Days
Bernalillo County							
2018	365	160	186	18	1	0	0
2017	365	170	191	4	0	0	0
2016	366	193	170	3	0	0	0
Sandoval County							
2018	354	224	118	12	0	0	0
2017	364	269	94	1	0	0	0
2016	361	292	69	0	0	0	0
Valencia County							
2018	359	238	116	5	0	0	0
2017	361	262	98	1	0	0	0
2016	362	280	82	0	0	0	0

Source: EPA 2019c

How air quality will change over time will depend on trends in air pollution associated with population and economic activity and technological changes associated with a variety of mobile and stationary sources. Air quality also will be affected by the adoption and implementation of federal, state, and local regulations intended to control emissions. Improvements in engine efficiency and fuel quality will continue to help to reduce many air pollutants in this area. At the same time, growing populations could cause increased levels of pollution due to increases in traffic and congested roadways and increased demand for electricity generation. Requirements for improvement in visibility under the Regional Haze Rule are also forcing states to strategize for further improvements in emissions reduction technology. There may, however, be some temporary impairment of air quality due to seasonal wildfire occurrences, as well as increases in prescribed burning and management of wildfires to meet resource objectives.

An area of concern for air quality impacts by BLM activities is the village of Placitas (**Appendix S, Map 3-2**). The village of Placitas is a small community adjacent to approximately 3,200 BLM-administered acres, with approximately 4,977 residents (City Data 2020). In 2016 the New Mexico Environment Department located a mobile air quality monitoring station for approximately 90 days in the area to measure $PM_{2.5}$. For the 90-day monitoring exercise, the hourly average result was 12 µg/m³ (NMED 2016a). The 24- hour NAAQS for $PM_{2.5}$ is 35 µg/m³ (EPA 2019a).

Hazardous Air Pollutants

The CAA requires control measures for hazardous air pollutants (also known as HAPs), which are a class of 187 toxic air pollutants that are known or suspected to cause cancer or other serious health effects or adverse environmental effects, or both. National Emission Standards for Hazardous Air Pollutants, established by the EPA, limit the release of specified HAPs from specific industries (BLM 2019b). Standards for oil and gas development include control of benzene, toluene, ethyl benzene, mixed xylenes, and n-hexane from major sources, and benzene emissions from triethylene glycol dehydration units as area sources (BLM

2019b). The CAA defines a major source for HAPs as being one that emits 10 tons per year of any single HAP or 25 tons per year of any combination of HAPs. Under New Mexico regulations, a construction or operating permit may be required for a major source; determining a major source requires consideration of each oil and gas exploration and production well individually (BLM 2019b). In New Mexico, regulations for major sources are found under New Mexico Administrative Code 20.2.70 and 20.2.71.

3.2.2 Clean Air Act Protection Classes

The Clean Air Act directs the EPA to classify areas as Class I, Class II, or Class III. Class I areas allow for minimal degradation of air quality to preserve the condition of those areas; Class II areas allow for a moderate degradation of air quality to allow for industrial growth; Class III areas allow for the greatest level of degradation, though no Class III areas have ever been designated by the EPA. The Bandelier National Monument Class I area is within the Planning Area, the San Pedro Parks Class I area is adjacent to the Planning Area, and several other Class I areas are nearby. Areas not designated as Class I are considered Class II for air quality planning. Although some degradation in air quality is allowable in Class II areas, some areas are more sensitive than others. This is because they exhibit a higher sensitivity to impacts from atmospheric deposition of sulfur and nitrogen compounds and decreased visibility, or because of cultural significance. There are three such Class II areas within the Planning Area: Cebolla, Ojito, and West Malpais Wilderness Areas.

Part C of the Clean Air Act, prevention of significant deterioration (PSD), prohibits areas that are in attainment for the NAAQS from being polluted up to the level of the standards. The CAA affords the strictest air quality protection to PSD Class I areas. For some pollutants, the PSD program protects clean air through a system of increments. These increments specify the maximum extent to which the ambient concentration of these pollutants may be allowed to increase above the legally defined baseline concentration in an area with clean air.

Visibility is of concern in Class I areas. Visibility impairment is a result of regional haze, which is caused by the accumulation of pollutants from multiple sources in a region. Emissions from industrial and natural sources may undergo chemical changes in the atmosphere to form particles of a size that scatter or absorb light and result in reductions in visibility. Visibility data have been measured by the Interagency Monitoring of Protected Visual Environments network in Bandelier National Monument since 1989 and at San Pedro Parks Wilderness since 2001. Visibility has improved at both locations since monitoring began (Interagency Monitoring of Protected Visual Environments 2019).

3.2.3 Climate, Climate Change, and Greenhouse Gases

Climate is the composite of generally prevailing weather conditions of a region throughout the year. Climate is both a driving force and a limiting factor for biological, ecological, and hydrologic processes, as well as for resource management activities such as disturbed site reclamation, wildland fire management, drought management, rangeland and watershed management, and wildlife habitat administration. Climate is characterized using statistical descriptions (i.e., mean and variability) of temperature, precipitation, and other measured climate variables over a period of time, typically 30-year periods known as climate normals.

Climate change refers to any significant change in the measures of climate lasting for an extended period (IPCC 2014), including major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer. Climate change can result from both natural and human-caused sources. Natural contributors to climate change include fluctuations in solar radiation, volcanic eruptions, and plate tectonics. Global warming refers to the apparent warming of climate observed since the early ~~twentieth~~ 20th century and is primarily attributed to human activities, such as fossil fuels combustion, industrial processes, and land use changes.

Greenhouse gases are compounds in the atmosphere that absorb infrared radiation and re-radiate a portion of that back to the earth's surface, thus trapping heat and warming the atmosphere. Consequently, more heat is trapped in the earth's atmosphere when atmospheric concentrations of greenhouse gases are greater. The most commonly emitted greenhouse gas compounds are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. While greenhouse gases have occurred naturally for millennia and are necessary for life on earth, human-caused emissions from industrialization and the burning of fossil carbon sources have driven large increases in atmospheric concentrations of carbon dioxide, methane, and nitrous oxide since 1750 (IPCC 2014). Carbon dioxide concentrations increased from 278 ppm in 1750 to 407 ppm in 2017, while methane increased from 722 ppb to 1,850 ppb, and nitrous oxide increased from 270 ppb to 330 ppb (BLM 2019b). These increased atmospheric greenhouse gas concentrations, as well as land use changes, have been accompanied by a long-term warming trend in the earth's temperatures. The Intergovernmental Panel on Climate Change (IPCC) links human activity with this warming trend, stating that it is extremely likely humans are the main cause of the recent warming trend since the mid-~~twentieth~~ 20th century (IPCC 2014).

Global mean surface temperatures increased nearly 1.8 degrees Fahrenheit (°F) from 1890 to 2006. Northern latitudes (above 24°N) have exhibited temperature increases of nearly 2.1 °F since 1900, with nearly a 1.8° F increase since 1970 alone (EPA 2016a). As global temperatures have risen, measurable precipitation over the Northern Hemisphere has also increased. Changes in extreme weather events have also been observed since about 1950, including lower cold and higher warm temperature extremes, as well as more heavy precipitation events in certain regions of the globe (IPCC 2014). Warming has occurred on land surfaces, oceans, and other waterbodies. It has also occurred in the troposphere, which is the lowest layer of the earth's atmosphere ranging from 4 to 12 miles above the surface within which all the weather phenomena we experience on a daily basis occur.

Assuming there are no major volcanic eruptions or long-term changes in solar irradiance, global mean surface temperature increase, for the period 2016–2035 relative to 1986–2005, will likely be in the range of 0.3–0.7 degrees Celsius (0.5–1.3° F). Global mean temperatures are expected to continue rising over the ~~twenty-first~~ 21st century under all of the projected future representative concentration pathways. Global mean temperatures in 2081–2100 are projected to be between 0.3–4.8 degrees Celsius (0.5–8.6° F) higher relative to 1986–2005 (IPCC 2013).

In the region encompassing southern Colorado and New Mexico, average temperatures rose just under 0.7° F per decade between 1971 and 2011, which is approximately double the global rate of temperature increase (Rahmstorf 2012). Climate modeling suggests that average temperatures in this region may rise by 4 to 6° F by the end of the 21st ~~twenty-first~~ century, with warming increasing from south to north. By 2080 to 2090, the southwestern US may see a 10 to 20 percent decline in precipitation, primarily in winter and spring, with more precipitation falling as rain (Cayan 2013).

Based on the current and predicted future warming, by the end of 21st ~~twenty-first~~ century the Upper Rio Grande Basin (southern Colorado to central-southern New Mexico) may see decreases in overall water availability by one-quarter to one-third, a change in the seasonality of stream and river flows with summertime flows decreasing, an increase in stream and river flow variability, and an increase in the frequency, intensity, and duration of droughts and floods (Bureau of Reclamation, Sandia National Laboratories, US Army Corps of Engineers 2013).

Greenhouse Gas Emissions

Greenhouse gas emission levels in the United States have been tracked since 1990. The EPA's Inventory of US Greenhouse Gas Emissions and Sinks found that in 2018, total US greenhouse gas emissions were 6,676.6 million metric tons (MMT) of carbon dioxide equivalents (CO_2e) and that total US emissions increased by 3.7 percent from 1990 to 2018, down from a high of 15.2 percent above 1990 levels in 2007 (EPA 2020b).

CO_2e is a unit of measure that accounts for the varying global warming potential of different greenhouse gases.

The Inventory of New Mexico Greenhouse Gas Emissions: 2000–2013 (NMED 2016b) listed total statewide gross greenhouse gas emissions in 2013 as 80.9 MMT of CO_2e. Total direct emissions peaked in 2007 at 90.9 MMT of CO_2e and decreased by approximately 7 percent from 2000 (86.8 MMT of CO_2e) to 2013. The primary contributors to 2013 greenhouse gas emissions in New Mexico were electricity production (35 percent), the fossil fuel industry (26 percent), and transportation (17 percent) (NMED 2016b). The New Mexico Greenhouse Gas Inventory and Reference Case Projections, 1990–2020, predicted state greenhouse gas emissions of 101.7 MMT of CO_2e in 2020 (Center for Climate Strategies 2005).

The EPA Facility Level Information on Greenhouse Gases Tool (EPA 2020e) database reports annual greenhouse gas emissions from facilities emitting more than 25,000 metric tons of CO_2e per year that are subject to the EPA's Greenhouse Gas Reporting Program (GHGRP) under 40 CFR 98. This includes emissions from most large, stationary sources of greenhouse gas (smaller emitters are not required to report) and emissions from most end uses of fossil fuels. Nationally, the GHGRP accounts for 85 to 90 percent of total greenhouse gas emissions accounted for in the EPA's Inventory of US Greenhouse Gas Emissions and Sinks (EPA 2020b). Reported 2018 emissions for generators in the Planning Area were 1.26 MMT CO_2e (EPA 2020e).

The BLM New Mexico State Office tracks oil and gas-related development in New Mexico. With 33 oil and gas wells in the Planning Area (Crocker and Glover 2019) and using a per well emission factor of 1,229 metric tons of CO_2e per year, as reported in the Cumulative BLM New Mexico Greenhouse Gas Emissions Supplemental White Paper (BLM 2019c), greenhouse gas emissions from federal wells in the Planning Area are estimated at 0.41 MMT CO_2e per year.

3.3 CAVE AND KARST RESOURCES

Karst is a type of topography that is formed in soluble rock such as limestone and gypsum. It is characterized by sinkholes, caves, and underground drainages. A pseudokarst is a topography that resembles karst but is not formed by the dissolution of limestone, usually a rough-surfaced lava field in which ceilings of lava tubes have collapsed. A cave is defined as any naturally occurring void, cavity, recess, or system of interconnected passages occurring beneath the surface of the earth or within a cliff or ledge large enough to permit an individual to enter, whether or not the entrance is naturally formed or human-made (Federal Cave Resources Protection Act [FCRPA], Sec. 3(1)). In the Planning Area, travertine, gypsum, and lava tube caves are the most common types of cave formations.

Under the FCRPA, a cave is considered significant if it meets one or more of the following criteria:

- **Biota**—The cave serves as seasonal or year-round habitat for organisms or animals or contains species or subspecies of flora or fauna native to caves, or that are sensitive to disruption, or that are found on state or federal sensitive, threatened, or endangered species lists.
- **Cultural**—The cave contains historic or archaeological resources included on or eligible for inclusion on the NRHP because of research importance for history or prehistory, historic association, or other historic or traditional significance.
- **Geological/Mineralogical/Paleontological**—The cave possesses one or more of the following features: geologic or mineralogical features that are fragile or exhibit interesting formation.
- **Hydrologic**—The cave is part of a hydrologic system or contains water important to humans, biota, or development of cave resources.
- **Recreational**—The cave provides or could provide recreational opportunities or scenic values.

- **Educational or Scientific**—The cave offers opportunities for educational or scientific use or is in a virtually pristine state, lacking evidence of contemporary human disturbance or impact, or the length, height, volume, total depth, or similar measurements are notable.

The 1986 Rio Puerco RMP addressed management actions for cave resources in the Pronoun Cave ACEC, which currently has no management plan. Other caves within the Planning Area have been identified and inventoried, with Hummingbird Cave being identified as significant under the FCRPA. Some Planning Area caves are culturally significant.

A map of cave and karst potential will be maintained and will serve as a potential indicator for encountering caves or karsts. The cave and karst potential zones were identified using geologic maps and other existing information on caves and karst. There are approximately 1.9 million acres of karst within the entire Planning Area, regardless of surface ownership. This estimated acreage was taken from map data in a USGS unpublished report and includes areas of volcanic pseudokarst, carbonate karst, and evaporite karst.

Qualitative trend data for cave resources in the Planning Area are not available. Recreational cavers constitute the majority of cave users. Animal and human visitations into caves, even by competent, careful cavers, affect these resources to some degree. Caves are a target of looters in the Planning Area, and a few are exposed to livestock seeking shelter from the elements.

Given the lack of condition or trend data collected for caves in the Planning Area, predicting changes, given current management, is not possible. The potential for additional cave discoveries in the Planning Area is high, considering the abundance of karst topography. Based on consultation with members of the Southwest Region, National Speleological Society, BLM cave specialists believe that a number of undiscovered caves occur within the Planning Area. BLM staff will determine whether or not caves on RPFO public lands meet the criteria for significance, as set forth at 43 CFR 37.11(c). If so, the RPFO will describe management objectives and prescriptions. Data to make an accurate estimate of the total number of caves in the Planning Area are not available.

Key features for cave and karst resources are areas underlain by soluble rock types and volcanic lava flows. The potential for cave and karst substrates (volcanic pseudokarst, evaporate, and carbonate karst) are represented in **Appendix S**, **Map 3-3**.

3.4 CULTURAL RESOURCES

Cultural resources as defined by the BLM consist of "a definite location of human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence" (BLM 2004b). They include archaeological, historic, or architectural sites and traditional cultural properties. Some of these sites are historic properties and cultural resources eligible for, or included on, the National Register of Historic Places (NRHP). Archaeological, historic, and architectural sites are spatially finite areas containing physical remains of past human activity. They are important for the information they can provide regarding past lifeways and as a tangible link to the past. TCPs are definite locations deriving significance from traditional values associated with them by a cultural group, such as an Indian tribe or local community (Page et al.1998).

Because cultural resources have intrinsic values (e.g., scientific, traditional, or public interpretation values) that, under FLPMA, must be managed, planning and implementing management practices related to cultural resources involves a multiple resources approach. NEPA, NHPA (as amended), and other federal legislation require that the BLM assess the impacts of a proposed action on cultural resources.

The Planning Area has a wide variety of environmental settings and resources and has long been used by humans. The Planning Area encompasses a large and diverse assemblage of prehistoric archaeological sites, historic archaeological sites and localities, and locations of traditional religious and cultural importance to Indian tribes. For BLM management purposes, these remains take the form of sites, artifacts, buildings,

structures, ruins, features, and natural landscapes with particular cultural importance. With a few exceptions, these remains must be at least 50 years old, or the period of traditional use of that place must be at least 50 years old.

3.4.1 Cultural History of the Planning Area

Occupation of what is today the Rio Puerco Planning Area is divided into several time periods, based largely on variation in artifact assemblages and feature types. The dates provided here serve only as general time frame markers; any new dating technology advances or new discoveries will likely alter these date ranges somewhat. Nevertheless, five broad time periods serve as temporal foundations for explaining human behavior in this area. An outline of these five periods, typical resources, and their associated behavioral trends is below.

The Planning Area encompasses a long history of occupation, beginning with Paleo-Indians who camped on Albuquerque's West Mesa. Sites dating to Paleo-Indian, Archaic, Ancestral Puebloan, and Historic time periods are represented within the Planning Area. Many other sites lack temporally diagnostic artifacts, precluding assignment to any of the above periods. A brief summary of the culture history of the Rio Puerco Planning Area follows.

The Paleo-Indian Period (12,000–10,000 BCE) is represented in the Rio Puerco Planning Area as isolated finds as well as more substantial sites. Paleo-Indians were highly mobile hunters and gatherers living during the Late Pleistocene age. Paleo-Indians are best known from sites where now extinct Pleistocene fauna (like mammoth) were killed and butchered. Most sites consist of limited activity artifact scatters, but some more substantial scatters are also found.

The Archaic Period (5500 BCE–200 CE) is well represented within the Rio Puerco Field Office. The Archaic way of life was based on hunting of small and medium-sized animals and gathering of wild plants. The Late Archaic period includes what is known as the Basketmaker II period, which marks the transition to the subsequent Ancestral Pueblo Period (formerly referred to as Anasazi). Archaic site types include special activity sites, such as limited activity artifact scatters, hunting blinds and stone quarries, as well as habitation sites with shallow pit structures.

The Rio Puerco Field Office, as well as a much larger region including the Four Corners, has abundant Ancestral Puebloan (600–1600 CE) sites, which include the archaeological cultures popularly known as the Anasazi and the Mogollon. The Ancestral Puebloan Culture is highlighted by the development of agriculture, architecture, ceramics, and complex social organization. The Planning Area encompasses the southeastern portion of the archaeological culture known as the Chaco Anasazi, represented by several Chacoan outliers that are protected under the Chacoan Outliers Protection Act (Public Law 104-11). One of these sites is a UNESCO (United Nations Educational, Scientific and Cultural Organization) World Heritage Site. In addition, two of the large Ancestral Puebloan communities protected under the Galisteo Basin Archaeological Sites Protection Act (GBASPA) are located within the Planning Area. Puebloan presence extends into the present in the form of pueblos that have been continuously occupied for centuries.

Archaeological evidence of Navajo and Apache occupation of the area appears as early as the late 1400s to 1500s and continues into the present. Site types include culturally modified trees, artifact scatters, and habitation sites. Habitation sites can include shallow pit structures, forked stick hogans, cribbed log hogans, stone hogans, and pueblitos in defensive settings. In the Planning Area, culturally modified trees and forked stick hogans are the most common site types from the Navajo and Apache occupation.

European settlement of the area that is now the Rio Puerco Planning Area began shortly after the Coronado expedition entered the middle Rio Grande Valley in 1540. The earliest route of Spanish settlement in New Mexico, El Camino Real de Tierra Adentro (designated as a National Historic Trail [NHT]), passes through

the Planning Area. Hispanic communities, some of which were established before the Pueblo Revolt of 1680, are found here. One, San Jose de las Huertas, is also protected under the GBASPA. Large-scale cattle ranching in New Mexico began in the 1880s, a decade characterized by the arrival of the railroads and thriving grasslands due to wetter than normal conditions.

A combination of a return to more arid conditions, falling cattle prices after World War II, institution of more sustainable grazing practices, and development of a feedlot cattle business led to smaller herds on the ranges and abandonment of many small ranching homesteads established under the Homestead Act and the Stock Raising Homestead Act.

For a complete culture history of the Planning Area, see Cordell (Cordell 1984). Mangum (1990) summarizes the history of El Malpais, and Baker and Durand (2003) present much information regarding the middle Rio Puerco Valley. Much of the information in these two sources pertains to the rest of the Planning Area.

3.4.2 Current Condition

This section provides information on the cultural resources of the Planning Area in terms of their management, current state of knowledge of their nature, historic context, condition, and spatial distribution.

3.4.3 Indicators

Given the goals and objectives of the cultural resources program, several indicators are identified. These are designed to facilitate evaluation of the degree to which the goals and objectives are being met through management action guided by the land use planning process. These indicators and those that will be used for impact analyses in **Chapter 4** are based on the same data, but they are not equivalent. Factors relevant for describing the condition of cultural resources of the Planning Area include the following:

- Extent of inventory survey and number, type, and significance of identified cultural resources
- Identification of, and responses to threats to the integrity of cultural resources

Archaeological sites are abundant in the region and little funding has been available for proactive inventory, as required by Section 110 of the NHPA. Inventory of cultural resources is typically done during the NHPA Section 106 compliance process for projects sponsored both internally by the BLM and by external proponents. Therefore, the distribution of known sites in the Planning Area is highly correlated with the location of past federal undertakings that required inventory to complete Section 106 compliance. The distribution of known sites does not necessarily reflect the actual distribution of all archaeological sites created through past human occupation. There may be areas that were extensively used prehistorically that have abundant archaeological sites, but because those areas are not currently the location of federal undertakings, no inventory has been undertaken and no archaeological sites identified. This underlines the importance of proactive inventory.

Threats and disturbances are identified programmatically through the NEPA and Section 106 process and through direct observations made by field personnel on a site-by-site basis, often associated with compliance activities. The RPFO also partners with the New Mexico Historic Preservation Department's SiteWatch program to visit 30 high-value cultural resources on a quarterly basis and document resource damage. Responses to threats often involve some level of NEPA and Section 106 of the NHPA compliance, which identifies cultural resources in the area of potential effect, potential impacts, and mitigation measures. The specific responses or mitigations depend on the nature of the impacts and cultural resources involved and are determined on a case-by-case basis. These often include documentation, signage, fencing, or increased patrols.

Information about the status of the inventory and evaluation of cultural resources within the Planning Area are available from two sources: 1) annual tracking data from the RPFO Cultural Resource Program; and 2)

399 the New Mexico Cultural Resource Information System (NMCRIS). Both sources of information have their
400 limitations, but together, they provide a basis for characterizing the current state of knowledge of cultural
401 resources of the Planning Area.

402 The RPFO began electronic tracking of data from annual reports in fiscal year (FY) 1999, providing a general
403 indication of the volume of inventory conducted by the BLM and external project proponents for projects
404 that include BLM-administered land, as well as the number of sites recorded within a FY. The data for
405 inventory and recorded sites on public lands in the Planning Area for FY99 through FY2019 are shown in
406 **Table 3-4**. Note that eligibility information is incomplete for some fiscal years.

407 **Table 3-4: Class III and Site Status (All Jurisdictions)**

Fiscal Year	Class III Acres	Newly Recorded Sites	Site Updates	Total Sites in Survey	1 Site per X Acres	Eligible	Not Eligible	Undetermined	Sites with Eligibility Information	Percent of Sites Eligible or Potentially Eligible
FY99	2,583	30	0	30	86	No data	No data	No data	No data	No data
FY00	2,250	24	8	32	70	No data	No data	No data	No data	No data
FY01	12,538	240	9	249	50	23	2	3	28	92.9%
FY02	7,672	171	39	210	37	89	21	49	159	86.8%
FY03	5,285	182	51	233	23	91	9	36	136	93.4%
FY04	2,342	86	27	113	21	65	25	21	111	77.5%
FY05	3,324	126	23	149	22	77	39	30	146	73.3%
FY06	5,450	96	10	106	51	57	29	13	99	70.7%
FY07	1,948	42	47	89	22	23	41	25	89	53.9%
FY08	2,086	65	25	90	23	65	17	8	90	81.1%
FY09	2,925	72	18	90	33	45	15	33	93	83.9%
FY10	4,950	144	43	187	26	147	11	27	185	94.1%
FY11	3,512	110	44	154	23	54	6	15	75	92.0%
FY12	1,435	45	65	110	13	91	6	6	103	94.2%
FY13	4,008	88	43	131	31	58	49	23	130	62.3%
FY14	563	13	19	32	18	23	5	4	32	84.4%
FY15	838	33	19	52	16	33	5	14	52	90.4%
FY16	3,354	40	20	60	56	31	0	29	60	100.0%
FY17	3,806	98	84	182	21	89	65	28	182	64.3%
FY18	3,697	34	36	70	53	29	19	22	70	72.9%
FY19	4,268	90	35	125	34	18	14	13	45	68.9%
Total	78,834	1,829	665	2,494	32	1,108	378	399	1,885	79.9%

408 Source: BLM GIS 2020

409 The number of acres surveyed per year varies unpredictably, based on the kinds of projects carried out in a
410 given fiscal year. Some projects are large, while others involve only a few acres. The number of sites
411 discovered generally increases with increased survey coverage, but some areas of the Planning Area exhibit
412 lower site density than others. For the most part, the Planning Area has a high proportion of eligible sites.
413 Some areas contain a larger number of sites not meeting the criteria for listing on the NRHP. If survey

activities during a given fiscal year were concentrated in a low site density area, or an area with many ineligible sites, this would be reflected in lower numbers of sites overall and lower numbers of eligible sites regardless of the acres surveyed.

The NMCRIS database, which is broken down by planning unit, was used as another source of information about the extent of inventory and evaluation of cultural resources within the Planning Area. NMCRIS is a statewide database that was developed and is maintained by the State Historic Preservation Division (with support from the BLM).

3.4.4 Trails, Roads, and Railroads

Historic trails, roads, and railroads are another type of cultural resource that is difficult to include in tables such as those in the preceding section. Laboratory of Anthropology numbers can be assigned to segments that are identifiable on the ground, but this results in a single linear site being comprised of many Laboratory of Anthropology numbers. Within the Planning Area, a number of historic trails, roads, and railroads have been identified through a Class I Inventory of these linear cultural resources, resulting in the identification of trail, road, and railroad corridors (Myers 2009). No field surveys have been carried out to identify the physical remains of the features on the ground. The linear transportation corridors are listed in **Table 3-5**.

Table 3-5: Linear Transportation Corridors within the Planning Area

Type	In Planning Area, Not Administered by the BLM RPFO	Administered by the BLM RPFO (BLM Surface and Federal Minerals)	Administered by the BLM RPFO (Non-BLM Surface and Federal Minerals)
Trails and roads	• El Camino Real de Tierra Adentro (an NHT) • Coronado Expedition Trail • Routes between Zuni Pueblo and Albuquerque – Amiel Weeks Whipple – Edward Fitzgerald Beale – Juan de Oñate – Dominguez-Escalante – Lorenzo Sitgreaves • Captain John N. Macomb, 1859, return from Utah • The road from Jemez to Navajo – Simpson, Washington - 1849 – Backus - 1858 – Shepherd - 1859 • The road from Jemez to Abiquiu • Roads from Anton Chico and Santa Fe to Fort Stanton • Carleton Expedition to Abó • The road from Albuquerque to Pecos River • Stage route from Tijeras to Cañon Blanco • Santa Fe, New Mexico, to Prescott, Arizona, stage line • Route 66	• Santa Fe, New Mexico to Prescott, Arizona Stage line • Captain John N. Macomb, 1859, Return from Utah • The Road from Jemez to Navajo – Simpson, Washington - 1849 – Backus—1858 – Shepherd - 1859	• Fort Wingate-Zuni Wagon Road, Old • Route 66

Type	In Planning Area, Not Administered by the BLM RPFO	Administered by the BLM RPFO (BLM Surface and Federal Minerals)	Administered by the BLM RPFO (Non-BLM Surface and Federal Minerals)
Railroads	• Santa Fe to Torrance • Moriarty to almost Hagan • Algodones to Hagan and Coyote • Bernalillo to San Ysidro to Porter • Bernalillo to San Ysidro and La Ventana • Domingo to Boom • Zuni Mountain Rail Lines	• Moriarty to almost Hagan • Bernalillo to San Ysidro to Porter • Bernalillo to San Ysidro	• Atchison, Topeka, and Santa Fe Railroad

Special Status Resources

Another aspect of evaluation is designating special status resources. These include national historic sites, national cultural historical parks, national monuments, national historic landmarks, cultural ACECs (**Table 3-6**), and cultural properties listed on the NRHP or the New Mexico State Register of Cultural Properties (SRCP). Resources that are determined to be NRHP-eligible are afforded the same consideration as those that are actually listed, but the additional effort entailed in listing properties often reflects a higher degree of publicly perceived significance or sentiment for preservation in place. National historic landmarks (NHLs) are nationally significant sites that have received a higher degree of recognition than sites listed only on the NRHP. **Table 3-6** lists special status resources in the Planning Area. There are 257 SRCP-listed properties in the Planning Area.

Table 3-6: Special Status Cultural Resources in the Planning Area

Type	In Planning Area, not Managed by BLM-RPFO	Managed by BLM-RPFO (BLM Surface and Federal Minerals)	Managed by BLM-RPFO (Non-BLM Surface and Federal Minerals)
National monuments	• Bandelier (south of Frijoles Canyon) • El Malpais • El Morro • Petroglyph • Salinas Pueblo Missions	• Kasha-Katuwe Tent Rocks (contains cultural resources)	• Salinas Pueblo Missions
National historic trails	• El Camino Real de Tierra Adentro	Not applicable	Not applicable
National historic landmarks	• Abo • Acoma Pueblo • Ernie Pyle House • Hawikuh • Quarai • Sandia Cave • San Estevan del Rey Mission Church • Zuni-Cibola Complex • Manuelito Complex	• Big Bead Mesa	• Abo Mission • Quarai

Type	In Planning Area, not Managed by BLM-RPFO	Managed by BLM-RPFO (BLM Surface and Federal Minerals)	Managed by BLM-RPFO (Non-BLM Surface and Federal Minerals)
Designated Chacoan Outliers (Public Law 104-11)	• San Mateo • Manuelito-Atsee Nitsaa • Manuelito-Kin Hochoi	• The Dittert Site (within El Malpais NCA) • Guadalupe Ruin • Casamero* • Andrews Ranch* • Kin Nizhoni*	Not applicable
Galisteo Basin sites (Public Law 108-208)	• Pa'ako • San Jose de Las Huertas • Espinazo Ridge Pueblo	• San Jose de las Huertas	Not applicable
Cultural ACECs	• No equivalent designations	• Cañon Tapia • Jones Canyon • Pronoun Cave Complex	Not applicable
New Mexico State Register of Cultural Properties		• San Antonio de Padua de Carnue • Mount Taylor Cultural Landscape • Ojo Pueblo • Route 66	• Abenicio Salazar National Register Historic District • Alameda School Site • Albuquerque Municipal Airport Building, Old • Armijo School, Old • Atchison, Topeka and Santa Fe Railroad Depot • Barela-Bledsoe House • Barela, Adrian, House • Bosque Cooperative Building • Casa Perea • Casa San Ysidro and Collections • Casa Vieja • Chavez, Juan, House • Chavez, Rumaldo, House • Corrales North Archeological District • Cousins Bros. Trading Post • Cultural Landscape of Las Huertas Creek Drainage • Dietz, Robert, Farmhouse • Dust Bowl Home • Elias Martinez House • Espinazo Ridge Pueblo • Garcia, Juan Antonio, House • Gomez, Refugio, House • Gonzales, Alehandro, House • Griego de Garcia, Tomasa, House • Guadalupe Historic District • Holy Child Tijeras Church, Old • Hubbell House • Huning Mercantile and House • Indian Petroglyph State Park (see Las Imagines HPD 1234)

Type	In Planning Area, not Managed by BLM-RPFO	Managed by BLM-RPFO (BLM Surface and Federal Minerals)	Managed by BLM-RPFO (Non-BLM Surface and Federal Minerals)
			• Kromer House • LA 290 (Piedras Mercadas Pueblo) • La Capilla de San Antonio de Los Lentes • La Quinta • Las Imagines: Albuquerque West Mesa Archaeological District • Los Alamos Addition • Los Griegos Historic District • Los Poblanos Historic District • Lucero y Montoya, Francisco, House • Luna-Otero, Tranquilino, House • Martinez House/Perea Hall • Mt. Taylor Cultural Property • Muench House • Mushroom Store • Neon signs along Route 66 in New Mexico • Nordhaus, Robert, House • North Edith Casa Corral (LA 50245) • Otero's 66 Service Station • Our Lady of Mount Carmel Church • Our Lady of Sorrows Church • Our Lady of Sorrows Convent • Plaza de San Miguel de Carnue, Site of (LA 12924) • Pueblo Calabacillas (LA 289) • Pueblo Corrales • Romero, Felipe, House • Romero, Paia, Cafe • San Antonio de Padua de Carnue • San Antonito Church and Cemetery • San Ysidro Church • Shalit, Samuel, House • Simms, John F., House • Tafoya, Domingo, House • Tile House • Tucson Gas and Electric Route Sites (14 Sites) • Wittwer, Dr. William Fredrick, House • Woodall House

442 * Located within Farmington Planning Area but administered by RPFO under inter-area agreement NM-010-071

Congressionally Designated or Presidentially Proclaimed Cultural Resources

These cultural resources are nationally significant cultural resources, such as national monuments, national historic sites, national historical parks, and NHTs. While Kasha-Katuwe Tent Rocks National Monument and El Malpais National Conservation Area (NCA) have cultural resource values that are included in their designation, both areas are excluded from consideration in this planning effort; both areas have stand-alone land use plans.

El Camino Real de Tierra Adentro (the Royal Road of the Interior), one of 19 designated NHTs, crosses through the Planning Area but is not on BLM-administered land. The trail connected Mexico City with New Mexico's Spanish colonial capitals. The identified corridor of El Camino Real de Tierra Adentro roughly parallels the Rio Grande. El Camino Real de Tierra Adentro does not currently include public lands in the Planning Area, but it would be desirable for the BLM to obtain portions of this NHT in the future from willing sellers.

In addition to these designations, two laws have recognized the national significance of certain sites within the Planning Area: 1) Chaco Outlier Protection Act of 1995 (which amended Public Law 96-550 of 1980, the law that originally designated Chacoan Outliers as special sites); and 2) Galisteo Basin Archaeological Site Protection Act of 2004. These laws recognize that 39 Chacoan Outliers and 24 Galisteo Basin sites have special value to the nation through their research and interpretive potential and their value to traditional communities. While most of the Chacoan Outliers are administered by the BLM Farmington Field Office and most of the Galisteo sites are administered by the Taos Field Office, some are located within the Planning Area, as noted in **Table 3-6**. These legislatively designated sites have provisions for management in the legislation. Both of the protection acts allow for the addition of sites in the future.

Traditional Cultural Properties

As defined at the beginning of this section, TCPs are definite locations deriving significance from traditional values associated with them by a cultural group, such as an Indian tribe or local community. The Planning Area is known to contain TCPs affiliated with a number of Indian tribes, pueblos, and traditional Hispanic communities, such as land grant communities. Some of these locations have been identified, such as the Mt. Taylor Cultural Landscape, and it is likely that other TCPs exist within the Planning Area but have not been identified to the BLM as TCPs by affiliated groups.

The identification of TCPs is an ongoing process of consultation on a project-by-project basis. Within a given project area, it is possible that only TCPs that will be affected by that particular project will be identified. When subsequent projects involving different activities are proposed, it is possible that additional TCPs may be identified if the project's activities are determined by the affiliated group to have potential impacts.

Additionally, groups may decide that revealing the location of TCPs may have greater impacts than allowing the project to proceed without identification. For this reason, affiliated groups' silence on the existence of TCPs within the Planning Area should not be interpreted to mean that there are no additional TCPs present. This underscores the need for consultation on a case-by-case basis and for consultation early in the planning process.

3.4.5 Key Features

The geographic distribution of cultural resource features described above is not known, due to the limited percentage of lands within the Planning Area that have been inventoried for cultural resources. To address this lack of 100 percent inventory and to guide land use allocation or management decisions through analysis in **Chapter 4**, a cultural resources sensitivity model has been developed. The relative site density potential for areas within the Planning Area was estimated using known site locations. All areas of the Planning Area were then ranked as having high, medium, or low potential for containing cultural sites.

Table 3-7 summarizes the acreage of the three site probability categories estimated within the Planning Area. A detailed description of the factors considered and methodology used to assess site probability is provided in **Chapter 4**. Although the model does not attempt to distinguish site type, temporal period, cultural affiliation, or NRHP eligibility, the information presented in this chapter provides the general characteristics that can be expected from the cultural resources modeled.

Table 3-7: Site Probabilities by Acres

	High	Medium	Low	No Data
BLM surface ownership	14,865	284,124	27,497	405,113
Acres all jurisdictions	387,457	2,707,283	267,285	6,141,906

Source: BLM GIS 2020

3.5 FIRE MANAGEMENT

Land managers have recognized fire as a natural disturbance that plays a significant role in healthy ecosystem function and that there is a need to reintroduce fire into the landscape. The frequency of fire is often used as an indicator of how well ecosystems are adapted to fire. This can be discussed in terms of fire regime, which is the combination of fire frequency, predictability, intensity, seasonality, and extent characteristic of fire in an ecosystem. Classification of fire regime may be based on the characteristics of the fire itself or on the effects produced by the fire (Agee 1993). Fire regimes have been described by factors such as frequency, severity, intensity, and size of burn.

The ways in which fire regimes change over both time and space are vitally important to understanding the role of fire in ecosystems. For this reason, the current fire regime condition class (FRCC) of an ecosystem is often described in terms of how it differs from its historical FRCC. By delineating current FRCCs within the context of the historical fire regime, land managers may be better able to predict fire extent, severity, intensity, and effects.

The 2001 Federal Fire Policy references preliminary FRCC data as a way of inferring risk to ecosystem sustainability and risk of uncharacteristic wildland fire behavior and effects (Schmidt et al. 2002). These are qualitative measures that incorporate the concept of historical fire regimes as a baseline against which current conditions are compared. **Table 3-8** describes the attributes associated with each FRCC.

Historical fire regimes in New Mexico were developed through an interaction of vegetation communities, topography, climate, and ignition sources. Lightning has been a source of fire ignition over geologic time, and the use of fire by Native Americans during the past several centuries is probably not fully understood (Denevan 1992). The term "historic" generally refers to the period from about 1500 to late 1800, a time before extensive settlement by European-Americans in many parts of North America, before intense conversion of wildlands for agricultural and other purposes, and before fire suppression effectively altered fire frequency in many areas (Brown and Smith 2000).

The development of Fire Management Units (FMUs) is a mechanism for managers to group risks and opportunities associated with allowing fire to play its role as a natural disturbance within social constraints. FMUs are predetermined areas that have similar fuels, topography, management objectives, and resource needs that allow each area to be administered as a unit. In terms of fire management, FMUs are important planning categorizations that allow management to determine how to respond to wildfire in a given area and where to focus resources in case of multiple ignitions. FMUs are delineated with consideration of public safety concerns first and natural resource values second. These FMU categories are shown on **Appendix S**, **Map 2-2**.

526 **Table 3-8: Current 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 management of wildfires for resource benefit.
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. This will result in moderate changes to one or more of the following: fire size, frequency, 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 management of wildfires for resource benefit and hand or mechanical treatments, to be restored to the historical fire regime.
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. This will result in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or 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 fire is used to restore the historical fire regime.

527 Source: BLM 2004b

528 Based on the historical fire regimes and on-the-ground conditions, the BLM had assigned lands within the
529 Planning Area into the three FRCCs (BLM 2004a). **Table 3-9** summarizes current FRCC acres for the
530 Planning Area. The geographical locations of the FRCC are included **Appendix S**, **Map 2-1**.

531 **Table 3-9: Fire Regime Condition Class Acreages by Fire Management Unit**

Fire Management Unit	Class 1 Acres	Class 2 Acres	Class 3 Acres	Not Inventoried	Total
B6. Sandia	1,460	7,512	2,971	981	12,924
B8. Candy Kitchen	572	5,869	6,378	9	12,828
C1. North Malpais	4,109	77,619	39,404	1,390	122,522
C3. Wilderness and WSAs	2,870	32,883	1,448	2,661	39,862
C5. Mesa Chivato	3,122	37,707	17,124	421	58,374
C7. Scattered Grass/Shrub	70,195	357,322	43,500	38,441	509,458
Total	82,328	518,912	110,825	43,902	755,967
Total acres needing treatment		518,912	110,825		629,737

532 Source: BLM GIS 2020

3.5.1 Wildland Fire Management Strategies

Within the defined FMUs, the BLM has developed specific management strategies to meet public safety and resource objectives. For example, fires within ACECs and WSAs may not pose a threat to public safety if not suppressed; however, the resource values associated with ACECs and WSAs may necessitate a high fire suppression priority. Therefore, these areas may be assigned to FMU Category A. Other areas are high priority suppression areas because they pose a high public safety threat.

The number and size of wildland fires is heavily dependent on environmental factors that are variable over time. Fuel characteristics, climate, topography, and suppression activities all interplay to create the dynamics of wildland fire. Some trends may be apparent by analyzing the number and size of past fires.

Fuels Treatments

According to coarse-scale spatial estimates for New Mexico, the fire regimes and frequencies on about 7.8 million of the 13.4 million acres of BLM-administered public lands in the state have been either moderately or significantly altered (BLM 2004a). The result is moderate to dramatic changes in fire size, intensity, severity, and/or landscape patterns. Based on estimates of the condition, these 7.8 million BLM-administered acres in New Mexico need treatments to restore the historical fire regime. The Planning Area contains 629,737 acres that need to be treated.

Fuels treatment uses various tools (i.e., prescribed fire, mechanical, biological, and chemical) to reduce hazardous fuel loads or to achieve resource objectives. A goal of treating up to 23,171 acres by prescribed fire and non-fire treatments annually for the Planning Area was developed in the Decision Record and RMP Amendment for Fire and Fuels Management on Public Land in New Mexico and Texas (BLM 2004a). The acreage goal was based on a full funding and staffing scenario. Actual prescribed fire accomplishments vary greatly from year to year due to weather patterns; actual mechanical treatment accomplishments tend to be based on annual budget allocation.

Prescribed burning within the Planning Area takes place year-round. The majority of pile burning takes place during the winter and late spring, but it also can take place during monsoon season. Grassland burns take place before green-up in late winter. Ponderosa pine and piñon-juniper burns take place during late spring and summer and have the tightest windows for opportunity, as they require the warmest and driest parameters to meet objectives. **Table 3-10** shows approved fuels management treatments for the FMUs in the Planning Area.

Fire Suppression

Residential developments in outlying areas that are surrounded by lands in the Planning Area are termed wildland-urban interface (WUI) areas. These are high priority suppression areas due to public safety concerns. The following is a list of WUI areas in the Planning Area:

- Kasha Katuwe-Tent Rocks National Monument, which includes Pueblo de Cochiti (in a separate planning unit)
- Sandia Mountains
- Candy Kitchen

The communities of Candy Kitchen and Pueblo de Cochiti (B4.FMU) are listed in the *Federal Register* as a community at risk from wildfire. The National Fire Plan directs funding to projects designed to reduce the risks to these identified communities.

573 **Table 3-10: Prescribed Fire on Public Land of the Planning Area, 2001–2019**

Year	Prescribed Fire Treatments	
	Planned Acres	Implemented Acres
2001	1,200	1,592
2002	1,000	1,137
2003	5,325	4,251
2004	3,849	3,815
2005	3,824	1,398
2006	2,225	1,757
2007	2,565	1,510
2008	3,200	1,246
2009	4,175	4,175
2010	5,563	5,563
2011	6,600	5,200
2012	7,050	3,400
2013	12,250	0
2014	2,806	2,201
2015	680	0
2016	3,965	215
2017	7,000	500
2018	14,443	893
2019	10,539	4,441
Total	98,259	43,294

574 Source: BLM GIS 2020

575 Rural fire departments within the Planning Area benefit from the BLM's Local Cooperator Assistance
576 Program, where the BLM provides wildland fire training and training materials for the development of
577 department wildland fire qualifications. The Local Cooperator Assistance Program enhances the abilities of
578 rural fire departments to fight wildland fires on BLM-administered or nearby lands.

579 Fire suppression in the Planning Area has been influenced primarily by direction provided in the Review and
580 Update of the 1995 Federal Wildland Fire Management Policy and the Guidance for Implementation of
581 Federal Wildland Fire Management Policy (National Interagency Fire Center 2009). This policy emphasizes
582 the role of fire as a natural process and contains guidance to allow fire to function in this role, among other
583 things (refer to the above policy and guidance for more information).

584 Expanding WUI areas are creating more areas where wildfire poses a risk to the public. These areas may
585 demand high suppression priority. Collaborative efforts in Sandoval, McKinley, Valencia, and Cibola Counties
586 have created countywide fire risk and hazard mitigation plans and community wildfire protection plans
587 (CWPPs).

588 WUI areas are expected to grow or remain static over the next 20 years, which would result in fire
589 suppression in more areas, to respond to public safety concerns. Risk associated with fire danger will increase
590 as populations and recreational use increases and will continue to rise until communities complete
591 community wildfire protection plans, or countywide fire risk and hazard mitigation plans. Completion of
592 these plans will enhance agency partnerships and the potential of communities to receive rural fire assistance
593 funding and grants.

594 The RPFO has been involved in developing countywide CWPPs. Plans for protection of communities at risk
595 (Pueblo de Cochiti) and communities of interest (Cuba and Zuni Mountain) are addressed in countywide
596 CWPPs completed for Sandoval and Cibola Counties. Other countywide CWPPs are McKinley and Valencia
597 Counties.

Fire Regimes

From 1980 through 2019, the Planning Area averaged 14 fires per year, burning an average of 953 acres annually. Generally, lightning or naturally caused fires accounted for approximately 80 percent of the fires, while a variety of human-caused fires account for the other 20 percent. The majority of the lightning-caused fires occurred from May to September, while human-caused fires have occurred at all times of the year.

While the majority of fires are relatively insignificant in terms of size and fire intensity, periodic large fire events typically burn at high-intensity levels. These fires can reach several thousand acres in size in a short period of time. The majority of large fires in the Planning Area occur in short-grass savanna, short-grass shrub vegetation, and ponderosa pine. Other large fires occur in the piñon-juniper shrublands.

All fires were on FRCC 2 and FRCC 3 lands, with about 70 percent moving to FRCC 1 after the fires. The fire management staff, in collaboration with the resource specialist staff, (e.g., wildlife biologists and range conservationists) initiate most of the prescribed fire projects.

3.5.2 Current Conditions

Natural and human-caused fires will continue throughout the Planning Area. The majority of natural fires will be ignited by lightning every year from May to September. Natural fires are expected to continue to account for approximately 80 percent of the annual number of ignitions. The size of these fires will depend on weather, topography, fuel characteristics, and suppression response times.

Human-caused fires will continue to occur year-round and likely will increase in ignitions per year over the next 20 years. The primary drivers for increased human-caused ignitions in the Planning Area are activities associated with recreation, land tenure, and WUI areas. Places that draw recreation and development have an increased potential for ignition from human activities.

The likelihood that any fire will improve the FRCC of an ecosystem will depend on two things—first, the condition of the system before the burn, and second, the management of the community after the burn. For example, a community that is in FRCC 3 due to high densities of invasive grasses will not likely improve as a result of fire alone. Disturbance from fire creates niches for colonizing plants and releases a pulse of nutrients to the soil. These conditions create ideal conditions for opportunistic and invasive plant colonization. If the fire does not burn hot enough to destroy the existing seedbank of invasive grass, or if there is a seed source adjacent to the burned area, the FRCC may not be improved and could potentially deteriorate.

In addition, the management of an area after a burn will continue to play a key role in the resulting FRCC. Emergency stabilization and rehabilitation practices may improve FRCCs by altering the post-burn plant community. A FRCC is improved when the resulting plant community better resembles those plant community characteristics present under the historical fire regime. These characteristics involve surface fuel continuity, fuel structure, fuel moisture, and photosynthetic processes.

3.6 Forests and Woodlands

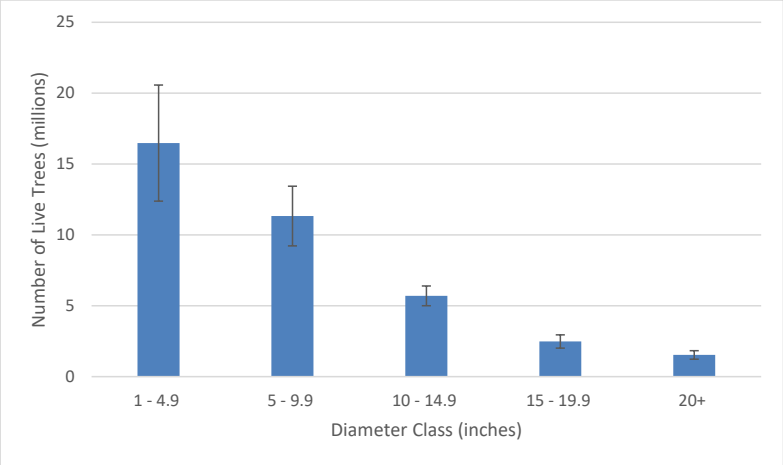
The forestry program within the Planning Area consists of managing an estimated 161,455 acres of piñon-juniper woodland, 43,046 acres of juniper woodland, 6,123 acres of ponderosa pine forest, and 3,061 acres of Rocky Mountain juniper woodland (Forest Service 2020). Estimates for forest area, basal area, and live and standing dead volume by forest type are specified in **Table 3-11**. Estimates for the number of live trees by diameter class within the Planning Area are presented in **Figure 3-1**. Forests and woodlands are administered for providing ecosystem services, such as wildlife habitat, forage, watershed requirements, carbon sequestration, recreational values, and renewable wood products (i.e., special forest products).

Table 3-11: Estimates for Forest Area, Basal Area, and Live and Standing Dead Volume by Forest Type*

Forest Type	Forest Area (acres)	Live Cubic-foot Volume** per Acre	Live Basal Area per Acre (square feet)	Standing Dead Cubic-foot Volume** per Acre
Rocky Mountain juniper	3,062	410	51	0
Juniper woodland	43,043	278	56	30
Piñon-juniper woodland	161,456	577	86	33
Ponderosa pine	6,123	1,783	102	80

Source: Forest Inventory and Analysis 2009–2018, USDA Forest Service (Forest Service 2020).
*BLM forested lands within the Planning Area only.
**Cubic-foot volume includes only trees 5-inch diameter and larger.

Figure 3-1: Estimates for the Number of Live Trees by Diameter Class*



Source: Forest Inventory and Analysis 2009–2018, USDA Forest Service (Forest Service 2020).
*BLM forested lands within the Planning Area only.

Within the Planning Area, woodlands on BLM-administered lands are still a vital source of fuelwood for heating and cooking. Forestry and woodland products within the Planning Area are managed primarily in conjunction with the District Fire and Fuels Programs. Under these programs, woodlands are managed to provide fuelwood for local communities through hazardous fuels reduction and forest health improvement projects. No sale of commercial saw timber is occurring within the Planning Area. However, permits are allowable up to a certain volume for commercial species to be purchased under authorities found in 43 CFR 5400 and following ecological principles to achieve land management objectives. Permits are also sold for commercial and noncommercial use under contract and stewardship authority for special forest products, such as fuelwood, Christmas trees, transplants, and fenceposts.

Approximately 87 percent of forest types are in FRCC 2 or 3; in other words, close to 90 percent of the forestland has had its fire regime altered from historical fire intervals (see **Table 3-12**). A result of reduced fire frequency has been an increase in the amount of smaller diameter trees (<16 inches) found throughout the Planning Area.

Table 3-12: Forest and Vegetation Type by Fire Regime Condition Class (Acres)

Forest and Vegetation Type	Total	FRCC 1	FRCC 2	FRCC 3
Ponderosa pine	3,597	10	251	3,336
Piñon-juniper	176,598	14,681	107,456	54,461
Riparian/wetland	3,490	55	507	2,928
Shrub, steppe, scrub	332,261	57,118	255,705	19,438
Grasslands	151,585	7,741	126,910	16,934
Other	64,068	-	-	-
Total	731,599	79,605	490,829	97,097

Source: BLM GIS 2020

Without restoration of natural disturbances such as fire, the trend of increasing stand densities will most likely continue. Similarly, historical spatial distribution would continue to become modified as trees per acre increase. Research has shown that lack of disturbance in many of the piñon-juniper woodlands is reducing overall forest ecosystem health and increasing susceptibility to insects, disease, and wildfire. Management actions such as mechanical treatments or prescribed fire may be used to improve woodland health. Forest health may also be achieved through fuelwood gathering activities and biomass utilization when these activities are properly designed and monitored accordingly (Miller 2005).

Fuelwood demand by local communities also shows an upward trend (based on the number of permits sold). Portions of the local population rely on fuelwood (primarily piñon pine and juniper) as a source of heat and for cooking. As the population increases, the demand for merchantable fuelwood will most likely increase. The RPFO has experienced persistent unauthorized removal of both live and dead trees for fuelwood, primarily in the area west of Cuba, New Mexico; this situation was also recognized and documented as early as 1983 (BLM 1986).

Other forecasts relevant to forestry and woodland products are found in the *Fire Management* section of this document, where the trends in fire regime condition class are discussed in relation to current woodland condition, forecasts are described, and treatment objectives are identified.

3.7 GEOLOGIC RESOURCES

Factors that describe the condition of geologic resources may include the demand for and establishment of reserves or parks in areas having unique geologic features of interest or scenic value, and the public desire to have existing scenic views unaffected by surface mining activities or development of oil and gas fields. The impact on geologic resources resulting from uses of mineral resources, such as surface mines or quarries, affects the quality of the geology resource.

The geologic resources of the Rio Puerco Planning Area are best understood within the context of the regional physiography, broadscale regional subdivisions based on terrain texture, rock type, and geologic structure and history (**Appendix S**, **Map 3-4**).

3.7.1 Physiographic Provinces

The Colorado Plateau, Rio Grande Rift, and Southern Rocky Mountain physiographic provinces are represented within the Rio Puerco Planning area (**Table 3-13** and **Appendix S**, **Map 3-4**).

Table 3-13: Physiographic Provinces and Corresponding Counties and Planning Units

Physiographic Province	Counties
Colorado Plateau	Cibola, west half of Sandoval, southwest portion of McKinley
Rio Grande Rift	Torrance, Valencia, Bernalillo, southeast portion of Sandoval
Southern Rocky Mountains	Northeast portion of Sandoval

3.7.2 Rock Units

Major rock units in the Planning Area consist of Quaternary alluvium, Cretaceous mudstone and sandstone, Tertiary volcanic rocks, Jurassic sandstone, gypsum, limestone, and sedimentary units from the Triassic and Jurassic (**Table 3-14**).

Table 3-14: Geologic Epoch and Major Rock Units Found within the Planning Area

Epoch (Million Years Ago)	Rock Units
Quaternary (present–2.5)	• Santa Fe Group
Tertiary (2–65)	• Volcanics of various ages, including lava flow, volcanic plugs, and volcanic ash
Cretaceous (65–145)	• Fruitland-Kirtland Formation • Menefee Formation • Pointlookout Sandstone • Mancos Shale
Jurassic (145–200)	• Morrison Formation • Todilto Formation
Triassic	• Chinle Group
Permian	• Yeso Formation

This is not a complete list of units found within the Planning Area, merely the most significant based on the combination of surface exposure, mineralized zones, and depositional environments.

There is a trend of increased public interest in scenic, unique, fragile, or scientifically important geologic resources within the Planning Area. In the past, areas of geologic interest have been proposed and given special designation by the BLM. For example, on January 17, 2001, Presidential Proclamation 7394 designated Kasha-Katuwe Tent Rocks National Monument to provide opportunities for visitors to observe, study, and experience geological processes and other objects of interest, and to protect these resources.

Current special designations known as ACECs have been identified specifically for geologic values. Current areas of interest include Cabezon Peak, Pronoun Caves, and the San Juan Badlands. Geologic resources within the Planning Area host a variety of uses, from recreation to scientific research. These types of proposals indicate a desire by the public and the BLM to protect areas that contain special geologic values.

3.8 Protection of Public Health, Safety, and Environment

Public safety issues can arise from a variety of circumstances, ranging from natural to human-made hazards. In remote areas, natural environmental circumstances pose safety issues, including extreme temperature variations, storms and inclement weather, flooding, debris flows, the presence of aggressive or venomous animals, trip and fall hazards, steep slopes, and cliff ledges. Human-made hazards include the presence of active or abandoned mines, unexploded ordnance (UXO) located in and near military training areas, recreational activities such as target shooting, and the presence of hazardous materials, hazardous wastes, and solid wastes. Public safety issues associated with specific geographic areas or BLM programs are described below.

3.8.1 Motorized Vehicle Use

The greatest risk on public lands and on the access to them is related to the use of motorized vehicles in remote locations. Whether for recreational or commercial purposes, access to public lands is generally through the existing network of federal, state, or county transportation routes.

Safety issues associated with the use of these roadways may have implications for the management of or access to public lands. Such access must consider a variety of user needs. Public land provides public access via traditional established public routes to rural communities and individual homes. Public land access routes lead to lease and ROW destinations, as well as general public access to public land for recreation to specific area destinations for focused recreation and lawful harvest of natural resources.

Off-Highway Vehicles

OHV use, which by definition includes any motor vehicle that may travel over land, occurs throughout the Planning Area for purposes of transportation as well as for recreation. OHVs are used to transport recreational visitors to recreation sites and as a recreational activity in itself, with any of several classes of OHVs. Specialized activities for motorcycles and ATVs include organized and informal races and hill climbing. This recreational activity has its own safety implications due to the nature of the vehicles, rough terrain, and an active style of operation.

Nationwide, data on ATV injuries and deaths are estimated by the Consumer Product Safety Commission. These statistics show that 148 ATV-related deaths have been reported in New Mexico from 1982 to 2017 (Consumer Product Safety Commission 2019).

The popularity and availability of ATVs has dramatically increased in the past 10 years. Safety training such as that offered by the ATV Safety Institute, manufacturer recommendations for age- and size-appropriate vehicles, and strict adherences to applicable state laws have shown to be highly influential in reducing accident statistics. Another safety factor to consider is creating specially designated areas where vehicle-specific recreation can take place with minimum conflict with other activities.

3.8.2 Recreational Shooting

All firearm use carries a certain degree of risk to both participants and nonparticipants. Recreational shooting occurs at organized shooting ranges in the Shooting Range State Park, the only remaining public shooting range in the greater Albuquerque area. This range was created under the Recreation and Public Purposes Act ~~(R&PP Act)~~. Open shooting also occurs in dispersed, informal locations throughout the Planning Area. Dispersed recreational shooting is not prohibited on BLM-administered lands. Although recreational shooting requires a significant amount of personal responsibility, it is a viable use of the public lands as long as it follows county, state, and federal laws, which are also applicable to any other use of the public land.

Concerns were raised during public scoping regarding the safety of some recreational shooting and hunting activities. These concerns pertained principally to hunters and recreational shooters leaving trash behind, including homemade targets and empty cartridges that may pose a safety or contamination hazard (BLM 2008a). A major problem occurs when the community discovers a site littered by shooting debris and decides to bring household trash and appliances onto the site, creating a dump. Existing criminal laws are adequate to address these concerns; however, law enforcement resources are spread thin. Law enforcement is active in the recommendation of suitable areas for specific recreational shooting activities. As part of an ongoing public outreach, the law enforcement officer will offer safe firearms handling information in impromptu and opportunistic encounters in the field. Localization of these areas makes patrol function more efficient. The public lands near Milan, west of Grants, that had been an Recreation and Public Purposes~~R&PP~~ Act public park were relinquished back to the BLM and have become a popular place for the local population to use as an unofficial shooting range.

An already popular area east of the Ojito Wilderness has gained in popularity due to the loss of public lands near the metropolitan area and development of private land north and west of Rio Rancho, both of which were very popular for informal shooting. Directed patrol activities and peer pressure have been instrumental in limiting adverse impacts in these areas. Another area of concern is a long-time unofficial range in Valencia County, more specifically near Bernardo, an area south of Los Lunas. This area has an informal group of regulars who have helped limit trash and who, by repeated use, have established safe impact berms.

3.8.3 Other Recreational Activities

Almost any recreational activity may be hazardous to the participants and, in some circumstances, to nonparticipants. Exercising appropriate caution, using appropriate gear, and wearing the correct clothing helps to reduce the risk of injury.

3.8.4 Abandoned Mines and Prospects

A number of active and abandoned mines and prospects are located throughout the Planning Area. Visitors often find abandoned mines and prospects attractive to explore and may be exposed to hazards at these sites. State-wide efforts to inventory and safeguard abandoned mines are ongoing. Features that could pose physical and environmental hazards at abandoned mining sites could include, but may not be limited to, the following:

- Open and unstable shafts, adits, drifts, pits, tailings piles, wells, or other excavations
- Dilapidated and unstable buildings or other structures
- Collapsed buildings or other structures
- Mining implements or construction debris
- Hazardous or toxic materials

On-the-ground abandoned mine lands inventories have been conducted under a 1993 BLM directive that established common data elements to ensure that abandoned mine land information would be characterized consistently. Mining activities are shown on **Appendix S**, **Map 3-5** for fluid mineral leased areas, **Map 3-6** for locatable, and **Map 3-7** for salable mining activities. To date, only a small percent of all public lands has been inventoried. The available abandoned mine lands data collected have been compiled into the Abandoned Mine Site and Clean Up Module (AMSCM).

While most mines are hazardous primarily in terms of public safety, the potential exists for hazardous material and solid waste dumping in old mine shafts. As these areas are made known, they are compiled into the AMSCM. Mine tailings located at both active and closed mine sites pose additional potential hazardous effects, including leaching of chemicals into the soil and/or groundwater from mine tailing piles and airborne hazardous wastes.

3.8.5 Air Transportation and Military Operations

Current Training Operations

Military operations are conducted within the Planning Area. These military operations use airspace for low-level training exercises. While rare, there is a remote possibility of aircraft crashes during military training operations. The authorized areas are dispersed through the Rio Puerco Field Office and primarily engage in touch-and-go landing operations.

The United States Air Force conducts special operations training within the Planning Area. The mission of the 58th Special Operations Wing (SOW), Kirtland AFB is to train US Air Force Special Operations Forces (SOFs) and Personnel Recovery Aircrew Members in specialized flight skills to perform worldwide aircrew duties. This training develops pilots, navigators, electronic warfare officers, combat systems operators, flight engineers, special mission aviators, and loadmasters into mission qualified aircrew members. The 58 SOW aircrew training is accomplished by classroom, simulator, and flight training over an average of a 6-month time frame. The Air Education and Training Command (AETC) approved Syllabi of Instruction for the various airframes require the use of flight training in mountainous terrain, to include modified contour low level training, aerial refueling, helicopter weapons employment tactics training, helicopter and tiltrotor landings, and search and rescue training scenarios.

The 58 SOW is the sole SOF and Personnel Recovery training wing for AETC, and is the Air Force's training course for aircrews operating four variants of C-130 aircraft (HC-130J, MC-130J, MC-130H, and HC-130P), the CV-22B tilt rotor aircraft, and three types of helicopters (HH-60G, TH-1H, and UH-1N). Aircrews are trained and evaluated in daytime and nighttime for both basic and advanced aviation. AETC prescribed training requires operations in varied locations, to prepare aircrews for worldwide contingency operations.

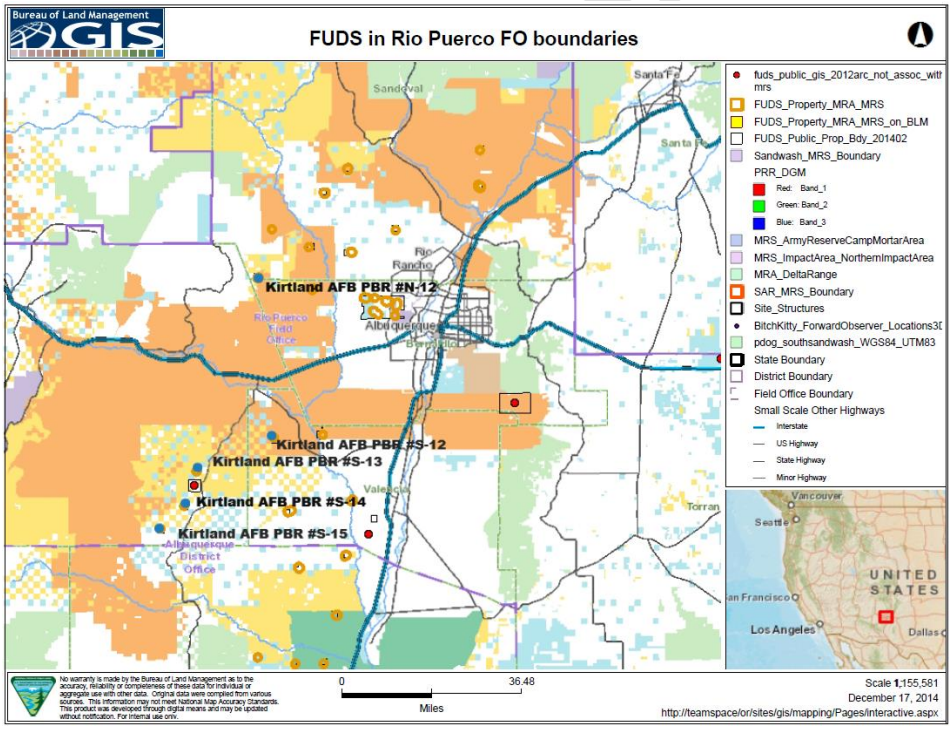
Potential training sites must be located near existing airspace and utilize landing zones adjacent to and in proximity to Kirtland Air Force Base (AFB), New Mexico, to maximize available training funds and minimize training requirements. Kirtland AFB in Albuquerque is located in close proximity to BLM locations that are currently used for this type of training.

Past Training Operations

The US Army Corps of Engineers, through their Formerly Used Defense Sites (FUDS) Military Munitions Response Program, identified five World War II era precision bombing ranges located within the Planning Area. Each target area that has been approximated to encompass 640 acres is shown on **Figure 3-2** and listed below:

- Kirtland Air Force Base Precision Bombing Range #N-12
- Kirtland Air Force Base Precision Bombing Range #S-12
- Kirtland Air Force Base Precision Bombing Range #S-13
- Kirtland Air Force Base Precision Bombing Range #S-14
- Kirtland Air Force Base Precision Bombing Range #S-15

Figure 3-2: FUDS in RPFO Boundaries



The training activities were conducted with practice bombs; however, these practice bombs had energetic components that could still represent an explosive hazard if they did not function properly. As a result, there is the potential that UXO may be located on the surface or may be buried beneath the surface from the momentum of impact. UXO represents an acute public safety hazard.

The Army Corps has conducted preliminary investigations that indicate the sites are relatively low risk. Munitions debris, which does not represent an explosive hazard, has been observed on the sites, but no UXO has been found. However, further work is needed to adequately determine the risk and the presence of explosives. If a risk is identified and remediation required, the BLM will work with the Army Corps to identify the appropriate course of action to minimize the public's risk.

A feasibility study will evaluate options for cleanup actions that support the current land use. These actions may include complete or targeted clearance of the surface and subsurface where munitions are identified.

Land use controls are another potential option to be considered, including restrictions on accessing the subsurface and/or public education programs. The public will have an opportunity to comment on the selected cleanup option through the FUDS Program community relations efforts, required as part of the cleanup process.

3.8.6 Livestock Operations

Livestock grazing operations present minimal overall risk to visitors to public lands. Potential risks associated with livestock grazing operations include collisions between livestock and vehicles, encounters with agitated livestock, and visitor mishaps at range improvements, such as stock ponds, fences, or wells.

3.8.7 Crimes Against Persons and Property

Illegal dumping, vandalism, and discharging of firearms were listed as concerns during the scoping process (BLM 2008a). Specific issues of crimes against persons have occurred. Thefts of resources, such as live plants, have increased with the increasing population desiring these items for their homes. Similarly, theft of fuelwood for residential wood burning stoves has been increasing, both in cases of personal use and commercial theft for resale. Also, theft of metal equipment from various permitted BLM sites for oil and gas operations has been documented.

3.8.8 Wildfires

Wildfires have the potential to endanger persons or property. The density and types of vegetation and the consequent likelihoods of natural or human-caused fires vary greatly due to differences in elevation, climate, soils, and topography in the Planning Area.

3.8.9 Regulated Hazardous Materials/Hazardous Waste Sites

No Superfund sites are known to be located in the RPFO Decision Area.

Regulated Landfills

The construction of landfills on BLM-administered public land has historically been accomplished under the Recreation and Public Purposes ~~R&PP~~ Act. The RPFO does not have any active landfills at this time. Five Recreation and Public Purposes ~~R&PP~~ Act leases were issued for landfill facilities in the Decision Area between 1966 and 1980. Two cases have been closed and three have expired. The most recent one to expire was in February 1992. The BLM no longer has the authority to lease public land for landfills.

Illegal Dump Sites

A significant issue related to hazardous and nonhazardous waste on public lands is the practice of abandoning solid and hazardous waste items. Unregulated sites include illegal dump sites, where solid and hazardous wastes are abandoned in locations other than established landfill facilities. These occurrences range in

severity and volume from isolated episodes of individuals dumping household trash and appliances to regular use by family and community groups and disposal of items by businesses.

3.8.10 Hazardous Materials

As part of the maintenance and management of the public lands, a variety of hazardous materials are utilized. These include products such as paint (both in gallon cans and spray cans), paint thinner, automobile lubricants (oil and grease), chainsaw fuel and lubricants, propane, drip torch fuel, and petroleum products. The use, storage, and transport of hazardous substances on public land, by the BLM or authorized users, may lead to accidental releases. Some examples include the above common chemical products, pesticide applications, military operations, construction activities, mining activities, concessionaire operations, commercial transportation, and oil and gas operations.

3.9 LANDS AND REALTY

The 1986 Rio Puerco RMP designated areas for retention and disposal to maintain lands of particular resource and/or use value and to provide for orderly disposition. Retention areas are generally relatively concentrated blocks of public land that include scattered or isolated parcels of state trust land, or special designations, such as WSAs and ACECs. Disposal areas include tracts of land that are difficult and uneconomic to manage, those that do not have legal access, or parcels that could serve important public objectives, including, but not limited to, community expansion, and economic development. Some parcels within Torrance County have been identified for disposal because of the lack of legal access. Public lands identified as potentially suitable for disposal or further study can be found in **Appendix Q**.

Since the 1986 Rio Puerco RMP was adopted, several adjustments to surface ownership have occurred as the result of certain realty actions, including exchanges, sales, and patents under the Recreation and Public Purposes~~R&PP~~ Act. Under the ~~R&PP~~ Act, the BLM issues leases and patents of public land to governmental and nonprofit entities for public purposes, such as public parks, building sites, and schools. The existing surface management pattern within the Planning Area is shown on **Appendix S**, **Map 1-1**.

Land tenure (or landownership) adjustment refers to those actions that result in the disposal of BLM-administered lands and the acquisition of nonfederal lands or interests in land. Current planning guidance with respect to landownership is provided by the 1986 Rio Puerco RMP. This direction establishes land exchange as the predominant method of landownership adjustment and categorizes BLM-administered lands into management areas or adjustment areas. The goal in management areas is to retain or enhance public land holdings within retention zones. Management areas typically include the large blocks of BLM-administered lands that meet the retention criteria, but also may include areas in which there are high public values suitable for BLM management. Lands outside these management areas are in the adjustment areas and are generally available for the full range of landownership adjustment opportunities, including exchange, sale, or other methods of disposal. Landownership adjustment proposals in the RPFO Planning Area are analyzed in project-specific reviews.

Based on the projected growth of the communities in the Planning Area, particularly near Albuquerque, the number of land disposals likely will increase. Disposals could occur for various uses, particularly under Recreation and Public Purposes~~R&PP~~ Act leases and patents, where public lands administered by the BLM provide opportunities for uses such as schools and parks. In addition to more public land disposals for developed uses, more public land may be disposed of for parks and recreation areas. This may occur as communities are seeking dedicated open space in perpetuity, rather than assuming that what now may appear as open space (i.e., state trust land or BLM-administered public land presently serving as *de facto* open space) will continue to be undeveloped in the future. As part of the lands and realty program, the BLM will continue to coordinate disposals with state, county, and local agencies, as appropriate, to consider consistency with existing plans for the Planning Area.

3.9.1 Land Use Authorizations

The realty program in the RPFO is responsible for processing ROW applications, land use authorization applications, and Recreation and Public Purposes~~R&PP~~ Act applications. All resource values and uses are considered and environmental impacts analyzed prior to the issuance of leases, grants, patents, and permits.

The RPFO processes approximately 20 ROW actions annually. These include ROW applications for new facilities (e.g., roads, power lines, telephone lines, communication sites, and water facilities), as well as amending, assigning, renewing, or relinquishing existing ROW grants (e.g., roads, railroads, power lines, communication sites, water facilities, and energy). The RPFO administers 434 ROWs, encumbering 18,673 acres of public land (BLM 2008b).

Temporary use permits are issued for a term of up to 3 years and are for the temporary use of public lands. Temporary use permits are used to authorize permittees to temporarily occupy or use land for a short term. Several permits have been issued for commercial filming projects on a one-time basis. No easements have been authorized.

Based on past trends, the BLM anticipates that requests for land use authorizations, such as ROWs, will continue, with the greatest proportion of requests in designated corridors and developing areas. Additionally, the projected population growth will likely drive an increase in the demand for facilities to accommodate this growth, including transmission lines, communication sites, and other utilities.

3.9.2 Utility Corridors

The BLM has formally designated ROW corridors and use areas within the RPFO Planning Area, and it attempts to group compatible facilities where possible. Deviations from designated corridors have been permitted, based on the type and need of the proposed facility and lack of conflicts with other resource values and uses. The RPFO currently has some ROW exclusion and avoidance areas, as detailed in **Chapter 2**, but not all such areas are mapped. Corridors are designated in areas where topographic or landownership constraints make it advantageous to locate transmission lines and pipelines on public lands.

As a result of the Energy Policy Act of 2005, the BLM completed the Designation of Energy Corridors on Bureau of Land Management Administered Lands in the 11 Western States (BLM 2009b), which designated Section 368 corridors on federal land in 11 western states for oil, gas, hydrogen pipelines, and power lines. Procedures for processing ROW applications within these corridors are in Appendix B, Interagency Agency Operating Procedures, of that EIS. This reference document identifies segments of utility corridor 80-273 within the Planning Area and on public lands administered by the BLM.

Many of the linear facilities authorized under various ROW grants have led to the establishment of de facto ROW corridors. The corridor philosophy within the BLM is to manage current and future uses of ROWs on public land through a system of designated corridors. The presence of designated ROW corridors does not preclude the granting of a ROW on public land outside a designated corridor, although the BLM does encourage placement near or in existing ROWs.

3.9.3 Communication Sites

Approximately 20 communication site ROWs occupying approximately five different communication site locations are authorized within the Planning Area. Potential new users are encouraged to locate within existing locations.

The Rio Puerco RMP provides general direction for the placement of any new ROW to be located near existing sites or in existing corridors. As a result, many of the current ROW holders in these areas are authorized to sublease to other users.

3.9.4 Withdrawals

The BLM uses withdrawals for the purpose of withholding an area of federal land from settlement, sale, location, or entry, under some or all of the general land laws; for the purpose of limiting activities under those laws to maintain other public values in the area or reserving the area for a particular public purpose or program; or transferring jurisdiction over an area of federal land. Under Section 204 of FLPMA, the BLM has been given the responsibility of reviewing all land classifications and withdrawals on BLM-administered lands. The review ensures that the reasons for the withdrawal are still valid and that the smallest acreage possible is retained in withdrawal status (FLPMA Section 204). Withdrawals can be continued, modified, revoked, or terminated, consistent with the needs, as justified by the withdrawing agency. As withdrawals are revoked or terminated, the land use decisions in the RMP will apply to those areas.

The RPFO currently uses nine types of withdrawals. The first is a wilderness designation withdrawal that includes the 11,000-acre Ojito Wilderness. There is one power site withdrawal, which includes 207 acres in the Planning Area. The miscellaneous withdrawals include a variety of purposes, but usually protect a BLM recreation site or other facility that would otherwise be adversely affected by mineral entry. The RPFO administers eight such withdrawals, involving a total of 20,333 acres. The only national monument withdrawal is to the NPS for 5,280 acres for the Petroglyphs National Monument. There are 35 withdrawals to the Forest Service that are spread across the Planning Area. There are 45,148 acres withdrawn to the Department of Defense, and 3 acres are withdrawn to the Federal Aviation Administration for an air naval facility.

Secretarial orders and Public Land Orders have been used in the RPFO to withdraw public lands from general use by transferring management responsibility to other US Department of the Interior agencies, such as BIA and the Bureau of Reclamation (BOR). Public lands have been transferred by executive order (EO) to agencies outside the US Department of the Interior, such as the Department of Defense and the Federal Aviation Administration. In such cases, both the lands and responsibility for their management are transferred.

In an effort to keep as much of the public land open to the widest variety of uses as is possible, the RPFO reviews all existing withdrawals on a periodic basis. Such review ensures that the reasons for the restrictions are still valid and that the smallest acreage possible is included in withdrawal status. The need for new withdrawals of public land within the Planning Area should continue to decrease in the future. Most BLM-administered lands containing resources that need to be protected by withdrawals already have such protection in place.

3.9.5 Access

For the purposes of this section, access refers to the physical ability and legal right of the public, agency personnel, and authorized users to reach public lands. The lands and realty program primarily assists in the acquisition of easements to provide for legal access where other programs have identified a need.

Access to public lands administered by the RPFO is an issue of concern to both agency personnel and the public. The existing, fragmented ownership pattern of BLM-administered lands intermingled with private, state, and other federal lands complicates the access situation.

The RPFO uses the acquisition of road and trail easements as the primary means of obtaining legal access to public lands where it does not currently exist. There are three types of easements: exclusive easements, where the BLM acquires full public rights to the road in perpetuity and exclusively manages all other uses; nonexclusive easements, where the BLM acquires only the right to use the road in perpetuity but does not control other uses; and temporary easements, where the BLM acquires the right to use the road for only a fixed period.

When possible, emphasis for easement acquisition is on those roads or trails identified through a route analysis process. Although used much less frequently than easement acquisition, the RPFO uses land exchanges on occasion to acquire needed access to public lands. Access is typically just one of many benefits of these exchanges. The consolidation of BLM landownership patterns by exchange has generally improved the access situation in the RPFO Planning Area. When disposing of BLM parcels containing roads or trails necessary for access to other public lands, the RPFO protects these access routes by reserving them in the conveyance documents. Access needs within the RPFO Planning Area are predicted to remain at a relatively constant level. Recreation access to public land should still be a high priority in the future.

The scattered public land pattern in the RPFO Planning Area contributes to trespass problems, particularly where patented land makes the determination of federal/private property lines difficult. The RPFO attempts to abate trespassing by prevention, detection, and resolution. In the lands and realty program, priority for resolving trespass in the Planning Area is accorded to those newly discovered ongoing uses, developments, or occupancies where resource damage is occurring and needs to be halted to prevent further environmental degradation. Lesser priority is accorded those historic trespass cases where little or no resource damage is occurring. Realty trespass cases in this latter category are resolved as time permits. Trespass problems are anticipated to remain at current levels within the Planning Area. With the BLM's scattered land pattern, encroachments on public land will likely continue to occur.

3.10 Lands with Wilderness Characteristics

Wilderness characteristics are defined by sufficient size, naturalness, and either outstanding opportunities for solitude or primitive and unconfined recreation. In addition, it may also possess supplemental values. The BLM is required under Section 201 of FLPMA to maintain a current inventory of the public lands, including those areas with wilderness characteristics. In 1980, the BLM conducted a nationwide inventory of its lands for wilderness characteristics. That inventory included the lands within the Rio Puerco Planning Area. Where changes to the landscape have occurred since the 1980 inventory, there is the potential for wilderness characteristics to now be present where they were not before. Examples of changes that could lead to the presence of wilderness characteristics include land acquisition, road decommissioning, facility removal, and reclamation projects.

In 2010, the wilderness inventory of the RPFO was updated. The BLM reviewed its records to identify these and similar changes and evaluated public scoping comments to identify areas where the potential for wilderness characteristics exists. Where these factors were identified, the BLM conducted a new wilderness inventory to update the 1980 inventory. The new inventory resulted in the identification of seven areas (37,514 acres) outside of WSAs or wilderness as having wilderness characteristics (**Table 3-15**; **Appendix S**, **Maps 2-~~18~~-14** through **2-~~21~~16**).

Table 3-15: Lands with Wilderness Characteristics

Name	Acres
Chamisa E	2,239
Cimarron Mesa	7,329
Ignacio Chavez A	2,462
Ignacio Chavez B	1,541
Ignacio Chavez C	72
Petaca Pinta A	38
Volcano Hill	23,843

Source: BLM GIS 2020

3.11 LIVESTOCK GRAZING

The livestock grazing resource is measured in terms of the amount of forage available for livestock occurring on a specified area of land, such as an allotment. An allotment's carrying capacity is expressed in AUMs. Livestock grazing management practices are assessed using the New Mexico Standards and Guidelines, which bridges the health of the public lands to the occurring multiple uses.

3.11.1 Livestock Use of Grazing Allotments

Grazing use is authorized and billed on the basis of the number of AUMs that the forage on a particular allotment will sustain. There are a total of 89,617 AUMs available for livestock grazing within the Planning Area. Grazing operations range in size from small to large. In addition to variations in size of operations, there are variations in individual allotment use. For example, one individual may be authorized to graze livestock on several different allotments or may be authorized to graze only a few head of livestock as part of a community allotment. Grazing authorizations on community allotments are held by more than one individual or family that run livestock in conjunction with one another.

There are a total of 204 grazing allotments within the Planning Area that total 648,400 acres of public land. Surface ownership of lands within grazing allotments consists of BLM, private, state, and tribal lands (~~See~~ see **Appendix S**, **Map 2-~~22~~17**). A description of each allotment by acreage and authorized public AUMs within the Planning Area can be found in **Appendix B**.

Grazing is administered by the RPFO on 40 allotments within the boundaries of the Farmington Field Office (FFO), as well as three allotments partially within the boundaries of the Socorro Field Office (SFO). Both the SFO and FFO administer grazing on allotments that are within the boundaries of the RPFO. Exchanges in allotment administration between the FFO and the RPFO are outlined in a memorandum of understanding. Administration of 30 allotments located in Rio Arriba County (FFO) was returned to the FFO in 2006 by the RPFO.

Authorized use varies each year depending upon a number of factors, including the current range condition, the ability of the permittee/lessee to purchase livestock, and long-term weather patterns. Long-term weather patterns and the ability of the permittee/lessee to purchase livestock are interrelated. Often permittees/lessees remove livestock from their grazing allotment and sell them during a period of prolonged drought. In many cases, it may take a number of years for an individual to purchase the authorized number of livestock even if range conditions are suitable. Prior to the annual generation of grazing bills, a grazing application is mailed to each permittee/lessee as a courtesy. The grazing application allows the permittee/lessee to designate the number of livestock that will be run on a particular allotment in that year up to the number authorized on the permit or lease. During this time, the permittee/lessee is allowed to designate nonuse, which means that they will not place a specified number of livestock on the allotment during a specified period of use and will not be billed for those livestock.

The number of cattle or AUMs within an allotment can vary each year, depending on current range conditions and livestock management needs. The majority of allotments are grazed year-round, with some type of grazing system (pasture rotation, watering sites, salt placement) in place to reduce or disperse grazing impacts on soils and vegetation. Grazing systems (grazing prescriptions) can vary within the Planning Area, ranging from intensive management, where cattle are moved every couple of days, to a rotational grazing plan that provides grazing and deferment periods throughout the year (see **Appendix C**).

Of the 195 allotments, approximately three-fourths are grazed year-round, while one-fourth are grazed seasonally. Grazing is authorized both seasonally and year-round on 22 community allotments. Some permittees/lessees that graze allotments seasonally are authorized to graze on allotments managed by the Forest Service. Generally, these individuals graze on Forest Service allotments from June to the middle of October.

One hundred and three of the 114 allotments within the Planning Area are authorized by Section 15 of the Taylor Grazing Act, while the other 125 are under the authority of Section 3 of the Taylor Grazing Act. Refer to **Appendix E** for more information.

Lands Removed from Grazing

Livestock grazing has been removed in the interest of wildlife values from the following allotments: Molino–12 AUMs, Rock Ridge–36 AUMs, San Miguel–12 AUMs, Bama–8 AUMs, and Elk Springs–168 AUMs. AUMs on the Molino, Rock Ridge, San Miguel, and Bama allotments were identified in the 1978 Rio Puerco Grazing EIS for wildlife use only. Livestock grazing on the Elk Springs allotment were removed in October of 1991 through a cooperative agreement between the BLM and the Rocky Mountain Elk Foundation. The Elk Springs Allotment is within a designated ACEC because of key deer and elk winter range values.

In establishing the El Malpais National Monument, Congress transferred over 100,000 acres of public land formerly administered by the BLM as multiple use lands to the NPS. Public Law 100-225 provided that livestock grazing in the monument could continue until December 31, 1997, under BLM administration. Now that such use has been discontinued in the monument, the BLM has adjusted all affected grazing permits to reduce livestock numbers.

Grazing has also been excluded from certain riparian areas administered by the RPFO, which are described in detail in the Final EIS for Riparian and Aquatic Habitat Management (BLM 2000).

3.11.2 Selective Management Categorization

In the 1980s, the BLM developed classification criteria to assist field offices in identifying management priorities by allotment. Allotments are placed in one of three selective management categories—maintain, improve, or custodial—based on criteria; refer to **Appendix E**.

Appendix E outlines information including the unit each grazing allotment is located in, allotment management category, Section 3 or 15 status of each allotment, and the EIS relevant to each allotment.

3.11.3 Range Improvements

Typical rangeland improvements and the general procedures to be followed in implementing them are described in **Appendix D**. Future rangeland improvements will be designed and constructed to meet the management objectives proposed in this RMP. The extent, location, and timing of such actions would depend on the improvements needed for each allotment, allottee contributions, and BLM funding capability, and they would be developed with consideration for other resource uses.

Fifty percent of all BLM grazing fees or $10 million, whichever is greater, is allocated to the range improvement fund annually, pursuant to FLPMA Section 401. Range improvements should be consistent with multiple use management, and the objective of improvement projects should meet one of the following criteria: enhance or improve livestock grazing management, improve watershed conditions, or enhance wildlife habitat, or they should serve similar purposes (43 CFR 4100). These improvements can be both structural and nonstructural and include, but are not limited to, prescribed burns, chemical brush control, mechanical brush control, water wells, water pipelines, and fencing. Range improvement funds in the RPFO are typically allocated to the treatment of brush or invasive species with aerially applied herbicides as well as structural improvements such as water wells, water pipelines, and fencing.

Pipeline Systems

The largest well/pipeline system in the Planning Area is the Cabezon pipeline system. A test hole drilled during a period of uranium exploration produced a high output artesian well (the Homestake Well), which was subsequently developed into an extensive pipeline system. The well and pipeline system provide water for livestock to approximately 20 grazing allotments from nearly 100 miles of pipeline. At this time, the BLM

has maintenance responsibility of the well and main trunk line. Maintenance responsibility has been assigned to the Cabezon Water User Association for the rest of the system.

3.12 MINERAL RESOURCES

Leasable minerals discussed in this section include the following:

- Energy fluid minerals—oil and gas, coal bed methane
- Nonenergy fluid minerals—carbon dioxide and helium
- Solid minerals—coal, potash, sulfur, and sodium

Locatable mineral resources discussed in this section include the following:

- Metallic minerals—e.g., gold, silver, base metals, and rare earth elements
- Nonmetallic minerals—e.g., gemstones, fluorspar, gypsum, perlite, and uranium

Salable mineral resources discussed in this section include sand, gravel, limestone, cinders, and building stone.

The mineral resource discussions include known prospects, mineral occurrences, mineralized areas, mining claims, leases, material sites, and types of mineral deposits in the area of interest.

The BLM has a policy to make mineral resources available for disposal and encourage development of these minerals to meet local and national needs. In the near future, the mining industry will have to locate its operations farther away from populated areas, where zoning restrictions, land development regulations, and environmental concerns discourage or prohibit mining actions. As a result, shortages of certain mineral resources in urban and industrial areas will increase, and these resources will have to be obtained from outside sources at a much greater cost to public users. Mineral ownership is shown on **Appendix S**, **Maps 1-2** through **1-4**.

3.12.1 Salable Minerals

Salable minerals include, but are not limited to, sand and gravel, cinders, scoria, non-block pumice, building stone, limestone, common clay, and humate. These minerals must be purchased from the BLM and are sold by the ton or cubic yard at an estimated fair-market value. Certain governmental agencies and organizations, such as the New Mexico Highway Department, can qualify for a free use permit and are not charged for mineral extraction on public land. Applications for mineral material sales must go through NEPA review unless they are individual sales or free use permits from community pits and common use areas, which would have had gone through a NEPA review prior to the individual sale or free use permit. Permit stipulations to protect surface values are based on interdisciplinary review of the environmental impacts of the application request. Regulations pertaining to this program are found in 43 CFR 3600. Salable mineral potential areas are shown on **Appendix S**, **Map 3-8**.

The availability of BLM-administered lands for extraction of salable minerals can be measured by the number of acres of federally owned minerals open, open with limitations, or closed to mineral material sales. The actual amount of salable mineral development in the Planning Area can be quantified by the number of mineral material sales and the tonnage of mineral material produced. Mineral material sales can fluctuate from year to year and are dependent on consumer demand. The RPFO analyzes each proposal based on resource conflicts, regulations, and policies and through the NEPA process, on a case-by-case basis.

Sand and gravel are abundant in the Planning Area. There are several mineral material sales of sand and gravel in the Planning Area. There are also nonfederal sand and gravel mining operations on Indian lands in the Planning Area.

Limestone is present in Cibola, Bernalillo, southeast McKinley, and northern Valencia Counties.

Scoria is known to exist in Cibola and southeast McKinley Counties, moss rock (lichen-covered sandstone) is found throughout the Planning Area, humate is known to exist within Sandoval County, baked shale (red dog or clinker) is known to exist in Sandoval County, and basalt is known to exist in Sandoval and Cibola Counties. Sandstone and other saleable minerals are known to exist throughout the Planning Area.

The demand for industrial minerals (including sand and gravel) continues to rise as these mineral materials supply construction industries. Depending on the rate of future commercial and residential development in the region, it is expected that there will be continued demand for salable minerals in the Planning Area. In particular, increased demand for salable minerals is expected in Valencia County, which is predicted to be one of the fastest growing counties in New Mexico over the next 5 years. Also, on public land around nearby Albuquerque, sand and gravel deposits that meet public works construction concrete and asphalt specifications are nearly depleted. Therefore, in the future, more sand and gravel may need to be brought into the Albuquerque metropolitan area from outlying areas, some of which may include portions of the Planning Area.

3.12.2 Locatable Minerals

Public land is open to mineral entry unless previously withdrawn. The 1872 Mining Law allows for the location of mining claims on public land for the purpose of exploration, development, and production of minerals. Exploration, development, and filing for a mining claim are regulated under 43 CFR 3800. The RPFO's responsibility consists of completing validity exams for patent or BLM actions and review and inspection of notices and plans filed under 43 CFR 3809 regulations. Most solid minerals, other than common variety minerals, are locatable, but exceptions exist (e.g., coal, potash, sulfur, and sodium). Locatable minerals are metallic (e.g., gold and silver) and nonmetallic (e.g., gemstones and perlite).

Before any disturbance associated with exploration or mining can begin, an operator must submit a notice (for exploration of 5 acres or less) or a plan of operations (for any mining activity regardless of size) describing the proposed activities, in accordance with applicable regulations.

Locatable mineral potential areas are shown on **Appendix S**, **Map 3-9**. The availability of BLM-administered lands for a mining claim location can be measured by the number of acres of federally owned minerals that is open to or withdrawn from the location. According to the 1986 RPFO RMP/ROD (BLM 1986), all of the BLM-administered federal mineral estate in the RPFO is available for claim location, except for the SMAs that were recommended for withdrawal.

Mining claims filed, maintained, and closed fluctuate at any given time. At the present time (2020), there are 403 active mining claims in the Planning Area occupying approximately 8,876 acres. Very few of the active mining claims located within the Planning Area are producing locatable minerals at the present time.

Uranium

The economic feasibility of uranium development depends on the price of uranium, the availability of mill sites and transportation, and the political and regulatory framework for uranium extraction in New Mexico. In 2007, the price of uranium rose high enough (from $60.00 to $135.00 per pound) to make uranium economic to mine in New Mexico. Demand for uranium has dropped, along with interest in development of uranium resources. However, it is predicted that demand will increase in the future, as more alternative energy sources are needed and if the price of uranium remains high or continues to increase.

New Mexico's uranium mills have been dismantled, leaving the area without a local means of processing uranium ore. A Texas-based company, Uranium Resources, Inc., announced plans in 2007 to open a new uranium mill near Grants, New Mexico. However, these plans are currently on hold. Should uranium prices rise again, the most likely area to be targeted for development is the Grants district, followed by the Rio Puerco district. The Hagen Basin is not as likely to be developed because of high production costs and low-

grade ore. If prices become high enough, it may be economic to produce uranium deposits in the Hagen Basin area.

Uranium deposits are most likely to be explored in the Grants district (along with associated vanadium and molybdenum in the Zuni uplift and the Rio Puerco district, southeastern Valencia and southwestern Torrance Counties, the Marquez-Bernabe Montano and Nacimiento districts, and the Hagen Basin).

Metals

The mining of metallic mineral resources is in a supply and demand market. Mining overseas has increased, and metallic minerals are being imported, resulting in less development of smaller deposits in the US. Demand is increasing. The current administration's goal is to assure the US is not dependent on foreign minerals, which could make exploration for, and mining of, metals in the Planning Area more economically viable in the future. Should prices rise high enough, some of these favorable environments could be economical enough to increase exploration and production of some locatable mineral occurrences within the Planning Area.

The mining districts most likely to experience development are the Cochiti, Nacimiento, and Jemez Spring districts. The Tijeras Canyon and Placitas districts are less likely to experience development because of low-grade orebodies, regulatory obstacles, and residential expansion. Metals, including gold, silver, copper, iron, lead, zinc, and manganese, are most likely to be developed in the Zuni Uplift area (Cibola County), the Rio Puerco District (Sandoval County), the Lucero area, the Manzano Mountains area, and in the mining districts located in central Sandoval County and eastern Bernalillo County.

Nonmetals

Gypsum deposits are found primarily in Sandoval County, the Lucero Uplift, Manzano Mountains, Albuquerque Basin, and the western edges of the Nacimiento Mountains. The gypsum deposits are found primarily in the Jurassic-age Todilto Formation. There is currently one gypsum operation located within the Planning Area, which is on tribal land. The mine is located on the Pueblo of Zia land, near San Ysidro (Sandoval County). Gypsum demand has been increasing over the last few years due to the improved economy and booming construction and housing markets. A pandemic has recently stagnated the construction and housing markets but is expected to be of a short duration. Demand for the resource is expected to increase within the near future as the market construction and housing market rebounds.

Fluorite and barite deposits are most likely to be explored and developed in the Zuni Uplift area (Cibola County). There should be a sustained demand for decorative rock (travertine), which is produced in Valencia County. It is probable that there will be continued claim location and extraction of travertine deposits in the Planning Area.

3.12.3 Leasable Minerals

Leasable minerals are from four categories: energy fluid minerals (e.g., oil and gas, coal bed methane, and geothermal), nonenergy fluid mineral (e.g., carbon dioxide and helium), coal, and nonenergy leasable solid minerals (e.g., potash, sulfur, and sodium). Requirements for extraction of leasable minerals from public lands are a lease and royalty payment. Leasable minerals include oil and gas, geothermal, coal, coal bed methane, oil shale, tar sands, phosphate, sodium, and potash.

Oil and gas leases are sold by auction on a quarterly basis, as are leases for other fluid minerals, such as carbon dioxide and helium. Coal leases are processed in a "lease by application" procedure (see **Appendix H** for a more detailed description of the process by which the BLM makes leasable minerals available).

The USGS designates areas prospectively valuable for geothermal energy as known geothermal resource areas (KGRAs). The New Mexico State Land Office designates favorable areas as known geothermal resource fields (KGRFs).

The availability of BLM-administered lands for mineral leasing can be measured by the number of acres of federally owned minerals that are open to leasing, open to leasing with moderate constraints (controlled surface use or timing limitation leasing stipulations), open to leasing with major constraints (no surface occupancy leasing stipulations), or closed to leasing.

The actual amount of leasing of federal mineral estate in the Planning Area can be quantified by the number of leases authorized and the acreage that is currently leased. As of October 2019, there are 33 active fluid mineral leases in the RPFO, all of which are in the San Juan Basin (Crocker and Glover 2019).

Another indicator of leasable mineral development in the Planning Area is the number of wells that have been drilled and the amount of fluid minerals that have been produced from those wells. As of July 2019, there have been 919 wells drilled in the RPFO (Crocker and Glover 2019). There has been no development of leasable minerals other than oil and gas resources.

Oil and Gas

The primary oil and gas fields in New Mexico are located in the northwestern and southeastern parts of the state. However, there are oil and gas resources located within the RPFO. As of October 2019, there are 33 active fluid mineral leases in the RPFO, all of which are in the San Juan Basin (Crocker and Glover 2019). Most of the exploration and development of oil and gas resources in the Planning Area has taken place in the northwestern portion of Sandoval County, which is on the fringe of the highly productive San Juan Basin. Small amounts of exploration and production have taken place in other areas of the Planning Area.

Although there are currently no oil and gas leases in Cibola County and southeast McKinley County, there are potential reservoirs in the area (**Appendix S**, **Map 3-10**) that have undergone exploration in the past. There have been oil and gas shows from exploratory wells drilled in this part of the Planning Area, but there are currently no producing wells on BLM-administered mineral ownership.

Very little petroleum has been produced in Bernalillo County and northern Valencia County, but there have been several exploratory drilling programs in the Albuquerque Basin between 1912 and 2019. Very little, if any, petroleum has been produced in Torrance County.

There are oil and gas leases located mainly in the northwest corner Sandoval County, west and southwest of Cuba, New Mexico, within Sandoval County (**Appendix S**, **Map 3-10**).

For details on porosity, permeability, various structural and stratigraphic trapping mechanisms, and production statistics, the reader is referred to **Chapter 6**, References, specifically, McLemore et al. 1984.

Increased oil and gas exploration and development is a direct result of the price of a barrel of crude oil, which is a function of supply and demand. Crude oil demand and prices are likely to continue to increase, which, in turn, can cause more exploration in hitherto unexplored areas, potentially resulting in new oil and gas fields. Secondary and tertiary petroleum recovery from known producing and past producing formations and reservoirs should also become economically viable. Oil and gas lease sales are likely to increase within the Planning Area. Petroleum resources in the Albuquerque, Hagan, and Espanola Basins, the Nacimiento Uplift, and the Sandia Mountains, which in the past had low potential, may also become economical to mine. The proximity of the Planning Area to major transportation routes and pipeline corridors may also attract exploratory drilling.

Future oil and gas development over the next 20 years (2020 to 2039) is projected to result in eight wells drilled per year in the Planning Area (federal mineral ownership), with the majority of development expected to occur in areas of high and medium development potential. These are located in the northern portion of the RPFO in Sandoval County, according to the RPFO reasonably foreseeable development (RFD) scenario for oil and gas leasing. As of October 2019, there are 33 active fluid mineral leases in the RPFO, all of which are in the San Juan Basin (Crocker and Glover 2019).

Hydraulic fracturing (fracking) is a process used to stimulate production from oil and gas wells. Fracking techniques are particularly effective in enhancing oil and gas production from shale gas or oil formations. The development of horizontal drilling, combined with hydraulic fracturing, has made production of oil and gas from shale possible. The injection of fluid, typically water, under high pressure, which creates or enlarges fractures in the reservoir rocks, is the essential function of fracking. Depending on the rock formations, the well, and operating procedures, chemicals are also frequently added.

The chemicals used in fracking can serve many functions, which include limiting bacteria growth and preventing corrosion of the well casing. Proppants such as particles of sand are usually combined with the fracking fluids, which helps keep the fractures open once the pressure from the fracturing operation is released. These fractures then become the pathways for fluid movement from the reservoir rock to the wellbore bringing the fluids to the surface. The returned fluids are known as "flowback" and "produced water" and contain the injected chemicals plus naturally occurring materials such as brines, metals, and hydrocarbons. The flowback and produced water is typically stored on-site in tanks or pits before treatment, disposal, or recycling. In some instances, the flowback may be injected underground for disposal.

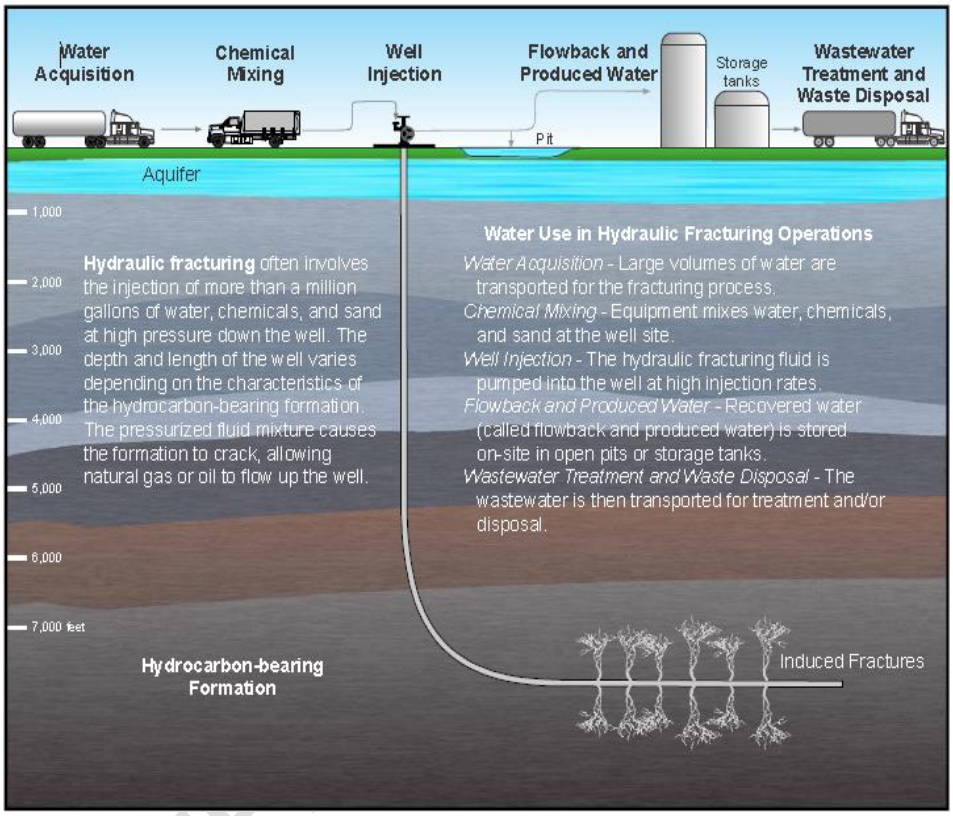
In accordance with American Petroleum Institute (2009), proper well design "ensures the environmentally sound, safe production of hydrocarbons by containing them inside the well, protecting groundwater resources, isolating the production formations from other formations, and by proper execution of hydraulic fractures and other stimulation operations."

Constructing proper wells essentially facilitates the isolation of the production zone from drinking water resources. The primary elements for proper well construction include drilling the hole, installing the steel pipe (casing), and cementing the pipe in place. Once the well construction is completed the shale, coal bed, or tight sands area is hydraulically fractured to stimulate production.

The vertical well sections may be drilled thousands of feet below the land surface, and the lateral section may extend 1,000 to 7,000 feet away from the well. Fracture height is important to the issue of whether or not hydraulic fracturing can affect underground sources of drinking water (USDWs). Shorter fractures are less likely to extend into a USDW or connect with natural fracture systems that may transport fluids to USDWs or existing formation fractures.

The extent of a fracture is controlled by the characteristics of the geologic formation (including the presence of natural fractures), the volume and types of fracturing fluid used, the pumping pressure, and most important, the depth at which the fracturing is being performed (Nolte 1991). Non-typical shallow wells, 1,000 to 2,000 feet, which develop deep vertical fractures, can propagate to shallower depths and develop a horizontal component into the USDWs or surface, creating ground disruptions (Nielsen and Hansen 1987, as cited in Appendix A: Department of Energy, Hydraulic Fracturing). **Figure 3-3** below illustrates a typical hydraulic fracturing operation.

Figure 3-3: Illustration of a Horizontal Well Showing the Water Lifecycle in ~~Typical~~ Hydraulic Fracturing ~~Operation~~



Source: EPA 2011

Coal

Coal normally crops out in coal-bearing sedimentary rocks. Locations where coal occurs and is mineable are designated as coal fields. Deposits are ranked on quality and are based on carbon content, volatile matter and water content, hardness, and heat released during burning. Lowest to highest quality are termed lignite, sub-bituminous, bituminous, and anthracite.

There are federal no coal leases in Cibola and southeast McKinley Counties. Coal is present within this area, but it is currently uneconomical to mine due to depth and quality. Cibola County contains Cretaceous age coal-bearing outcrops that are designated as recognized fields. The coal fields here are southwestern East Mount Taylor, South Mount Taylor, northern Datil Mountains, northern Salt Lake, and southern Zuni fields. See McLemore et al. 1986 for physiographic and detailed geologic description of the coals in each field. The portion of McKinley County within the Planning Area contains a portion of the Gallup and Zuni recognized fields.

There are no federal coal leases in Bernalillo and northern Valencia Counties. Coal is present within the unit, but it is currently uneconomical to mine due to thin beds, high-angle faulting, and quality. Valencia County contains Cretaceous age coal-bearing outcrops. Coal here ranks sub-bituminous A to high volatile C bituminous. Ash content is low (less than 8.0 percent) and the sulfur content is high (greater than 1.5 percent; McLemore et al. 1985).

There are no federal coal leases, no Cretaceous age coal-bearing rocks due to erosion or non-deposition, and no other coal-bearing units in Torrance County.

There are no federal coal leases in Sandoval County. Sandoval County contains a portion of the San Juan Basin coal fields. The coal fields here are La Ventana, northeast East Mount Taylor, northeast Rio Puerco, east Chacra Mesa, east San Mateo, and east Star Lake.

Eastern Sandoval County contains the Hagan and Placitas fields in the southeastern corner of Sandoval County and the Tijeras field in northeastern Bernalillo County.

An increase in demand for coal would likewise increase new coal mine development, although coal resources in the Planning Area are not suitable for economic development without a commensurate price increase. For example, the steep dip and thinness of the beds makes strip mining economically impractical in the Tijeras field, and transportation to market would need to be made available. If construction of coal-fired power plants increases, the demand for coal will also increase and leases will again be issued. Coal resources in the Planning Area are uneconomical to mine commercially at this time. There is no predicted future development for coal within the Planning Area over the next 20 years (Crocker ad Glover 2019).

Geothermal

Two KGRAs have been identified by the USGS: the Baca Location #1 and San Ysidro. These are both located in Sandoval County. KGRFs have been identified by the New Mexico State Land Office in the following locations: western McKinley and Cibola Counties, the Lucero Uplift in eastern Cibola County, western Valencia County, the Rio Grande rift, and the Jemez Mountains (which include the two KGRAs).

Geothermal resources will be found in areas like the KGRFs. These features are typically associated with volcanism and have a magmatic source for geothermal energy. Another source is in active tectonic sedimentary basins, which contain warm waters that circulate to great depth along major fault systems. A different system is that of hot dry rock, where water is not present. The geothermal energy is extracted from hot rock via injected water. Geothermal areas are found in various host rocks, generally late Tertiary to Quaternary in age. Although there are known geothermal resources in the Planning Area, there are no leases at this time.

New geothermal resources may be discovered by drilling exploratory wells in areas of high temperature gradients or in areas of oil and gas exploratory drilling. Geothermal resources may not be economically competitive with other energy forms, as holes are very expensive to drill and distances to market are enough to add significantly to the cost (Williams et al. 2008). Exploration for and development of geothermal resources should continue, as petroleum resource costs are on the rise, creating a demand for renewable energy forms such as geothermal.

Carbon Dioxide/Helium

The Estancia Basin (eastern Sandoval County) contains carbon dioxide reservoirs that were explored from 1934 to 1942. Depending upon the demand for carbon dioxide and the supply available from other resources, it is possible that the carbon dioxide resources in the Estancia Basin could be developed in the coming years. Carbon dioxide reservoirs are also located in the Nacimiento Mountains (Sandoval County), Mesita (Cibola and southeast McKinley Counties), and Valencia County, but these areas are rated as having only moderate potential.

The Nacimiento Mountains of Sandoval County and the Mesita area of Cibola County have moderate deposits of helium. The development potential of these helium reservoirs is also moderate because other sources of helium are becoming limited. If demand cannot be met by other helium sources (such as the Bravo Dome in northeastern New Mexico), it is possible that exploration and development of helium in the Planning Area could occur.

Helium and carbon dioxide resource development potential depends on the longevity of existing sources of these gases as well as the level of demand in the future. If demand remains high for these gases and the existing sources diminish, it is likely that development of these resources in the RPFO will occur.

Sodium/Halite

There is a high potential source location for sodium in playas located in Torrance County, but the development potential of this mineral resource is low. There are no other sources of sodium/halite in the Planning Area. Although there are sodium/halite resources within the Planning Area, the development potential for these is likely to remain low.

Sulfur

There are sources of sulfur in the Planning Area at Sulfur Springs and San Diego, but there is low development potential for these resources.

3.13 PALEONTOLOGICAL RESOURCES

Paleontological resources consist of any fossilized remains, traces, or imprints of organisms, preserved in the earth's crust that are of paleontological interest and that provide information about the history of life on earth (Paleontological Resources Preservation Act Section 6301; 16 USC 470aaa-1). The fossils found on public lands are considered part of our national heritage and are therefore afforded protection under the Paleontological Resources Preservation Act of 2009.

Vertebrate fossils or other noteworthy occurrences of invertebrate and plant fossils are considered scientifically important by the BLM and must be administered using scientific principles and expertise. Common invertebrate and plant fossils are typically more abundant, and the BLM does not ordinarily consider them to be scientifically important.

Indicators for the significance of paleontological resources are as follows:

- Type of fossil resource present (vertebrate, invertebrate, trace, or plant)
- Prevalence of the fossil resource in the area
- Recognizable condition of the fossil
- Scientific, educational, and/or recreational value of the resource

The PFYC system has been developed to predict the potential for discovering scientifically important fossils during any surface-disturbing activity in specific geologic units. Based on specific geologic units, the PFYC uses a ranking of 1 through 5; PFYC 5 indicates a geologic unit that is known to contain abundant scientifically significant paleontological resources, while a PFYC 1 indicates a geologic unit that has a very low probability of containing paleontological resources. The following is a brief description of each classification's probability of containing paleontological resources:

- **PFYC 1** – Very Low. Geologic units that are not likely to contain recognizable paleontological resources.
- **PFYC 2** – Low. Geologic units that are not likely to contain paleontological resources.
- **PFYC 3** – Moderate. Sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence.

- **PFYC 4** – High. Geologic units that are known to contain a high occurrence of paleontological resources. Significant paleontological resources have been documented, but may vary in occurrence and predictability. Surface-disturbing activities may adversely affect paleontological resources.
- **PFYC 5** – Very High. Highly fossiliferous geologic units that consistently and predictably produce significant paleontological resources. Paleontological resources are highly susceptible to adverse impacts from surface-disturbing activities.
- **PFYC U** – Unknown Potential. Geologic units that cannot receive an informed PFYC assignment.

Development of the PFYC is based in part on known fossil occurrences and geology (see **Appendix S**, **Map 3-11**). Acreages of each class can be expected to change as more data are collected from ongoing field surveys and inventories and as refined maps become available.

The PFYC map (**Appendix S**, **Map 3-11**) was developed by the BLM. Since the scale of the base map is 1:500,000, the RPFO would refine the data as part of plan implementation. Ideally, the PFYC map would be refined to the 1:100,000 scale and to the 1:24,000 scale in areas where needed. The geologic units range from almost two billion years old to the present. Almost all fossils are found in sedimentary deposits. Sedimentary rocks form in marine and nonmarine environments and include sandstone, siltstone, clay, and limestone. There are caves in lava tubes in volcanic fields and limestone terrains within the Planning Area that can serve as traps for animals; they have preserved a record of the changing conditions through the ice ages (Lucas et al. 2005). The PFYC of both volcanic and limestone areas may be 1, 2, or 3, but cave and karst conditions should enter into decisions.

Within the Planning Area, PYFC Class 5, 4, and 3 geologic formations account for approximately 31 percent of the total acreage, including all ownerships. About 32 percent of public land in the Planning Area is underlain by Class 2 rock units, and Class 1 makes up 37 percent of the Planning Area (**Table 3-16**).

Table 3-16: Potential Fossil Yield Classifications in the Rio Puerco Planning Area

PFYC	Acres
1	1,381,600
2	3,244,700
3	3,661,7000
4	1,042,912
5	175,700

Source: BLM GIS 2020

Although the Planning Area contains rocks as old as 2 billion years, known fossil deposits extend back to about 300 million years, reflecting a long history of life on earth. Many major fossil bearing rock units identified within New Mexico are present in the Planning Area. Vertebrate fossils in these sedimentary rocks range from fish, reptiles, amphibians, dinosaurs, birds, and mammals. Rock units exposed in the Planning Area include some important boundaries, including the transition from fish to early land dwelling animals, into a dinosaur dominated ecosystem, through early and middle portions of the predominance of mammals. Data contained in this section are derived from the New Mexico Museum of Natural History and Science (NMMNHS) Collections database.

In the case of split estate, all paleontological resources belong to the surface owner. The BLM's obligation in a case where a federal action may affect the paleontological resources is to ensure the action is conditioned with appropriate paleontological mitigation recommendations to protect the interests of the surface owner. For this reason, **Table 3-16** is not separated by surface ownership.

Specific fossil resources in the Planning Area have been, and will continue to be, identified by field surveys conducted by permitted paleontologists, including faculty at universities and curators at museums, as well as

by students conducting research. Additional fossil resources may be identified by consultants conducting environmental reviews of specific land use proposals and as discoveries reported by members of the public. There are five active research paleontology permits in the Planning Area, representing five different researchers. Three of these active permits are issued statewide to the NMMNHS, and active research is being conducted under these permits within the Planning Area. Student researchers are considered and encouraged to pursue research under the supervision of a qualified advisor.

Trends within the RPFO are for increased use of the landscape for resource extraction, increased recreational use (both permitted and unpermitted), and decreasing funding and personnel for resource protection. Such trends are expected to have an effect on some important paleontological resources from authorized and unauthorized uses. Over the past 20 years, the BLM New Mexico has worked cooperatively with the NMMNHS. The partnership is expected to continue if personnel are present to maintain the partnership.

As the public lands within the Planning Area become subject to more use for a variety of purposes, scientifically important paleontological resources might be more likely to be affected from this use. The increase of uses within key areas will require additional measures to be taken in order to manage these resources according to BLM policy and laws. New species may be discovered at any time, and even fragments of fossils may yield important information. The scientific, educational, and recreational value of any fossil must be determined with each discovery through careful examination and evaluation by a paleontological resource specialist.

There are key features in the Planning Area where important fossil-bearing rock units are well exposed on the earth's surface with minimal soil development. Exposure of the rock at the surface allows for easier discovery of significant fossils. There are also some important localities known that will require monitoring and more intense management to conserve and manage these resources according to BLM policy. The RPFO will encourage continued scientific research and inventory of paleontological resources throughout its administrative area.

3.13.1 Cibola County and Southeast McKinley County

West-central New Mexico contains 364,208 acres of surface estate where the BLM has direct responsibility for management of surface resources. Cibola County and southeast McKinley County contain geologic formations ranked PYFC 4 and 3 for potential to produce significant fossil resources.

3.13.2 Bernalillo County and Portions of Cibola and Valencia Counties

Located in central New Mexico, this area contains 139,724 acres of surface estate where the BLM has direct responsibility for management of surface resources. This area contains geologic formations ranked PYFC 3 and 2 for potential to produce significant fossil resources.

3.13.3 Torrance County

Located in central New Mexico, this area contains 16,356 acres of surface estate where the BLM has direct responsibility for management of surface resources. Although the sensitivity level given to this area is PFYC 1 because of map scale, fossil vertebrate localities have been documented and recorded by researchers from the NMMNHS.

3.13.4 Sandoval County

Sandoval County contains key features where Cretaceous and Paleocene rocks have produced significant vertebrate fossils for over 150 years. Located in the northwestern New Mexico, Sandoval County contains 465,670 acres of surface estate where the BLM has direct responsibility for management of surface resources. Sandoval County contains geologic formations ranked PYFC 5, 4, and 3 for potential to produce significant fossil resources.

The San Juan Basin has been an important fossil producing area for the last two centuries and continues to produce material important to science.

There are areas within the unit where active excavation of fossil resources occurs. One locality has produced important dinosaur material, and excavation has been ongoing for 17 years. Another area continues to produce important mammalian fossils that define part of the geologic time scale for the Paleocene Epoch and is the type locality for the Torrejonian Land Mammal age in North America. The excavations have been conducted by the NMMNHS.

3.13.5 Eastern Sandoval County

Located in central New Mexico, eastern Sandoval County contains 11,069 acres of surface estate where the BLM has direct responsibility for management of surface resources. These formations have been given PYFC Class 3 and 2 levels of sensitivity and have produced important paleontological resources.

3.13.6 Cibola County and Southeast McKinley County

Important vertebrate fossils, including new species of dinosaurs, have been discovered in Catron County, outside of Cibola County, and in southeast McKinley County; however, the same type rocks occur within the Cibola County area.

3.14 Recreation and Visitor Services

3.14.1 Recreation Opportunity Spectrum

A recreation opportunity spectrum (ROS) inventory was conducted for the RPFO and is described in the 1986 RMP. According to BLM Manual 8320, ROS is defined as a continuum used to characterize recreation opportunities in terms of setting, activity, and experience opportunities. ROS is a conceptual planning tool that applies a set of criteria to a land area's physical, social, and managerial settings to describe the existing conditions, which in combination define a land area's capability and suitability for providing a particular range of recreational experience opportunities.

The ROS is subdivided into six classes that cover the full spectrum of experience opportunities: primitive, semiprimitive nonmotorized, semiprimitive motorized, roaded natural, rural, and urban. Once these opportunities have been defined, managers are able to determine which opportunities are provided and are able to assess the impacts of other resource actions on the recreation resource.

The BLM assessed the ROS for the following specific management areas:

- Azabache Station—Semiprimitive motorized
- Cabezon Peak—Semiprimitive nonmotorized
- Guadalupe Ruin—Semiprimitive nonmotorized
- Ignacio Chavez—23,587 acres of primitive, 8,800 acres of semiprimitive nonmotorized, 10,761 acres of semiprimitive motorized
- San Juan Badlands Motorcycle Endurance Trails—Semiprimitive motorized
- Perea Nature Trail—Semiprimitive motorized
- San Ysidro Trials Area—Semiprimitive motorized
- White Ridge Bike Trails—Semiprimitive nonmotorized

The Planning Area provides various opportunities for sightseeing, wildlife viewing, hiking, backpacking, picnicking, horseback riding, sport shooting, bird and big game hunting, rock climbing, biking, OHV use, geocaching/orienteering, camping, and solitude. A majority of the recreational uses occurring on public land are dispersed.

RPFO management priorities are congressionally recognized areas, administratively recognized areas, and undeveloped areas currently experiencing resource damage, user conflicts, or threatening visitor safety. Management priority is also given to those areas where use exceeds current capacity and to areas near urban centers. Additionally, unique and/or scenic attractions adjoining heavily traveled highways are managed on a priority basis. Other priorities are preservation and protection of natural and cultural resources, including scenic, historic, and archaeological values and primitive environments.

Special recreation permits (SRPs) are issued for competitive events, commercial use, organized groups, vending, and recreation use in special areas. The RPFO would continue to issue SRPs after the appropriate NEPA study is completed. The RPFO administers approximately 19 SRPs annually within the Decision Area (13 big game outfitting, one motorcycle race, one trials event, one llama hike, one environment education, and two Jeep tours). Recreation resources will continue to be evaluated on a case-by-case basis as part of project-level planning. Such evaluation will consider the significance of the proposed project and the sensitivity of recreation resources in the affected area. Stipulations will be attached as appropriate to ensure compatibility of projects with recreation management objectives and the BLM's policy of multiple use.

As a result of the resolution of the 1986 RPFO RMP (BLM 1986), 13 areas were identified as containing important and valuable recreation values and opportunities that warrant special management attention. These 13 areas are located within the following SMAs: Historic Homesteads, Cañon Jarido, Jones Canyon, Azabache Station, Cabezon Peak, Ignacio Chavez, Elk Springs, Ojito, Pronoun Cave Complex, Continental Divide Trail, 1870s Wagon Road Trail, Petaca Pinta, and Bluewater Canyon. In the 1986 RMP, Tent Rocks and El Malpais were listed in the count of 13, making the actual number 15. Both areas now have their own RMPs. Included in the Planning Area are El Malpais NCA and Kasha-Katuwe Tent Rocks National Monument. Standalone plans exist for the management of these BLM-designated areas.

As the population in the area continues to increase, the demand for recreational uses of public land and visitor services has also increased. The public has expressed interest in adopting various RPFO areas for hiking, camping, and OHV use.

Some recreation activities, such as paintball, rock crawling, geocaching, and recreational shooting are beginning to pose management concerns. These uses likely will increase as the population in the Decision Area grows.

White Ridge Bike Trails

Located southwest of San Ysidro, New Mexico, the bike trail crosses a landscape of spectacular beauty and exceptional geology, meandering through the Pueblo of Zia, state of New Mexico lands, and public lands administered by the RPFO. White Ridge is named for the color of the gypsum that forms much of the mesa and majority of the bike trails. Trails were developed primarily for mountain biking; however, hikers are welcome and often find the trails as exhilarating as the bikers.

San Juan Badlands Endurance Courses

Three separate and unique loop trails were designed and implemented for the Endurance Trails SRMA competitive motorcycle race. The Endurance Trails SRMA consists of three courses, A, B, and C, which are designed solely for event use once every 3 years. Race course A is 22 miles, B is 28 miles, and C is 36 miles. All three courses are only 2 to 3 miles from each other and are located west of Cuba, New Mexico, and north of State Road 197.

San Ysidro Trials Area

Located approximately 1 mile west of San Ysidro, New Mexico, north of US 550, is the San Ysidro Trials Area, which is quite popular with hikers, mountain bike enthusiasts, and the trials bike community. The San Ysidro Trials Area is a unique slot canyon area that offers recreation for anyone with an appreciation of

natural wonders. The entire recreation area lies at the southern tip of the Jemez Mountain range and is open for hiking, primitive camping, equestrian activities, and mechanical vehicles such as mountain bikes. The area is closed to off-road motorized vehicles, except for SRPs, which use the area for competitive and practice events, remote-controlled car rock climbing, and educational and recreational events and activities.

Perea Nature Trail

A mountain peak dominates the 1-mile Perea Nature Trail located just outside the village of San Ysidro in northwest New Mexico. The mountain highlights the Jemez Mountain Range, which is the southern start of the Rocky Mountains, which extend northward to Alaska. The Perea Nature Trail offers a short, refreshing hike. Visitors to the Perea Nature Trail may look to the southwest over the Rio Salado riverbed to view an outstanding geologic setting. Blanco Mesa, known for its unusual white surface, is used as a creative backdrop for motion pictures and photography. The high rock formations with purple hues seen in the distance are part of the Nacimiento Mountain chain and are some of the oldest rocks in the area.

Guadalupe Ruin

The Guadalupe Ruin is a prehistoric Chacoan outlier of about 45 rooms, about half of which have been excavated and stabilized. The earliest date of occupancy occurred approximately 918 CE, and by 1140 CE Guadalupe was abandoned. A second occupation occurred in the late 1200s with migrations from the Mesa Verde region. The central ruin and community lie on the western edge of the Rio Puerco Valley immediately below the confluence of the Arroyo Chico and Rio Puerco.

Ojo Azabache Old Stage Station

Located in the northern boundary area of the Ignacio Chavez SMA along County Road 25, is the old stage station at Ojo Azabache. This station served as a way stop for travelers on the route from Santa Fe to old Fort Wingate during the 1870s.

Cabezon Peak

Cabezon Peak's dramatic volcanic formation is one of the most well-known landmarks in northwest New Mexico. With an elevation of 7,785 feet, the Peak is part of the Mount Taylor volcanic field and is the largest of 50 volcanic necks rising from the Rio Puerco Valley. The peak is believed to have religious significance for the Pueblo and Navajo Indians, and remnants of their visits still exist. Cabezon, rising nearly 2,000 feet above the valley floor, is a popular area for rock climbing and scrambling. A climb to the summit provides an expansive view of the Rio Puerco Valley.

Ignacio Chavez Grant

Steep canyons and high, rugged cliffs provide rewarding challenges for the backcountry hiker within Ignacio Chavez. The Ignacio Chavez Grant was awarded to settlers in 1768 by the Spanish government for establishing communities. Because these communities were never developed, the US government later acquired the land grant. Activities such as hiking, backpacking, mountain biking (on designated routes), and horseback riding can all be enjoyed without a permit in this remote, secluded area. Hunting is also allowed but requires a license from the New Mexico Department of Game and Fish for protected species. Unless specifically designated, all roads and trails are open to mountain biking.

Continental Divide National Scenic Trail

The Continental Divide National Scenic Trail provides for high-quality, scenic recreational experiences, including primitive hiking and horseback riding, and (in some areas) mountain biking. Extending 3,100 miles between Mexico and Canada, the trail traverses landscapes primarily on public lands within 50 miles of the natural geographic feature of the divide (**Appendix S**, **Map 3-12**). This national scenic trail was established in 1978 through the authority of the National Trails System Act (Public Law 90-543) and is one of the outstanding resources of the National Land Conservation System.

3.15 RENEWABLE ENERGY

In some locations within the Planning Area it may be economical to produce renewable energy resources (e.g., wind, biomass, solar, and geothermal). Where feasible, BLM policy is to make possible environmentally sound development of renewable energy projects. Renewable energy resources in the Planning Area can be administered if the BLM authorizes the use of public lands for the development of various energy-generating facilities. Applications for commercial renewable energy projects are processed as ROW authorizations under Title V of FLPMA and under 43 CFR 2800. Geothermal energy is discussed in **Section 3.12.3**, Leasable Minerals, *Geothermal*.

3.15.1 Biomass Energy

Biomass is material derived from trees, shrubs, plants, agricultural crops, agricultural or forestry residues, and other plant waste that can be burned or processed into fuel to produce energy.

A report prepared by the DOE and the BLM identified the Planning Area as having a fair biomass potential (BLM and DOE 2003). On public lands within the Planning Area, there currently are no commercial biomass facilities.

In the Planning Area, the forecast for biomass resources is dependent on the cost of nonrenewable energy resources such as petroleum. If biomass resources become competitive with other energy resources and thereby economical to produce, new facilities would need to be constructed for processing and burning. This should lead to more biomass harvesting, especially in areas where downed trees, tree limbs, and underbrush have not been harvested or cleared.

Agricultural and forested areas within the Planning Area contain biomass resources for energy production, but due to arid conditions biomass may not be as sustainable as in other states.

3.15.2 Solar Energy

A report prepared by the DOE and the BLM identified lands within the Planning Area as having large acreage with high-potential concentrations of solar power (BLM and DOE 2003). Solar energy is a renewable energy resource that has excellent potential for generating electricity in the Planning Area. Solar energy resources are classified based on the amount of solar radiation that contacts the ground surface in a specified area.

Solar energy in the Planning Area ranges from 5.6 to 6.5 kilowatt-hours per square meter per day (see **Appendix S**, **Map 2-~~60~~47**). There are no commercial solar energy facilities currently on public lands within the Planning Area.

The development forecast for solar resources in the Planning Area is directly tied to solar technology cost, suitable areas for solar, and the availability of transmission corridors. With technological advances in and mass production of solar collection equipment, costs should decrease in the long run. Cost increases for nonrenewable energy resources will also help to make solar energy more competitive in the future market.

New Mexico, including the Planning Area, receives a large amount of annual sunshine. The Planning Area is well located for development of solar energy resources.

3.15.3 Wind Energy

A report prepared by the DOE and the BLM identified lands within the Planning Area as having minimal acreage with high-potential wind power density (BLM and DOE 2003). The majority of the Planning Area falls into wind power density class 1 (poor), but there are a few high elevation sites that fall into class 2 (marginal) and class 3 (strong).

The DOE and BLM survey of topographic and historical wind conditions has identified locations in the Planning Area where wind resources are available for development.

There are no commercial wind energy facilities on public lands within the Planning Area, but there are private commercial operations. Future wind resource use is dependent on the cost of installing and operating wind resource facilities. Technological advances may decrease costs for equipment and facilities, making this resource economically competitive with nonrenewable resources.

3.16 RIPARIAN RESOURCES

Riparian-wetland areas, though they comprise a small percent of the total land base, are the most productive resources on BLM-administered land. Riparian areas make up less than 2 percent of the land base in New Mexico, but they are critical areas in relation to the total amount of land administered by the RPFO. These areas represent important migratory bird flyways and nesting areas for threatened and endangered species and have been found to contain large populations of bird species in desert areas (Hoag 2005).

Riparian zones are the most critical wildlife habitats in managed rangelands. More wildlife species depend entirely on or spend disproportionately more time in this habitat than any other. The zone is also disproportionately important for grazing, recreation, fisheries production, road location and other similar developments, and water quality and quantity.

The major watersheds occurring in the Planning Area are the Rio Grande and Rio Puerco. Aquatic and riparian habitats are relatively rare in the RPFO. Rivers and creeks in the Decision Area include the Rio Puerco, Las Huertas, Bluewater, Rio Senorito, Rio Gallina, Rito Leche, Rio Salado, and others. The Rio Puerco Resource Area riparian areas also include a number of springs and seeps.

Riparian-wetland areas in the RPFO traverse portions of public, state, tribal, and private land, and therefore not all habitats have been completely mapped and studied. Also, due to recent land acquisitions, some riparian-wetlands have not been inventoried at all. Riparian monitoring and management emphasis is based upon the degree to which that portion of the riparian area has existing use and impact, or the potential for increased use or impact. A great deal of variation can occur between riparian zones and even within (or along) the same drainage.

Table 3-17 lists mapped riparian areas in the RPFO.

Out of all inventoried/assessed riparian areas, 8 are at proper functioning condition, 11 are functioning at risk, and 4 are nonfunctional. Currently, the RPFO is actively involved in riparian restoration projects that include physical reconstruction of hydrologic flow, revegetation, exclusion of livestock, and more. These projects are aimed at bringing the above riparian areas up to PFC and/or maintaining them at that level or above. The RPFO continues to acquire new critical riparian areas through land exchanges with the state and private groups or individuals, and also manages riparian values through partnerships with federal, state, and private cooperators.

Up to 90 percent of natural riparian communities in New Mexico have been lost or significantly altered due to human activity, resulting in loss of habitat for wildlife, increased/decreased streamflows, increased erosion, and altered stream channel configurations. More recently, streams and rivers have been impounded for flood control, irrigation water storage, agriculture, and municipal uses. Floodplains have been constricted and wetland areas drained for development. The resulting hydrologic changes (drop in water tables, diminished flow rates, lack of overbank flooding, and reduced in-channel scouring have decreased natural regeneration of native vegetation and allowed for uncontrolled growth of exotic, nonnative vegetation. Invasive species, especially Russian olive and saltcedar, are outcompeting native cottonwoods and willows.

1729 **Table 3-17: Riparian Areas in the Rio Puerco Field Office**

Riparian/Wetland Area	Area (Acres)	Length (Feet)	PFC Status
Arroyo Chico—Azabache	380	43,200	FAR—D (1998)
Arroyo Chico—Charlotte's Well	15	3,300	NF (2014)
Arroyo Chico—Chico Crossing	206	50,000	NF (1998)
Azabache Flowing Artesian Well	16	-	PFC (2014)
Bluewater Canyon	25	10,800	PFC (2014)
Cabezon Community	45	10,200	FAR—NA (2000)
Cachulie	26	11,500	FAR—NA (2000)
Cebolla Canyon	91	23,300	NF (2014)
Cebolla Spring	7.2	-	PFC (2014)
Cerros Colorados	43	12,500	FAR—NA (2000)
Chamisa Losa Spring and Canyon	0.25	-	NR
Charlotte's Well	1.5	-	PFC (1998)
Coal Creek	100	18,500	FAR—U (2000)
Guadalupe Community	77	10,500	NF (FAP) (1998)
La Lena Artesian Well	0.5	-	PFC (1998)
Las Huertas Creek	-	-	NR
Long Ridge	36	7,000	NF (FAP) (2016)
Lost Valley	103	21,600	PFC (2000)
Mound Springs	50	-	FAR—NA (2016)
Oak Spring	3	-	NR
Ojo de las Yeguas	0.25	-	NR
Ojo Frio	1.5	-	PFC (2000)
Rinconada Canyon	15	3,000	FAR—(1998)
Rio Gallina	10	2,000	PFC (2014)
Rio Salado Community	143	18,000	NF (FAP) (1998)
Rio Salado Community (Jemez Valley Irrigation)	12.6	-	PFC (1998)
Rito Leche	9.6	2,800	PFC (2015)
Road Spring	0.2	-	FAR—NA (2016)
San Luis Community	22	6,000	FAR—NA (2000)
Senorito Canyon	35	9,800	PFC (2015)
Two Bridges	30	10,000	PFC (2012)
Wilson Canyon	77	12,000	PFC (2000)
Total	1,581.6	286,000 (~55 miles)	N/A

1730 Source: BLM GIS 2020
1731 PFC = Properly Functioning Condition
1732 FAR = Functional At Risk (U indicates upward trend, D indicates downward trend, NA indicates not apparent)
1733 FAP = Functioning At Potential
1734 NR = Not Rated
1735 NF = Nonfunctional
1736 N/A = Not Applicable

1737 Several activities permitted on BLM-administered land have the potential to impact riparian resources.
1738 Threats to habitat include, but are not limited to, recreation, livestock grazing, agricultural development,
1739 water diversion and impoundment, and mineral development. The two most common issues that have led
1740 to the degradation of riparian habitat in the RPFO are historic continuous grazing by livestock and/or wildlife
1741 and the replacement of native habitats by introduced vegetation, such as saltcedar and Russian olive.
1742 Improper livestock grazing practices in and around riparian areas may harm riparian habitat and the rich
1743 diversity of wildlife that thrives in these environments. Heavy (greater than 50 percent of annual growth)
1744 continuous grazing reduces water quality, changes stream flow, compacts and erodes soil, and affects native

plants and animals that live in and around riparian-wetland areas. To protect critical areas, the RPFO has limited livestock access to some riparian zones, and alternate water sources have been provided.

As of 2020, there have been 28 riparian areas that have been assessed for Proper Functioning Condition. Out of the 28 riparian areas assessed, 13 are properly functioning. Furthermore, 13 of the sites allow grazing by livestock, while 15 do not allow grazing by livestock. Out of those that were grazed, only 31 percent were rated at PFC, while 31 percent were either functioning at risk or nonfunctional. Out of those that excluded grazing via fencing structures, 60 percent were rated at PFC, while 33 percent were either functioning at risk, and 7 percent were nonfunctional.

At least 60 projects aimed at riparian restoration and enhancement have been conducted since the 1986 RMP. The majority of these projects involved riparian fencing to exclude livestock grazing. Project types included treatment of noxious weeds, cottonwood and willow pole and seed plantings, development and fencing of natural springs, construction of hydrologic structures such as retention dams, beaver reintroductions, and others.

From the data described above, there is a higher occurrence of riparian-wetland areas rated at PFC in areas protected from livestock grazing than areas unfenced from grazing. From this qualitative analysis, the trend for areas protected from livestock grazing seems to be upward. Due to a lack of regular monitoring and quantitative data from the riparian-wetland areas in the RPFO, this conclusion is based on the assumption that the increased quality of areas protected from livestock grazing is a direct effect of removal of grazing (grazing as an independent variable). Without detailed monitoring data, the BLM cannot conclude that the removal of livestock grazing has in fact been the only factor contributing to this change. However, it can reasonably be assumed for analysis purposes.

Currently, a number of noxious weeds treatments are ongoing within the Rio Puerco watershed. While the condition of riparian plant communities is important to the hydrologic function and water quality of these systems, it also contributes to the health of habitat for special status species, specifically the endangered southwest willow flycatcher. The goal of ongoing invasive weed projects is to develop and protect riparian ecosystems by controlling and removing invasive, nonnative vegetation, restoring native plant cover, and improving wildlife habitat for a variety of terrestrial and aquatic species.

BLM biologists, range conservationists, and hydrologist in the RPFO are increasing efforts to monitor riparian areas to determine if land use plans and subsequent management actions are meeting the resource objectives. This information advises managers on the effectiveness of land use and activity plans and recommends where changes in management strategies are needed. As for the current trends in riparian resource condition in the RPFO, current management practices are addressing the threats to riparian habitat and in the past 10 years have shifted management to focus on restoration and enhancement of these habitats.

The geographic location, distribution, functioning status and habitat management objectives (including those of special status species) of riparian-wetland resources are key features that guide the allocation of land uses and management decisions. There are approximately 1,600 acres of riparian area described in the 2000 Riparian and Aquatic Habitat Management Plan for the Albuquerque District Office. These areas, along with those not described in the document, represent important considerations for land management authorizations, including livestock grazing, recreation activities, mineral development, and potential sites for renewable energy and rights-of-way. The proper functioning condition assessment is a key feature in determining compliance with bureau policies, including the New Mexico Standards for Public Land Health.

3.17 Social and Economic Conditions

Commented [AA1]: The older (2017) Census data (e.g., population, housing, EJ, etc.) are in the process of being updated. Updated data will be included in preliminary PRMP/FEIS version 2 for HQ/DOI review (anticipated in January 2022).

The Planning Area is defined by its unique history, the presence of specific industries, and the diverse cultural identities of various groups and communities who reside in the region. As a steward of area resources, the BLM operates within this social context and plays a principal role in the economy amid the complex array of human concerns in the area. Public lands management decisions have direct impacts on many groups and communities. This discussion provides insight on the connections between existing social and economic conditions and the management of public lands in the Planning Area.

3.17.1 Methodology for Analysis

BLM-administered lands within the Planning Area contribute a wide range of economic values to people. For example, market goods such as minerals, timber, livestock, and recreation generate payments to local communities and some revenue for the federal treasury. For this analysis, county-level demographic and economic data are provided from publicly available data sources (i.e., Bureau of Economic Analysis [BEA] and the US Census Bureau) to present the relevant regional market data pertaining to population, housing, income, employment, and fiscal conditions. In addition, data are provided related to current economic contributions from key economic sectors related to public land use. These data provide the baseline conditions relevant to the delineation of local labor markets and support the estimates of effects on local jobs and income from changes on BLM-administered lands within the Rio Puerco RMP Planning Area.

BLM-administered lands within the Planning Area also contribute nonmarket environmental values. These are nonmonetary values held by individuals that result from experiencing the natural environment. Nonmarket values might include recreational uses of natural resources, or the existence of particular ecological conditions, such as untrammeled views, that do not involve market transactions. Nonmarket goods in the Planning Area include the existence values of cutthroat trout fishing opportunities, unique scenery, ecosystems and habitats, and outdoor recreational experiences. A qualitative description of these values is included, following direction provided in Instruction Memorandum No. 2013-131, Guidance on Estimating Nonmarket Environmental Value.

3.17.2 Socioeconomic Study Area

Social and economic impacts may extend beyond the administrative boundaries of the Rio Puerco Field Office. In recognition of this, the geographic area (Study Area) for the social and economic impact analysis is defined as the six-county area encompassing Bernalillo, Cibola, McKinley, Sandoval, Torrance, and Valencia Counties in central and northwestern New Mexico. This Study Area allows for impacts to be addressed at both the larger region and at the level of municipalities and tribal communities within the Planning Area. The Planning Area also includes tribal lands. Data are included for relevant tribal reservation and pueblo lands as well as Navajo Nation chapters. If a portion of a reservation or land grant is located in the Study Area, impacts on the entire reservation or grant are assessed in order to ensure a thorough analysis of potential socioeconomic effects.

3.17.3 Community and Social Conditions

Historical and Social Setting

The Planning Area has a complex history. Central New Mexico was home to myriad social and cultural groups long before Europeans reached the Americas, and the Planning Area has been occupied by multiple indigenous groups for thousands of years. Before Euro-American contact, archaeological records indicate that some indigenous groups in the area practiced sophisticated forms of sedentary agriculture and multiregional trade. Around 200 CE, people lived in year-round pit houses and depended intimately on the land for their food, clothing, and shelter. In the late ~~eleventh~~ 11th century, multistoried pueblos began to appear, and soon after the Athabascan people (now called Apaches and Navajos) began to settle in the area. Lands now administered by the BLM continue to support ancient social and cultural traditions.

Starting in the late 1500s, Spanish settlers entered the area, establishing agricultural communities. Native Americans, including Navajo, Ute, and Apache Indians, adopted some of the Spanish practices, such as sheep and cattle herding. Wool and yarn blanket and rug production, and turquoise and silver jewelry making were also of importance. European settlement of the area that is now the Rio Puerco Planning Area began shortly after the Coronado expedition entered the middle Rio Grande Valley in 1540. The earliest route of Spanish settlement in New Mexico, El Camino Real de Tierra Adentro (an NHT), passes through the Planning Area. The Spanish authorities awarded land grants to individuals or groups of settlers, who built villages, dug irrigation ditches, and cleared fields for planting. After Mexico separated from Spain in the Revolution of 1821, the new Mexican government took over jurisdiction and ownership of all Spanish lands but continued to honor Spanish land grants.

Following the Treaty of Guadalupe Hidalgo and the annexation of what is now Arizona and New Mexico by the United States in 1848, the majority of the Spanish and Mexican land grants in the annexed areas became the common property of the descendants of the original grantees. Lands outside these specific land grants gradually became controlled by the BLM and the Forest Service. In addition, in the late 1800s, the US government created reservation areas for the Navajo, Ute, and Apache Indians. On reservations, there is typically no individual landownership; all land is owned in common and is administered by the tribal government.

Much of the tribal land in the Planning Area was subdivided into small parcels or allotments after the establishment of reservations. This was done under the authority of the Dawes Act of 1887, also known as the Allotment Act. The Dawes Act allowed the federal government to grant reservation lands formerly held in common for a tribe to Indian individuals, and to reclassify lands as "undeveloped" and auction off those undeveloped lands to non-Indians. The sale created surplus lands from former reservation lands. Granting ownership of these lands to developers resulted in a chaotic landownership pattern in some areas of the western United States. As a result of this allotment period, portions of the Planning Area today reflect a checkerboard pattern, where tribal lands are intermingled with fee lands (owned by both Native American and nonnative American people) and federal and state lands under various jurisdictions.

Land grants by the Spanish and Mexican governments were used as a means to expand areas of settlement and control along the frontier. Most land grants were made to individuals and groups who agreed to establish farming settlements and haciendas in areas previously unsettled by Euro-Americans. As New Mexico grew, its expansion outward to the Rio Grande Valley and into the frontier was made possible through this system of land grants, which awarded tracts of land to individuals and groups who agreed to establish settlements and cultivate land along the frontier. The two major types of land grants were private grants made to individuals and communal grants made to groups of individuals for the purpose of establishing settlements. Communal land grants were also made to Pueblos for the lands they inhabited. In 1854, the US government established the office of the Surveyor General of New Mexico to ascertain "the origin, nature, character, and extent to all claims to lands under the laws, usages, and customs of Spain and Mexico." The Surveyor General considered approximately 180 claims (excluding Pueblo grants) and confirmed 46 of these grants. However, the Surveyor General was largely unsuccessful in confirming the validity of New Mexican land grants.

In 1891, the US government established the Court of Private Land Claims to adjudicate land grant claims in New Mexico and other states. Over its 13-year history the Court considered 282 claims to land grants in New Mexico and confirmed 82 of these grants. Throughout the ~~twentieth~~ 20th century, legal battles over land grant claims continued in New Mexico's district courts (New Mexico Commission of Public Records 2019b). Several families in New Mexico have remained on the same land originally granted to their ancestors for close to 400 years. The connection to the land felt among communities who participated in frontier settlement and defense made possible by these Spanish settlements is similar to the connection that Native American tribal members feel to the land. Torrez (1998) explains the importance of one such community,

the genizaro, who were comprised of "Indians from various tribes, who had, for a variety of reasons, lost their tribal identity …[many of whom] were captive children who had been raised in Spanish households and been baptized, had assumed Spanish surnames, and had eventually become Hispanicized. Genizaro settlements such as those established in Abiquiu and Tomé areas bore a significant portion of New Mexico's frontier defense well into the 19th century." Subsequent American colonization, which resulted in many of the land grants not being recognized, has led to the displacement of some communities who had historically occupied the land and used it for their livelihoods. Landownership conflicts continue to this day within the Planning Area. Land grant heirs and Native tribes continue to dispute ownership of several areas administered by the RPFO.

The predecessor agency of the BLM, the General Land Office, was charged with disposing of, or privatizing, unsettled land to foster westward expansion. A significant tool in accomplishing this was the Homestead Act of 1862, which passed only after the southern states seceded from the Union. While homesteading by Anglos within the Planning Area began soon after the passage of the act, many early homesteads were patented by local Hispanic families, who often homesteaded on adjacent parcels. After New Mexico acquired statehood in 1912 and the Stock-Raising Homestead Act was passed in 1916, homesteading by Anglo settlers increased, and peaked in the Planning Area in the 1930s. Many of these homesteaders left these lands with the start of World War II. A combination of a return to more arid conditions, falling cattle prices after World War II, institution of more sustainable grazing practices, and development of a feedlot cattle business led to smaller herds on the ranges and abandonment of many small ranching homesteads established under the Homestead Act and the Stock-Raising Homestead Act. When many of these lands returned to the public domain under the Bankhead-Jones Farm Tenant Act, families nonetheless retained a social and cultural connection to the land. In some cases, homesteaders and their descendants visit their former homesteads and the graves of their relatives who passed while homesteading.

In 1928, oil was discovered in New Mexico, which began a boom in oil and gas development. Fossil fuels development continues to represent a significant component of the local economy, and the region has experienced numerous boom and bust cycles of development since the 1940s. Production levels depend on various factors affecting output, including prices, well capacity, and both national and international demand. Advances in hydraulic fracturing technology in the 1950s and 1960s improved recovery techniques. The next major period of fossil fuels development occurred in the mid- to late 1970s. New Mexico's fossil fuel energy industry, led by oil development, made a strong recovery after the recession.

Historical trends in population and ethnicity change in the six-county Socioeconomic Study Area are depicted in **Table 3-18** below. Overall, these trends indicate a growing and diversifying population, with the largest rates of growth over the 17-year period occurring in Bernalillo and Sandoval Counties.

Table 3-18: Population and Ethnicity in the Six-County Socioeconomic Study Area

		Total Population			2000–2010 Percentage Change	2010–2017 Percentage Change	2000–2017 Percentage Change
		2000	2010	2017			
County	Bernalillo	556,678	646,881	674,855	16.2%	4.3%	21.2%
	Cibola	25,595	27,179	27,049	6.2%	-0.5%	5.7%
	McKinley	74,798	70,663	72,849	-5.5%	3.1%	-2.6%
	Sandoval	89,908	124,263	138,815	38.2%	11.7%	54.4%
	Torrance	16,911	16,467	15,534	-2.6%	-5.7%	-8.1%
	Valencia	66,152	74,554	75,845	12.7%	1.7%	14.7%
Study Area	6 Counties	830,042	960,007	1,004,947	15.7%	4.7%	21.1%
State	New Mexico	1,819,046	2,013,122	2,084,828	10.7%	3.6%	14.6%

		Percentage of Population White Alone (Non-Hispanic/Latino)		2010–2017 Percentage Change
		2010	2017	
County	Bernalillo	42.6%	39.5%	-3.1%
	Cibola	22.0%	20.0%	-2.0%
	McKinley	10.6%	9.1%	-1.5%
	Sandoval	48.1%	44.6%	-3.5%
	Torrance	56.5%	52.2%	-4.3%
	Valencia	36.6%	33.6%	-3.0%
Study Area	6 Counties	40.2%	37.2%	-3.0%
State	New Mexico	41.3%	38.2%	-3.1%

Sources: US Census Bureau 2000, 2010 (2006–2010 ACS), 2017 (2013–2017 ACS)
Note: US Census data on racial origin of non-Hispanic/Latino, white alone, were not available for year 2000.

From 2000 to 2017, the population increased by 21.1 percent in the Study Area, attributed primarily to large rates of growth in Bernalillo, Sandoval, and Valencia Counties between 2000 and 2010. However, during the 7-year time span from 2010 to 2017, population growth slowed to a more gradual 4.7 percent in the Study Area overall as the rate of population growth in these counties decreased. With regard to ethnicity, the proportion of residents living in the Study Area who identified as "White Alone (Not Hispanic or Latino)" decreased over the 2010 to 2017 time period, reflecting larger demographic changes occurring at the state level.

Communities of Place

Counties and Municipalities

The Rio Puerco Field Office jurisdiction includes multiple counties and municipalities, including the largest metropolitan area in the state of New Mexico. Counties and municipalities include the six Study Area counties of Bernalillo, Cibola, McKinley, Sandoval, Torrance, and Valencia, and the municipalities of Albuquerque, Belen, Bernalillo, Estancia, Grants, Moriarty, and Rio Rancho. These are described in greater detail below.

Bernalillo County—Bernalillo County was also one of the original seven counties recognized by the New Mexico Territorial Legislature. It is the largest county in New Mexico, with a population of 674,855 in 2017 (US Census Bureau 2017), and benefits from the economic and social diversity that comes with the Albuquerque metropolitan area. This county also includes the communities of Los Ranchos de Albuquerque, Tijeras, and a number of unincorporated communities.

City of Albuquerque—Albuquerque, established in 1706, is the center of commercial and cultural activity in Bernalillo County. With a population of 556,718 in 2017 (US Census Bureau 2017), Albuquerque accounts for over 82 percent of the population of the county. Albuquerque is host to some of the nation's leading high-tech research facilities, including Sandia National Laboratories, Intel, and the University of New Mexico.

Cibola County—Cibola County borders McKinley County to the north, Bernalillo County to the east, Catron County to the south, and Apache County, Arizona, to the west. It encompasses approximately 4,542 square miles and contained a population of 27,049 in 2017 (US Census Bureau 2017). Cibola County was created in 1981 from the western portion of Valencia County and is the last county to form in New Mexico. Milling, tourism, and outdoor recreation are considered important to the area economy.

City of Grants—Grants is located approximately 78 miles west of Albuquerque and is the county seat of Cibola County with a population of 9,094 in 2017. Grants began as a railroad camp in the 1880s and was a part of the existing colonial New Mexican settlement of Los Alamitos, which grew along the tracks of the

Atlantic and Pacific Railroad. The town originally prospered from railroad logging in the nearby Zuni Mountains, serving as a focal point for regional railways (City of Grants 2019). In the 1950s, uranium mining took off in the Grants area and continued until prices fell in the 1980s.

McKinley County—McKinley County was established in 1899 and contains portions of the Navajo reservation and other tribal lands. The population of the county was 72,849 in 2017 (US Census Bureau 2017). Prevalent industries include lumber, oil refining, coal mining, and uranium production. Uranium, vanadium, crushed stone, and perlite are also produced and are considered economically important, as is tourism. Local attractions include Navajo and Zuni art and cultural opportunities, Red Rock State Park, and the Chuska and Zuni Mountains.

Sandoval County—The area consisting of modern-day Sandoval County was included in one of two *partidos*, or districts, created in the New Mexico Territory. Sandoval County was created in 1903, 9 years before New Mexico's statehood, from part of Santa Ana County (Sandoval County 2019). In 2017, the population of the county was 138,815 (US Census Bureau 2017). Sandoval County encompasses 3,714 square miles and includes the incorporated municipalities of Bernalillo, Cuba, Corrales, Jemez Springs, Rio Rancho, and San Ysidro; numerous unincorporated communities; all or portions of seven Indian pueblos; and all or portions of six tribal entities/lands (Sandoval County 2019). Pueblos within the county include Cochiti, Jemez, Sandia, San Felipe, Santa Ana, Santo Domingo, and Zia, as well as portions of the Navajo and Jicarilla Apache Nations. The county contains numerous sites of cultural importance depicting Puebloan, Spanish, Mexican, and Anglo histories. This rich cultural history attracts many visitors to sites such as Bandelier National Monument, Coronado and Jemez state monuments, Casa San Ysidro, the DeLavy House, and area pueblos. While tourism contributes considerably to the county economy, semiconductor manufacturing and construction are also considered economically important.

City of Rio Rancho—Rio Rancho, located in Sandoval County, sits at an elevation of approximately 5,290 feet and is the third-largest city in New Mexico (Rio Rancho 2019). In 2017, the population of Rio Rancho was 93,317 (US Census Bureau 2017).

Town of Bernalillo—The town of Bernalillo, located in Sandoval County, is part of the Albuquerque Metropolitan Statistical Area and had a population of 8,991 in 2017 (US Census Bureau 2017). Bernalillo is set at the northwest slope of the Sandia Mountains along the banks of the Rio Grande and is located between two pueblos, Sandia Pueblo on the south and Santa Ana Pueblo on the north, creating limits to expansion beyond the current municipal boundary. Bernalillo has a long history of human occupation, with several early pueblo sites and Spanish colonial sites found in the town. The town progressed from a string of haciendas along the river in the 1600s to a commercial center of trade among the pueblos and the Mexican settlers in the 1800s (Town of Bernalillo 2019).

Torrance County—Torrance County was created in 1903 from parts of Lincoln, San Miguel, Socorro, Santa Fe, and Valencia Counties. The county population in 2017 was 15,534 (US Census Bureau 2017). The county is located east of the Manzano and Sandia Mountains and includes four Mexican land grants. It is one of the state's top 10 agricultural producers. While farming and ranching are traditional livelihoods, the economic base has changed over the years with population increases. About 95 percent of residents live in the western half of the county, and a growing number of Torrance County residents commute to Albuquerque or Santa Fe for jobs (Mid-Region Council of Governments 2019a).

Town of Estancia—The town of Estancia is the seat of Torrance County. It is located in the Estancia Basin, a level area surrounded by mountains and highlands. The area has been a cattle and sheep ranching region since the ~~nineteenth~~ 19th century. The town began with the arrival of the railroad around 1902. In the mid-~~twentieth~~ 20th century beans were the principal crop (Mid-Region Council of Governments 2019b). The population of Estancia was 1,657 in 2017 (US Census Bureau 2017).

City of Moriarty—Moriarty is the largest city in Torrance County and has been growing steadily since the early 1970s, largely the result of spillover from the Albuquerque metropolitan area. The community is also a popular stopping place for travelers and truckers on Interstate 40 (Mid-Region Council of Governments 2019c). The population of Moriarty was 2,276 in 2017 (US Census Bureau 2017).

Valencia County—Valencia County was one of the original seven counties that made up the New Mexico Territory in 1852. The county, traditionally agricultural, has become increasingly diversified; it now draws industries needing room to expand and attracted by low-cost industrial sites, easy transportation access, an available workforce, and affordable housing. The county includes Tomé, site of the University of New Mexico-Valencia campus; Peralta; Isleta Pueblo, one of the state's largest pueblos; and the state's newest incorporated community, Rio Communities. Many residents of the county, especially those located in northern Valencia County, commute to jobs in Albuquerque (Mid-Region Council of Governments 2019d). The county population in 2017 was 75,845 (US Census Bureau 2017).

City of Belen—Belen is located in the Rio Grande Valley beside the Manzano Mountains in Valencia County. The city is a major transportation hub for crew changes and equipment maintenance for the Burlington Northern and Santa Fe Railway. More than 120 trains pass through the town on a daily basis. Belen is also a trade center for the area; about one-third of jobs are in retail. Government accounts for about 20 percent of all jobs, mostly with Belen Public Schools. Agriculture remains key to the area, but acreage is declining in the face of urban development (Mid-Region Council of Governments 2019e). The population of Belen was 7,125 in 2017 (US Census Bureau 2017).

Tribal Reservations

The Planning Area contains Native American communities occupying reservation lands and off-reservation trust lands managed by tribal governments, including the Zuni tribe and Navajo and Jicarilla Apache Nations. A total of 13 individual Navajo Nation Chapters are located within the Planning Area. These are as follows: Baca, Bread Springs, Canoncito, Chichiltah, Church Rock, Counselor, Manuelito, Nahata Dziil, Ojo Encino, Ramah, Red Rock, Torreon, and Tsayatoh. Numerous Native American pueblos also occupy lands within the Planning Area. These include the following: Acoma Pueblo, Isleta Pueblo, Jemez Pueblo, Laguna Pueblo, Pueblo de Cochiti, San Felipe Pueblo, Sandia Pueblo, Santa Ana Pueblo, Santa Clara Pueblo, Santo Domingo Pueblo, and Zia Pueblo.

Communities of Interest

In addition to communities of place, as described above, there are multiple groups for whom management and use of public lands is of particular interest. These include recreational visitors, Native American tribal members, livestock producers, land grant communities, groups interested in resource conservation, and groups interested in resource development. Together, these groups comprise communities of interest in public lands management in the Planning Area.

Recreational Visitors

Recreational visitors to the Planning Area include residents of the region, those traveling to the area for regionally and nationally recognized recreational events, and those attracted by the warmer, dryer conditions of the Planning Area. Recreational outfitters in the area include recreational guides as well as organizers of special events that occur on an annual basis in the Planning Area. Outfitters and vendors are particularly concerned with the management directing motorized and mechanized use, the issuance of special recreation permits, and access to area roads and trails.

Native American Tribal Members

The Planning Area contains reservation land managed by tribal governments, as described above. Native Americans have a unique relationship with public lands based on traditional uses and cultural values. Tribal groups consider multiple uses of lands in the Planning Area as being essential for their survival. These uses

include grazing, fuelwood, wild piñon nut and herb gathering, and hunting of both small and large game. Related to these land uses are tribal concerns about immediate access to water and other resources. The value tribal groups place on public lands includes extractive resource use as well as uses pertaining to religious, spiritual, and traditional aspects of tribal culture, all of which may be affected by BLM resource management decisions. These values are defined solely by the concerned tribes and are integral to tribal history, sense of place, and community identity.

Livestock Producers

Ranching and agriculture are a part of the Planning Area's history, culture, and economy. Ranchers face such challenges as fluctuating livestock prices, increasing equipment and operating costs, fluctuating water availability, and changing federal regulations. Additional income sources are often necessary to continue ranching, and ranchers or their family members may also work in other sectors of the economy. Agriculture and livestock grazing are historical uses of public lands in some parts of the Planning Area, and livestock producers have become accustomed to oil and gas development. The exploratory phase of oil extraction induces changes to the social setting and way of life for livestock producers, including increased traffic, more roads, and new accessibility to once inaccessible lands.

Land Grant Communities

As described above, American colonization subsequent to Spanish settlement has resulted in many of the original Spanish land grants not being recognized. As a consequence, displacement has occurred among some communities who had historically occupied the land and used it for their livelihoods. Landownership conflicts continue to this day in the Planning Area as land grant heirs claim ownership of several parcels administered by the RPFO. These communities value the connection to specific lands, which have strong historical linkages to their ancestral heritage. Of principal concern among these communities are ownership rights among descendants of those who shouldered the original burden of frontier settlement and defense.

Groups Interested in Resource Conservation

Various individuals and groups at the local, regional, and national levels are interested in how the BLM administers public lands. Many of their concerns are in regard to oil and gas development and impacts on water and air quality, wildlife, and visual quality. They value public lands for open space, wildlife, recreation, and scenic qualities, among other aspects. Nonmarket benefits include ecosystems services such as clean air and water, as well as the values of open space for the local community.

Groups Interested in Resource Development

Due to the long history of fossil fuels development in the Planning Area, sectors of the local economy are tied to fossil fuels development on public lands. Interested parties include local, regional, and national energy development companies as well as local retailers that directly support construction, drilling, and operations for the industry. In addition, local retailers that offer lodging, food, and other services to oil and gas employees have an interest in management decisions affecting the level of permitted development.

3.17.4 Demographics and Economic Conditions

Population

Albuquerque is the largest city in New Mexico, and it is the county seat of Bernalillo County. Albuquerque is the primary hub for most tourism- and recreation-related economic activity for New Mexico. There is a marked difference between economic and social activity within the Albuquerque metropolitan area and adjacent nonurbanized parts of the region. An analysis that focuses on county-level data would overlook these essential differences. It must be recognized that most population and economic growth and change for both Sandoval and Bernalillo Counties can be attributed to activity in the Albuquerque metropolitan area. Such an analysis would not accurately represent the nature of economic activity found in both urbanized and nonurbanized areas of the county.

Similarly, the economic character of Sandoval County is primarily buoyed by the large population and economic activity occurring in the growing city of Rio Rancho, located near the Albuquerque metropolitan area, in the southeastern corner of the county. In order to balance the outsized influence of these metropolitan areas on county-level data, the following discussion reports additional data and information, where relevant, to differentiate socioeconomic conditions more effectively within and outside these major urban centers. Data for areas outside Rio Rancho in Sandoval County and Albuquerque in Bernalillo County were calculated by subtracting the data for the cities from the data for the counties.

Over the 17-year period from 2000 to 2017, population in the six-county Study Area experienced an accelerating growth, with a 4.7 percent increase occurring between 2000 and 2010 and a 21.1 percent increase during the next 7 years. This rate of growth closely matches that of the state of New Mexico over the same period, although population growth in the Study Area has been slightly higher (21.1 percent compared with 14.6 percent at the state level). Cities experiencing the highest rate of growth include Rio Rancho (which grew by 80.3 percent between 2000 and 2017). Population growth has been unequally distributed throughout the Study Area, however, with the counties of McKinley and Torrance experiencing slow growth marked by a negative population change (of -2.6 and -8.1 percent, respectively). Outside the city of Albuquerque, population in Bernalillo County decreased by 6.5 percent while the city's population increased by over 21 percent between 2000 and 2010. However, over the next 7 years both the city and county population increased, with most population growth (16.9 percent) occurring in the county, compared with only 2 percent in the city. Similarly, outside the city of Rio Rancho, population in Sandoval County decreased by 3.7 percent while the city's population increased by over 69 percent between 2000 and 2010. However, over the next 7 years both the city and county population increased, with most population growth (23.8 percent) occurring in the county, compared with only 6.6 percent in the city (**Table 3-19**).

Table 3-19: Population Characteristics (2010 to 2017)

Location	2000	2010	2000-2010 Percent Change	2017	2010–2017 Percent Change	2000–2017 Percent Change
Counties						
Bernalillo County	556,678	646,881	16.2%	674,855	4.3%	21.2%
Bernalillo County (excl. Albuquerque)	108,071	101,029	-6.5%	118,137	16.9%	9.3%
City of Albuquerque	448,607	545,852	21.7%	556,718	2.0%	24.1%
Cibola County	25,595	27,179	6.2%	27,049	-0.5%	5.7%
City of Grants	8,806	9,182	4.3%	9,094	-1.0%	3.3%
McKinley County	74,798	70,663	-5.5%	72,849	3.1%	-2.6%
Sandoval County	89,908	124,263	38.2%	138,815	11.7%	54.4%
Sandoval County (excl. Rio Rancho)	38,143	36,742	-3.7%	45,498	23.8%	19.3%
City of Rio Rancho	51,765	87,521	69.1%	93,317	6.6%	80.3%
Town of Bernalillo	6,611	8,320	25.9%	8,991	8.1%	36.0%
Torrance County	16,911	16,467	-2.6%	15,534	-5.7%	-8.1%
Town of Estancia	1,584	1,655	4.5%	1,657	0.1%	4.6%
City of Moriarty	1,765	1,910	8.2%	2,276	19.2%	29.0%
Valencia County	66,152	74,554	12.7%	75,845	1.7%	14.7%
City of Belen	6,901	7,269	5.3%	7,125	-2.0%	3.2%
State of New Mexico	1,819,046	2,013,122	10.7%	2,084,828	3.6%	14.6%
Study Area	830,042	960,007	15.7%	1,004,947	4.7%	21.1%

Location	2000	2010	2000-2010 Percent Change	2017	2010–2017 Percent Change	2000–2017 Percent Change
Native American Communities						
Pueblos						
Acoma Pueblo	2,802	3,011	7.5%	2,974	-1.2%	6.1%
Isleta Pueblo	2,201	2,489	13.1%	2,605	4.7%	18.4%
Jemez Pueblo	1,953	1,788	-8.4%	2,022	13.1%	3.5%
Laguna Pueblo	4,330	4,459	3.0%	4,146	-7.0%	-4.2%
Pueblo de Cochiti	507	528	4.1%	579	9.7%	14.2%
San Felipe Pueblo	2,080	2,404	15.6%	2,786	15.9%	33.9%
Sandia Pueblo	344	369	7.3%	394	6.8%	14.5%
Santa Ana Pueblo	479	610	27.3%	675	10.7%	40.9%
Santa Clara Pueblo	980	1,018	3.9%	967	-5.0%	-1.3%
Santo Domingo Pueblo	2,550	2,456	-3.7%	2,596	5.7%	1.8%
Zia Pueblo	646	737	14.1%	994	34.9%	53.9%
Tribal Nations/Reservations						
Jicarilla Apache Nation	N/A	3,228	N/A	3,183	-1.4%	N/A
Navajo Nation	N/A	10,107	N/A	10,296	1.9%	N/A
Zuni	6,367	6,302	-1.0%	7,532	19.5%	18.3%
Navajo Chapters						
Baca				813		
Bread Springs				856		
Canoncito				1,702		
Chichiltah				1,524		
Church Rock				2,637		
Counselor				815		
Lupton				933		
Manuelito				272		
Nahata Dziil				2,130		
Ojo Encino				537		
Ramah				1,429		
Red Rock				1,974		
Tsayatoh				631		

Sources: US Census Bureau 2000, 2010 (2006–2010 ACS), 2017 (2013–2017 ACS)

Native American communities experiencing the highest rate of growth include Santa Ana and Zia Pueblos (which experienced 40.9 percent and 53.9 percent increases in population, respectively, over the 17-year period), while Laguna Pueblo and Santa Clara Pueblo have both experienced population losses. Overall, most Native American communities experienced modest population growth over the 17-year period (**Table 3-19**).

Housing

Between 2010 and 2017, housing in the Socioeconomic Study Area grew at roughly the same rate (2.7 percent) as the state (2.9 percent). Housing units in Bernalillo County grew by 5.8 percent, with most of this growth in the area outside the city of Albuquerque. By contrast, growth in housing in the city of Rio Rancho (6.1 percent) outpaced that of greater Sandoval County (4.4 percent) over the same period. The highest rate of growth in housing occurred in the city of Moriarty, which added 17.4 percent more housing units

from 2010 to 2017. The lowest rate of growth occurred in the city of Belen, which lost 3 percent of its housing stock over the 7-year period. Vacancy rates were highest in Torrance County (29.9 percent) and lowest in the city of Rio Rancho (7.4 percent). Among Native American communities, Acoma Pueblo and Santa Clara Pueblo had the highest vacancy rates in the Planning Area, with 33.2 and 35.9 percent, respectively. Santa Ana Pueblo exhibited a vacancy rate of 7.3 percent, which was notably lower than that of the state (17.0 percent; **Table 3-20**).

Table 3-20: Study Area Household Characteristics (2010 to 2017 Comparison)

Location	Average Household Size		Total Housing Units			Occupied Housing Units		Vacant Housing Units			
	2010	2017	2010	2017	% Change 2010–2017	2010	2017	2010	% Vacant 2010	2017	% Vacant 2017
Counties											
Bernalillo County	2.45	2.61	284,234	291,099	2.4	266,000	263,551	18,234	6.4	27,548	9.5
Bernalillo County (excl. Albuquerque)	N/A	N/A	45,068	47,697	5.8	41,670	42,432	3,398	7.5	5,265	11.0
City of Albuquerque	2.40	2.6	239,166	243,402	1.8	224,330	221,119	14,836	6.2	22,283	9.2
Cibola County	2.79	2.70	11,101	11,306	1.8	8,860	9,068	2,241	20.2	2,238	19.8
City of Grants	2.54	2.21	3,804	3,739	-1.7	3,327	3,357	477	12.5	382	10.2
McKinley County	3.22	3.76	25,813	26,163	1.4	21,968	19,764	3,845	14.9	6,399	24.5
Sandoval County	2.75	2.82	52,287	55,163	5.5	47,602	49,265	4,685	9.0	5,898	10.7
Sandoval County (excl. Rio Rancho)	N/A	N/A	18,323	19,136	4.4	15,710	15,893	2,613	14.3	3,243	16.9
City of Rio Rancho	2.74	2.79	33,964	36,027	6.1	31,892	33,372	2,072	6.1	2,655	7.4
Town of Bernalillo	2.63	2.58	3,207	3,706	15.6	2,952	3,306	255	8.0	400	10.8
Torrance County	2.52	2.47	7,798	7,990	2.5	6,264	5,598	1,534	19.7	2,392	29.9
Town of Estancia	2.55	2.32	492	555	12.8	410	430	82	16.7	125	22.5
City of Moriarty	2.55	2.62	892	1,047	17.4	750	822	142	15.9	225	21.5
Valencia County	2.73	2.74	30,085	30,894	2.7	27,500	26,985	2,585	8.6	3,909	12.7
City of Belen	2.48	2.63	3,346	3,247	-3.0	2,887	2,709	459	13.7	538	16.6
State of New Mexico	2.60	2.69	901,388	927,790	2.9	791,395	770,435	109,993	12.2	157,355	17.0
Study Area	2.74	2.85	411,318	422,615	2.7	378,194	374,231	33,124	8.1	48,384	11.4
Native American Communities											
Pueblos											
Acoma Pueblo	3.88	3.99	1,167	1,110	-4.9	803	742	364	31.2	368	33.2
Isleta Pueblo	2.74	2.85	1,023	1,152	12.6	910	922	113	11.0	230	20.0
Jemez Pueblo	3.85	4.6	510	495	-2.9	464	447	46	9.0	48	9.7
Laguna Pueblo	3.26	3.2	1,572	1,480	-5.9	1,340	1,236	232	14.8	244	16.5
Pueblo de Cochiti	3.36	3.68	178	188	5.6	157	159	21	11.8	29	15.4
San Felipe Pueblo	5.59	6.02	460	520	13.0	430	464	30	6.5	56	10.8
Sandia Pueblo	2.82	3.1	143	143	0.0	131	132	12	8.4	11	7.7
Santa Ana Pueblo	3.72	3.77	185	191	3.2	164	177	21	11.4	14	7.3
Santa Clara Pueblo	2.64	3.12	385	462	20.0	385	296	65	16.9	166	35.9
Santo Domingo Pueblo	5.27	5.97	501	504	0.6	466	442	35	7.0	62	12.3
Zia Pueblo	4.05	4.73	201	242	20.4	182	218	19	9.5	24	9.9

Location	Average Household Size		Total Housing Units			Occupied Housing Units		Vacant Housing Units			
	2010	2017	2010	2017	% Change 2010–2017	2010	2017	2010	% Vacant 2010	2017	% Vacant 2017
Tribal Nations/Reservations											
Jicarilla Apache Nation	3.11	4.03	1,161	1048	-9.7	1,019	771	142	12.2	277	26.4
Navajo Nation	3.47	3.99	3,589	3,808	6.1	2,905	2,589	684	19.1	1,219	32.0
Zuni	4.07	5.15	1,672	1,749	4.6	1,547	1,483	125	7.5	266	15.2
Navajo Chapters											
Baca		4.46		279			188			91	32.6
Bread Springs		3.93		291			220			71	24.4
Canoncito		3.74		559			450			109	19.5
Chichiltah		3.77		633			420			213	33.6
Church Rock		3.98		861			642			219	25.4
Counselor		3.43		335			243			92	27.5
Lupton		3.64		390			260			130	33.3
Manuelito		2.92		127			92			35	27.6
Nahata Dziil		3.92		627			507			120	19.1
Ojo Encino		3.24		254			152			102	40.2
Ramah		2.84		635			458			177	27.9
Red Rock		3.97		684			502			182	26.6
Tsayatoh		3.63		277			173			104	37.5

Sources: US Census Bureau 2010, 2017 (2013–2017 ACS)

Income Distribution and Poverty

Within the Study Area, personal income was highest in Bernalillo County and lowest in Torrance County. Labor income totaled over $23 billion in the Study Area, averaging nearly $3 billion for each Study Area county. Sandoval County had the highest percentage of labor income as a share of total personal income (64.4 percent). By comparison, the Study Area had 58.9 percent of labor income as a share of total personal income, which is higher compared with the state percentage of 56.7 percent. Nonlabor income as a percentage of total income ranged from 35.6 percent to 53.7 percent among Study Area counties, compared with 43.3 percent at the state level. For the Study Area, nonlabor income as a percentage of total income was 41.1 percent (**Table 3-21**).

Employment

The Study Area exhibited slightly lower labor force participation (54.3 percent) when compared with the state (58.5 percent). Labor force participation within the Study Area in 2017 was highest in the city of Albuquerque, at 64.1 percent, and lowest in the town of Estancia, which was 23.0 percent. Both Albuquerque and Rio Rancho had higher labor force participation rates than their county equivalents, although Bernalillo and Sandoval Counties exhibited higher employment than the state of New Mexico employment rate of 53.5 percent. Estancia had the highest rate of unemployment in the Study Area. While many Study Area counties and communities exhibited higher rates of unemployment when compared with the state, unemployment was lower than the state unemployment rate in Albuquerque, Bernalillo County, Rio Rancho, Santa Clara and Jemez Pueblos and the city of Moriarty (**Table 3-22**).

In 2018, the unemployment rate in Study Area counties was lowest in Bernalillo County (4.5 percent) and highest in Torrance County (7.6 percent). By comparison, unemployment stood at 4.9 percent in the state of New Mexico and 4.0 percent in the US overall during the same year (**Table 3-23**).

2145 **Table 3-21: Study Area Labor and Nonlabor Income (2017)**

Location	Personal Income Total (Thousands of Dollars)	Labor Income (Net Earnings)		Nonlabor Income (Dividends, Interest, Rent, Personal Transfer Receipts)	
		Thousands of Dollars	Percentage of Personal Income Total	Thousands of Dollars	Percentage of Personal Income Total
Counties					
Bernalillo County (includes Albuquerque)	28,550,658	16,942,740	59.3%	11,607,918	40.7%
Cibola County	741,683	362,682	48.9%	379,001	51.1%
McKinley County (includes Rio Rancho)	1,947,383	967,321	49.7%	980,062	50.3%
Sandoval County	5,756,717	3,704,944	64.4%	2,051,773	35.6%
Torrance County	452,657	209,579	46.3%	243,078	53.7%
Valencia County	2,448,624	1,322,741	54.0%	1,125,883	46.0%
State of New Mexico	83,127,258	47,159,039	56.7%	35,968,219	43.3%
Study Area	39,897,722	23,510,007	58.9%	16,387,715	41.1%

2146 Source: US Bureau of Economic Analysis 2016 (Table CA5N)
2147 Notes:
2148 All state and local area dollar estimates are in 2017 dollars.
2149 Nonlabor income and labor earnings may not add to total personal income because of adjustments made by the BEA analysis to
2150 account for contributions for Social Security, cross-county commuting, and other factors.
2151 Labor and nonlabor personal income data are not available for tribal nations or Navajo Nation chapters.

2152 **Table 3-22: Study Area Employment Status 2017[1] (Population 16 Years and Over)**

Location	Total Population (16 Years and Over)	Labor Force Participation Rate (Percent)	Labor Force Employed[2] (Percent)	Unemployment Rate[3] (Percent)
Counties				
Bernalillo County	539,287	62.8	58.2	6.7
City of Albuquerque	442,560	64.1	59.7	6.5
Cibola County	21,252	53.8	45.2	16.0
City of Grants	7,019	52.9	46.5	12.1
McKinley County	53,706	51.5	43.2	16.1
Sandoval County	108,945	59.6	54.7	8.0
City of Rio Rancho	72,648	63.2	58.4	7.2
Town of Bernalillo	7,461	48.4	43.4	10.4
Torrance County	12,636	45.7	42.1	7.8
Town of Estancia	1,440	23.0	15.8	31.1
City of Moriarty	1,641	50.2	47.7	5.1
Valencia County	59,753	52.6	47.7	9.1
City of Belen	5,516	47.8	41.5	13.2
State of New Mexico	1,643,708	58.5	53.5	7.7
Study Area	795,579	54.3	48.5	10.6
Native American Communities				
Pueblos				
Acoma Pueblo	2,273	60.2	47.8	20.7
Isleta Pueblo	2,122	58.3	49.3	15.4
Jemez Pueblo	1,512	53	49.7	6.4
Laguna Pueblo	3,348	60.2	45.9	23.7
Pueblo de Cochiti	431	55.5	49.9	10.0
San Felipe Pueblo	1,912	51.2	40.9	20.1

Location	Total Population (16 Years and Over)	Labor Force Participation Rate (Percent)	Labor Force Employed[2] (Percent)	Unemployment Rate[3] (Percent)
Sandia Pueblo	285	59.6	53.7	10.0
Santa Ana Pueblo	532	59.4	51.7	13.0
Santa Clara Pueblo	729	50.3	47.3	6.0
Santo Domingo Pueblo	1,964	41.3	37.8	8.4
Zia Pueblo	673	67.3	51.1	24.1
Tribal Nations/Reservations				
Jicarilla Apache Nation	2,091	61.6	50.9	17.4
Navajo Nation	7,662	38.5	32.7	15.1
Zuni	5,946	60.6	48.4	20.1
Navajo Chapters				
Baca	598	52.7	39.0	13.5
Bread Springs	708	41.8	34.9	6.9
Canoncito	1,314	61.0	43.8	17.2
Chichiltah	1,181	46.7	35.9	10.8
Church Rock	1,965	52.3	41.5	10.8
Counselor	560	42.5	23.8	18.8
Lupton	789	30.5	28.6	1.9
Manuelito	217	40.6	37.8	2.8
Nahata Dziil	1,460	39.6	34.7	4.9
Ojo Encino	384	45.8	31.0	14.8
Ramah	1,058	60.3	41.0	19.3
Red Rock	1,415	43.8	34.7	9.1
Tsayatoh	521	36.9	32.4	4.4

Source: US Census Bureau 2017

[1]American Community Survey estimates are based on data collected over 5 years. The estimates represent the average characteristics of populations and housing between January 2013 and December 2017 and do not represent a single point in time.

[2]Labor force employed data represent the percentage of the total population over 16 years and employed in civilian employment. Armed forces employment was less than 0.5 percent of the labor force for all populations examined and is not included in this table.

[3]Employment rate represents the percentage of civilian labor force employed.

Table 3-23: Socioeconomic Area of Analysis Employment Status Annual Average (2000–2018)

		Bernalillo County	Cibola County	McKinley County	Sandoval County	Torrance County	Valencia Country	New Mexico	US (1,000s)
2000	Employment	275,836	9,225	22,796	41,448	7,154	28,552	804,103	136,901
	Unemployment	11,456	673	1,597	1,832	374	1,390	41,652	5,685
	Unemployment rate	4.0%	6.8%	6.5%	4.2%	5.0%	4.6%	4.9%	4.2%
2005	Employment	291,412	11,538	25,159	47,553	7,188	29,068	871,248	141,710
	Unemployment	14,345	679	1,790	2,620	418	1,632	46,908	7,579
	Unemployment rate	4.7%	5.6%	6.6%	5.2%	5.5%	5.3%	5.1%	5.3%
2010	Employment	301,358	8,341	22,929	55,793	5,331	28,187	860,154	139,077
	Unemployment	25,236	896	2,511	5,108	697	2,980	75,934	14,808
	Unemployment rate	7.7%	9.6%	9.9%	8.4%	11.6%	9.6%	8.1%	10.6%
2015	Employment	304,141	8,551	21,985	58,111	4,985	27,526	873,442	148,847
	Unemployment	18,925	740	2,369	4,110	493	2,201	60,801	8,293
	Unemployment rate	5.9%	8.0%	9.7%	6.6%	9.0%	7.4%	6.5%	5.6%

		Bernalillo County	Cibola County	McKinley County	Sandoval County	Torrance County	Valencia Country	New Mexico	US (1,000s)
2018	Employment	314,530	8,366	22,111	61,416	5,176	28,584	893,823	155,764
	Unemployment	14,850	561	1,699	3,217	427	1,650	46,536	6,306
	Unemployment rate	4.5%	6.3%	7.1%	5.0%	7.6%	5.5%	4.9%	4.0%

Source: Bureau of Labor Statistics 2019a, 2019b

Fiscal Conditions

State of New Mexico Revenues

The general fund is the primary state fund from which the ongoing expenses of state government are paid. The major components of general fund revenue in New Mexico include the gross receipts tax (GRT), income taxes (both corporate and personal), and natural resource extraction revenues, which include severance taxes, rents, and royalties. See **Table 3-24**, Major Components of General Fund Revenue (2014–2018).

Table 3-24: Major Components of General Fund Revenue (2014–2018)

Tax/Revenue		General Fund Year to Date Revenue Accrual ($M)				
		2015	2016	2017	2018	2019*
Gross receipts tax	Amount	$2,095	$1,975	$2,013	$2,381	$2,261
	% general fund	33.3%	34.3%	36.8%	39.2%	37.6%
Income tax	Amount	$1,594	$531	$524	$541	$451
	% general fund	25.4%	9.2%	9.6%	8.9%	7.5%
General and selective sales tax	Amount	$528	$1,445	$1,450	$1,625	$1,350
	% general fund	8.4%	25.1%	26.5%	26.8%	22.5%
Severance taxes	Amount	$427	$279	$341	$493	$526
	% general fund	6.8%	4.9%	6.2%	8.1%	8.8%
Rents and royalties	Amount	$584	$437	$507	$676	$1,154
	% general fund	9.3%	7.6%	9.3%	11.1%	19.2%
Total general fund revenue		$6,285	$5,754	$5,475	$6,074	$6,007

Source: New Mexico Department of Finance and Administration 2019

* 2019 general fund revenues are provisional and reported as draft estimates in April 2019

Notes: Severance taxes include the oil and gas school tax, oil conservation, resource excise, and natural gas processors. Due to rounding, not all values may sum to exact totals.

Approximately 80 percent of the general fund comes from revenue from the gross receipts and compensating taxes, selective sales taxes, income taxes, and interest earnings from the land grant and severance tax permanent funds and balances held by the state treasurer. About 40 percent of general fund revenue is attributable to gross receipts tax. General and selective sales taxes are the second-largest source of general fund revenue, historically making up about 25 percent of the total. Public education has typically received the largest share of state general funding (around 45 percent), and higher education has generally received 15 percent, making education the biggest recipient of state general funds. Health and human services has historically received about 25 percent of the general fund budget, leaving 15 percent for the rest of the state government (State of New Mexico Legislative Finance Committee 2019).

Revenue has been relatively steady from 2015 to 2019, with the highest total general fund revenue over the last 5 years being reported in 2015. GRT accounts for the largest revenue source for the state and for the years shown, with income taxes and general and selective sales taxes contributing anywhere from 8 to 26 percent over the 5-year period.

Federal mineral leasing constitutes the largest portion of rents and royalties, while the oil and gas tax and taxes on natural gas processors make up the majority of revenues from severance taxes. Taken together, these revenue sources accounted for 12 to 28 percent of total state general fund revenues from 2015 to

2019. The full effect of oil and gas industry operations on the general fund goes beyond these categories to include production taxes, bonuses, and taxes on direct and indirect activities.

Local Government Revenues

Gross Receipts Tax and Revenue

As described above, GRT is a major component of both state and local government revenue. The GRT rate varies throughout the state from 5.5 percent to 9.3 percent depending on the location of the business. It varies because the total rate combines rates imposed by the state, counties, and, if applicable, municipalities where the businesses are located. Businesses pay the total gross receipts tax to the state, which then distributes the counties' and municipalities' portions to them. The most recent rates and GRT collections for Study Area counties are listed in **Table 3-25**, Gross Receipts Tax Rates. It should be noted that tax rates can be higher for specific municipalities.

Table 3-25: Gross Receipts Tax Rates

Location	Tax Rate (January–June, 2019)	Tax Revenue (Quarter 2 of 2019)
Bernalillo County	6.4375%	$406,485,568.29
Cibola County	6.8125%	$24,023,950.34
McKinley County	6.7500%	$3,493,093.00
Sandoval County	6.3750%	$24,321,957.71
Torrance County	6.7500%	$24,023,950.34
Valencia County	6.8750%	$24,321,957.71

Sources: New Mexico Department of Taxation and Revenue 2019a, 2019b
Note: New Mexico's state gross receipts tax rate is 5.125%.

Property Taxes

Property taxes are another substantial source of revenue for the counties in the Socioeconomic Study Area. Property tax obligations (revenue assuming 100 percent collection) and current tax rates are shown in **Table 3-26**, Property Tax Obligations (2018). Ad valorem production taxes represent tax on the assessed value of products severed and sold in a given area. Four of the six counties in the Study Area reported zero ad valorem taxes for 2018. The ad valorem tax rate is a composite of rates imposed by local taxing authorities, including counties and school districts. Production tax rates change every September. Ad valorem equipment taxes are tax on equipment used in production of oil, natural gas, carbon dioxide, and non-hydrocarbon gas. As is evident from the information presented in the table below, revenues from ad valorem production and equipment taxes within the Study Area represent minimal contributions compared with the contributions of these revenues at the state level.

Table 3-26: Property Tax Obligations (2018)

Location	Residential	Nonresidential	Ad Valorem Production	Ad Valorem Equipment
State of New Mexico	$1,078,413,786	$574,740,204	$135,334,315	$31,248,054
Bernalillo County	$505,111,116	$168,059,410	$0	$0
Cibola County	$4,022,377	$7,656,154	$0	$0
McKinley County	$8,195,853	$19,117,372	$5,844	$2,042
Sandoval County	$82,010,880	$25,827,880	$850,387	$211,001
Torrance County	$4,211,123	$5,577,607	$0	$0
Valencia County	$28,328,391	$14,225,019	$0	$0

Source: New Mexico Department of Finance and Administration 2019

Payments in Lieu of Taxes

Payments in lieu of taxes (PILT) are federal payments to local governments that help offset losses in property taxes due to nontaxable federal lands within their boundaries. Congress appropriates PILT annually, and the BLM administers disbursement to individual counties. PILT are determined according to a formula that includes population, the amount of federal land within the county, and offsets for certain federal payments to counties, such as timber, mineral leasing, and grazing receipts. PILT payments are transferred to state or local governments, as applicable, and are in addition to other federal revenues, including those from grazing fees. The Study Area counties received approximately $5.9 million in PILT in 2019 (**Table 3-27**).

Table 3-27: Study Area PILT (Fiscal Year 2019)

County	Total Acres	BLM Acres (% of total)	PILT Amount
Bernalillo	89,775	12,685 (14.1%)	$221,040
Cibola	788,635	407,078 (51.6%)	$1,943,508
McKinley	416,188	228,756 (55.0%)	$983,855
Sandoval	908,518	504,040 (55.5%)	$2,330,950
Torrance	161,416	19,536 (12.1%)	$334,820
Valencia	36,037	20,132 (55.9%)	$84,478
Total for 6 Study Area Counties	2,400,569	1,192,227 (49.7%)	$5,898,651

Source: USDI 2019

3.17.5 Key Economic Sectors

The BLM collects revenues from recreation and commercial activities that take place on the land that it administers, and a portion of these revenues are redirected back to the state and county governments. These revenues are collected from facilities (such as fees from campgrounds), from BLM recreation permits (special, competitive, organized group activity, and event use permits), grazing fees, mining leases, and mineral revenues.

Tourism and Recreation

BLM-administered land within the RPFO provides a variety of recreational opportunities. There were approximately 213,282 visitor use days in the Planning Area in 2019, based on infrared and magnetic sensor tracking.[1] Prior to this fiscal year, visitor use was tracked based on voluntary surveys and is therefore not comparable.

On their way to the Study Area, and once they arrive, visitors spend money on goods and services they would spend elsewhere if these opportunities did not exist. In this manner, the opportunities on BLM-administered lands contribute to the local economy by attracting these visitors. Comparable analyses of expenditures reported by national forest visitors show that on average, visitors to national forests spend about $172 per party per trip (White et al. 2013), and the primary factor determining the amount spent by a visitor was the type of trip taken and not the specific activity or forest visited. While providing recreational opportunities to local residents is an important contribution, the recreation expenditures of locals do not represent new money introduced into the economy. If BLM-related opportunities were not present, residents would likely participate in other locally based activities, and their money would still be spent in the local economy.

Livestock Grazing

Within the Planning Area, agriculture plays an important economic and social role; area residents identify with the tradition, land use, and history. The most recent USDA's Census of Agriculture (USDA 2017) reports that Torrance County was New Mexico's eleventh-largest cattle-producing county, containing 2.6

[1] Jackie Leyba, BLM, personal communication via email with Adam Lujan, BLM, and Elaine Lopez, BLM, regarding visitor use days (2015-2019) on Thursday, September 19, 2019.

percent of the total state cattle inventory. All other counties in the Study Area ranked lower than seventeenth in the state. All six counties within the Study Area had total cattle numbering 115,392, which was 7.7 percent of the total state cattle inventory (USDA 2017).

The active permitted use in the Planning Area is currently 129,815 AUMs. This is the maximum number of AUMs that could be offered under ideal forage conditions. Actual use of AUMs has ranged between 45 and 67 percent of the active permitted use in the last 5 years due to factors such as drought, financial limitations on operators, market conditions, and implementation of grazing practices to improve range conditions. Grazing in the Planning Area occurs year-round, and quite a few permittees also have Forest Service permits that they move to from June to October. **Table 3-28** provides authorized use numbers and grazing fees collected over the last 5 years.

Table 3-28: Annual AUM Authorizations and Grazing Receipts in the RPFO

Year	AUMs	Preferred AUMs	%Percent	Fee Per AUM	Grazing Receipts Collected
2018	90,577	129,815	70	$1.35	$122,279
2017	98,234	129,815	76	$1.69	$166,015
2016	90,235	129,815	70	$2.11	$190,585
2015	101,949	129,815	79	$1.87	$190,644
2014	103,489	129,815	80	$1.41	$145,919

Source: BLM Rangeland Administration System 2019

A thin profit margin often separates these livestock producers from negative net earnings. Often, employment outside the ranch augments livestock producer income. Federal grazing land is particularly valuable because of the low grazing fees charged for use of this land. In 2019, the federal grazing fee was $1.35 per AUM. The formula used for calculating the grazing fee was established by Congress in the 1978 Public Rangelands Improvement Act and has remained in use under a 1986 presidential executive order. Under that order, the grazing fee cannot fall below $1.35 per AUM per head month (HM), and any increase or decrease cannot exceed 25 percent of the previous year's level (BLM 2020). As a consequence, the rates the federal government applied to grazing are not meant to reflect fair market value, and rates would increase for grazing once lands are transferred to the state. This federal land is the least expensive grazing land available; hence, use and access are coveted by area ranchers even though additional costs are usually incurred to use these lands. While these AUMs in the Decision Area represent a small portion of grazing in the Planning Area counties, BLM allotments provide an important complement to ranching operations that also occur on national forest and privately leased land.

Mineral Production

More than two-fifths of the surface acreage and about three-fifths of the minerals acreage in New Mexico are federally administered, and the state is second only to Wyoming in the number of producing crude oil and natural gas leases on federal land. The state has more than 6 percent of US total proved crude oil reserves, and in 2017 it became the fifth-largest oil-producing state, accounting for 5 percent of the nation's crude oil production (Energy Information Administration 2019).

As of October 2019, there are 33 active fluid mineral leases in the RPFO, all of which are in the San Juan Basin (Crocker and Glover 2019). In 2018, Sandoval and McKinley Counties were the only counties producing oil and gas from BLM-administered mineral estate in the Study Area (State of New Mexico, Oil Conservation Division 2019). Production volume within the Rio Puerco Field Office has fallen over the past decade to less than 35,000 barrels of oil per year since 2006. It is estimated that a total of 200 wells may be drilled in the RPFO during the 2020 to 2039 planning period, mostly within areas of high and medium development potential in the northern portion of the field office in Sandoval County (Crocker and Glover 2019).

Salable mineral material removed from the RPFO includes general stone, common variety crushed stone, construction sand and gravel, and humate. The crushed stone is most often used for highway resurfacing, while construction sand and gravel are often used for concrete or other construction purposes, such as bank stabilization. General stone is used for a wide variety of applications, including decorative purposes, while humate is used often as a soil conditioner and livestock feed amendment.

3.17.6 Nonmarket Values

Public lands in the Study Area hold a large and wide variety of nonmarket values for both residents and visitors. Nonmarket values are the benefits derived by individuals and society from the uses or experiences that are not dispensed through markets and do not require payment. For example, there are unique and specific scenic, spiritual, cultural, and natural resources on public lands in the Study Area. Individuals and communities value these very highly, for a wide variety of reasons. These values enhance the quality of life and enjoyment of place, thereby improving regional and local economic conditions. Proximity to undeveloped, natural lands and the resources they harbor, including scenic vistas and recreation and wildlife viewing opportunities, add nonmarket value to the area. Examples of nonmarket benefits available from public land resources are the enhancement value of open space and ecosystem services, as discussed below.

Social Setting and Way of Life

The Planning Area was historically based on a rural agricultural economy. As discussed in **Section 3.4.1**, Cultural History of the Planning Area, indigenous peoples, settlers of Hispanic descent, and non-Hispanic settlers have all played a role in the development of the region and continue to live in the area. As the population has increased throughout the Planning Area, the economic base has shifted away from farming and ranching. A growing workforce residing within the Planning Area now commutes to the larger metropolitan areas of Albuquerque or Santa Fe. Historically, oil and gas development has played an important role in local economies, as have other industries. In addition to energy development, mineral mining, tourism, and outdoor recreation are considered important to the area economy.

In economies where rapid economic development occurs, large swings in population and associated strains on public services can be experienced. The influx of populations of people from outside the region can also result in strains on the social setting. Large population changes may alter perceptions of the friendliness, neighborliness, and trustworthiness of other residents; security; safety; and the risk of victimization by crime, and how satisfying community life is in general (Smith et al. 2001). Changes to the social setting are more likely to occur when development and the associated population change are introduced to communities that do not have a long history of economic development. Changes to the social setting can also impact the ability of different groups to adopt historical land uses. Subsistence agriculture, for instance, is of historical importance for the Native American tribal groups in the area, particularly for the Navajo. In addition, the Planning Area contains traditional cultural properties (TCPs), places that have cultural values and that have potential to be affected by development. Refer to **Section 3.4**, Cultural Resources, for a detailed discussion of traditional and sacred areas and uses within the Study Area.

Attracting Nonlabor Income

Open space can be an important contributor to the quality of life for communities next to public lands providing scenic views, recreational opportunities, and other benefits. In addition, nonmarket resources may provide indirect economic benefits. Enhancement value is the tendency of open space to enhance the property value of adjacent properties. The Decision Area may provide enhanced value to adjacent private parcels. Additionally, open space and related amenities may attract new residents, who in turn bring new sources of income to the area. Communities next to BLM-administered lands may offer a high level of natural amenities that often attract retirees and others with nonlabor sources of income, as well as sole proprietors and telecommuters who bring income from other regions into the local economy.

These new residents, in turn, spur economic development. Residents who rely on nonlabor income become both a pool of customers and clients for new business and a potential source of investment capital (Haefele et al. 2007).

Ecosystem Services

Ecosystem services are provided to all components of an ecosystem, including humans, without market costs, but rather as a function of the ecosystem itself. Examples of ecosystem services include the provision of freshwater and air, regulation of wastes, maintenance of biodiversity, formation of soil, and protection from natural hazards. Recent models have been created to assess the economic benefits of ecosystem services so that these economic values can be incorporated into the planning process. Batker et al. (2014) examined the ecosystem service contributions from the Colorado River Basin, including the subbasin of the San Juan River within the Planning Area. Following the Millennium Ecosystem Assessment approach, this study defined four main groups of ecosystem services: 1) provisioning services (goods including food, water, and materials from public lands, such as oil and gas and wood products), 2) regulating services (services from intact ecosystems, such as regulation of climate, water, soil, floods, and storms), 3) supporting services (habitat for wild plants and animals, which thereby contribute to the conservation of biological diversity), and 4) information services (services from interaction with nature, such as recreation, spiritual, aesthetic, historic, educational, scientific, and subsistence values).

Maintenance or environmental restoration of lands can have economic value for local communities related to the ecosystem services provided. Maintaining or improving land and water quality would maintain or improve the value of these resources. Conversely, if land or water quality is degraded by development, the value of these commodities decreases.

3.17.7 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations, requires that federal agencies identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. Guidance for evaluating environmental justice issues in land use planning is included in the BLM Land Use Planning Handbook, Appendix D (BLM 2005a). Environmental justice refers to the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies (BLM 2005a). Guidance on environmental justice terminology developed by the president's Council on Environmental Quality (CEQ 1997) provides the following definitions:

- Low-income population. A low-income population is determined based on annual statistical poverty thresholds developed by the US Census Bureau. For 2016, the poverty threshold was $12,228 for an individual and $24,563 for a family of four (US Census Bureau 2019a).
- A low-income community may include either a group of individuals living in geographic proximity to one another or dispersed individuals, such as migrant workers or Native Americans.
- Minority. Minorities are individuals who are members of the following population groups: American Indian, Alaskan Native, Asian, Pacific Islander, Black, or Hispanic.
- Minority population area. A minority population area is so defined if either the aggregate population of all minority groups combined exceeds 50 percent of the total population in the area or if the percentage of the population in the area comprising all minority groups is meaningfully greater than the minority population percentage in the broader region. Like a low-income population, a minority

population may include either individuals living in geographic proximity to one another or dispersed individuals.

- Comparison population. For the purpose of identifying a minority population or a low-income population concentration, the comparison population used in this study is the state of New Mexico as a whole.

Low-Income Populations

Income and poverty data estimates for Study Area counties from the US Census Small Area Poverty Estimates model indicate that the percentage of the population living below the poverty level in the Socioeconomic Study Area as a whole is slightly below that of the state (17.2 percent and 19.0 percent, respectively). See **Table 3-29**, Study Area Low-Income Population Percentages (2010–2017). Poverty levels ranged from 14.6 percent in Bernalillo County to 37.8 percent in McKinley County. Bernalillo, Sandoval, and Valencia Counties were all below the state average. Similarly, estimates from 2017 indicate that Bernalillo and Sandoval Counties had household median incomes ($51,091 and $56,937, respectively) above the state level of $47,086. Median household incomes in all other counties, and the Study Area as a whole ($43,428), were below that of the state in 2017.

Minority Populations

Based on 2017 data, non-white residents made up 63 percent of the population in the Study Area, compared with 66.4 percent in the state of New Mexico. See **Table 3-30**, Study Area County Population by Race/Ethnicity (2017). At the county level, the population ranged from 47.8 percent minority in Valencia County to 90.9 percent minority in Sandoval County.

2402 **Table 3-29: Study Area Low-Income Population Percentages (2010–2017)**

Location	Total Population 2010	Percentage in Poverty 2010	Total Population 2017	Percentage in Poverty 2017	Median Household Income 2010	Median Household Income 2017
Counties						
Bernalillo County	646,881	11.8	674,855	14.6	$47,481	$51,091
Cibola County	27,179	20.1	27,049	30.1	$37,361	$37,753
McKinley County	70,663	26.6	72,849	37.8	$31,335	$31,746
Sandoval County	124,263	8.3	138,815	15.3	$57,158	$56,937
Torrance County	16,467	13.5	15,534	26.7	$37,117	$36,886
Valencia County	74,554	15.7	75,845	17.5	$42,044	$46,155
State of New Mexico	2,013,122	13.9	2,084,828	19.0	$43,820	$47,086
Study Area	960,007	13.0	1,004,947	17.2	$42,083	$43,428
Native American Communities						
Pueblos						
Acoma Pueblo	3,011	21.2	2,974	22.2	$34,886	$39,868
Isleta Pueblo	2,489	15.6	2,605	22.3	$43,594	$33,917
Jemez Pueblo	1,788	9.3	2,022	25.7	$50,625	$43,438
Laguna Pueblo	4,459	18.3	4,146	22.8	$40,420	$34,063
Pueblo de Cochiti	528	14.9	579	15.0	$31,750	$44,375
San Felipe Pueblo	2,404	19.7	2,786	27.9	$49,205	$53,611
Sandia Pueblo	369	21.2	394	30.0	$43,750	$35,833
Santa Ana Pueblo	610	8.6	675	19.3	$45,833	$49,688
Santa Clara Pueblo	1,018	13.2	967	27.6	$50,500	$28,214
Santo Domingo Pueblo	2,456	19.2	2,596	33.8	$39,946	$33,289
Zia Pueblo	737	22.7	994	24.4	$37,212	$41,136
Tribal Nations/Reservations						
Jicarilla Apache Nation	3,228	16.5	3,183	23.7	$44,301	$34,675
Navajo Nation	10,107	31.9	10,296	37.8	$27,319	$25,653
Zuni	6,302	30.4	7,532	31.1	$34,844	$35,828

2403 Source: US Census Bureau 2010, 2017, 2019b
2404 Notes: Median household income (MHI) for the Study Area is based on an average of MHI for all counties in the Study Area.
2405 The percentage of the population in poverty for the Study Area is a weighted average of percentages for individual counties.

2406 **Table 3-30: Study Area County Population by Race/Ethnicity (2017)**

	Hispanic or Latino Ethnicity of Any Race		White Alone		Black or African American Alone		American Indian or Alaskan Native Alone		Asian Alone		Native Hawaiian and Other Pacific Islander Alone		Some Other Race		Two or More Races	
	Population	Percent	Population	Percent	Population	Percent	Population	Percent	Population	Percent	Population	Percent	Population	Percent	Population	Percent
Counties																
Bernalillo County	1,004,103	48.2	795,728	38.2	37,287	1.8	181,382	8.7	28,005	1.3	956	0.0	3,915	0.2	33,452	1.6
Cibola County	334,067	49.5	266,372	39.5	16,914	2.5	26,940	4.0	15,837	2.3	403	0.1	1,923	0.3	12,399	1.8
McKinley County	10,269	38.0	5,412	20.0	271	1.0	10,593	39.2	121	0.4	0	0.0	71	0.3	312	1.2
Sandoval County	10,297	14.1	6,620	9.1	369	0.5	53,434	73.3	672	0.9	32	0.0	16	0.0	1,409	1.9
Torrance County	52,572	37.9	61,889	44.6	2,553	1.8	16,659	12.0	1,756	1.3	115	0.1	314	0.2	2,957	2.1
Valencia County	6,537	42.1	8,116	52.2	268	1.7	165	1.1	32	0.2	0	0.0	0	0.0	416	2.7
State of New Mexico	45,505	60.0	25,480	33.6	610	0.8	2,715	3.6	393	0.5	0	0.0	71	0.1	1,071	1.4
Study Area	1,417,845	45.9	1,144,137	37.0	57,662	1.9	289,173	9.4	46,423	1.5	1,506	0.0	6,239	0.2	50,945	1.6
Native American Communities																
Pueblos																
Acoma Pueblo	126	4.2	19	0.6	55	1.8	2,769	93.1	0	0.0	0	0.0	0	0.0	5	0.2
Isleta Pueblo	352	13.5	50	1.9	0	0.0	2,116	81.2	58	2.2	0	0.0	0	0.0	29	1.1
Jemez Pueblo	16	0.8	7	0.3	8	0.4	1,915	94.7	0	0.0	0	0.0	0	0.0	76	3.8
Laguna Pueblo	366	8.8	36	0.9	0	0.0	3,639	87.8	21	0.5	0	0.0	0	0.0	84	2.0
Pueblo de Cochiti	47	8.1	0	0.0	0	0.0	532	91.9	0	0.0	0	0.0	0	0.0	0	0.0
San Felipe Pueblo	7	0.3	9	0.3	0	0.0	2,770	99.4	0	0.0	0	0.0	0	0.0	0	0.0
Sandia Pueblo	30	7.6	2	0.5	0	0.0	360	91.4	0	0.0	0	0.0	0	0.0	2	0.5
Santa Ana Pueblo	27	4.0	0	0.0	0	0.0	639	94.7	1	0.1	8	1.2	0	0.0	0	0.0
Santa Clara Pueblo	247	25.5	19	2.0	0	0.0	678	70.1	0	0.0	0	0.0	0	0.0	23	2.4
Santo Domingo Pueblo	220	8.5	0	0.0	0	0.0	2,376	91.5	0	0.0	0	0.0	0	0.0	0	0.0
Zia Pueblo	42	4.2	1	0.1	0	0.0	949	95.5	0	0.0	0	0.0	2	0.2	0	0.0
Tribal Nations/Reservations																
Jicarilla Apache Nation	85	2.7	85	2.7	26	0.8	2,453	77.1	0	0.0	0	0.0	8	0.3	99	3.1
Navajo Nation	98	1.0	98	1.0	6	0.1	9,785	95.0	37	0.4	0	0.0	0	0.0	118	1.1
Zuni	61	0.8	61	0.8	0	0.0	7,340	97.5	28	0.4	0	0.0	0	0.0	0	0.0

Source: US Census Bureau 2017 (2013–2017 ACS)

3.18 Soil and Water Resources

3.18.1 Soil Resources

Soil types and properties vary within the Planning Area. Soils are formed on volcanic and sedimentary bedrock, and on water-deposited and wind-deposited sediments on the landscape.

The overriding importance of stable soils on the landscape is to support vegetation. Soil properties, in combination with the precipitation and topography, are key factors in determining what vegetation types are supported. The soils support forest, woodland (piñon-juniper), brush, and grass vegetation types that provide livestock grazing, wildlife habitat, and watershed stability. Rock outcrops and rubble fields occur in many areas, which support little, if any, soil and vegetation.

In a semiarid landscape typical of the RPFO, naturally occurring surface water runoff and flooding may create sheet, rill, gully, and streambank erosion on some areas of public lands. A normal degree of soil erosion caused by wind or water is expected under natural conditions, but erosion that exceeds natural rates because of land use activities is referred to as accelerated erosion, which will result in the loss of soil productivity and stability. The deposition of eroded soil particles is referred to as sedimentation and also is a natural landscape process to some degree. However, sedimentation resulting from accelerated water erosion may create water quality and channel stability problems or may destructively cover upland vegetation. Deposition from accelerated wind erosion also can suppress vegetation and produce air quality problems.

In this planning document, "sensitive soil" refers to: 1) erosion-sensitive soils that have higher susceptibility to wind or water erosion, and 2) reclamation-sensitive soils that would be difficult to restore or reclaim with vegetation after drastic disturbance of the soil profile has occurred. This sensitive soil description is based on detailed soil information found in soil surveys published by the USDA Natural Resources Conservation Service in cooperation with other entities, including the BLM (USDA NRCS 2011). Due to soil mapping procedures, most soil mapping units (the individual areas outlined on soil maps) contain at least two major soil types that have different properties; the proportions of the different soils within the mapping unit are specified, but the spatial locations of the different soils are not shown. There is some overlap between the erosion-sensitive soils and reclamation-sensitive soils. Soil mapping units that are dominantly erosion-sensitive and reclamation-sensitive are depicted on **Appendix S**, **Maps 3-13** to **3-15**, respectively. Additional discussion of sensitive soils follows.

Erosion-sensitive soils would include those with higher susceptibility to wind erosion as indicated by a wind erosion potential rating of "high" or "very high" in the soil survey. Soils that are rated as such are due to a surface layer that has a sandy particle size, high carbonate content, low organic matter content, or no coarse fragment protection. These soils occur as the dominant condition on approximately 399,000 acres of soil mapping units on RPFO-administered lands.

Erosion-sensitive soils also would include those with higher susceptibility to water erosion as indicated by a water erosion potential rating of "high" or "very high" in the soil survey. Soils that are rated as such are due to unfavorable particle sizes and low organic matter content, in combination with high runoff, that have low resistance to water erosion processes. These soils occur as the dominant condition on approximately 159,000 acres of soil mapping units on RPFO-administered lands. Areas that are dominantly water or wind erosion-sensitive are depicted in **Appendix S**, **Map 3-13** and **3-15**.

Reclamation-sensitive soils would include those with a rating of "poor" for potential reclamation in the soil survey, which indicates that revegetation and stabilization are expected to be difficult and costly following drastic disturbances such as oil and gas field development, temporary road construction, or similar disturbances. This rating of the disturbed soil and its subsequent reclamation potential are based on the soil properties that affect erosion and stability of the surface and the vegetation productivity potential of the

reclaimed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; edibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility. These soils occur as the dominant condition on approximately 393,000 acres of soil mapping units on RPFO-administered lands. Areas that are dominantly rated as poor reclamation potential are depicted in **Appendix S**, **Map 3-15**.

Development of infrastructure and soil disturbance on steeper slopes (greater than 15 percent slope) generally increases the downslope water erosion potential because of increased runoff volumes and rates. This typically would be expected with permanent surface installations such as wind farms, solar arrays, pipelines, roads, communication sites, transmission lines, and oil and gas production facilities. The appurtenant access roads required for most of these would be a part of the increased runoff and erosion potential. Therefore, the effect of slope steepness on soil stability would be considered when authorizing land uses where disturbance on slopes could present increased runoff and erosion potential.

3.18.2 Water Resources

Surface water and groundwater are an important factor in public land management. The overriding importance of surface water is the support of upland and riparian vegetation through recharge of soil water and groundwater aquifers. In addition, streams and ponds provide wildlife and livestock water, and support recreation and aesthetics. Groundwater from wells and springs has been developed for public water supply, livestock, and wildlife use, and for ongoing or temporary industrial uses such as mining and road construction activities.

The BLM files claims for existing water uses in accordance with applicable state and federal laws and regulations, and participates in adjudications. The RPFO holds groundwater and surface water permits and rights for livestock and wildlife watering and for public water supply.

Surface and Groundwater

The occurrence of surface water and groundwater on BLM-administered land varies considerably with the diversity in geology, topography, and climate in the Planning Area. The Continental Divide runs through the west part of the Planning Area, separating streamflow between the Rio Grande River and the Colorado River Basins. Most of the RPFO drains to the Rio Grande through the Rio Puerco, Arroyo Chico, and Rio San Jose drainages, which have the greatest acreage of BLM-administered land in the RPFO.

Streams on BLM-administered lands are dominantly ephemeral or intermittent channels (normally dry washes and streambeds) that flow for brief periods only in response to rainfall and snowmelt. Runoff and streamflow may result from summertime thunderstorms, melting snow in higher terrain, and frontal system rainfall. Many perennial and intermittent streams, springs, or seeps within the Planning Area occur on higher terrain within national forest boundaries or on private lands both upstream and downstream from BLM-administered lands.

Groundwater is an important resource in the Planning Area, and its distribution and quality are complex and not completely defined. The principal aquifers within the Planning Area are the Rio Grande aquifer system and the Colorado Plateau aquifers (Robson and Banta 1995). The more important groundwater discharge areas in the Planning Area are exemplified by the presence of perennial and intermittent streams and springs. A number of these water sources occur on BLM-administered lands and support riparian/wetland areas that are detailed in the EIS for riparian and aquatic habitat management (BLM 2000).

BLM land management does have a direct influence on groundwater recharge in both upland and stream channel environments. Increasing infiltration is identified as an objective in the Standards for Public Land Health and Guidelines for Livestock Grazing (BLM 2001b). Riparian and upland vegetation communities are

dependent upon infiltration and recharge to provide reliable amounts of shallow groundwater and soil moisture.

Current estimated water use for hydraulic fracturing associated with oil or gas wells in the San Juan Basin varies by well type. During a hydraulic fracturing operation in the San Juan Basin, the average water use is 0.537 acre-feet per vertical well and 4.8 acre-feet per horizontal well (BLM 2019).

In the RPFO, an extensive watershed management practice in the past was to construct earthen erosion control dams and diversions. From the 1950s through the 1970s, approximately 650 dams and diversions were built to reduce peak flows and stabilize stream channels, and many of them have filled with sediment and require regular maintenance so that stored sediment is not lost downstream, and so that runoff and erosion rates remain controlled. Many of these dams/reservoirs continue to serve as a source for livestock and wildlife water.

The occurrence of 100-year floodplains as designated by the Federal Emergency Management Agency (FEMA) is a key feature in complying with the Executive Order 11988, Floodplain Management. Digital data for these areas were available for Sandoval, McKinley, and Bernalillo Counties, which show that there currently are 10,769 acres of 100-year floodplains on BLM-administered lands for these three counties. These 100-year floodplains include major streams, such as the Rio Puerco, Arroyo Chico, and the Rio San Jose. In addition, active floodplains, defined as the low-lying land surface adjacent to a stream that is flooded at least once or twice (on average) every 3 years (Prichard 1999, 1998), are associated with nearly all identifiable streams such as those depicted in the National Hydrologic Dataset (US Geological Survey 2019). An acreage figure for active floodplains on the Planning Area is not readily known because this is not usually mapped for channels. Both kinds of floodplains areas are important considerations for land management authorizations, including but not limited to ROWs and potential sites for renewable energy facilities.

Water Quality

The BLM complies with applicable water quality laws, chiefly the federal Clean Water Act, and therefore protection and improvement of water quality is a primary goal for the BLM. Water quality protection and improvement on BLM-administered land is achieved mainly through the implementation of BMPs. BMPs are implemented in land management actions that are carried out by the BLM (e.g., vegetation management projects), as well as in actions that are authorized on BLM-administered land but are conducted by another party (e.g., ROW developments).

The NMED assesses and monitors water quality under the Clean Water Act and designates surface waters that are not meeting water quality standards in the CWA Section 303(d) List of Impaired Waterbodies (NMED ~~2018~~2016c). Impaired waters within the Planning Area are generally perennial streams that are upstream from BLM-administered land, or are the major perennial rivers, such as many reaches of the Rio Grande. Groundwater protection is achieved largely through State of New Mexico drilling regulations for water wells and oil and gas wells, and by controlling surface pollution that could migrate to groundwater.

In addition to the many erosion control structures built from the 1950s through the 1970s (as previously described), watershed protection and improvement in the RPFO continues through implementation of BMPs and watershed restoration and stabilization projects. Other agencies and watershed interest groups, as well as the BLM, have focused on planning and project efforts to improve watershed conditions, especially in the Rio Puerco watershed. Current management activities include fuels and vegetation treatments, grazing management actions, transportation management, and erosion control projects such as stream stabilization and restoration of disturbed areas (e.g., unused/unneeded dirt roadbeds).

Trends

Surface water quality and watershed health in the Planning Area are improving over time through continuing implementation of both regulatory and nonregulatory programs. In the Planning Area, voluntary water quality improvement projects are funded by programs such as the CWA Section 319 grants, public land management agency efforts, and private land initiatives (e.g., USDA NRCS landowner programs). The designation of impaired water bodies by NMED on the CWA Section §303(d) List of Impaired Waterbodies will be potential key areas for management attention if they are on BLM-administered lands or if public lands are tributary to these waters. The BLM New Mexico Standards for Public Land Health and Guidelines for Livestock Grazing Management includes erosion assessments to inform and guide management for the protection or improvement of water quality and watershed health.

Surface water quality is probably most vulnerable to increased urbanization, conversion of rangeland to suburbs, and development of more roads. Increased runoff associated with these factors usually increases erosion from uplands and stream channels and increases turbidity and sedimentation. Urban and suburban surface water quality issues might increasingly be a factor in public land management decisions where public lands are in close proximity to these areas.

In the Planning Area, surface water supplies always are subject to climatic conditions. Groundwater withdrawals for public water supply and agricultural irrigation represent the largest current water use in the Rio Grande corridor (New Mexico Office of the State Engineer 2017). Increased withdrawals for public water supply represent the largest potential groundwater demand in the middle Rio Grande region, and population increases here already have caused dramatic increases in groundwater withdrawals from the aquifer system, resulting in large groundwater level declines (Mid-Region Council of Governments 2018).

The use of groundwater from nonpublic lands adjacent to public land has not yet presented apparent problems. Under current RPFO management, the supply and quality of water, both surface and underground, have not been identified as major limiting factors for public land management. It is likely that there will be growing interest in surface and groundwater on the public lands corresponding with regional growth and increasing use of the public lands.

3.19 Special Designations

Special designations include areas provided special management prescriptions to protect certain significant values, congressional designations, or other administrative or executive designation giving emphasis to significant resources or activities. Such designations within the Planning Area include ACECs, SMAs, WSRs, WSAs, and Wilderness. Many of these areas are currently designated, while other areas have been determined to qualify for special management subsequent to previous land use planning efforts.

3.19.1 Wilderness and Wilderness Study Areas

Wilderness characteristics are defined by sufficient size, naturalness, and either outstanding opportunities for solitude or primitive and unconfined recreation. In addition, Wilderness may also possess supplemental values.

Wilderness

One designated Wilderness is located within the Planning Area: Ojito Wilderness (11,183 acres). Only Congress may designate Wilderness areas.

The Ojito Wilderness Act was signed into law on October 27, 2005. The Ojito Wilderness includes 11,823 acres of public land, with approximately 160 acres of private land included as inholdings, as well as 116 acres still in WSA status. The Wilderness is located in Sandoval County, approximately 5 miles southwest of San Ysidro, New Mexico. Mesas, cuestas, rock terraces, retreating escarpments, canyons, arroyos, and badlands all make up the dramatic landscape of the Wilderness. The natural qualities of the area are highlighted by

multicolored rock formations, sculptured badlands, and expansive plateaus and mesa tops. The scenic values of these diverse landforms and close proximity to the population centers of Albuquerque and Santa Fe contribute to the area's outstanding opportunities for solitude and primitive and unconfined recreation. The cultural resources include Archaic and other prehistoric and historic sites. Paleontological sites include fossil resources, including petrified wood, plant fragments, mollusks, and dinosaur bones. Fossils of a large *Seismosaurus halli* were discovered here in 1979 and removed in 1985. In addition, rare plant species are found in the Ojito Wilderness.

A Wilderness management plan for the Ojito Wilderness will be prepared when the Rio Puerco RMP is complete.

Wilderness Study Areas

The BLM was authorized to consider areas under its management for Wilderness designation upon passage of FLPMA in 1976. An inventory was conducted in 1980 that identified which areas met the wilderness criteria of naturalness and ability to provide an outstanding opportunity for solitude or primitive and unconfined recreation. These areas must also be 5,000 acres or larger in size. The 1980 inventory resulted in the designation of eight WSAs. A portion of the Ojito WSA was later designated as a Wilderness, while the others remain in WSA status.

There are eight WSAs for a total of 86,800 acres in the Planning Area (**Appendix S**, **Map 2-~~81~~62**):

- Cabezon WSA, NM-010-022 (8,200 acres)
- Chamisa WSA, NM-010-021 (14,500 acres)
- Ignacio Chavez WSA, NM-010-020 (32,200 acres)
- La Lena WSA, NM-010-063A (10,200 acres)
- Petaca Pinta WSA, NM-010-014 (11,700 acres)
- Empedrado WSA, NM-010-063 (9,000 acres)
- Manzano WSA, NM-010-092 (900 acres)
- Ojito WSA, NM-010-024 (100 acres)

No additional areas can be considered for designation as a WSA because the congressional authorization to do so expired. However, the BLM does recognize that some public land areas that have been acquired since the 1986 Rio Puerco RMP, or that have seen more limited use since the inventory was completed, have wilderness characteristics that should be considered in the planning process.

WSAs will continue to be managed so as not to impair their suitability for preservation as Wilderness under the BLM's Management of Wilderness Study Areas (BLM Manual 6330) until Congress either designates all or portions of the WSAs as Wilderness or releases the lands from further Wilderness consideration. Current allowable uses of these WSAs include hiking, hunting, horseback riding, backpacking, and biking or vehicle use on ways (undeveloped vehicle routes) that were present upon the establishment of the WSA. Other activities that may occur include livestock grazing, wildlife management, certain mineral uses, restoration activities, or other activities that do not result in impairment of the wilderness values. The Ignacio Chavez and Chamisa WSAs have higher densities of conifer species than is natural due to past land use practices, including fire suppression and grazing. Detailed information and descriptions of the WSAs within the Planning Area can be found in the BLM New Mexico Wilderness Study Report, Volume 1 (September 1991).

Human activity and its effects in the WSAs are increasing as the population continues to grow in both Albuquerque and Santa Fe. Visitation to Cabezon WSA draws the largest number of visitors due to the uniqueness of the peak, a large volcanic plug, and the climbing experience. A visitor-created trail provides access to the base of the peak. The Ignacio Chavez and Chamisa WSAs draw fewer visitors, but are an

attraction because of the pine forests (their visitation peaks during hunting season). The increasing levels of use of the WSAs may continue to diminish the ability to find solitude. The other WSAs are much less frequently visited, and are places where those looking for solitude are the primary visitors. Many of the access roads are impassible during inclement weather. The only designated trail in the WSAs is the Continental Divide National Scenic Trail, which passes through the Ignacio Chavez, Empedrado, and La Lena WSAs.

3.19.2 Continental Divide National Scenic Trail

From the rugged Rocky Mountains to the desert grasslands of the Chihuahuan Desert, the Continental Divide National Scenic Trail (CDNST) extends 820 miles through New Mexico, a mosaic of azure skies, adobe architecture, ancient civilizations, and red rock cliffs. The CDNST preserves the unique natural history of the Divide and provides the opportunity for access and enjoyment of primitive backcountry experiences. The CDNST, as it exists within the RPFO Planning Area, lies between the Santa Fe and Carson National Forests. It enters the Planning Area from Mount Taylor Ranger District on Ignacio Chavez Grant and continues north on the west side of the Rio Puerco toward Mesa Portales. At this point, it crosses US Route 550 and the Rio Puerco and ties into the Santa Fe National Forest south of the San Pedro Parks Wilderness.

The CDNST traverses the Planning Area for approximately 135 miles; approximately 50 miles are located on BLM-administered lands or BLM-owned easements (**Appendix S**, **Map 3-12**). The majority of the CDNST is absent tread; instead, it is marked across the landscape by posts and rock cairns. The nature of the trail means that travelers walk on live vegetation in many portions of the trail. The setting is a primitive, natural-appearing route.

Use on the trail is light, but is increasing closest to access points near towns. Portions of the trail are not rideable by horses or mountain bikes where it climbs up steep slopes. Water is very limited along its route. The trail is permanently located, except for two areas where its location is not in close correlation with the purposes of the CDNST. Those areas are the vicinity of the town of Cuba and the area south of Grants where the trail is located on the shoulder of paved highways. A trail reroute project decision was signed in 2018 to move the existing route from public roadways to either newly constructed trail segments or renamed and designated existing trails in the vicinity of Cuba, New Mexico (Forest Service and BLM undated). Approximately 17.8 miles of trail are proposed to be constructed on BLM-administered lands, 5.1 miles on National Forest System lands, 1.0 mile on State lands, and 1.0 mile on private lands (BLM 2018a). The purpose of the CDNST is to connect people and communities to the Continental Divide by providing scenic, high-quality, primitive hiking and horseback riding experiences while preserving the significant natural, historic, and cultural resources along the CDNST.

3.19.3 Wild and Scenic Rivers

There are no congressionally designated Wild and Scenic Rivers in the Planning Area. The Planning Area was inventoried for the presence of rivers eligible for inclusion in the National Wild and Scenic Rivers System. Such rivers must be free flowing and have at least one outstandingly remarkable value associated with the river. Eligible rivers are managed under BLM Manual 6400 to protect their free-flowing qualities, outstandingly remarkable values, and tentative classification until superseded by congressional action.

Two river segments were analyzed for National Wild and Scenic Rivers System eligibility, Bluewater Creek and Las Huertas Creek. Las Huertas Creek lacks several of the criteria for eligibility since it is an intermittent wash that primarily flows during heavy rains, as do most other washes (arroyos) within the RPFO. Bluewater Creek is the only perineal flowing river with the RPFO with several characteristics that would meet eligibility for its scenic values. Regionally, Bluewater Creek is a significant and special site. The high canyon walls of Bluewater Creek provide minimal access, thus allowing for the area to remain relatively undisturbed (see **Appendix N**). Bluewater Creek is approximately 30 miles in length with slightly over 2 miles on BLM lands. Grazing, which was the primary impact to the site, has been deferred for the last two decades.

One stream was found to be eligible for inclusion in the National Wild and Scenic Rivers System: Bluewater Creek. Its tentative classification is wild. Bluewater Creek is approximately 30 miles long and the area is rated as scenic quality "A," as defined in the BLM Visual Resource Inventory Handbook. Bluewater Creek contains four relevant environmental resources that require special management attention: (a) natural systems, (b) scenic values, (c) wildlife resources, and (d) cultural values. Bluewater Creek is the only perennial stream on public land in the Rio Puerco Field Office. The beginning of Bluewater Creek is below the dam of Bluewater Reservoir, which receives recreation use year-round, but this use is heaviest during the spring and summer seasons.

- **Natural System**—Bluewater Creek is composed of riparian habitat and a perennial stream. The habitat contains large cottonwoods, dense vegetation, and abundant wildlife.
- **Scenic Values**—Bluewater Creek contains outstanding scenic values and is managed as a Class II Visual Resource Management area. The steep rocky canyon walls offer a pleasant contrast to the vegetation that grows along them, and the lush vegetation in the canyon bottom provides an agreeable setting for primitive recreation opportunities.
- **Wildlife Resources**—Adequate water contributes to wildlife concentrations. The canyon walls provide potential habitat for the peregrine falcon along with several other species, as identified in 1983 Environmental Assessment for Bluewater Canyon ACEC Plan Element.
- **Cultural Values**—Bluewater Creek contains one identified "moki" ruin. This is a single storage bin located three-fourths of the way up one of the canyon walls. Mokis were usually used to store corn, beans, grains, etc., and are usually found either on a cliff as an isolated occurrence or in a pueblo ruin.

3.19.4 Areas of Critical Environmental Concern and Special Management Areas

The ACEC is unique to the BLM and is authorized by section 202 of FLPMA. ACEC designation highlights areas where special management attention is needed to protect and prevent damage to important historic, cultural, scenic, or natural resources or values. For an area to be eligible for designation as an ACEC, it must meet one or more relevance criteria and one or more importance criteria (BLM Manual 1613). It must also require special management to protect the resources or values identified for the area; see **Chapter 2**.

An area meets the relevance criterion if it contains one or more of the following:

- **R-1**. A significant historic, cultural, or scenic value (including, but not limited to, rare or sensitive archeological resources and religious or cultural resources important to Native Americans).
- **R-2**. A fish and wildlife resource (including, but not limited to, habitat for endangered, sensitive, or threatened species, or habitat essential for maintaining species diversity).
- **R-3**. A natural process or system (including, but not limited to, endangered, sensitive, or threatened plant species; rare, endemic, or relic plants, or plant communities that are terrestrial, aquatic, or riparian; or rare geological features).
- **R-4**. Natural hazards (including, but not limited to, areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs). A hazard caused by human action may meet the relevance criteria if it is determined through the resource management planning process to have become part of a natural process.

In order to satisfy the importance criterion, the value, resource, system, process, or hazard described above must have substantial significance, generally characterized by one or more of the following:

- **I-1**. More than locally significant qualities that gives it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared with any similar resource.
- **I-2**. Qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.

- **I-3**. Recognized as warranting protection to satisfy national priority concerns or to carry out the mandates of FLPMA.
- **I-4**. Qualities that warrant highlighting to satisfy public or management concerns about safety and public welfare.
- **I-5**. Poses a significant threat to human life and safety or to property.

Existing ACECs/Special Management Areas

The 1986 RMP gave special management consideration to 23 SMAs containing important recreational, natural, scientific, cultural, and scenic values, and management goals and objectives were established for each SMA (BLM 1986). Because SMA is a designation that is no longer used by the BLM, RPFO staff determined whether each SMA (except the Continental Divide National Scenic Trail and the 1870s Wagon Road Trail) met relevance and importance criteria for ACEC designation. All but three SMAs (Pelon Watershed, Headcut Prehistoric Community and Historic Homesteads) were found to meet the relevance and importance criteria for ACEC designation. The results of the evaluation of each area for the presence of relevance and importance criteria are included in the following description of each area (**Appendix S**, **Maps 2-~~70~~ 55** through **2-~~74~~58**).

Azabache Station Special Management Area (80 Acres)

The Azabache Stage Station is an abandoned, four-room, sandstone masonry ranch house with spring house, corral, and evidence of at least two other buildings built near the base of Mesa La Azabache, next to a small spring known as Ojo Azabache. The ruin is located along the old Santa Fe-Prescott wagon road and the even older Zuni-Jemez trail about 15 miles west of the Village of Cabezon. The house was built and occupied during the late territorial period (1846–1880), homesteaded following World War I, and was abandoned around 1925. The stone masonry of the structure has been stabilized by the BLM since the 1980s with maintenance occurring sporadically since then.

Evaluation of Azabache Station as an ACEC found that the SMA does not meet relevance criteria, but does possess one importance criteria due to its fragility (I-2). As such, the SMA does not qualify as an ACEC, but would be managed instead as a Cultural Resource Area to protect and preserve the important cultural values present at this site.

Ball Ranch (Espinazo Ridge) ACEC (1,278 acres)

The Ball Ranch ACEC is located in Sandoval County, approximately 30 miles north of Albuquerque, New Mexico. This ACEC is divided into three small tracts or segments. This area contains extensive paleontological deposits of petrified wood. In the 1940s, Charles E. Stearns discovered a deposit of fossil material along Arroyo Pinovetito. The fossil material is composed largely of bones of titanotheres, a group of extinct, horned, perissodactyl ungulates related to horses that reached the size of small elephants. This is the only deposit of this type of fossils found in New Mexico. Since the discovery of the titanothere fossils, numerous other scientifically important vertebrate fossils have been discovered from this area. These fossils date to the Eocene Epoch at about 41 million years old. In addition, the area also has several populations of endangered plant species. A past survey conducted by Paul J. Knight found five plant species of concern to be within the area. The ACEC meets relevance (R-1, R-2, and R-3) and importance (I-1, I-2, and I-3) criteria.

Big Bead Mesa Special Management Area (311 Acres)

This site presents an excellent opportunity for archaeologists to study the effects of intertribal relations, conflicts, and alliances. It is an important representation of trade patterns and raiding that characterized Navajo relations with Pueblos, Apache, and Hispanics. It is the best known site of its time period and cultural affiliation. It is the first National Historic Landmark designated with Navajo cultural affiliation. The importance ranking for this site is I-1 based on is rarity and ranks and R1 for relevance based on its significant historic value.

Bluewater Canyon ACEC (89 acres)

Bluewater Canyon ACEC, located in an area of sandstone mesas, is a steep-walled canyon. This canyon contains the only perennial stream within the RPFO. The canyon bottom is composed of riparian habitat and a perennial stream. The availability of water leads to a heavy concentration of birds and mammals. The canyon contains outstanding scenic values and has been rated as a Class II VRM area. The canyon contains a unique and aesthetically appealing combination of vegetation, which includes cottonwoods, piñon-juniper, ponderosa pine, oak, and willow, along with various grasses, shrubs, and cacti. The ACEC meets relevance (R-2) and importance (I-2) criteria.

Cabezon Peak ACEC (5,765 acres)

Cabezon Peak, at over 8,000 feet high, is one of the most prominent local landmarks in the Rio Puerco Valley. It is a popular recreation site for casual visitation and rock climbing. The area also contains raptor nesting sites, and various raptor species have been observed using the area. The peak has populations of the rare plant species *Mammillaria wrightii, Sclerocactus papyracanthus, Abronia bigelovii,* and *Astragalus knightii.* Cultural resources are also present on the peak, and the peak has religious significance for both Pueblo and Navajo tribes. In addition to being a traditional cultural place, the peak also served as a boundary marker and reference point in prehistoric times.

Because of these geologic, biologic, and cultural values, Cabezon Peak ACEC meets relevance (R-1, R-2, and R-3) and importance (I-1, I-2, and I-3) criteria.

Cañon Jarido Special Management Area (1,803 acres)

Cañon Jarido is a steep-sided sandstone canyon cut approximately 100 feet into Mesa Portales, which provides raptor nesting sites. The vegetative community also provides good mule deer habitat. There are five springs in the canyon, two of which are associated with historic homesteads settled during the early 1900s. Additional historic and prehistoric cultural resources have also been identified in the canyon. Due to the presence of these scenic, wildlife, and cultural resources, the Cañon Jarido SMA meets relevance and importance criteria (R-1, R-2, I-1, and I-2).

Cañon Tapia ACEC (1,093 acres)

The Cañon Tapia ACEC is located in Sandoval County, about 80 miles northwest of Albuquerque, New Mexico. The ACEC is located within a 5-mile section of Tapia Cañon, a major secondary drainage that flows eastward into the Rio Puerco about a mile away in T. 15 N, R. 3 W. The ACEC is approximately 1,093 acres and contains three privately owned segments. The BLM currently manages approximately 4 of the 5 miles comprising the designated ACEC. Important resources within the ACEC include very high densities of both prehistoric and historic art in petroglyph and pictograph forms; related small storage and residential structures; spectacular views of contrasting red, orange, and brown high sandstone cliffs; and a large natural sandstone bridge. The ACEC meets relevance (R-1 and R-2) and importance (I-2) criteria.

El Malpais National Conservation Area (305,400 acres)

The Albuquerque Field Office prepared a "stand-alone plan"—the El Malpais Plan—to consolidate the RMP amendment decisions and activities as they relate to El Malpais NCA. The El Malpais lies south of the city of Grants, New Mexico, primarily in Cibola County. The Planning Area encompasses approximately 266,100 acres of federal land, 36,800 acres of private land, and 2,500 of Indian land. El Malpais was an ACEC in the 1986 plan, but was designated as an NCA.

Elk Springs ACEC (10,300 Acres)

The Elk Springs ACEC is located in Sandoval County, approximately 65 miles northwest of Albuquerque, New Mexico. Access to the ACEC is available from US Highway 550 and several dirt roads leading to northern, central, and southern portions of the area. Several miles of road leading to the northern and

central parts of Elk Springs cross private land. The topography of the ACEC is characterized by mesa tops with steep rocky sides and rimrock cut by narrow drainages and valleys. Elevations range to 8,000 feet. The ACEC is bounded on the east by the steep cliffs and rocky slopes of the Nacimiento Mountains, which also form the western boundary of the Santa Fe National Forest. The Jemez Indian Reservation lies just south of the ACEC, and the Rio Puerco is located about 1.5 miles west of the area. The adjacent land to the north of the ACEC is privately owned. Vegetation is characterized by types typical of piñon-juniper woodlands and sagebrush-dominated valleys. Key forage species for livestock and wildlife include mountain mahogany, Gambel oak, four-wing saltbush, big sagebrush, western wheatgrass, mutton bluegrass, alkali sacaton, bottlebrush squirrel-tail, and Indian ricegrass. The ACEC meets relevance (R-2 and R-3) and importance (I-1 and I-2) criteria.

Guadalupe Ruin and Community Special Management Area (487 acres)

Guadalupe Ruin is a single-story, masonry, tenth- to ~~thirteenth~~13th-century pueblo situated on an isolated sandstone mesa rising nearly 200 feet above the valley floor and isolated by sheer walls on all sides. The ruin consists of at least 39 rectangular rooms and 7 kivas. Archaeological investigations conducted in the 1970s suggest that the site was originally built as a Chacoan Outlier, but was reoccupied in the late ~~thirteenth~~ 13th century by immigrants from the Mesa Verde area. The surrounding community consists of 157 recorded sites. Curiously, most outliers are situated at locations generally north, west, and south of Chaco Canyon, while Guadalupe stands out nearly alone in its eastern placement in the Chaco world and may have been positioned to take advantage and possibly control a migration and trade route between the San Juan Basin and the Rio Grande. Guadalupe Ruin is one of the Chaco Outliers protected under Public Law 96-550 and is recognized as one of the earliest firmly dated Chaco Outliers. This site has been excavated and some of the masonry walls stabilized, including two kivas that also have protective roofs over them to protect them while leaving them open for public visitation. These special qualities meet the relevance (R-1) and importance (I-2 and I-2) criteria.

Headcut Prehistoric Community Special Management Area (2,274 acres)

The Headcut Prehistoric Community SMA contains a prehistoric Pueblo II–III community with a large isolated kiva, at least five major pueblos ranging in size from 45 to 100 rooms, and numerous smaller sites. The Headcut Prehistoric Community SMA does not meet the ACEC relevance and importance criteria.

Historic Homesteads Special Management Area (16 acres)

This SMA consists of nine historic log cabin sites scattered through the northern portion of the Planning Area. These cabins were constructed between 1900 and 1940. The Historic Homesteads SMA does not meet ACEC relevance and importance criteria. In addition, cultural resource staff at RPFO determined that, due to the small size of each dispersed homestead site (10 acres or less), the historical and recreational values of the homesteads could be managed adequately under existing laws and regulations.

Ignacio Chavez Special Management Area (43,182 acres)

The Ignacio Chavez SMA is located approximately 25 miles west of San Ysidro, New Mexico, in Sandoval and McKinley Counties. The SMA has a variety of landforms, including mesas, cuestas, rock terraces, canyons, basalt plains, cinder cones, and talus slopes. The proximity of these landforms to one another creates a striking landscape and gives the area a high scenic quality. The habitat in the Ignacio Chavez SMA is a mix of piñon-juniper woodland, ponderosa pine with oak understory, and open grasslands. The SMA provides excellent habitat for many wildlife and plant species. Because of these scenic and wildlife values, the Ignacio Chavez SMA meets the relevance (R-2) and importance (I-2) criteria.

Jones Canyon ACEC (649 acres)

Nationally significant cultural resources are present in Jones Canyon ACEC, most notably, the large prehistoric Pueblo II–III, with nearly 200 rooms and numerous other prehistoric dwellings present in the

area. As such, Jones Canyon ACEC continues to meet the relevance (R-1) and importance (I-1 and I-2) criteria.

Ojito ACEC (13,700 acres)

The Ojito ACEC consists of 13,700 acres. The Ojito ACEC is located in west-central Sandoval County approximately 40 air miles northwest of Albuquerque and 6 miles west of San Ysidro. The Ojito ACEC is located in a rather special setting in that it is situated at the intersection of the Navajo and Datil sections of the Colorado Plateau physiographic province, and the southern terminus of the Southern Rocky Mountains physiographic province. Expressions of these physiographic subdivisions that occur in and around the Ojito ACEC include lava flows, volcanic necks and plugs, cuestas, fault block mountains, desert plains, and canyoned plateaus. The ACEC meets relevance (R-1) and importance (I-1 and I-2) criteria. Also, the area overlaps the Ojito Wilderness.

Pelon Watershed Special Management Area (858 acres)

The Pelon Watershed SMA is one of three watershed Study Areas that were part of the Rio Puerco Hydrology Study. The objective of the study was to monitor hydrologic responses to the Rio Puerco grazing management programs, which was achieved by allowing grazing in the watershed Study Areas but excluding all other surface-disturbing activities. The watershed study ended in 2004, so the management actions associated with the watershed Study Area are no longer necessary.

Petaca Pinta Special Management Area (13,789 acres)

The area has unique geological formations. Because of these values, the area meets relevance (R-1, R-2, and R-3) and importance (I-3 and I-4). Also, the area overlaps 100 percent of the Petaca Pinta WSA.

Pronoun Cave Complex ACEC (1,194 acres)

The travertine deposits housed in these caves are proposed to be some of the most unusual in the world (Forbes 1993). Entering the caves is equated to entering the throat of an extinct travertine-depositing spring. In addition, paleontological resources are abundant within the caves and have been used for paleoclimate reconstruction. Given the well-preserved spring vent depositional environment, hydrologic interaction between the lower San Andres limestones, and extensive paleontological resources, this ACEC meets the criteria for relevance (R-30) and importance (I-1 and I-2).

San Luis Mesa Raptor Area ACEC (10,447 acres)

The San Luis Mesa Raptor Area ACEC consists of about 20 miles of sandstone bluffs about 100 to 200 feet high. The geologic values associated with these bluffs are exemplary exposure of Mancos Shale and Point Lookout Sandstone outcrops, with implications for paleographical reconstruction. Ledges carved in the bluff by wind erosion form excellent raptor nest sites, and numerous raptor species have been observed nesting there. Because of these wildlife and geologic values, the San Luis Mesa Raptor Area meets relevance (R-2, R-3, and R-4) and importance (I-1, I-2, and I-3) criteria.

Tent Rocks National Monument (11,743 acres)

Located in north-central New Mexico in the foothills of the Jemez Mountains on the Pajarito Plateau, the Kasha-Katuwe Tents Rocks National Monument (formerly an SMA) is in Sandoval County. The monument was designated by Presidential Proclamation 7394 on January 17, 2001. With a stand-alone plan, existing actions, decisions, and guidelines under which the ACEC have been managed have effectively met public needs and/or resolved issues; thus, the BLM will continue to use them as specified in the Final Protection Plan for Tent Rocks.

Torreon Fossil Fauna ACEC (6,488 acres)

This area, located near the head of Torreon Wash, is a major collecting area for fossil mammals. Wood et al. (1941) formally defined this area as the type locality for the Torrejonian Land Mammal Age. A type locality is an important paleontological feature in that it represents the place at which a fossil assemblage was first scientifically recognized and from which it derives its name. Type specimens of the Torreon Fauna were originally recognized and described from this locale. Thus, the area represents a unique and irreplaceable resource. Because of these important paleontological resources, this area meets the relevance (R-1 and R-3) and importance (I-1, I-2, and I-3) criteria.

3.20 SPECIAL STATUS SPECIES

The RPFO maintains a special status species list that contains both federally protected species, as well as BLM sensitive species. Many species listed by the New Mexico Department of Game and Fish are also contained in this list. Monitoring for many special status species has been ongoing since the 1986 RMP. However, many data gaps exist due to budget and staffing constraints throughout the years. The following description of the current conditions of special status species within the RPFO was ascertained from the current available data within the field office, as well as outside data sources. **Table 3-31** represents the federally endangered and threatened species that occur within the affected environment.

Table 3-31: Federally Protected Species in Planning and Decision Areas

Species	Status	County Occurrence	Occurs in Planning Area	Occurs in Decision Area
Black-footed ferret, *Mustela nigripes*	Endangered	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	No	No
Southwestern willow flycatcher, *Empidonax traillii extimus*	Endangered	Bernalillo, Cibola, McKinley, Sandoval, Valencia	Yes	Yes
Jemez Mountains salamander, *Plethodon neomexicanus*	Endangered	Sandoval	Yes	No
Rio Grande cutthroat trout, *Oncorhynchus clarkii virginalis*	Candidate	Sandoval	Yes	No
Rio Grande silvery minnow, *Hybognathus amarus*	Endangered	Bernalillo, Sandoval, Valencia	Yes	No
Zuni bluehead sucker, *Catostomus discobolus yarrowi*	Endangered	Cibola, McKinley	Yes	Yes
New Mexican jumping mouse, *Zapus hudsonius luteus*	Endangered	Bernalillo, Sandoval, Valencia	Yes	Yes
Yellow-billed cuckoo, *Coccyzus americanus*	Threatened	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	Yes	Yes
Mexican spotted owl, *Strix occidentalis lucida*	Threatened	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	Yes	No
Monarch butterfly, *Danaus plexippus plexippus*	Candidate	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia	Yes	Yes
Pecos sunflower, *Helianthus paradoxus*	Threatened	Cibola	Yes	No
Zuni fleabane, *Erigeron rhizomatus*	Threatened	Cibola, McKinley	Yes	No

Species	Status	County Occurrence	Occurs in Planning Area	Occurs in Decision Area
American Hart's-tongue Fern, *Asplenium scolopendrium* var. *americanum*	Threatened	Cibola	Yes	No

Sources: BLM 20182019d, e; USFWS 2021a2019a, b, c, d, e

The current condition of federally listed special status species within the Planning Area is best described by analyzing the availability and health of critical habitat based on defined key habitat types. For federally listed species, designation of critical habitat is used. Critical habitat for Mexican spotted owl (*Strix occidentalis lucida*), Rio Grande silvery minnow (*Hybognathus amarus*), southwestern willow flycatcher (*Empidonax traillii extimus*), yellow-billed cuckoo (*Coccyzus americanus),* and Pecos sunflower (*Helianthus paradoxus*) exists within the Planning Area, but no critical habitat exists within the Decision Area. Out of these five species, suitable habitat for the southwestern willow flycatcher occurs within the Decision Area.

According to current RPFO data, the only federally listed species known to occur within the Planning Area is are the southwestern willow flycatcher and monarch butterfly. The RPFO contains habitat that may support the Mexican spotted owl, but higher densities of this species are more likely found in higher-elevation, mixed conifer forests. No data suggest the RPFO supports the Rio Grande silvery minnow, yellow-billed cuckoo, or Pecos sunflower. However, these habitats may be considered part of the affected environment as management decisions within the Planning Area may have the potential to affect these species populations that are outside the Planning Area. For example, the Rio Puerco feeds into a segment of the Rio Grande River that contains designated critical habitat for the southwestern willow flycatcher, Rio Grande silvery minnow, and yellow-billed cuckoo. Therefore, decisions made affecting the condition of the Rio Puerco have the potential to affect these critical habitats.

3.20.1 Southwestern Willow Flycatcher

The RPFO has conducted annual surveys for the flycatcher in multiple locations throughout the field office where it has been positively identified, and seven other riparian sites that are monitored annually for all breeding birds. The three sites that have been most consistently monitored for southwestern willow flycatcher are Bluewater Canyon (south of Bluewater, New Mexico), Lost Valley (north of Cabezon Peak), and San Ysidro (on southern edge of San Ysidro, New Mexico). From 1996 to 2009, the occurrence of southwestern willow flycatcher at Bluewater and Lost Valley appears to be in a downward trend according to survey data taken throughout those years (r^2=0.01 for Bluewater, r^2=0.2 for Lost Valley). The only site that appears to have an upward trend in occurrence is San Ysidro (r^2=0.1). The goodness-of-fit values, as measured by r^2, indicate that although there is a general upward or downward trend, none of the data are significantly conclusive of the trend of this species in each site surveyed. However, since the southwestern willow flycatcher is a riparian-obligate species, the current condition of riparian areas in the RPFO indicate habitat trends of this endangered species.

Riparian/wetland areas represent important migratory bird flyways and nesting areas for threatened and endangered species and have been found to contain large populations of bird species in desert areas (Hoag 2005). Riparian/wetland areas in the RPFO traverse portions of public, state, tribal, and private land, and therefore not all habitats have been completely mapped and studied. Out of the 28 riparian areas assessed, 13 are properly functioning. Furthermore, 13 of the sites allow grazing by livestock, while 15 do not allow grazing by livestock. Out of those that are grazed by livestock, 31% percent were rated at PFC, 31 percent% were rated as FAR, and 38 percent% were non-functional or FAP. Out of those that exclude livestock grazing, 60 percent% were rated at PFC, 33 percent% were FAR, and the remaining 7 percent% were non-functional.. Currently, the RPFO is actively involved in riparian restoration projects that include physical

reconstruction of hydrologic flow, revegetation, and exclusion of livestock and others. Many of these projects include the objective of recovery of the southwestern willow flycatcher. Threats to their habitat include, but are not limited to, recreation, livestock grazing, agricultural development, water diversion and impoundment, and mineral development. Riparian habitat is discussed in detail in **Section 3.16.**

3.20.2 Monarch Butterfly

Monarch butterflies occur throughout the RPFO. As a new addition to the federally protected species list, there are currently no surveys or monitoring efforts for this species within the RPFO decision area.

~~3.20.2~~3.20.3 Black-footed Ferret

The other federally listed endangered species that warrants discussion is the black-footed ferret (*Mustela nigripes*). After 75 years without a sighting, a wild-born black-footed ferret has been found in New Mexico. The ferret was discovered in north-central New Mexico on the Vermejo Park Ranch. The ferret is the offspring of ferrets from a captive bred reintroduction program that had been made possible through Recovery Program funds provided by the ~~US Fish and Wildlife Service~~USFWS and ~~our~~ many partners, including substantial help from the Turner Endangered Species Fund. Ultimately, the reintroduction effort at Vermejo Park Ranch failed due to the low survival rate of prairie dog pups from prolonged, intermittent drought. An additional recovery effort was initiated in 2018 near Wagon Mound, New Mexico~~; the success and results of this effort are unknown~~. Eight ferrets were released in September 2018; however, BLM surveys suggest that only three of those individuals survived the first winter. One individual captured in August 2019 was a young ferret that was born on site that previous year, indicating successful reproduction that year. An additional four black-footed ferrets were released in late September 2019 to further augment the population. Within the RPFO, opportunities exist to implement certain measures of the black-footed Ferret Recovery Plan (USFWS 1988) involving enhancement of prairie dog colonies/complexes.

~~Currently, the El Malpais Plan (BLM/NM/Public Law 01-007-1610) designates the historic location of the largest known prairie dog colony within the RPFO as a prairie dog colony enhancement area. It should be noted that the EL Malpais Plan is a stand alone plan not part of the Rio Puerco Field Office RMP Planning Area. This effort was initiated to benefit a local special status species, the burrowing owl. However, if the colony can be expanded to the appropriate size and density, it will be a potential release site for an experimental population of the endangered black footed ferret.~~

~~3.20.3~~3.20.4 RPFO Sensitive Species

In addition to management of federally listed threatened, endangered, and proposed species, the RPFO also maintains a list of Bureau sensitive species, which includes rare plants, as shown in **Table 3-32**, RPFO Sensitive Species Verified in the Decision Area. Also see **Appendix J**, Rio Puerco Field Office Special Status Species List.

Currently, the RPFO maintains little data on the previously mentioned RPFO Bureau sensitive animal species. One-time surveys have been conducted for few of them, and there are no monitoring programs in place for any of them. The majority of Bureau sensitive species include bats, birds, and plants. A survey in 1998 documented 13 bat species, some of which are special status species, in five sites. Two riparian sites (Rio Salado Marsh and Bluewater Canyon), two piñon-juniper sites (Cañon Jarido and Pronoun Caves), and one site with characteristics of both riparian and piñon-juniper habitat types (Cebolla Canyon) were surveyed, and the following species were identified: pallid bat, Townsend's big-eared bat, big brown bat, California myotis, little brown bat, and spotted bat. A roost of Townsend's big-eared bat was located at Pronoun Caves. The caves also provide important winter hibernacula for bat species.

Although the 1986 RPFO RMP designated Pronoun Caves as an SMA for protection of resources, the area the SMA covers currently has mining claims on it. There are large travertine deposits in the area and two

active mines within 1 mile of the caves. It is likely that these mining activities are having a negative effect on bats utilizing the Pronoun Caves due to their close proximity and the noise/ground disturbance they produce.

Sensitive bird species in the RPFO occupy a variety of habitats including piñon-juniper, desert scrub, riparian/wetlands, and grassland savannahs. The main habitat type that most birds in the desert southwest gravitate toward is riparian/wetland due to its ability to provide food, water, shelter, and nesting substrate. Riparian restoration is one common objective of the wildlife, riparian, and special status species program goals in the RPFO. Annual breeding bird monitoring in riparian/wetland areas is ongoing. Current threats to special status bird species include landscape-level mechanical and chemical treatments of sagebrush and piñon-juniper encroached grasslands, livestock grazing in riparian areas, and the invasion of noxious weeds in all native habitats.

Management of special status species in the RPFO is often done through the designation and protection of SMAs and ACECs. Currently, the RPFO manages four ACECs for the protection of rare plants. These areas include Cabezon Peak ACEC (*Abronia bigelovii*, *Astragalus knightii*, *Mammillaria wrightii*, and *Sclerocactus papyracantha*), Cañon Tapia ACEC (*Astragalus knightii*), Espinazo Ridge ACEC (formerly Ball Ranch ACEC) (*Astragalus feensis, Astragalus kentrophyta var. neomexicana*, *Oenothera caespitosa spp. navajoensis*, and *Sclerocactus papyracantha* [synonymous with genera *Toumeya* and *Pediocactus*] (*Abronia bigelovii*), Ignacio Chavez Grant SMA (*Sclerocactus papyracantha, Mammillaria wrightii*, and *Corypantha missouriensis*), and Ojito ACEC (*Sclerocactus papyracantha* and *Astragalus knightii*). Surveys were conducted (anywhere from 5 to 20 years ago) to determine the extent of the populations; however, regular monitoring programs are not in place, and it is difficult to determine the trends of these species and their occupied habitat. There are few to no site-specific measures and procedures that protect sensitive plant species from resource uses in the RPFO.

Table 3-32: RPFO Sensitive Species ~~Found~~ Verified in the Decision Area

Species[1]	Status	County Occurrence
~~Monarch butterfly, *Danaus plexippus plexippus*~~	~~RPFO Bureau Sensitive (Arthropod)~~	~~Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia~~
Northern leopard frog, *Lithobates (Rana) pipiens*	RPFO Bureau Sensitive (Amphibian)	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia
Desert massasauga, *Sistrurus tergeminus*	RPFO Bureau Sensitive (Reptile)	Bernalillo, Torrance, Valencia
Bendire's thrasher, *Toxostoma bendirei*	RPFO Bureau Sensitive (Bird)	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia
~~Western burrowing owl, *Athene cunicularia*~~	~~RPFO Bureau Sensitive (Bird)~~	~~Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia~~
Mexican Whip-poor-will, *Antrostomus arizonae*	RPFO Bureau Sensitive (Bird)	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia
Pinyon jay, *Gymnorhinus*	RPFO Bureau Sensitive (Bird)	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia
~~Bendire's thrasher, *Toxostoma bendirei*~~	~~RPFO Bureau Sensitive (Bird)~~	~~Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia~~
Virginia's warbler, *Vermivora virginiae*	RPFO Bureau Sensitive (Bird)	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia
Western burrowing owl, *Athene cunicularia*	RPFO Bureau Sensitive (Bird)	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia
Gunnison's prairie dog, *Cynomys gunnisoni*	RPFO Bureau Sensitive (Mammal)	Bernalillo, Cibola, McKinley, Sandoval, Torrance, Valencia
Spotted bat, *Euderma maculatum*	RPFO Bureau Sensitive (Mammal)	Bernalillo, Cibola, Sandoval, Valencia
Townsend's big-eared bat, *Corynorhinus townsendii*	RPFO Bureau Sensitive (Mammal)	Bernalillo, Cibola, Sandoval, Torrance

Species[1]	Status	County Occurrence
~~Spotted bat, *Euderma maculatum*~~	~~RPFO Bureau Sensitive (Mammal)~~	~~Bernalillo, Cibola, Sandoval, Valencia~~
Acoma fleabane, *Erigeron acomanus*	RPFO Bureau Sensitive (Plant)	Cibola, McKinley
Gypsum townsend daisy, *Townsendia gypsophila*	RPFO Bureau Sensitive (Plant)	Sandoval
Knight's milkvetch, *Astragalus knightii*	RPFO Bureau Sensitive (Plant)	Sandoval
Parish's alkaligrass, *Puccinellia parishii*	RPFO Bureau Sensitive (Plant)	Cibola, McKinley, Sandoval
Sand verbena, Galisteo, *Abronia bigelovii*	RPFO Bureau Sensitive (Plant)	Sandoval
Todilto stickleaf, *Mentzelia todiltoensis*	RPFO Bureau Sensitive (Plant)	Bernalillo, Cibola
~~Tufted sand verbena, *Abronia bigelovii*~~	~~RPFO Bureau Sensitive (Plant)~~	~~Sandoval~~
Yeso twinpod, *Physaria newberryi* var. *yesicola*	RPFO Bureau Sensitive (Plant)	Cibola, Valencia

Sources: BLM~~, 2018~~2019d, e

[1]Includes verified, not potential, species

Threats likely to affect special status plant species on the RPFO include recreation uses, such as motorized and nonmotorized OHV use, special recreation events, and recreational visitors leaving authorized roads and trails; trampling due to livestock grazing; habitat loss due to the creation of roads, trails, and rights-of-way; mineral development facilities; and any other surface-disturbing activities that occur within the RPFO.

~~3.20.4~~3.20.5 Migratory Birds

The Migratory Bird Treaty Act (1918) implements various treaties and conventions between the US and Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under the act, taking, killing, or possessing migratory birds is unlawful. Over 800 species are covered under the treaty. The RPFO protects migratory birds by designating ACECs, protecting riparian areas, and implementing best management practices and mitigation during all construction and project activities (analyzed through NEPA). These areas include San Luis Mesa Raptor ACEC, Cabezon Peak ACEC, and Cañon Tapia ACEC. Protection of these areas includes protection of prairie dog towns adjacent to suitable nesting habitat for prey base. In the 1986 RMP, one management objective for San Luis Mesa Raptor ACEC was to alter livestock grazing patterns within the ACEC and surrounding allotments to improve raptor prey base. However, management prescriptions to accomplish this objective were never implemented, and reports of raptor numbers in the ACEC have been lower than expected.

The main threats to migratory birds in the RPFO are depletion of water resources and riparian/wetland areas, mineral development and construction activities during the nesting season, and habitat loss, specifically to nesting areas and migratory bird flyovers/migration corridors.

3.21 Travel Management

The existing RMP does address OHV (formerly ORV) designations, but does not include access and transportation program issues throughout the Planning Area. These designations will not be covered in this section. A formal transportation plan was scheduled for 1987, but was not completed due to inadequate staffing and funding. As a result, only minimal information is known about the transportation network for the Planning Area. No documentation was found on the current goals, objectives, or actions taken in regards to transportation and access. There are 29 roads and 15 trails currently tracked in the BLM Facilities and

Assets Management System (FAMS) for the RPFO. The FAMS database is the official repository of current information on the BLM's transportation systems.

The Rio Puerco Field Office used the BLM Facility Inventory System to manage and maintain their roads and trails up until 2002 when the BLM switched to FAMS. There are currently 28 roads and one primitive road tracked in the Planning Area. Two of the 28 are located in Cibola and southeast McKinley Counties, and the rest are located in Sandoval County. In addition, the BLM has 67 existing road ROWs in the Planning Area.

The RPFO currently tracks 15 trails in FAMS. These trails have never been formally condition assessed, and minimal information is known about the current condition of the trails. These trails are maintained through a combination of annual maintenance funding, recreation funding, and volunteer support.

In the 1986 RMP, the RPFO delineated 23 SMAs. These areas were analyzed, and planned actions were made on how each area would be classified. Classifications include open, limited, or closed to motorized travel.

There has been a noticeable deterioration of the roads within the Planning Area. County maintenance of BLM roads has increased, but still does not account for all roads. Trails have seen minimal maintenance, with the focus being on maintaining recreational sites; not much maintenance has been achieved due to lack of funding.

There is also a large portion of linear features within the Rio Puerco Planning Area that may qualify as roads, primitive roads, and trails that have yet to be assessed. Once the transportation plan has been completed for the RPFO, the number of roads, primitive roads, and trails being tracked in FAMS will increase. Current maintenance funding will continue to be inadequate as it will be spread across more linear features. With an increase of annual maintenance that was not performed when it was scheduled or was delayed, deferred maintenance increases.

As the population in the Planning Area continues to grow, so does the demand for access to public lands. Sandoval County currently holds the highest volume of BLM roads in the Planning Area. With the population growth in the city of Rio Rancho, development will continue to increase and encroach upon BLM-administered lands located within Sandoval County, which is a high use area. The maintenance on these roads, primitive roads, and trails that provide public land access also increases while funding to accomplish the maintenance decreases annually. Funding will play a vital role in the classification of the road as open, limited use, or closed.

The growing populations in urban areas such as Albuquerque, Rio Rancho, and Los Lunas may demand additional access to BLM-administered lands.

The checkerboard surface ownership pattern allows private entities to block access to some BLM-administered lands. Legal access has the potential to be illegally gated by private landowners or permittees. Areas where access may be an issue extend throughout the Planning Area, and are not necessarily concentrated within a particular geographic area.

Route inventories have been completed for ACECs and WSAs in the Planning Area.

A preliminary inventory of the existing road, primitive road, and trail network is shown in **Appendix S**, **Maps 3-16** through **3-19**. These routes were inventoried, ground verified, and mapped using aerial photographs and global positioning system (GPS) devices. These maps do not include an inventory of existing single-track routes. A road is a linear route declared a road by the owner, managed for use by low-clearance vehicles having four or more wheels, and maintained for regular and continuous use. A primitive road is a linear route managed for use by four-wheel drive or high-clearance vehicles. These routes do not normally meet any BLM road design standards. An existing road is one that appears on the road inventory.

3.22 VEGETATIVE COMMUNITIES

The major ecosystems of the RPFO are scrub/steppe/shrub, piñon-juniper, grassland, ponderosa pine, riparian/wetland, and aquatic (**Table 3-33**; **Appendix S**, **Map 3-20**).

The information used to characterize current conditions within Bernalillo, Cibola, Sandoval, Valencia, Torrance, and McKinley Counties was obtained from the following four information sources: 1) EPA Level III Ecoregions descriptions; 2) NRCS Major Land Resource Areas (MLRAs) descriptions; 3) ecological site descriptions (USDA NRCS); and 4) land cover information derived from the Southwest Regional Gap Analysis Project (SWReGAP) data (USGS).

Table 3-33: Major Vegetation Communities of the RPFO

Ecosystem Types	Acres
Aquatic	431
Grassland	152,539
Other	59,440
Piñon-Juniper	177,843
Ponderosa Pine	3,598
Riparian/Wetland	3,513
Shrub/Steppe/Scrub	334,235
Total	**731,599**

Source: BLM GIS 2020

3.22.1 EPA Level III Ecoregions

Ecological regions or ecoregions are designed to serve as a spatial framework for environmental resource management; ecoregions denote areas within which ecosystems (type, quality, and quantity of environmental resources) are generally similar. Ecological regions or ecoregions are identified through the analysis of the patterns and the composition of biotic and abiotic phenomena that affect or reflect differences in ecosystem quality and integrity (Wiken 1986; Omernik 1987, 1995). These phenomena include geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The relative importance of each characteristic varies from one ecological region to another regardless of the hierarchical level. Level I is the coarsest level, dividing North America into 15 ecological regions, whereas at Level II the continent is subdivided into 52 classes. For portions of the United States, the ecoregions have been further subdivided to Level IV. The applications of the ecoregions are explained in Gallant et al. (1989). Level III ecoregions and estimated BLM acres within each are identified in **Table 3-34** below; also see **Appendix S**, **Map 3-1** (EPA 2020a).

Table 3-34: Ecoregions in the Decision Area

Ecoregion	BLM Acres
Arizona/New Mexico Mountains	62,438
Arizona/New Mexico Plateau	644,579
Southern Rockies	9,915
Southwestern Tablelands	14,667

Source: BLM GIS 2020

3.22.2 Major Land Resource Areas

The MLRAs provide a coarse-scale description of the vegetation and habitat found within the Planning Area; this information has been excerpted from the New Mexico Standards for Public Land Health and Guidelines for Livestock Grazing Management (BLM 2001b). Ecological site descriptions provide more detailed information on vegetation within the MLRAs (based on a general association of these two datasets).

MLRAs found within the Planning Area classify nearly homogeneous areas in terms of land use, elevation, topography, climate, water resources, potential natural vegetation, and soils. These coarse-scale descriptions

of the Planning Area are based upon aggregations of geographically associated areas derived from New Mexico State soil geographic database map unit boundaries, and include the known plant community types that could potentially occur. Information specific to each MLRA, including physiography, geology, climate, water, soils, biology, and land use, can be found in the US Department of Agriculture Handbook 296 (USDA NRCS 2006). Each MLRA is broken down further into land resource units (LRUs).

LRUs are the basic units from which MLRAs are determined. They are also the basic units for state land resource maps. They are typically coextensive with state general soil map units, but some general soil map units are subdivided into land resource units because of significant geographic differences in climate, water resources, or land use (USDA NRCS 2006).

The Planning Area is classified within six MLRAs (**Appendix S**, **Map 3-21**) and 10 LRUs as described by the USDA Natural Resources Conservation Service (USDA NRCS 2006) shown in **Table 3-35** below. The MLRAs and LRUs are broken down by county within the Planning Area in **Table 3-36** below.

Table 3-35: MLRAS and LRUS in the Planning Area

MLRA	LRU
35) Colorado Plateau	35.1 Colorado Plateau Mixed Grass Plains 35.3 Colorado Plateau Sagebrush-Grasslands 35.6 Colorado Plateau Piñon-Juniper-Sagebrush 35.7 Colorado Plateau Piñon-Juniper 35.8 Colorado Plateau Ponderosa Pine Forest
36) Southwest Plateaus, Mesas, and Foothills	36.2 Southwestern Plateaus, Mesas, and Foothills, Warm Semiarid Mesas and Plateaus
39) Arizona and New Mexico Mountains	39.2 Central New Mexico Mountains
42) Southern Desertic Basins, Plains, and Mountains	42.1 Upper Rio Grande Rift Valley
48) Southern Rocky Mountains	48A.1 Southern Rocky Mountains-High Mountains and Valleys
70C) Central New Mexico Highlands	70C.1 Central New Mexico Highlands

Table 3-36: LRUs by County Within the Planning Area

MLRA	*LRU by County					
	McKinley	Cibola	Valencia	Bernalillo	Sandoval	Torrance
35	35.1, 35.6, 35.7, 35.8	35.1, 35.6, 35.7, 35.8	35.7	35.1	35.3, 35.1, 35.8	
36					36.2	
39			39.2	39.2	39.2	39.2
42		42.1	42.1	42.1	42.1	42.1
48					48A.1	
70C			70C.1	70C.1		70C.1

Source: BLM GIS 2020
*Units provided include RPFO-administered lands outside the Decision Area.

LRUs are broken down further into ecological site descriptions (ESDs; USDA NRCS 2006). An ecological site, as defined for rangeland, is a "distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation" (Bestelmeyer et al. 2003). A large number of ESDs occur within the Planning Area and can be found in the NRCS Field Office Technical Guide (USDA NRCS 2020). State and transition models associated with ecological sites specify indicators of ecological resilience and thresholds. Ecological sites are currently being updated to include state and transition models in the state of New Mexico. The BLM uses state and transition models as guides to manage vegetative communities in a manner that will result in a stable or desired state.

3.22.3 Southwest Regional Gap Analysis Project

The SWReGAP data has been aggregated using the National Landcover Dataset Classification (NLDC) system (US Geological Survey 2004), developed in collaboration with NatureServe (2003) to represent the US National Vegetation Classification system (USNVC). The NLDC system combines finer-scale units defined by the USNVC to provide the basis for interpreting coarse scale ecological systems more practically. The USNVC categories are further combined into Natural Land Cover Types (NLCT) for coarse-scale analysis, for which NLDC classifications would be impractical. The following discussion integrates these data sets in order to most accurately describe the current condition and trend of vegetation, as they relate to both the Planning Area and Decision Area.

While the MLRA model uses a soils-based approach to identify and describe potential vegetative communities and habitat, the SWReGAP model uses canopy cover and reflectance values in a vegetation-based approach to map and assess current vegetative communities (US Geological Survey 2004). The SWReGAP data set emphasizes the vegetative communities more than the MLRA data set and provides greater detail describing the different plant communities (SWReGAP 2020).

3.22.4 Riparian

Riparian and wetland areas within the Planning Area were identified in the Riparian and Aquatic Habitat Management Plan (BLM 2000). The purpose of the plan is to provide guidance for the restoration and protection of riparian habitats under the jurisdiction of the RPFO. Standard 3 of New Mexico Standards and Guidelines also addresses the riparian health standards.

Native species such as cottonwoods and willows have been replaced by exotic invaders such as saltcedar and Russian olive. Only fragmented stands of cottonwoods/willows are now found along streambanks.

In the riparian-wetland ecosystem, there are certain plants or organisms that are more important than others and are considered dominant species. In the Rio Puerco Basin, the Fremont cottonwood should be dominant and form the main tree canopy in the riparian zone. Beneath the cottonwoods, a shrubby layer of willows should develop and below the willows an herbaceous layer of rushes, sedges, grasses, and other riparian plants should occur at the water's edge. Emergent or aquatic plants such as bulrushes or cattails should be evident in slow water or marshy areas. This layering of vegetation is referred to as stratification. This structural layering should also contain diverse age classes.

Among other factors, a proper functioning riverine riparian area should have bank vegetation, with root masses capable of withstanding high stream flow events. This vegetation should protect streambanks and dissipate energy.

Riparian and wetland resources are discussed further within their own section in this chapter.

3.22.5 Noxious and Invasive Species

The establishment and spread of invasive species can directly affect vegetation by increasing the overall competition with native species for limited resources (e.g., water, nutrients, and space), limiting the capacity of native or desirable communities to reestablish. Over time, invasive species also can alter the structural and functional components of a system (e.g., soil structure/function, hydrologic function, fire return intervals, and energy flow) severely enough that reestablishment of native or desirable species is not feasible (Barbour et al. 1999; West 2000).

Noxious weeds are nonnative plants that have been designated noxious by state law because of their potential harm to the state economy, generally associated with agriculture and livestock. Common locations for noxious weed infestations in the Planning Area include roadsides and areas that are highly disturbed or degraded.

Appendix K lists the noxious weeds that have been identified as occurring on lands within the boundaries of the RPFO. The ~~2016~~ 2020 New Mexico Noxious Weed List (New Mexico Department of Agriculture 2020) can also be found in **Appendix K**. This list is updated as new infestations are discovered and/or eradicated.

In addition to the Noxious Weed Prevention Schedule for the RPFO, the Final Programmatic Environmental Impact Statement (PEIS) for Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States and the Final PEIS for Vegetation Treatments Using Aminopyralid, Fluroxypyr, and Rimsulfuron (Final PEIS; BLM 2007b) have been finalized for the use of these herbicides on BLM-administered land.

The trend for noxious weed abundance and distribution is difficult to assess because some of the comprehensive data for noxious weed occurrence were collected based on presence/absence, providing little abundance data. Noxious weeds continue to expand their distribution by a variety of mechanisms, and often the mechanism is associated with human activity and soil disturbance. Abundance of most noxious weed species results from their ability to outcompete local native species for water or other resources.

The forecast for the noxious weeds in the Planning Area varies by species because of the variety of natural strategies each species possesses for survival. In some instances, a plant is relatively widespread but responds to management actions to control it if implemented consistently over time. Because other species cannot be controlled with current established methods, preventing their initial establishment is the only means of managing them.

Based on current weed management for both invasive and noxious species, the BLM is likely to continue individual and cooperative efforts to inventory the extent and location of existing populations, and to control and/or prevent new infestations where possible. As the amount and types of human uses increase, so does the potential for the spread and establishment of invasive and noxious weed species. Therefore, unless management and control measures are intensified to address increased land uses, it is likely that invasive and noxious weed species could proliferate throughout the Planning Area.

3.22.6 Vegetation Inventories

Five rangeland inventories have been conducted in the Planning Area since 1975. The Rio Puerco RMP/EIS range inventory utilized the SCS (now NRCS) range site methodology, as directed by BLM Instruction Memoranda WO-83-340 and 83-394. The NRCS inventory was completed on the Section 3 permit lands only. Section 3 permit lands are public lands within grazing districts for which livestock grazing is authorized under Section 3 of the Taylor Grazing Act. These are generally more consolidated blocks of public land. The Section 15 leased lands were not inventoried because a decision was made not to invest public funds on lands being considered for disposal or having limited potential for improved resource condition. Section 15 leased lands are public lands outside grazing districts for which livestock grazing is authorized under Section 15 of the Taylor Grazing Act.

The inventory data collected for the Section 3 permit lands were used to calculate an ecological condition rating for each allotment. An ecological condition rating is the comparison of the current vegetation production to the potential vegetation of a range site (an area possessing the capacity to produce a distinct and unique vegetation community), and is expressed as a percentage of the potential vegetation. The ecological condition ratings are one criterion used to determine the Selective Management Category (Maintain, Improve, or Custodial) for each allotment (**Appendix E**; BLM 1986).

A stocking rate analysis was performed for the Section 15 leased lands to indicate where forage allocation problems might exist. This analysis involved the comparison of the current stocking rates determined from the grazing case files to an estimation of the potential stocking rate for each leased area. An assumption was made that all range sites in the leased areas were in fair ecological condition and the stocking rates

recommended in the individual NRCS Range Site Guides, currently known as ecological site descriptions, were used to represent potential stocking for this analysis. The results of the stocking rate comparisons were used as the basis for establishing selective management categories for the Section 15 leased lands.

3.22.7 Land Health

Rangeland health standards are assessed prior to fully processing each grazing authorization. Yearly range health assessments are prioritized by those allotments that have never been analyzed with the NEPA process using EAs. Rangeland health assessments are based on the BLM and National Operations Center Technical Reference 1734-6, Interpreting Indicators of Rangeland Health (Pellant et. al. 2018).

Several types of vegetation manipulation activities have been administered by the RPFO since the completion of the 1986 RMP. Activities affecting trends utilized by the RPFO on a large scale include, but are not limited to, herbicide application, prescribed fire, and woodland thinning/mastication. Other forms of vegetation manipulation activities performed to a relatively minor extent include rangeland reseeding, cottonwood pole planting, and sagebrush shaving.

Herbicide application to Great Basin big sagebrush (*Artemisia tridentata*), saltcedar (*Tamarix spp*.), and piñon-juniper (*Pinus edulis-Juniperus monosperma*) is summarized by acres treated and year of treatment in **Table 3-37** below.

Forecasts of public land health would depend on comprehensive baseline data and good trend data over a long period of time, combined with expected weather conditions. A forecast of maintenance or improvement of public land health would require a stable or improving trend, properly implemented management actions based on monitoring results, and sufficient precipitation to allow vegetation to respond after being disturbed. The BLM will continue to collect monitoring data, similar to historical efforts and in accordance with the standards and guidelines. These data will be analyzed and used to make management decisions. Future trends in vegetation would be dependent on a number of changing environmental variables as well as management direction.

Table 3-37: Acres of Herbicide Application by Year and Species

Year	Acres of Herbicide Application by Species		
	Sagebrush	Saltcedar	Piñon-Juniper
1988	780	-	-
1989	860	-	-
1990	550	-	-
1991	2,020	-	-
1992	-	-	-
1993	5,538	-	-
1994	2,230	-	-
1995	6,418	-	-
1996	-	28	-
1997	7,350	132	-
1998	6,970	13	-
1999	-	5	-
2000	10,498	100	-
2001	-	44	-
2002	5,742	-	-
2003	1,060	263	-
2004	1,951	-	-
2005	-	-	-
2006	2,510	181	-
2007	810	374	-

Year	Acres of Herbicide Application by Species		
	Sagebrush	Saltcedar	Piñon-Juniper
2008	1,421	340	7,473
2009	2,366	0	0
2010	3,385	578	5,098
2011	2,009	302	0
2012	4,151	330	0
2013	0	0	3,769
2014	5,924	0	0
2015	2,323	72	0
2016	2,156	0	0
2017	0	0	0
2018	1,072	79	3,372
2019	964	114	2,692
Total	**81,058**	**2,955**	**22,404**

Source: BLM GIS 2020

3.23 VISUAL RESOURCES

The BLM is responsible for ensuring that RMPs consider the scenic values of public lands. The BLM accomplishes this through the VRM system that follows the management guidelines in BLM Manual Section 8400, Information Bulletin No. 98-135, and Instruction Memorandum No. 98-164. The objective of the VRM system is to manage public lands in a manner that will preserve the quality of the scenic (visual) values of those lands.

Three indicators are used to characterize and determine the relative values of the visual resources within the Planning Area: 1) landscape scenic quality; 2) viewer sensitivity; and 3) distance zones. VRM classes may differ from Visual Resource Inventory (VRI) classes reflecting visual resource management objectives that balance resource allocations decisions with protecting visual values. Ensuing projects and resource development would be required to conform to the visual resource management class decisions and respective visual management objectives. VRM class conformance is determined through use of the BLM Contrast Rating procedures described within BLM Handbook H-8431-1.

The BLM currently authorizes activities on BLM-administered lands that range from vegetation and habitat improvement projects to large-scale energy, mineral, and mining operations, all of which have the potential to impact visual resources. The BLM completed a VRI of the Decision Area in 2010 and updated it in 2015. The results of this inventory are used to assist in establishing VRM classes during this planning process. See **Table 3-38, Table 3-39**, and **Map 3-22**.

Table 3-38: BLM-administered Lands in Each Visual Resource Inventory Class

VRI Class	Acres per Class	Percent of Class with Cultural Modification	Acres of Scenic Quality Class A	Acres of Scenic Quality Class B	Acres of Scenic Quality Class C
VRI I	96,500	4.0% (3,900 acres)	0	100	96,500
VRI II	20,400	8.0% (1,700 acres)	0	6,400	14,000
VRI III	22,800	6.0% (1,400 acres)	0	3,900	18,800
VRI IV	591,900	8.8% (52,100 acres)	0	3,200	589,100

Source: BLM GIS 2020

Table 3-39: BLM-Administered Lands within Each Visual Resource Inventory Class (Map 3-22~~2~~ ~~87~~)

VRI Class	High Sensitivity	Moderate Sensitivity	Low Sensitivity	Acres of Distance Zone: Foreground/ Middleground	Acres of Distance Zone: Background	Acres of Distance Zone: Seldom-Seen
VRI I	94,800	300	1,500	0	5,600	90,800
VRI II	13,300	4,300	2,800	2,000	0	18,400
VRI III	22,600	200	0	13,200	100	9,500
VRI IV	274,400	9,700	312,500	17,200	18,800	555,900

Source: BLM GIS 2020

3.23.1 Landscape Scenic Quality

While the RPFO is still largely undeveloped, urban sprawl coupled with increased resource demand has occurred. VRM in the Planning Area focuses on values and resources existing throughout the Planning Area. Visual resources address the visual quality of landscapes and cover views of native landscapes and unique areas with high visual quality. All lands have scenic value, but areas with the most variety and the most harmonious composition have the greatest scenic value.

Visual Resource Inventory

The VRI determined the relative value of visual resources throughout the Decision Area and rated all lands with an assigned VRI class number. The VRI consists of identifying scenic quality, area sensitivity levels, and distance zones. The results of this inventory are used to assist in establishing VRM classes. Scenic quality is assessed using guidance from BLM form 8400-1 wherein the following features are rated: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modification. Sensitivity levels are determined by measuring the public concern for scenic quality of an area. Distance zones are classified as Foreground-Middleground, Background, and Seldom-Seen zones based on the relative visibility from travel routes or observation points. Cultural modifications are also considered during inventory and are modifications to landform/water, vegetation, and the addition of structures that may detract from the scenery in the form of a negative intrusion or complement or improve the scenic quality of a unit (BLM Manual H-8410-1, Visual Resource Inventory). There are four VRI classes: VRI Classes I and II represent the most or more valued visual resources, VRI Class III represents moderate value, and VRI Class IV represents the least valued. These VRI class ratings are informational in nature and provide a basis for considering visual values in the RMP process. VRI class ratings do not establish management direction and should not be used as the basis for constraining or limiting surface-disturbing activities.

Cultural modifications are defined as any human-caused change in the landform, water, or vegetation, or the addition of a structure that creates a visual contrast when evaluated against the basic elements (form, line, color, and texture) of the natural character of a landscape (BLM 1984). This does not mean that human-made features within a landscape necessarily detract from the scenic value; human-made features that complement the natural landscape may enhance the scenic value (US Geological Survey 2004). Much of the Planning Area retains its natural visual qualities, though numerous landscape modifications exist. The introduction of new structures, or other human-made changes, into the landscapes of the Planning Area primarily occurs near areas of urban and residential development, which are dispersed throughout the Planning Area. Existing changes (cultural modifications) in the Planning Area include the following:

- Access roads, ranging from highways to two-track roads
- Public utilities, including electric transmission lines and distribution lines, and gas, water, fiber-optic, and telecommunication lines

- Agricultural fields, including range improvements
- Communication sites, particularly on mountaintops
- Residential, commercial, and industrial development
- Recreational development, including picnic areas, parking lots, visitor centers, and trails

Special management areas generally contain areas of high scenic quality. Special designations with landscapes of visual interest within the Planning Area include:

- Pronoun Cave Complex ACEC
- Petaca Pinta SMA and WSA
- Azabache Station SMA
- Cabezon Peak ACEC, SMA, and WSA
- Cañon Jarido SMA
- Cañon Tapia SMA and ACEC
- Chamisa WSA
- Ignacio Chavez SMA and WSA
- Elk Springs SMA and ACEC
- Empedrado WSA
- Historic Homesteads SMA
- La Lena WSA
- Ojito Wilderness Area, WSA, and ACEC
- Pelon Watershed SMA
- San Luis Mesa Raptor Area ACEC
- Tent Rocks National Monument (not included in this RMP)
- Torreon Fossil Fauna ACEC
- Ball Ranch ACEC
- Manzano WSA

Modifications added are generally considered to be of lower scenic quality and hence the visual conditions would not be significantly affected by change. Open space, parks, and recreational areas are commonly used within the Planning Area, and the landscape characters of these lands are valued by the community. Also, the BLM and other federal and state agencies have protected valuable landscapes of high scenic quality by designating specific lands as ACECs, WSAs, wildlife refuges, or scenic corridors. Typically, any special designation that regulates use of an area serves to preserve scenic views as well as natural vegetation, wildlife, and wildlife habitat.

Visual Resource Management System

In addition to completing a VRI, the BLM is also required to designate all public lands with a VRM class objective to provide a management threshold or level of acceptable impacts on visual resources. The proposed VRM class objectives reflect not only the VRI but also take into account other proposed resource allocations and needs that may/would result in future visual intrusions (e.g., rights-of-way, recreation facilities, mineral leases, etc.).

The following BLM VRM class objectives and descriptions are summarized from BLM Manual Handbook H-8431-1 (1986):

- VRM Class I—The objective of VRM Class I is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited

management activities. The level of change to the characteristic landscape should be very low and should not attract attention.

- VRM Class II—The objective of this class is to retain the existing character of the landscape. The level of change to the landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes to the landscape must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- VRM Class III—The VRM Class III objective is to partially retain the existing character of the landscape. The level of change to the landscape should be moderate. Management activities may attract the attention of the casual observer, but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- VRM Class IV—The objective of VRM Class IV is to provide for management activities that require major modifications to the existing character of the landscape. The level of change to the landscape can be high. The management activities may dominate the view and may be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repetition of the basic visual elements of form, line, color, and texture.

Current VRM classes are summarized in **Chapter 2**, **Table 2-60** (VRM Management Decisions by Alternative [acres]) and displayed in **Appendix S**, **Map 2-~~87~~ 67** (Alternative A: Visual Resource Management).

3.24 WILDLIFE, FISHERIES, AND HABITAT

The RPFO wildlife program works with federal, state, and other cooperators to protect and enhance wildlife habitat and to mitigate, where necessary, the impacts of other resource uses. A goal of the wildlife program is to maintain wildlife habitat and species occurrence data with an emphasis on biodiversity and ecosystem management. These data are used in land use planning, habitat management, and program coordination for multiple use decisions.

All proposed actions are reviewed and given site-specific analysis through the NEPA process to determine whether the action will affect special status species' terrestrial, wetland, or riparian ecosystems. Impacts on resident species' habitat, habitat management projects, and compatibility with the New Mexico Department of Game and Fish habitat objectives are considered. The El Malpais Plan (BLM 2001a), the Kasha-Katuwe Tent Rocks National Monument RMP (BLM 2007a), and the Riparian and Aquatic Habitat Management Plan for the Albuquerque District Office (BLM 2000) contain wildlife habitat goals, objectives, and management actions that provide direction for implementation of the wildlife program across the Planning Area. A number of Special Management Areas since the 1986 RPFO RMP have been designated as ACECs, and protection plans have been developed that outline management prescriptions for sensitive wildlife/habitat areas.

Priority landscapes have been identified through the Comprehensive Wildlife Conservation Strategy for New Mexico (NMGDF 2006a) and the BLM's Habitat Management Plans (HMPs), ACECs, and SMAs. These areas have been identified for habitat improvement projects based on their ecological value. Priorities have also been placed on the 24 riparian/wetland areas identified in the Riparian and Aquatic Habitat Management Plan for the Albuquerque District (BLM 2000). Implementation of HMPs has resulted in wildlife water projects, fence modifications, livestock exclusions, vegetation treatments, and other projects that improve habitat for wildlife in the RPFO.

3.24.1 Seasonal Habitats

Critical winter range for elk and mule deer is located within the Planning Area. The Elk Springs ACEC and Ignacio Chavez SMA are managed for this value. Mesa Portales also provides crucial winter habitat for these species, but is not yet managed for this particular value. See **Table 3-40**.

Table 3-40: Critical Winter Range within the RPFO

Management Area	Designation	Acreage
Elk Springs	ACEC	10,334
Ignacio Chavez	SMA	43,026
Mesa Portales	No Designation	6,536

Source: BLM GIS 2020

3.24.2 Special Designation Areas

SMAs were delineated in prior planning efforts. Management prescriptions were developed to enhance and protect key winter ranges, improve habitat privacy, promote habitat diversity, protect and enhance riparian and aquatic habitat, and increase forage availability. Since the 1986 RPFO RMP, the designation of SMA has become obsolete, and has since been replaced with the designation of ACEC. Some former SMAs have been designated as ACECs. Key management prescriptions for these areas are summarized in SMA and ACEC protection plans.

In the 1986 RPFO RMP, 13 SMAs were listed as containing significant wildlife habitat values or features that warrant special management attention (**Table 3-41**). Three of these areas provide protection for rare plants (Cabezon Peak, Ojito, and Ball Ranch). Since the 1986 RPFO RMP, many of these areas have been designated as ACECs. The following table indicates these changes.

These special designation areas are crucial in the protection of wildlife in the RPFO. The following discussion describes their habitat values and how the RPFO is currently managing for the resources these areas were designated to protect. Refer to **Section 3.19** for background information on each special designation area.

Bluewater Canyon ACEC

Bluewater Canyon provides some of the highest quality habitat for the endangered southwestern willow flycatcher within the Planning Area. The RPFO conducts annual monitoring in this riparian area for the endangered southwestern willow flycatcher. Restoration projects have greatly enhanced the habitat, and a very high concentration of resident, migratory, and nesting birds inhabit the area. Refer to **Section 3.20.1** for additional information on the southwestern willow flycatcher. There are also a number of active beavers within the canyon. Livestock grazing was found to be the main reason the riparian area was not meeting PFC in the past. Therefore, it has been excluded to promote the restoration of riparian functioning and increase the quality of habitat for wildlife. The implementation of restoration projects and removal of grazing have

Table 3-41: Changes in Special Designations with Habitat Values

Name of Area	1986 RMP Designation	Current Designation	Resource Values Protected
Bluewater Canyon	SMA	ACEC	Endangered species habitat (southwestern willow flycatcher), and high-quality riparian habitat
Cañon Jarido	SMA	SMA	Critical winter deer/elk range, and riparian area
Cañon Tapia	SMA	ACEC	Sensitive plant species (*Astragalus knightii*), keystone species, and raptor prey base habitat (*Cynomys gunnisoni*)
Jones Canyon	SMA	ACEC	Riparian habitat

Name of Area	1986 RMP Designation	Current Designation	Resource Values Protected
San Luis Mesa Raptor Area	SMA	ACEC	Critical raptor nesting area
Ignacio Chavez	SMA	SMA	Exemplary diverse wildlife habitat, critical winter elk/deer range, sensitive plant species
Elk Springs	SMA	ACEC	Crucial winter deer/elk range, riparian areas
Tent Rocks	SMA	National Monument	The Tent Rocks SMA has been designated as the Kasha-Katuwe Tent Rocks National Monument, and management of the area is covered under its own stand-alone RMP. Therefore, this area will not be discussed further.
Ojito	SMA	Wilderness /ACEC	Raptor nesting habitat, sensitive plant populations (*Sclerocactus papyracantha* and *Astragalus knightii*)
El Malpais	ACEC	National Conservation Area	El Malpais SMA has been designated as a National Conservation Area and is covered under its own stand-alone plan. Therefore, this area will not be discussed further.
Cabezon Peak	SMA	ACEC	Raptor nesting sites, sensitive plant populations (*Abronia bigelovii, Astragalus knightii, Mammillaria wrightii,* and *Sclerocactus papyracantha*)
Ball Ranch	SMA	(Espinazo Ridge) ACEC	Sensitive plant populations (*Astragalus feensis, Astragalus kentrophyta var. neomexicana, Oenothera caespitosa spp. navajoensis, Sclerocactus papyracantha* [formerly of the genus *Toumeya*], and *Abronia bigelovii*), riparian areas
Pronoun Cave Complex	ACEC	ACEC	Bat roost habitat and winter hibernacula

increased the quality of wildlife habitat in Bluewater Canyon. However, the increase of recreational interest in the area has led to increased pedestrian traffic that is possibly having a negative effect on the wildlife species utilizing the area.

Cañon Jarido SMA

Cañon Jarido consists of a steep-sided sandstone canyon cut approximately 100 feet into Mesa Portales, which provides raptor nesting sites. Lower elevations consist of sage cover interspersed with piñon and juniper. This vegetative community progresses into ponderosa pine and Gambel oak, providing good mule deer habitat. Five springs are located within the canyon. Currently, the largest spring in Cañon Jarido has been fenced to exclude livestock in cooperation with the New Mexico Department of Game and Fish. This riparian area is managed to support the general wildlife population in the area, with an emphasis on the support of mule deer. Adjacent Mesa Portales consists of crucial winter habitat for the Jemez/Nacimiento deer and elk herds. Currently, chemical treatments of sagebrush within the canyon are aimed at improving rangeland health for both livestock and wildlife. Chemical treatments of this type may have both negative and positive impacts on wildlife species, but will, in the long term, benefit wildlife.

Jones Canyon ACEC

Vegetation in Jones Canyon is typical of the dry, high-elevation plateaus of north-central New Mexico (6,800–7,200 feet elevation). Dense juniper and piñon are the dominant species, with scattered grasses, Gambel's oak, cliff rose, sage, squawberry, yucca, cholla, and ponderosa pine also present. Recent reconnaissance of this area has shown an apparent increase in the occurrence of sagebrush. This area was once thought to have riparian characteristics due to a spring development and a detention dam on the adjacent private land.

However, the spring no longer produces water, and there are only remnants of the development. The area no longer harbors particularly valuable wildlife habitat.

San Luis Mesa Raptor Area ACEC

Ledges carved in the bluff by wind erosion form excellent nesting substrate for birds of prey (raptors). Some species that have been recorded nesting at San Luis Mesa are golden eagle, prairie falcon, great horned owl, red-tailed hawk, and raven. The area is currently designated as an ACEC, and management objectives set at the time of its designation were to protect raptor nesting sites and manage the adjacent lands for prey base by adjusting livestock grazing practices to provide increased quality habitat for prairie dogs and associated prey species. However, specific management of these prey populations has never been implemented, and according to the most current reports the RPFO maintains, numbers of raptors utilizing the nesting habitat are lower than would be expected given the quality of the nesting substrate provided by the sandstone bluffs.

Ignacio Chavez Grant Special Management Area

The area provides important habitat for a large variety of wildlife, including at least six game species (mule deer, elk, Merriam's turkey, black bear, tassel-eared squirrel, and mourning dove). Management of the Ignacio Chavez Grant SMA emphasizes maintenance of current wildlife habitat diversity by maintaining the current mix of three representative ecosystems. This has been done through prescribed fire and fuels treatments. Wildlife waters have also been developed in this area to support big game species, particularly elk.

Elk Springs ACEC

The western foothills and piedmont of the Nacimientos were designated as a crucial winter range for the Jemez elk and deer herds in the New Mexico Comprehensive Wildlife Plan (New Mexico Department of Game and Fish 1980). The portion of this area north of the Jemez Indian Reservation is predominantly public land managed as the Elk Springs ACEC (former SMA). In the past, chaining and seeding projects have been completed to improve winter forage for big game species. More recently, an integrated approach utilizing chemical and mechanical treatments and prescribed fire has been implemented to accomplish the same goal more efficiently with lower disturbance to the ecosystem. Wildlife waters have also been developed for the primary benefit of elk and deer, but benefit all wildlife in the area. The productivity of the area has also benefited from the exclusion of livestock grazing in this ACEC.

Ojito ACEC

Two sensitive plant species occur in this ACEC: *Sclerocactus papyracantha* and *Astragalus knightii*. Although wildlife is not abundant, a diversity of species is present. A number of bluffs and mesa edges in the SMA provide excellent nesting habitat for raptors, swallows, and swifts. Several stock ponds provide resting areas for migrating waterfowl. Scaled quail and mourning doves inhabit the brushy draws and rocky wooded hillsides. Mule deer occupy the piñon-juniper ecotype, and pronghorn antelope range into the northwest corner of the ACEC.

There are several possible reasons why wildlife is not more abundant in this area. The heavily visited White Ridge bike trails are adjacent to the Ojito ACEC, and consequently, the nearby areas receive elevated levels of visitor traffic. This area has also become very popular for recreational shooting. This type of activity has a tendency to drive out wildlife temporarily, and possibly permanently, if it occurs on a regular basis. This area is currently receiving increased interest from multiple recreational and professional shooting groups. Furthermore, this area includes Las Milpas natural gas storage facility. Although this facility is no longer in operation, the surface disturbance it caused was never reclaimed and has resulted in a certain degree of habitat loss due to replacement of native vegetation with noxious weeds.

Cañon Tapia ACEC

There is a population of the sensitive/rare plant *Astragalus knightii* within the Cañon Tapia ACEC boundary. The north part of the ACEC contains a prairie dog population that has potential to be proposed as part of a prairie dog augmentation area to benefit nesting, migratory, and resident raptors in the nearby Cabezon Peak ACEC and adjacent volcanic plugs. Currently, no specific management of these biological resources is occurring. The canyon bottom is highly infested with invasive weeds, predominantly saltcedar.

Cabezon Peak ACEC

The area contains raptor nesting sites and two rare cactus species. Raptors using the area include golden eagle, prairie falcon, great horned owl, sparrow hawk, raven, and red-tailed hawk. Currently, Cabezon Peak is designated as an ACEC, and management objectives include managing the raptor prey base in adjacent BLM-administered lands. After an evaluation of existing and potential biological special management areas in the RPFO, it was recommended to include four adjacent volcanic plugs and prairie dog habitat in the Cabezon Peak ACEC because they also provide excellent nesting substrate (The Nature Conservancy 1992). This has yet to occur but is being considered as an alternative in **Chapter 2** of this document.

Espinazo Ridge ACEC

The Espinazo Ridge ACEC (formerly Ball Ranch ACEC) was originally designated as an SMA to protect sensitive plant species. Five sensitive plant species are known to occur there. Those species are *Astragalus feensis, Astragalus kentrophyta var. neomexicana*, *Oenothera caespitosa spp. navajoensis*, *Sclerocactus papyracantha* (synonymous with genera *Toumeya* and *Pediocactus*), and *Abronia bigelovii*. This ACEC also contains an active spring that feeds into two substantially large ponds, both supporting riparian vegetation and multiple species of wildlife. This resource is on newly acquired land (fiscal year 2010), and has yet to be fully inventoried. During several brief visits to this riparian site, it was noted that the area appears to be infested with invasive bullfrogs. There is speculation as to whether this has a detrimental impact on the native aquatic and riparian fauna.

Pronoun Cave Complex ACEC

The Pronoun Cave Complex consists of What Cave, Which Cave, That Cave, and approximately six additional caves. These vertical caves are particularly valued for their paleontological values and habitat for several species of bats. The Which Cave is a known winter hibernaculum for chiropteran species. Summer roosting has also been reported (RPFO 1991 SMA Survey). Winter hibernacula warrant special protection because bats are particularly sensitive to disturbance during the hibernation period, and populations can be significantly negatively affected if disturbance is severe enough to wake them prior to the end of this period. Caves have also been documented to be some of the least known ecosystems due to their rarity and the physical difficulty associated with studying them. They have also been known to reveal a significantly high amount of biodiversity. The Pronoun Caves are known to harbor sensitive species, including Townsend's big-eared bat. They continue to warrant protection from mining activities and recreational visitors. The main threats to these caves include the nearby active travertine mining operations and the possible introduction of the white-nose fungus that is projected to enter New Mexico (USFWS 2011).

3.24.3 Habitat Trends

Increasing residential and recreational development presents a source of change and potential departure from management objectives for wildlife habitat in the Planning Area. Change in the extent of various land cover types has been driven primarily by human land and water uses over the past 400 years, and is now possibly affected by climate change. Habitat conversion in the form of development and aquatic habitat alteration due to draining and channelization are priority conservation management issues in the Rio Grande watershed (NMDGF 2006b).

While there is no recent habitat monitoring data available, observations by BLM staff suggest most suitable mule deer habitat is in a status of downward trend due to lack of fire, the early succession vegetation component, and edge habitat upon which the species depends. BLM staff and New Mexico Department of Game and Fish observations suggest habitat conditions on the public land in the Planning Area for elk are in an upward trend, while pronghorn habitat remains static. Improvement projects are targeted for mule deer and elk habitats to increase cool season grasses and forbs, as well as a mosaic of habitat types.

Habitats have been fragmented by roads, highways, and utility corridors, and lost because of human population growth and development. Continued encroachment of subdivisions and roads into previously undisturbed areas is an important factor in habitat fragmentation. Recent road inventory data will be used in the upcoming RPFO travel management plan to estimate the levels of habitat fragmentation in the Planning Area. To date, exploration for energy or mineral materials has not had a major influence on habitat fragmentation in the Planning Area. Mineral potential in the RPFO is somewhat limited when compared with other BLM field offices in New Mexico. Therefore, it does not appear to be a significant threat to wildlife species. However, important wildlife areas should be protected from energy and mineral exploration and development through exclusion, closure, and application of mitigation stipulations.

Given the synergistic effects of these and other factors, the Planning Area has a lesser ability to produce and maintain wildlife habitat when compared with the past. However, conditions improve for wildlife as meaningful cooperative relationships with other agencies and organizations are developed, appropriate objectives are incorporated into grazing allotment management plans, and stipulations are provided for BLM-approved authorizations to mitigate impacts and protect and/or enhance wildlife habitat.

3.24.4 Species with Special Management Emphasis

Gunnison's Prairie Dog

Gunnison's prairie dog (*Cynomys gunnisoni*) is discussed in the special status species section of this chapter with respect to the endangered black-footed ferret. However, it warrants discussion here because of its ecological value as a keystone species. A keystone species is a species whose ecological influence in a biotic community is disproportionately large with respect to its numerical abundance. Keystone species typically function as predators, prey, mutualists, or habitat modifiers. Prairie dogs differ from most conventional keystone species because they exhibit more than one of these functions. They act as prey and modify habitat structure and dynamics in many ways (Kotliar et al. 1999). Species in the RPFO that benefit from prairie dogs include burrowing owls and raptors. Currently, the RPFO is conducting a prairie dog population augmentation project in El Malpais National Conservation Area to enhance the largest historical colony of prairie dogs in the field office. If successful, the possibility of conducting this type of project will open up for the area covered under this RMP.

Big Game Species

The primary big game species in the Planning Area are Rocky Mountain elk, mule deer, and pronghorn antelope. The New Mexico Department of Game and Fish is the agency with the authority and responsibility for managing big game populations. The BLM works in partnership with the New Mexico Department of Game and Fish to establish population goals in big game management units that include public land and to manage habitats to try to achieve those goals.

Mule Deer

Much of the RPFO-administered land is important winter and/or summer habitat for mule deer. Areas with important winter range include Elk Springs, Ignacio Chavez Grant, and Mesa Portales. While mule deer occur throughout most of the Planning Area in woodland and timbered areas as well as adjacent shrublands, observations are infrequent and management emphasis in these areas is to increase the quality of habitat and potential habitat. Mule deer are known to utilize 167 vegetative types as a food source throughout the year.

In the RPFO, the mule deer's diet is made up of sagebrush, mountain mahogany, cliff rose, oaks, etc., and primarily occurs within the Madrean Pine-Oak Conifer-Oak Forest and Woodland/Intermountain Basins Big Sagebrush Shrubland key habitat types as described in the Comprehensive Wildlife Conservation Strategy (CWCS). Mule deer are a Species of Greatest Conservation Need (SGCN) within New Mexico's Wildlife Conservation Strategy (New Mexico Department of Game and Fish) and include a browse/shrub component within their habitat.

Projects for deer include wildlife waters and vegetation treatments, such as prescribed thinning/burning, to increase diversity of vegetation composition and structure. Currently, the RPFO conducts numerous chemical treatments to control encroaching sagebrush and piñon-juniper into historic grass/shrublands. An arising concern is that large-scale chemical treatments have potential to wipe out forb species highly valuable to species such as mule deer. Prior to chemical treatments, the RPFO should conduct vegetation surveys of treatment areas and exclude those areas with high-density browse species to preserve mule deer habitat. There are no established studies within these key habitat areas that address the condition of the mule deer habitat, and subsequently, the current condition of the habitat is unknown. Therefore, rangeland health standards assessments will be utilized to look at the habitat components and to address any degradation that might occur.

Rocky Mountain Elk

The RPFO also provides important winter and/or summer habitat for Rocky Mountain elk. Crucial winter range occurs in the Elk Springs, Ignacio Chavez Grant, and Mesa Portales areas for the Jemez/Nacimiento elk herds. Management of these areas has included designation of Elk Springs as an ACEC, the installation of wildlife waters, vegetation treatments, and seasonal closure of roads. Removal of livestock grazing has occurred on the Elk Springs ACEC and has greatly benefitted the resource. **Chapter 2** of this document identifies both Ignacio Chavez Grant and Mesa Portales as eligible for designation as an ACEC, and presents these alternatives for analysis. Elk habitat management should prioritize crucial winter and summer ranges, migration corridors, and calving areas. The RPFO does not yet have calving areas identified. However, in order to conserve and enhance big game calving and fawning habitat, identification of these areas should receive priority.

Bats

In the past two decades, considerable research emphasis has been placed on bat habitat relationships and population characteristics in the western states. The BLM signed a memorandum of understanding with Bat Conservation International in 1993, which increased BLM efforts to consider bat habitat protection in its management activities. Important habitat for bats includes cliffs, trees, caves, and abandoned mines. The RPFO is known to contain habitat for at least 13 bat species. The Pronoun Cave Complex is known to harbor a roost of Townsend's big-eared bat, a sensitive bat species in the RPFO. It is also a known winter hibernaculum.

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