U.S. Department of the Interior
Bureau of Land Management
Farmington Field Office

Mancos-Gallup Resource Management Plan Amendment
and
Environmental Impact Statement

Assessment of the Management Situation
March 2015

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BLM

New Mexico • Farmington Field Office

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

Mancos-Gallup RMPA/EIS

Analysis of the Management Situation

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Acronyms, Abbreviations, and Glossary

µg/m^3	micrograms per cubic meter
ACEC	area of critical environmental concern
AML	Abandoned Mine Lands (Program)
AMS	analysis of management situation
AO	Authorized Officer
APD	application for permit to drill
AQRV	air quality-related value
ATV	all-terrain vehicle
AUM	animal unit month
BCC	Birds of Conservation Concern
BEA	Bureau of Economic Analysis
BLM	United States Department of the Interior, Bureau of Land Management
BMP	best management practice
CBM	coal bed methane
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
COA	condition of approval
CWA	Clean Water Act
dBA	A-weighted decibels
EIS	environmental impact statement
EO	executive order
EPA	US Environmental Protection Agency
ERA	ecological risk assessment
ESA	Endangered Species Act
FAR	functioning at risk
FEIS	final environmental impact statement
FFO	Farmington Field Office
FLPMA	Federal Land Policy and Management Act of 1976
Forest Service	United States Department of Agriculture, Forest Service
FRCC	fire regime condition class
GHG	greenhouse gas
GIS	geographic information system
GPS	global positioning systemGRT
	gross receipts tax
HUC	hydrologic unit code
IPCC	Intergovernmental Panel on Climate Change
maf	million acre-feet
MBTA	Migratory Bird Treaty Actmg/L
	milligrams per liter
MOU	memorandum of understanding

ACRONYMS AND ABBREVIATIONS *(continued)*

	Full Phrase
NAAQS	National Ambient Air Quality StandardsNEPA National Environmental Policy Act of 1969
NF	nonfunctioning
NHT	National Historic Trails
NHPA	National Historic Preservation Act
NMAC	New Mexico Administrative Code
NMAQB	New Mexico Air Quality Board
NMED	New Mexico Environment Department
NMDA	New Mexico Department of Agriculture
NMDGF	New Mexico Department of Game and Fish
NMMNHS	New Mexico Museum of Natural History and Science
NMWQCC	New Mexico Water Quality Control Commission
NOAA	National Atmospheric and Oceanic Administration
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTL	notice to lessee
NVCS	National Vegetation Classification System
OHV	off-highway vehicle
ORV	off-road vehicle
PFC	proper functioning condition
PFYC	potential fossil yield classification
PIF	Partners in Flight
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
ppb	parts per billion
ppm	parts per millionPRMP proposed resource management plan
PSD	prevention of significant deterioration
R&PP Act	Recreation and Public Purposes Act
REA	rapid ecoregional assessment
RFD	reasonable foreseeable development scenario
RNA	research natural area
RMPA	resource management plan amendment
ROD	record of decision
ROW	right-of-way
SDA	Specially Designated Area
SMA	Special Management Area
SRMA	Special Recreation Management Area
SWQB	Surface Water Quality Bureau (New Mexico)
T&E	threatened and endangered species
TCP	traditional cultural property
TDS	total dissolved solidsTMDL total maximum daily load
USACE	US Army Corps of Engineers
USBR	United States Department of the Interior, Bureau of Reclamation
USC	United States CodeUSFWS United States Fish and Wildlife Service

ACRONYMS AND ABBREVIATIONS *(continued)*

	Full Phrase
USGS	US Geological Survey
UTV	utility trail vehicle
VRI	visual resource inventory
VRM	visual resource management
WA	wilderness area
WQCC	Water Quality Control Commission (Colorado)
WRCC	Western Regional Climate CenterWSA
	wilderness study area

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Chapter 1. Introduction

1.1 INTRODUCTION

The Bureau of Land Management (BLM) Farmington Field Office (FFO) is preparing this Resource Management Plan Amendment/Environmental Impact Statement (RMPA/EIS) for its planning area. Management decisions for this land area are currently covered by the 2003 Farmington RMP. This Farmington RMPA will replace or update certain decisions from the 2003 Farmington RMP for lands in the planning area.

1.2 PURPOSE OF THE ANALYSIS OF MANAGEMENT SITUATION

While preparing an RMP or an amendment, the BLM must analyze inventory data and other information to identify issues and opportunities. This is called the analysis of the management situation (AMS), which provides understanding of resources and uses in the planning area. It is a snapshot in time that the BLM continues to refine through additional compilation and analysis of data and information. The BLM will consider these preliminary and subsequent assessments of conditions, current management, and management opportunities in the RMPA/EIS.

An AMS for an amendment, such as the Mancos-Gallup RMPA, is narrower than an AMS prepared for a full RMP revision. For an amendment, the AMS primarily focuses on those issues and topics that fall within the scope of the amendment. For example, if visual resource management were not an issue to be addressed by the amendment, it would not be included in the AMS. As such, not every resource program or use that the BLM is charged with managing is included in this AMS. This document focuses on the four primary issues to be addressed by the amendment through new decisions. Additional resources and uses have been included to reflect the areas that are likely to be impacted or will need some additional stipulations or conditions of approval resulting from new decisions in the four main issue areas (see **Section 1.4**, Key Findings).

All data, maps, and figures are based on preliminary analyses of datasets as of August 2014. As both the data and analyses are in draft form, any numbers, acreages, and maps are presented for illustrative and comparative purposes only; they are not intended for use beyond this document. Before the Draft RMPA is published, new data may be added and existing data may be refined. Specific analyses, uses, and displays of data may vary from those that appear in the Draft RMPA/EIS as appropriate to the needs of that document.

The AMS represents an early component of the RMPA process. It is not intended to be an exhaustive review of resources or uses in the planning area, nor does it provide specific details about various resources. It is intended to provide a summary analysis of existing management practices, including direction from existing plans and agency policy and local resources and resource uses.

1.3 GENERAL DESCRIPTION OF THE PLANNING AREA, GEOGRAPHIC SCOPE, AND RESOURCES AND PROGRAMS

The 4.2-million-acre planning area is composed of federal, state, and private lands and Indian reservations overlying the Mancos/Gallup formations. These formations are in portions of San Juan, Rio Arriba, McKinley, and Sandoval Counties in New Mexico. The decision area for the Mancos-Gallup EIS includes only the surface land and subsurface mineral estate in the planning area under the BLM's authority to make land use and management decisions.

The decision area is made up of approximately 1.3 million acres of BLM-administered surface plus 1 million acres of federal mineral estate beneath lands owned or managed by private owners or state or other federal agencies. To aid in cohesive management across the Mancos/Gallup formations, the BLM is

updating a reasonably foreseeable development scenario (RFD) across 6.2 million acres (see **Figure 1-1**, Planning Area and Field Office Surface Administration). The RFD analysis area extends into portions of the BLM's Taos and Rio Puerco Field Offices. It includes some tribal and Forest Service-managed surface outside the FFO. Agencies managing these areas may use the RFD analysis for future land use planning decisions.

Figure 1-2, Federal Mineral Estate, illustrates the planning area, decision area, and RFD analysis area in New Mexico. The population centers of the project area are Farmington-Aztec-Bloomfield-Shiprock to the north, the Gallup-Crownpoint area to the south, and Cuba to the east.

Although most of northwestern New Mexico is in the Colorado Plateau, the San Juan Basin is the dominant feature of the planning area. The San Juan Basin is an asymmetrical syncline that extends from northwestern New Mexico into southwestern Colorado. Roughly circular, it is approximately 200 miles long (north to south) and 130 miles wide, including its Colorado portion, and covers approximately 15,000 to 25,000 square miles. The central part of the San Juan Basin is a dissected plateau, gently dipping to the west. Stream erosion has formed deep steep-sided canyons. Nearly all of the formations in the San Juan Basin can be observed on the surface due to the geologic structure and topographic relief.

The San Juan Basin is bordered on the west by the Defiance uplift and the Chuska Mountains, on the north by the San Juan dome, on the south by the Chaco slope and the Zuni uplift, and on the east by the Nacimiento Uplift (Engler et al. 2001). The Hogback monocline separates the San Juan Basin to the east from the Four Corners Platform, a structural divide that forms the northwestern border of the San Juan Basin. The Hogback monocline is a horseshoe-shaped feature that rims the San Juan Basin on the northwest and north with a maximum elevation of 700 feet above the surrounding area. The western flank of the San Juan Basin merges with the eastern edge of the Defiance uplift of northeastern Arizona. There are no sharp structural boundaries in the southern and southwestern parts of the basin, and rock outcrops form its south and east edges. Hydrocarbons in the San Juan Basin are developed in stratigraphic traps.

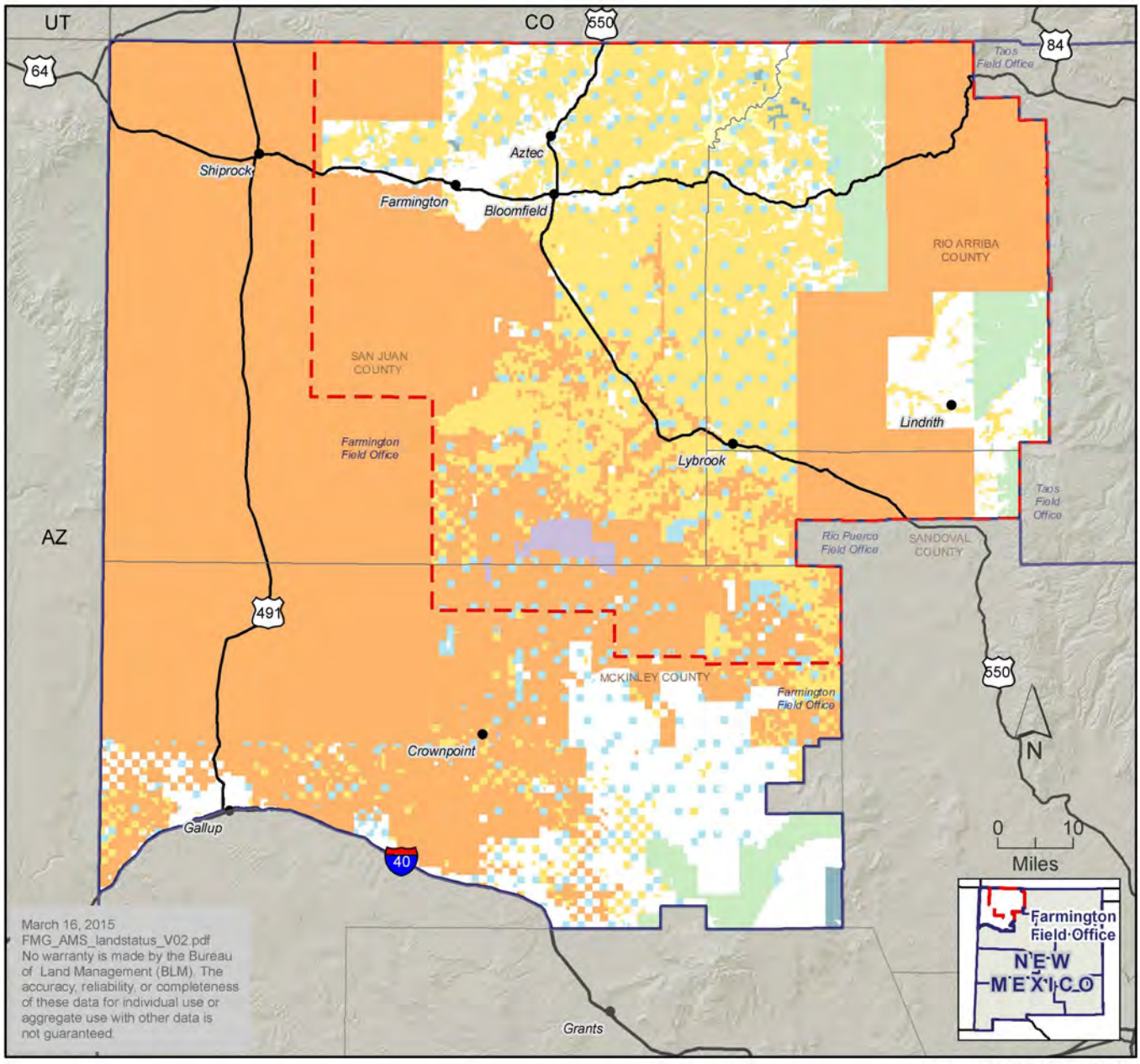
Extremes in topographic relief exist in the planning area, including areas of broad mesas. These are interspersed with many deep canyons, with steep walls, dry washes, entrenched narrow valleys, and alluvial fans and floodplains, extending on both sides of the Continental Divide. Elevations range from approximately 4,800 feet where the San Juan River flows into Utah to approximately 9,400 feet in the Chuska Mountains, 8,800 feet near the Jicarilla Apache land, and 7,300 feet near Cuba on the eastern side of the Continental Divide.

The climate of the planning area is classified as arid continental, characterized by cool dry winters and warm dry summers. The great distance from any source of oceanic moisture creates a climate of abundant sunshine and large diurnal variations in temperature. Due to the planning area's location in the southern Rocky Mountains, wintertime Pacific storm systems borne by westerly winds lose much of their moisture before passing through. The peak precipitation season occurs during late summer and early fall, when moisture moves into the region from the Gulf of Mexico in association with the western extension of the Bermuda High. The more mountainous and elevated portions of the planning area experience wetter and colder conditions than those near Farmington (WRCC 2001).

The annual precipitation at Farmington is 8.8 inches. The driest month is June, with 0.3 inch of rainfall, and the wettest month is August, with 1.2 inches of rainfall. The average high and low temperatures at Farmington in August are 90 and 59 degrees Fahrenheit (ºF). The January average high and low temperatures are 42 and 19ºF. The dominant winds in the region tend to prevail from the southwest and westerly directions during daytime for much of the year. However, local wind conditions can vary substantially from this general pattern throughout the planning area, due to the effects of topography channeling and mountain-valley circulations.

Figure 1-1 Planning Area and Field Office Surface Administration

The 4.2 million-acre planning area is comprised of federal, tribal, state, and private lands overlying the Mancos/Gallup formations within portions of San Juan, Rio Arriba, McKinley, and Sandoval Counties in New Mexico. The decision area for the RMPA/EIS includes only the surface land and subsurface mineral estate within the planning area for which the BLM has authority to make land use and management decisions.

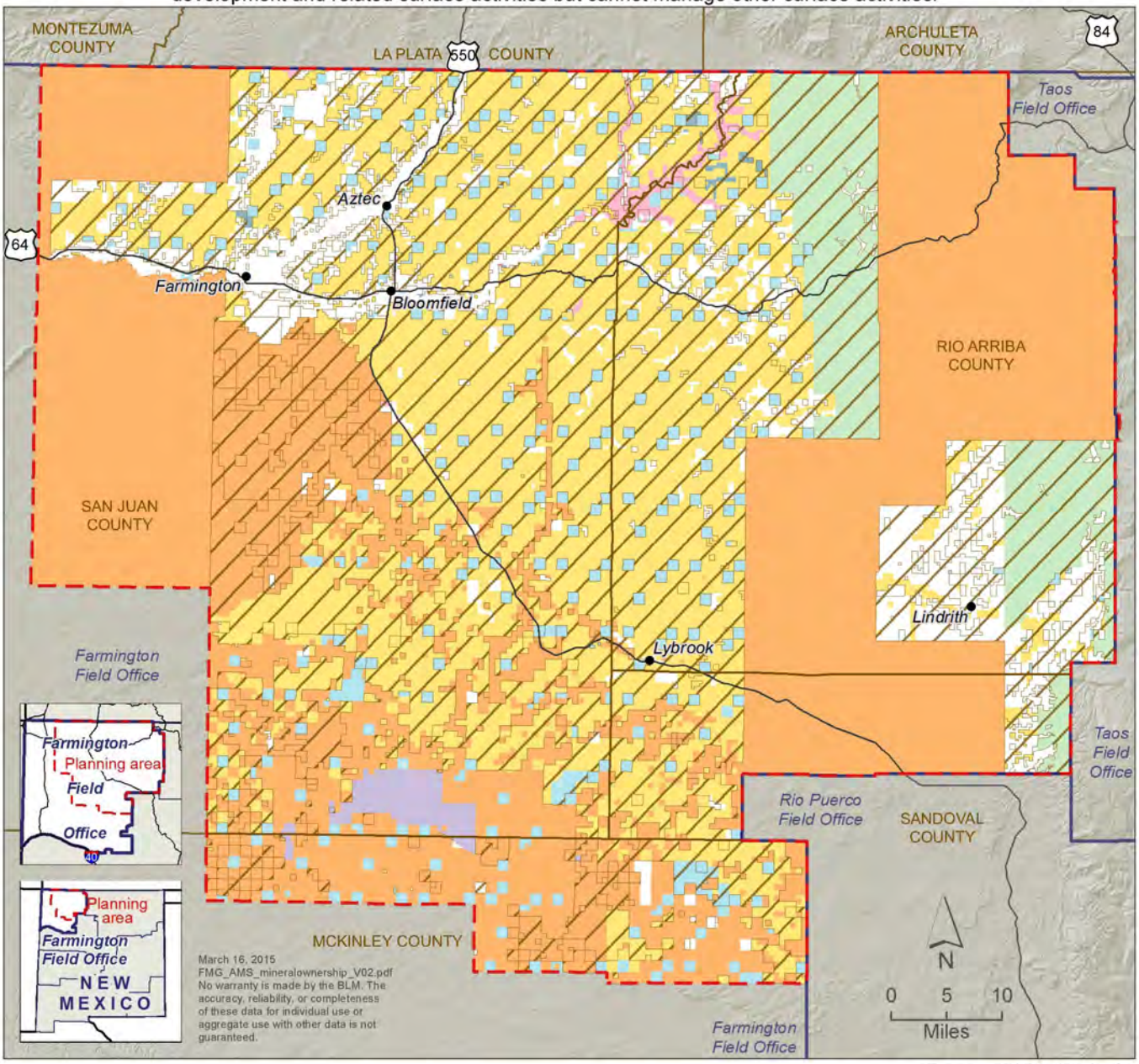


Source: BLM GIS 2014

- Bureau of Land Mangement
- Bureau of Reclamation
- US Forest Service
- Tribal Lands
- National Park Service
- Private
- State of New Mexico
- New Mexico State Game and Fish
- Planning area
- Field office boundary

Figure 1-2 Federal Mineral Estate

The decision area for the RMPA/EIS includes only the surface land and subsurface mineral estate within the planning area for which the BLM has authority to make land use and management decisions. Federal mineral estate is subsurface mineral estate owned by the US and administered by the BLM. The surface may be managed by the BLM, another federal agency, or owned by the state or private individuals. When the BLM does not manage the surface lands, the BLM still has the authority to manage the mineral development and related surface activities but cannot manage other surface activities.



Source: BLM GIS 2014

Decision Area
- BLM-managed mineral estate
- BLM-managed surface estate

Other Surface Management
- Bureau of Reclamation
- US Forest Service
- Tribal Lands
- National Park Service
- Private
- State of New Mexico
- New Mexico State Game and Fish

- Planning area
- Field office boundary

Resources discussed in the AMS are the following:

- Air
- Soil
- Geology
- Water
- Riparian areas and wetlands
- Forestry
- Upland vegetation
- Fish and wildlife
- Special status species
- Lands with wilderness characteristics
- Cultural resources
- Paleontology
- Visual resources

Resource uses discussed are the following:

- Minerals
- Lands and realty
- Transportation and travel management
- Recreation
- Rangeland management including wild horses and livestock grazing

Special designations and social and economic features are also discussed.

1.4 KEY FINDINGS

The 2003 Farmington RMP has been successful in providing direction for managing BLM-administered lands in the project area. However, as full-field development occurs, especially in the shale oil play, additional unforeseen impacts will occur that previously were not recognized or analyzed in the 2001 RFD or the Farmington RMP/EIS. This will require an EIS-level plan amendment and revision of the RFD for complete analysis of the Mancos Shale/Gallup Formation. Additionally, the amendment and EIS will address updates to some existing management decisions, new data where available, and changed resource conditions, as follows:

- Revised and updated RFD—The RFD will estimate the future number of oil and gas wells to be drilled in the Mancos Shale/Gallup Formation. It also will estimate the magnitude of the projected infrastructure improvements to assess the environmental impacts of full-field development in the formation.
- New analysis for changed conditions—This RMPA/EIS analyzes the impacts of constructing oil and gas-related infrastructure and additional well counts that could disturb more surface than was visualized in the 2003 RMP. Also, major oil production would generate additional volatile organic compounds, which are precursors to ozone production.
- Based on an analysis of the current situation, the BLM has determined that the amendment will consider new decisions in the following programs:
  - Oil and gas
  - Vegetative communities (e.g., uplands, riparian areas, and weeds)
  - Travel and transporation management
  - Lands and realty
  - Lands with wilderness characteristics

A list of key issues to be addressed in the RMPA was compiled during internal scoping based on the local knowledge of BLM staff and managers. **Table 1-1** identifies the key issues that will drive the amendment and NEPA analysis. These issues reflect the stated purpose and need for the amendment and are considered in the range of alternatives presented in the EIS. **Table 1-2** identifies issues that will be affected by the primary issues and may result in new actions, such as new stipulations or conditions of

approval, for these resources and uses. Further details and a discussion of how the secondary issues relate to the primary issues is provided in each respective section of the AMS.

Additional issues were identified and issue statements were refined during the public scoping period based on main themes in public comments; these issues are summarized in Table 1-2. All planning issues identified in internal and external scoping will be used in developing a range of alternatives for the EIS.

Table 1-1 Preliminary Planning Issues

Planning Issue Category	Issue Statement
Primary Issue #1: Oil and Gas	**Do the leasing versus no leasing decisions made in the 2003 RMP still apply? Are there areas that should be considered for no leasing? Are there new best management practices (BMPs) and possible special mitigation measures for sensitive areas that need to be considered to address impacts on other resources? Are there special leasing stipulations or requirements (e.g., sustainable/least impacting development requirements) that should be considered?**
Air resources	How would the anticipated oil and gas development affect air resources, including ozone, air quality related values (AQRVs), and visibility?
Noise	How would noise impacts from increased oil and gas development be addressed around sensitive areas, especially near National Park Service units and tribal sensitive sites?
Night sky	How would light pollution impacts from increased oil and gas development be addressed around sensitive areas, especially near National Park Service units and tribal sensitive sites?
Cultural resources	There are numerous new site complexes that have been identified since the 2003 RMP. These new sites need to be analyzed considering the new oil and gas development. Additionally, the 2003 RMP did not have clearly defined site management goals and objectives.
Paleontological resources	There are numerous new localities that have been identified since the 2003 RMP. They need to be analyzed considering the new oil and gas development.
Socioeconomics	How would new oil and gas development impact the socioeconomics of people in the planning area, including changes to nonmarket values, such as open space and recreation?
Salable minerals	The BLM needs to consider determining areas that would be open or closed to salable mineral disposals.
Soil resources	The 2003 Farmington RMP did not address fragile or sensitive soil resources. As part of this RMPA, the FFO will review current soil resource information. The purpose is to determine whether there are highly erosive, sensitive, or fragile soils that should be protected from impacts of anticipated oil and gas development.
Water resources	How will the anticipated oil and gas development affect groundwater and surface water in the analysis area? How will the new technologies being used for oil and gas development, such as hydraulic fracturing, affect water resources?
Primary Issue #2: Lands and realty	**New Mexico's boom in mineral development will result in the need for additional rights-of-way (ROWs) for power lines and pipelines. Are there ways to effectively manage for this increased demand and development? Should older withdrawals expiring soon be renewed and should new withdrawals be considered? No ROW corridors were defined in the 2003 RMP, which needs to be corrected as part of this land use planning.**
Cultural resources	There are numerous new site complexes that have been identified since the 2003 RMP. These new sites need to be analyzed considering potential changes in ROW management. Additionally, the 2003 RMP did not have clearly defined site management goals and objectives.

Table 1-1 Preliminary Planning Issues

Planning Issue Category	Issue Statement
Paleontological resources	There are numerous new localities that have been identified since the 2003 RMP. These need to be analyzed considering potential changes in ROW management.
Socioeconomics	There are expected to be changes in ROW management from the new oil and gas developments, for example, changes to nonmarket values, such as open space and recreation. How will this impact the socioeconomics of people in the planning area?
Soil resources	The 2003 Farmington RMP did not address fragile or sensitive soil resources. As part of this RMPA, the FFO will review current soil resource information to determine whether there are highly erosive, sensitive, or fragile soils that should be protected from the impacts of ROW development.
Water resources	How will potential changes in ROW management affect groundwater and surface water in the analysis area? The 2003 RMP does not have Clean Water Act goals, objectives, and standards.
Primary Issue #3: Lands with wilderness characteristics	**The 2003 RMP did not address management for lands with wilderness characteristics. The public in the FFO is interested in seeing lands considered for management to preserve wilderness characteristics. Since 2012, the BLM's policy has been to require a field office to identify lands with wilderness characteristics via inventory and to determine appropriate management actions as part of land use planning. For this RMP, the BLM needs to determine whether there are lands with wilderness characteristics in the planning area, and, if so, to determine appropriate management decisions through a range of alternatives.**
Transportation and travel management	The FFO needs to update transportation and travel management information considering the anticipated new development in the planning area. This is so the BLM will be able to protect lands with wilderness characteristics from impacts of new route creation. It will do this by enforcing the 2003 RMP decision to limit travel to existing routes.
Leasable minerals	Do the leasing versus no leasing decisions made in the 2003 RMP still apply? Are there areas that should be considered for no leasing? Are there new BMPs and possible special mitigation measures for sensitive areas that need to be considered to address impacts on other resources? Are there special leasing stipulations or requirements, such as those for sustainable/least impacting development, that should be considered?
Locatable minerals	The BLM needs to consider determining areas that may be unacceptable for further coal leasing or unsuitable for all or stipulated methods of coal mining.
Primary Issue #4: Vegetation management. including upland vegetation, riparian and wetland areas, and invasive/nonnative plants	**To address the anticipated increase in oil and gas development, how should the BLM maintain or restore healthy landscapes? Are there treatments that could be used for the benefit of resources, including vegetation, wildlife, rangeland health, and watershed health? The upland vegetation communities under consideration are desert grasslands, great basin desert scrub, juniper savannah, piñon-juniper woodland, ponderosa pine forest, subalpine montane grassland, subalpine coniferous forest, and urban/farmland/open water areas.**
Cultural resources	There are numerous new site complexes that have been identified since the 2003 RMP. These need to be analyzed when considering vegetation management. Cultural site density and presence of culturally significant plants influence vegetation management.
Soil resources	The 2003 Farmington RMP did not address fragile or sensitive soil resources. As part of this RMPA, the FFO will review current soil resource information to determine whether there are highly erosive, sensitive, or fragile soils that should be protected when vegetation is being treated and vegetation management changes.

Table 1-1 Preliminary Planning Issues

Planning Issue Category	Issue Statement
Water resources	How will the anticipated development affect groundwater and surface water in the analysis area and the vegetation that depends on it? How will the new technologies being used for oil and gas development, such as hydraulic fracturing, affect water resources? The 2003 RMP does not have Clean Water Act goals, objectives, and standards.
Wildlife	Where are priority species and habitats that require special management? What are the desired future conditions of these areas and other habitats throughout the planning area? How should the BLM address the progressive loss of habitat for specific sensitive species, such as the Mexican spotted owl, Colorado pike minnow, and razorback sucker?
Migratory birds	The 2003 RMP does not contain specific management objectives or direction for migratory birds. It did not consider the 2010 memorandum of understanding (MOU) between the US Fish and Wildlife Service (USFWS) and the BLM to promote the conservation of migratory birds. The FFO needs to consider including management objectives and direction to conserve migratory birds. New vegetation management decisions should take migratory bird habitat needs into account.
Special status species management	The FFO needs to consider the new listed plants and animals under the Endangered Species Act of 1973 (ESA) and address the sensitive and declining populations in the analysis area. A principal consideration is to manage habitat to ensure continued use by these species. The FFO should identify areas where other resource activities may conflict with special status species and their habitat requirements.

Table 1-2 Planning Issues Identified in External Scoping

Planning Issue Category	Issue Statement
Primary Issue #1. Oil and gas development	How would the BLM manage fluid mineral leasing, including level of permitted development, stipulations, and mitigation measures, to fulfill the multiple-use mandate, while addressing impacts on other resources, given the predicted increase in development and the use of hydraulic fracturing technology?
Primary Issue #2. Lands and realty	How would the BLM revise right-of-way management to allow for renewable energy development? How would land tenure be adjusted to support local communities' long-term planning goals and economic development and reduce trespass issues?
Primary Issue #3. Lands with wilderness characteristics	How would the BLM assess and manage for lands with wilderness characteristics in the planning area?
Primary Issue #4. Vegetation management	How would the BLM maintain or restore healthy river corridors and minimize and mitigate invasive weed spread in the planning area?
Other Resource Issues	
Air quality and climate change	How would the BLM accurately assess current air quality conditions and determine appropriate mitigation measures to minimize potential impacts on air quality from proposed fluid mineral development? How would the BLM address the effects of oil and gas development on greenhouse gas emissions?
Cultural resources	How would the BLM minimize impacts on the Old Spanish trail from oil and gas development? How would the BLM minimize the impacts of oil and gas development on important cultural resources in the planning area?

Table 1-2 Planning Issues Identified in External Scoping

Planning Issue Category	Issue Statement
	How would the BLM ensure preservation of the Chaco Canyon National Historic Park and the Chaco Canyon cultural landscape from impacts of oil and gas development?
Tribal interests	How would the BLM protect tribal interests?
Night skies and noise	How would the BLM minimize impacts of oil and gas development on noise and night skies, particularly near sensitive sites such as the Chaco Cultural National Historic Park?
Soil resources	How would the BLM reduce the risk of soil contamination and prevent disturbance to cryptogamic soil crusts from oil and gas development?
Paleontological resources	How would the BLM protect sites with important paleontological value in the planning area from oil and gas development?
Water resources	How would the BLM assess current water quality and minimize impacts on groundwater and surface water quality and quantity from oil and gas development, including hydraulic fracturing?
Socioeconomics	How would the BLM address both positive and negative impacts of oil and gas development on local and regional economies and social setting, including nonmarket values?
Wildlife	How would the BLM minimize impacts on wildlife habitat, such as fragmentation and contamination?
Special status species	How would the BLM minimize direct and indirect impacts of oil and gas development on special status species, including the Colorado pike minnow, Rio Grande cutthroat trout, Knowlton's cactus, Aztec gilia, and migratory birds?
Public health and safety	How would the BLM minimize impacts from the oil and gas industry on human health? What measures will be in place to ensure transparency of information related to potential contaminants in the planning area?
	How would the BLM minimize direct and indirect impacts from increased vehicular traffic and additional roads in the planning area as a result of oil and gas development?
	How would the BLM minimize potential impacts on recreation from oil and gas development?
	How would the BLM minimize potential impacts on livestock grazing from oil and gas development, including disturbance from increased roads and traffic and contamination?

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Chapter 2. Area Profile, Current Management Direction, and Management Opportunities

2.1 RESOURCES

2.1.1 Regional Context

New Mexico is the fifth largest state, with a total area of 121,412 square miles. The eastern border of New Mexico lies along 103° W longitude with Oklahoma and three miles west of 103° W longitude with Texas. On the southern border, Texas makes up the eastern two-thirds, while the Mexican states of Chihuahua and Sonora make up the western third, 90 percent of which is Chihuahua. The western border with Arizona runs along the 109° 03' W longitude. The southwestern corner of the state is known as the Bootheel. The 37° N latitude parallel forms the northern boundary with Colorado. New Mexico, Colorado, Arizona, and Utah come together at the Four Corners in the northwestern corner of New Mexico. Although it is a large state, New Mexico has little water; its surface water area is about 250 square miles.

The New Mexico landscape ranges from wide rose-colored deserts to broken mesas to high snow-capped peaks. Despite New Mexico's arid image, heavily forested mountain wildernesses cover a significant portion of the state, especially toward the north. The Sangre de Cristo Mountains, the southernmost part of the Rocky Mountains, run roughly north-south along the east side of the Rio Grande, in the rugged pastoral north. The most important of New Mexico's rivers are the Rio Grande, Pecos, Canadian, San Juan, and Gila.

Physiographic Provinces

Ecoregions defined by the US Environmental Protection Agency (EPA) are derived from the seminal work *Ecoregions of the Conterminous United States*, by J. M. Omernik (1987). These ecoregions form a framework for researching, assessing, managing, and monitoring environmental resources. Ecoregions denote areas whose ecosystems are generally similar. In ecoregions, the type, quality, and quantity of environmental resources are also similar.

The ecoregions in the project area are as follows:

- Colorado Plateau—Rugged tableland topography is typical. Canyons, mesas, plateaus, and mountains expose a long geologic history of rock formations. Precipitous sidewalls mark abrupt changes in local relief, often of 1,000 to 2,000 feet or more. The region contains piñon-juniper and Gambel oak woodlands. Large low-lying areas contain saltbush-greasewood communities.
- Southern Rockies—The Southern Rockies are high elevation, steep, rugged mountains. Although coniferous forests cover much of the region, vegetation, soil, and land use follow a pattern of elevational banding, as in most of the mountainous regions in the western United States. The lowest elevations are generally grass or shrub covered and are typically key primary areas for grazing. Low to middle elevations are also grazed and covered by a variety of vegetation types—juniper-oak woodlands, ponderosa pine, aspen, and Douglas fir. Middle to high elevations are largely covered by coniferous forests and have less grazing activity. The highest elevations have alpine characteristics. Numerous perennial mountain streams with deciduous riparian vegetation support cold-water fisheries and serve as wildlife corridors.
- Arizona/New Mexico Plateau—The Arizona/New Mexico Plateau represents a large transitional region. It is between the drier shrublands and wooded higher relief tablelands of the Colorado Plateau in the north, the lower, hotter, less vegetated Mojave Basin and Range in the west, and forested mountain ecoregions on the northeast and south. Local relief in the region varies from a few feet on plains and mesa tops to well over 1,000 feet along tableland side slopes. The Continental Divide splits the region but is not a prominent topographic feature. The region extends across northern Arizona, northwestern New Mexico, and into Colorado in the San Luis Valley. Gunnison prairie dogs are a keystone species in many of the sagebrush ecosystems; their burrows provide habitat for other wildlife, including burrowing owls, weasels, badgers, and a variety of snakes.

A small portion of the project area falls in the far southern area of the BLM's Colorado Plateau Rapid Ecoregional Assessment (REA; www.blm.gov/wo/st/en/prog/more/Landscape_Approach/reas/coloplateau.html; accessed on December 24, 2013).

REAs are a synthesis and analysis of the best available information about natural resource conditions and trends in an ecoregion. They highlight and map areas of high ecological value, including important wildlife habitats and corridors.

REAs also gauge the potential risks from four key environmental change agents: climate, wildfires, invasive species, and development. They map areas that have high energy development potential and relatively low ecological value; these areas could be best-suited for siting future energy development.

In addition, REAs establish landscape-scale, baseline, ecological data to gauge the effect and effectiveness of future management actions. Management decisions are not made nor resource uses allocated in REAs; nevertheless, they provide science-based information and tools for land managers and stakeholders to consider in subsequent resource planning and decision making.

The BLM will use the portion of the Colorado Plateau REA to inform resource management and to provide data for the EIS. The information, maps, and tools provided by the REA will strengthen analyses of the potential and cumulative effects of climate change and other environmental disturbances on important ecological values.

2.1.2 Air Resources

Air Quality

Profile

Air quality may be affected by BLM applications, activities, and resource management. Therefore, the BLM must consider and analyze the potential effects of BLM and BLM-authorized activities on air resources as part of the planning and decision-making process.

Indicators

The federal Clean Air Act (42 US Code [USC], Sections 7401-7642) established the principal framework for national, state, and local efforts to protect air quality. The EPA sets regulations and standards to implement the requirements of the Clean Air Act. While the EPA retains authority for certain air quality rules, including most rules pertaining to emission standards for mobile sources, it may give authority to states and, in some cases, to tribal governments to implement portions of the federal Clean Air Act. The EPA has approved New Mexico's State Implementation Plan, which means the state may implement certain provisions of the Clean Air Act.

Ambient Air Quality Standards

Under the Clean Air Act, the EPA has set time-averaged National Ambient Air Quality Standards (NAAQS) for six air pollutants considered to be key indicators of air quality: carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead, and two categories of particulate matter (particulate matter less than 10 microns in diameter [PM_{10}] and particulate matter less than 2.5 microns in diameter [$PM_{2.5}$]). The two-tiered standards may be primary or secondary. Primary standards set limits to protect public health, including the health of sensitive populations, such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. Averaging periods vary by pollutant, based on potential health and welfare effects of each pollutant. States may set their own ambient air quality standards, but they must be at least as stringent as the national standards.

National and New Mexico air quality standards are shown on **Table 2-1**. For actions on lands within the boundaries of Indian reservations, national rather than state standards apply.

Table 2-1 National and New Mexico Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards			New Mexico Standard
		Primary	Secondary	Form	
Ozone	8-hour	0.075 ppm[1]	Same as primary	Annual 4th-highest daily max. 8-hr concentration, averaged over 3 years	--
Carbon monoxide	8-hour	9 ppm	--	Not to be exceeded more than once per year	8.7 ppm
	1-hour	35 ppm	--		13.1 ppm
Nitrogen dioxide	Annual (arithmetic mean)	0.053 ppm	Same as primary	Annual mean	0.05 ppm
	24-hour	--	--	--	0.10 ppm
	1-hour	100 ppb	--	98th percentile, averaged over 3 years	--
Sulfur dioxide	Annual (arithmetic mean)	--	--	--	0.02 ppm
	24-hour	--	--	--	0.10 ppm
	3-hour	--	0.5 ppm	Not to be exceeded more than once per year	--
	1-hour	75 ppb[2]	--	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years	--
PM_{10}	24-hour	150 µg/m^3	Same as primary	Not to be exceeded more than once per year on average over 3 years	--
$PM_{2.5}$	Annual (arithmetic mean)	15 µg/m^3	Same as primary	Annual mean, averaged over 3 years	--
	24-hour	35 µg/m^3	Same as primary	98th percentile, averaged over 3 years	--
Lead[3]	Rolling 3-month average	0.15 µg/m^3	Same as primary	Not to be exceeded	--
Total suspended particulates	Annual (geometric mean)	--	--	--	60 µg/m^3
	30-day average	--	--	--	90 µg/m^3
	7-day	--	--	--	110 µg/m^3
	24-hour	--	--	--	150 µg/m^3
Total reduced sulfur	0.5 hour	--	--	--	0.003 ppm
Hydrogen sulfide	1-hour (statewide)	--	--	--	0.010 ppm
	0.5 hour (within 5 miles of municipalities > 20,000)	--	--	--	0.003 ppm

Table 2-1 National and New Mexico Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards			New Mexico Standard
		Primary	Secondary	Form	
Total reduced sulfur	0.5 hour	--	--	--	0.003 ppm

Sources: EPA 2011b; New Mexico Commission of Public Records 2002

[1]ppm—parts per million. Final rule signed March 12, 2008. The 1997 standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, the EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceed more than once per year) in all areas, although some areas have obligations under that standard (anti-backsliding). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 12 ppm is less than or equal to 1.

[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 one 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]$\mu g/m^3$—micrograms per cubic meter. Final rule signed October 15, 2008. The 1978 lead standard (1.5 $\mu g/m^3$) remains in effect until one 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.

In addition to criteria pollutants, the Clean Air Act regulates toxic air pollutants, or hazardous air pollutants, that are known to cause or are suspected to cause cancer or other serious health effects or adverse environmental impacts. The EPA has issued rules covering 80 categories of major industrial sources, as well as categories of smaller sources. Controls are usually required at the source to limit the release of these air toxics into the atmosphere.

Clean Air Act General Conformity

Section 176(c) of the Clean Air Act requires that federal actions conform to the appropriate state implementation plan. The EPA has promulgated rules establishing conformity analysis procedures for transportation-related actions and for other general federal agency actions (40 Code of Federal Regulations [CFR], Parts 6, 51, and 93).

The EPA general conformity rule requires preparation of a formal conformity determination document for federal agency actions that are undertaken, approved, or funded in federal nonattainment or maintenance areas. This rule applies when the total net change in direct and indirect emissions of nonattainment pollutants (or their precursors) exceeds specified thresholds. Because the planning area is attainment or unclassified for the NAAQS, the general conformity rule does not apply.

Prevention of Significant Deterioration

In addition to the NAAQS, the prevention of significant deterioration (PSD) regulations set forth a permit process that applies to new major sources or major modifications of existing sources for pollutants. It is applicable where the emission source is inside an attainment or unclassifiable area, as defined by the NAAQS. Furthermore, the PSD program requires the use of best available control technologies and provides for an air quality impact analysis and public involvement. The purpose of the PSD program is to protect public health and welfare. It also preserves, protects, and enhances the air quality of national parks and wilderness areas, national monuments, seashores, and other areas of recreation, scenic, or historic value.

PSD regulations prevent areas that are in attainment of the NAAQS from being polluted up to the level of the standards. The Clean Air Act directs the EPA to classify areas as Class I, Class II, or Class III. Class I areas are national parks and wilderness areas of a certain size that were in existence before 1977 or additional areas that have since been designated by federal regulation. The nearest Class I areas to the

planning area boundary are Mesa Verde National Park (11 miles to the northwest), San Pedro Parks Wilderness (adjacent to the southeast border of the planning area), and Bandelier National Monument (29 miles to the southeast) (National Park Service 2007). Class II areas are the remaining areas in the United States (outside nonattainment and maintenance areas). The planning area is in a Class II area. No Class III areas have been designated.

PSD regulations place limits on the total increase in ambient pollution levels above established baseline levels for sulfur dioxide, nitrogen dioxide, and PM_{10} that are allowed in these areas.

Current Conditions

The planning area consists of San Juan County, the northern two-thirds of McKinley County, and the western portions of Sandoval and Rio Arriba Counties. The area of analysis for directly emitted pollutants (pollutants other than ozone) is generally limited to a few miles downwind of a source. The area of analysis for ozone is larger; this is because it is formed by photochemical reactions of other pollutants in the atmosphere, primarily volatile organic compounds and nitrogen oxides. Ozone formation may occur later in time and at a greater distance from the sources of precursor emissions. The highest concentrations of ozone have occurred in the planning area on sunny days with light winds during the spring and summer.

The Clean Air Act requires each state to identify areas that have ambient air quality in violation of federal standards using monitoring data collected through state monitoring networks, as follows:

- Areas that violate air quality standards are designated as nonattainment for the relevant criteria air pollutants.
- Areas that comply with air quality standards are designated as attainment for the relevant criteria air pollutants.
- Areas that have been redesignated from nonattainment to attainment are considered maintenance areas.
- Areas of uncertain status are generally designated as unclassifiable but are treated as attainment areas for regulatory purposes.

The planning area is in attainment or unclassified for all NAAQS (EPA 2014a).

The NMED is responsible for operating the network of air monitoring stations in most of New Mexico, including in the planning area, where there are five monitoring stations. **Table 2-2** shows the locations of the stations, the pollutants monitored at each station, and the last three years of monitoring data for each station. As shown, ambient air concentrations of regulated pollutants are below the NAAQS.

Table 2-2 Air Quality Monitoring Values in San Juan County, New Mexico

Pollutant	Averaging Time	2010	2011	2012	3-Year Average	NAAQS	Percent of NAAQS
US Bureau of Reclamation (USBR) Shiprock Substation (Farmington)							
Ozone	8-hour	0.063 ppm	0.068 ppm	0.071 ppm	0.067 ppm	0.075 ppm	90
Nitrogen dioxide	1-hour	40 ppb	36 ppb	37 ppb	38 ppb	100 ppb	38
Sulfur dioxide	1-hour	14 ppb	20 ppb	24 ppb	19 ppb	75 ppb	26
Dine College, GIS Lab (Shiprock)							
Ozone	8-hour	0.064 ppm	0.066 ppm	0.071 ppm	0.067 ppm	0.075 ppm	89
Nitrogen dioxide	1-hour	32 ppb	34 ppb	37 ppb	34 ppb	100 ppb	34
PM_{10}	24-hour BLK avg.	56 $\mu g/m^3$	61 $\mu g/m^3$	54 $\mu g/m^3$	57 $\mu g/m^3$	150 $\mu g/m^3$	38
Sulfur dioxide	1-hour	Incomplete[1]	Incomplete[1]	23 ppb	--	75 ppb	--

Table 2-2 Air Quality Monitoring Values in San Juan County, New Mexico

Pollutant	Averaging Time	2010	2011	2012	3-Year Average	NAAQS	Percent of NAAQS
3400 Messina Drive, Farmington							
PM_{10}	24-hour	22 $\mu g/m^3$	38 $\mu g/m^3$	48 $\mu g/m^3$	36 $\mu g/m^3$	150 $\mu g/m^3$	24
$PM_{2.5}$	24-hour	18 $\mu g/m^3$	12 $\mu g/m^3$	11 $\mu g/m^3$	14 $\mu g/m^3$	35 $\mu g/m^3$	39
162 Highway 544, Bloomfield							
Ozone	8-hour	0.065 ppm	0.066 ppm	0.07 ppm	0.067 ppm	0.075 ppm	89
Nitrogen dioxide	1-hour	41 ppb	44 ppb	40 ppb	42 ppb	100 ppb	42
Sulfur dioxide	1-hour	6 ppb	9 ppb	9 ppb	8 ppb	75 ppb	11
423 Highway 539, Navajo Dam							
Ozone	8-hour	0.069 ppm	0.074 ppm	0.071 ppm	0.071 ppm	0.075 ppm	95
Nitrogen dioxide	1-hour	37 ppb	40 ppb	35 ppb	37 ppm	100 ppb	37

Source: EPA 2014b
[1]Collection data incomplete, likely due to monitoring equipment issues.

The EPA prepares a national emissions inventory every three years to provide a comprehensive and detailed estimate of emissions from all air emission sources in the country. Emissions in the inventory are presented by county. The inventories are based on emission estimates and model inputs provided by state, local, and tribal air agencies for sources in their jurisdictions, supplemented by data developed by the EPA.

Table 2-3 summarizes the mobile and stationary source emissions that occurred in the planning area counties (San Juan, McKinley, Rio Arriba, and Sandoval) in 2011. This baseline emissions summary is a conservative overestimate of planning area emissions. This is because it includes emissions from all of McKinley, Rio Arriba, and Sandoval Counties and not just the portions of those counties that are in the planning area.

In addition to the anthropogenic (man-made) emissions shown in Table 2-3, the EPA estimated in its 2011 emissions inventory for the planning area counties that biogenic sources (vegetation and soil) contributed an additional 186,102 tons of volatile organic compounds, 36,812 tons of carbon monoxide, and 2,024 tons of nitrogen oxides (EPA 2013a).

Table 2-3 Summary of 2011 Annual Emissions for San Juan, McKinley, Rio Arriba, and Sandoval Counties (Tons)

Source Category County	Volatile Organic Compounds	Carbon Monoxide	Nitrogen Oxides	Sulfur Dioxide	PM_{10}	$PM_{2.5}$
Agricultural						
McKinley County	--	--	--	--	11	2
Rio Arriba County	--	--	--	--	34	7
Sandoval County	--	--	--	--	36	7
San Juan County	--	--	--	--	1,058	212
Subtotal	--	--	--	--	*1,139*	*228*
Bulk Gasoline Terminals and Gas Stations						
McKinley County	921	--	--	--	--	--
Rio Arriba County	303	--	--	--	--	--
Sandoval County	591	--	--	--	--	--
San Juan County	736	--	--	--	--	--
Subtotal	*2551*	--	--	--	--	--

Table 2-3 Summary of 2011 Annual Emissions for San Juan, McKinley, Rio Arriba, and Sandoval Counties (Tons)

Source Category County	Volatile Organic Compounds	Carbon Monoxide	Nitrogen Oxides	Sulfur Dioxide	PM_{10}	$PM_{2.5}$
Commercial Cooking						
McKinley County	3	9	--	--	23	21
Rio Arriba County	1	3	--	--	7	7
Sandoval County	4	11	--	--	29	26
San Juan County	4	13	--	--	33	30
Subtotal	*12*	*36*	--	--	*92*	*84*
Dust						
McKinley County	--	--	--	--	66,838	6,799
Rio Arriba County	--	--	--	--	32,819	308
Sandoval County	--	--	--	--	38,616	3,949
San Juan County	--	--	--	--	71,764	7,297
Subtotal	--	--	--	--	*210,037*	*18,353*
Fire						
McKinley County	265	1,110	25	11	121	103
Rio Arriba County[1]	11,346	48,178	585	340	4,836	4,099
Sandoval County[1]	73,612	312,333	3,989	2,264	31,530	26,720
San Juan County	202	1,300	44	19	182	122
Subtotal	*85,425*	*362,921*	*4,643*	*2,634*	*36,669*	*31,044*
Fuel Combustion						
McKinley County	136	941	3,832	1,282	119	102
Rio Arriba County	811	2,542	1,811	13	109	106
Sandoval County	214	1,296	416	75	209	180
San Juan County	1,493	21,225	24,346	4,806	650	631
Subtotal	*2,654*	*26,004*	*30,405*	*6,176*	*1087*	*1019*
Industrial Processes						
McKinley County	598	104	167	49	2,684	354
Rio Arriba County	15,498	12,411	9,016	4	124	109
Sandoval County	525	338	300	0	35	9
San Juan County	20,590	18,976	13,750	711	2,580	612
Subtotal	*37,211*	*31,829*	*23,233*	*764*	*5,423*	*1084*
Miscellaneous Nonindustrial NEC						
McKinley County	26	0	0	0	0	0
Rio Arriba County	19	0	0	0	0	0
Sandoval County	36	0	0	0	0	0
San Juan County	45	0	0	0	0	0
Subtotal	*126*	0	0	0	0	0
Mobile Sources						
McKinley County	1,593	15,449	7,932	48	309	269
Rio Arriba County	920	6,608	1,108	6	62	49
Sandoval County	1,513	15,487	3,397	16	169	129
San Juan County	1,986	21,130	4,057	21	216	166
Subtotal	*6,012*	*58,674*	*16,494*	*91*	*756*	*613*
Solvents						
McKinley County	557	--	--	--	--	--
Rio Arriba County	295	--	--	--	--	--
Sandoval County	929	--	--	--	--	--
San Juan County	997	--	--	--	--	--
Subtotal	*2778*	--	--	--	--	--

Table 2-3 Summary of 2011 Annual Emissions for San Juan, McKinley, Rio Arriba, and Sandoval Counties (Tons)

Source Category County	Volatile Organic Compounds	Carbon Monoxide	Nitrogen Oxides	Sulfur Dioxide	PM_{10}	$PM_{2.5}$
Waste Disposal						
McKinley County	38	438	20	2	105	92
Rio Arriba County	30	366	14	1	67	57
Sandoval County	3	4	1	1	11	7
San Juan County	85	1,039	38	2	169	142
Subtotal	*156*	*1,847*	*73*	*6*	*352*	*298*
TOTAL SOURCE EMISSIONS	**136,925**	**481,311**	**74,848**	**9,671**	**255,555**	**52,723**

Source: EPA 2013a
[1]Most emissions were from wildfire.

Trends

The planning area has seen increases in ozone, nitrogen oxides, and particulate matter concentrations. These are attributed to oil and gas operations, power plants, and general growth in the region (Four Corners Air Quality Task Force 2007, page vii). Increasing ozone levels in particular are attributed to oil and gas development and energy generating plants in the planning area. In San Juan County, oil and gas production was the largest anthropogenic source of volatile organic compounds in the 2011 EPA National Emissions Inventory; oil and gas production and coal-fired power plants (including the San Juan Generating Station and the Four Corners Power Plant) were the largest sources of nitrogen oxides (EPA 2013a). Volatile organic compounds and nitrogen oxides are the two main ozone precursor emissions. Actions to address emissions from oil and gas operations nationally and power plant emissions in the planning area are described below.

In October 2012, the EPA promulgated New Source Performance Standards under 40 CFR, Part 60, Subpart OOOO that requires air pollution controls for volatile organic compounds at natural gas production wells and other facilities associated with the oil and gas industry. According to the EPA, the final rules are expected to yield a nearly 95 percent reduction in volatile organic compound emissions from more than 11,000 new hydraulically fractured gas wells each year (EPA 2014c).

In 2013, the New Mexico Environment Department, the Public Service Company of New Mexico, and the EPA agreed to meet the requirements of the federal regional haze rule by shutting down two units at the San Juan Generating Station by the end of 2017. The agreement also requires installing selective noncatalytic reduction technology on the remaining two units. This will significantly reduce the current emissions levels of many pollutants, including 67 percent of sulfur dioxide, 62 percent of nitrogen oxides, 50 percent of particulate matter, 44 percent of carbon monoxide, 51 percent of volatile organic compounds, 50 percent of carbon dioxide, and 50 percent of mercury (BLM 2014b, pp. 44-45).

In December 2013, three coal-fired generators were shut down at the Four Corners Power Plant as part of a plan to meet the requirements of the federal regional haze rule. The remaining two coal-fired generators will have selective catalytic reduction technology installed by 2018. These changes satisfy the EPA's best available retrofit technology requirements. This will significantly reduce the current emissions levels of many pollutants, including 36 percent of nitrogen oxides, 61 percent of mercury, 43 percent of particulate matter, 30 percent of carbon dioxide, and 24 percent of sulfur dioxide (BLM 2014b, p. 45).

The increase in ozone, nitrogen oxides, particulate matter, and other pollutants has impacted other AQRVs. This includes reduced visibility (haze) and increased deposition of mercury and nitrogen in Class I areas near the planning area (Four Corners Air Quality Task Force 2007, p. viii). More information on AQRVs may be found in the Air Resources Technical Report for Oil and Gas Development (BLM 2014b, pp. 18-25), prepared by the BLM's New Mexico State Office.

Forecast

Air pollutants, especially ozone, will continue to be a concern in the planning area. Sources of ozone precursor emissions, particularly from the oil and gas sector and electrical generating plants, continue to be proposed in the planning area. At the same time, federal, state, local, and tribal jurisdictions continue to seek ways to reduce emissions from these industries through voluntary and regulatory mechanisms, including measures described above under Trends.

A driver to reduce ozone concentrations is to avoid designating the area as nonattainment for the ozone NAAQS. The EPA revised the ozone standard in 2008 to be more stringent; it issued a proposed rule in 2010 to further revise the 8-hour primary standard from 0.075 ppm to a lower level in the range of 0.060 to 0.070 ppm. Air monitoring concentration levels shown in Table 2-2 for the past three years exceed the lower level of this proposed range. The EPA is reviewing the ozone standard and must promulgate a new standard by the end of 2015, in accordance with court proceedings.

Key Features

No key features for air quality have been identified in the planning area.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern air quality:

- BLM-M-7300, Air Resource Management
- Clean Air Act of 1970, as amended in 1977 and 1990
- Executive Order (EO)11738, providing for administration of the Clean Air Act and Federal Water Pollution Control Act with respect to federal contracts, grants, and loans
- Federal Lands Policy and Management Act of 1976 (FLPMA)

The 2003 RMP for the planning area contained the objective that BLM actions and use authorizations will comply with all applicable local, state, tribal, and federal air quality laws, statutes, regulations, standards, and implementation plans. (See the **Appendix**, Current Management.)

Since the RMP was adopted in 2003, the BLM FFO has included a condition of approval (COA) in all applications for permits to drill. This requires oil and gas operators to install engines rated for low emissions of nitrogen oxides and limits emissions that contribute to ozone formation. The BLM also has assisted in funding an ozone monitoring site at Navajo Lake in northern New Mexico.

In addition, the BLM in 2011 joined in an MOU related to oil and gas production (US Department of Agriculture, US Department of the Interior, and US Environmental Protection Agency 2011). The BLM, USFWS, National Park Service, the EPA, and Forest Service agreed to an interagency approach to address air quality issues associated with oil and gas development on federal lands.

The MOU establishes common procedures for the agencies to follow in analyzing and mitigating the potential air quality impacts of proposed oil and gas activities on federally managed public lands through the National Environmental Policy Act (NEPA) process. The MOU provides for the following:

- Consultation among the five participating agencies throughout the NEPA process
- Common procedures for determining what type of air quality analyses are appropriate and when air modeling is necessary
- Specific provisions for analyzing and discussing impacts on AQRVs and for mitigating impacts on air quality and AQRVs
- A dispute resolution process to facilitate timely resolution of differences among agencies

In addition to current BLM management, the New Mexico Air Quality Bureau (NMAQB) enforces the national and state ambient air quality standards by developing rules to regulate and permit stationary sources of air emissions (New Mexico Administrative Code [NMAC] Title 20, Chapter 2). Any emission source proposed for the RMP amendment would have to comply with the NMAQB regulations and ambient air quality standards.

Current management direction combined with the updated management and policy guidance noted above is adequate to address air resources issues associated with the anticipated new development in the Mancos-Shale project area.

Although management is considered adequate, there are some opportunities for addressing air quality impacts for future development, as follows:

- Adopting additional mitigation measures from the Four Corners Air Quality Task Force Report of Mitigation Options (Four Corners Air Quality Task Force 2007) for oil and gas development
- Perform additional monitoring of air quality as oil and gas development occurs
- Partner with agencies, organizations, and industries to periodically update air quality modeling

Climate Change and Climate

Profile

Climate is defined as the generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years. Climate is both a driving force and a limiting factor for biological, ecological, and hydrologic processes, as well as for resource management of public lands.

Climate change is a statistically significant and long-term change in climate patterns. The terms climate change and global warming are often used interchangeably, although they are not the same thing. Climate change is any deviation from the average climate, whether warming or cooling, and can result from both natural and man-made sources. Natural contributors include fluctuations in solar radiation, volcanic eruptions, and plate tectonics. Global warming refers to the apparent warming of climate observed since the early twentieth century. It is primarily attributed to human activities, such as fossil fuel combustion, industrial processes, and land use changes.

Indicators

Greenhouse gases (GHGs) are chemical compounds in the earth's atmosphere. These compounds allow incoming, short-wave, solar radiation but absorb long-wave infrared radiation re-emitted from the earth's surface, trapping heat. The 2013 Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report states that the atmospheric concentrations of well-mixed, long-lived GHGs have increased to levels unprecedented in at least the last 800,000 years. Further, human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. It is 95 to 100 percent probable that human influence has been the dominant cause of the observed warming since the mid-20th century (IPCC 2013).

Greenhouse gases are carbon dioxide, methane, nitrous oxide, water vapor, and several trace gases. Some GHGs, such as carbon dioxide, occur naturally and are emitted into the atmosphere through both natural processes and human activities, while others are created and emitted solely through human activities. The GHGs that enter the atmosphere due to human activities include the following:

- Carbon dioxide from burning fossil fuels, solid waste, and trees and wood products
- Methane emitted during the production and transport of coal, natural gas, and oil and by livestock grazing, deforestation, and agricultural practices
- Nitrous oxide from agricultural and industrial activities and the combustion of fossil fuels and solid waste
- Fluorinated gases, which result from a variety of industrial processes

Although GHG levels have varied for millennia (along with corresponding variations in climate), industrialization and burning of fossil carbon sources have caused GHG concentrations to increase measurably at a global scale. Because climate change is a global phenomenon, the degree of change and specific effects from these changes cannot be quantified at the regional or local scale.

Renewable and nonrenewable resource management actions could impact climate change due to GHG emissions and other anthropogenic effects. However, the assessment of GHG emissions and climate change is extremely complex. This is because of the inherent interrelationships among its sources, causation, mechanisms of action, and impacts.

Given the global and complex nature of climate change, it is not currently possible to link projected GHG emissions associated with any particular activity to specific environmental impacts at a specific site or location. The uncertainty in applying results from global climate models to the regional or local scale (a process known as downscaling) limits the ability to quantify potential future impacts from GHG emissions at this scale.

Current Conditions

Climate

The climate of the planning area is classified as arid continental and is characterized by cool dry winters and warm dry summers. The area is rarely influenced by oceanic moisture due to its distance from the Pacific Ocean; this results in a climate that is abundant in sunshine, with large variations between daytime and nighttime temperatures. Peak precipitation occurs in late summer and early fall, when moisture from the Gulf of Mexico moves into the region. Prevailing wind direction is generally from the southwest and west, though local wind conditions can vary substantially due to topographic channeling and mountain-valley circulations.

Table 2-4 shows monthly climate normal data for select towns in the planning area, from 1981 to 2010. Climate normals are three-decade averages of climatological variables produced by the National Oceanic and Atmospheric Administration (NOAA), National Climatic Data Center, every ten years. Monthly summary tables of these data, along with average annual snowfall, were obtained from the Western Regional Climate Center (WRCC).

Table 2-4 Average Temperatures and Precipitation in the Planning Area (1981-2010)

Location	Average Maximum Temperature (°F)			Average Minimum Temperature (°F)			Average Precipitation (in inches)			Average Snow in Inches
	Jan.	Jul.	Annual	Jan.	Aug.	Annual	June	Aug.	Annual	
Shiprock	46.4	96.4	71.9	19.1	59.8	38.8	0.22	1.24	8.21	3.9
Farmington	40.8	89.6	65.4	20.3	59.8	39.6	0.21	1.26	8.59	10.9
Bloomfield	44.0	92.0	68.7	20.1	60.0	39.6	0.36	1.34	9.27	11.4
Navajo Dam	40.2	90.5	65.5	20.1	59.6	39.1	0.57	1.76	14.13	11.6
Lybrook	38.4	83.6	60.8	16.5	54.8	36.1	0.63	2.00	10.84	25.5
Lindrith	39.9	84.4	61.5	10.9	50.1	30.2	0.98	2.34	15.37	59.4
Source: WRCC 2014a, b, c, d, e, f										

Greenhouse Gases

The EPA's National Emissions Inventory, described under Air Quality above, included emissions of the GHGs carbon dioxide, methane, and nitrous oxide for some source categories in planning area counties (EPA 2013a). These emissions, along with state and national emissions for comparison, are shown in **Table 2-5**. Note that there are limited regulatory requirements to track GHG emissions from stationary sources; therefore, emissions from the fossil fuel and other industries are not included.

Table 2-5 Summary of 2011 Annual Reported GHG Emissions by Source Category

Pollutant	Emissions (Tons)		
	Carbon Dioxide	Methane	Nitrous Oxide
San Juan, McKinley, Rio Arriba, and Sandoval Counties			
Fire			
Prescribed fire	93,227	408	--
Wildfire	4,003,741	17,251	--
Mobile Sources			
Non-road equipment	174,418	--	--
On-road	3,260,519	246	101
TOTAL COUNTIES	***7,531,905***	***17,905***	***101***
% of state	***25***	***36***	***22***
% of national	***0.35***	***1.4***	***0.17***
New Mexico			
Fire			
Prescribed fire	503,824	2,163	--
Wildfire	11,713,948	45,755	--
Mobile Sources			
Non-road equipment	1,115,802	--	--
On-road	16,249,377	1,349	463
TOTAL STATE	***29,582,951***	***49,268***	***463***
% of national	***1.40***	***3.83***	***0.80***
National			
Fire			
Prescribed fire	129,633,533	490,618	--
Wildfire	153,095,344	675,702	--
Mobile Sources			
Non-road equipment	224,309,079	--	--
On-road	1,610,659,180	121,680	57,992
TOTAL NATIONAL	***2,117,697,135***	***1,288,001***	***57,992***

Source: EPA 2013a

The most recently available comprehensive inventory of state-wide GHG emissions for New Mexico was done in 2007. It showed gross GHG emissions of 76.2 million metric tonnes of carbon dioxide equivalents (NMED 2010, p. 7). This state-wide inventory was 1.06 percent of total US emissions for that same year. Electricity production (41 percent), the fossil fuel industry (22 percent), and transportation (20 percent) accounted for most of the GHG emissions in 2007 (NMED 2010, p. 2).

Trends

Climate

In the region encompassing southern Colorado and New Mexico, average temperatures rose just under 0.7 degree Fahrenheit per decade between 1971 and 2011. This is approximately double the global rate of temperature increase (Rahmstorf 2012). Similar to trends in national data, increases in mean winter temperatures in the Southwest have contributed to this rise. When compared to baseline information, periods between 1991 and 2005 show temperature increases in over 95 percent of the geographical area of New Mexico. Warming is greatest in the northwestern, central, and southwestern parts of the state.

Greenhouse Gases

Atmospheric concentrations of naturally emitted GHGs have varied over time, and earth's climate has fluctuated accordingly. Since the beginning of the industrial revolution, human activities have increased GHG concentrations and introduced man-made compounds that act as GHGs in the atmosphere.

In its latest report, the IPCC stated that the atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years (IPCC 2013). From preindustrial times until today, global average concentrations in the atmosphere have increased by around 40 percent for carbon dioxide, 150 percent for methane, and 20 percent for nitrous oxide (IPCC 2013).

In New Mexico, the gross GHG emissions increased by about 21 percent during the 1990s (Center for Climate Strategies 2006, p. D-6), while the state's GHG emissions remained essentially level between 2000 and 2007 (NMED 2010, p. 2). GHG emissions from the energy and fossil fuel industries increased between 1990 and 2000 but decreased between 2000 and 2007; GHG emissions from transportation increased over both periods, primarily due to increased freight traffic and increased state population (NMED 2010, p. 5). Specific trends on these industries were presented as follows in the 2000-2007 Inventory of New Mexico Greenhouse Gas Emissions (NMED 2010, p. 5):

- Estimates for emissions from the fossil fuel industry (production, processing, and transportation of natural gas, oil, and coal) showed a slight decrease from 2000 to 2007. However, significant uncertainty exists regarding emissions estimates for this sector due to inadequate data. In addition, the 2007 estimate may reflect changes in the estimation method and data sources for some subsectors. One trend noted is a five-fold increase in methane emissions from coal mining, which comprised about 6.5 percent of the estimated emissions from the fossil fuel industry sector.
- Emissions from electricity generation are due predominantly to coal-fired power plants, which contribute approximately 90 percent of the total GHG emissions for this sector. However, the emissions per megawatt-hour of electricity produced have decreased by almost 7.5 percent since 2000, due to increases in the use of natural gas, wind, and solar energy to produce electricity.
- GHG emissions from the transportation sector increased 12 percent, due to a combination of factors, including increased freight traffic and increased state population. Emissions from diesel fuel use increased by 28 percent during this period, and the estimated emissions from gasoline consumption increased by 4 percent.

Forecast

Climate

Climate modeling suggests that average temperatures in this region may rise by 4 to 6 degrees Fahrenheit by the end of the twenty-first century, with warming increasing from south to north. By 2080-2090, the southwestern US will see a 10 to 20 percent decline in precipitation, primarily in winter and spring, with more precipitation falling as rain (Cayan 2013).

In a recent report, the USBR (2013) made the following projections through the end of the twenty-first century for the Upper Rio Grande Basin (Southern Colorado to central-southern New Mexico); the projections are based on current and predicted future warming:

- Overall water availability will decrease by one quarter to one third
- The seasonality of stream and river flows will change, with summertime flows decreasing
- Stream and river flow variability will increase
- The frequency, intensity, and duration of both droughts and floods will increase

Greenhouse Gases

The New Mexico Greenhouse Gas Inventory and Reference Case Projections report contained projections for 2020 GHG emissions. This report predicted that by 2010 GHG emissions would grow 8 percent above 2000 levels, and by 2020 they would increase another 14 percent above 2010 levels (Center for Climate Strategies 2006, p. D-11). However, the 2000-2007 Inventory of New Mexico Greenhouse Gas Emissions (NMED 2010) showed a decrease in emissions between 2000 and 2007. It did not include future emission projections because uncertainties regarding the federal GHG program and instability of fuel prices and the economy did not allow NMED to develop valid projections (NMED 2010, p. 4).

Key Features

No key features have been identified for climate.

Current Management and Management Opportunities

There are no national ambient air quality standards for greenhouse gases. The Final Greenhouse Gas Tailoring Rule and the Greenhouse Gas Mandatory Reporting Rule govern climate and climate change. Climate change was not addressed in the 2003 RMP.

Since 2003, the Council on Environmental Quality (CEQ) has released draft guidance for NEPA documents for federal agencies for GHGs and the effects of climate change (CEQ 2014). The guidance provides federal agencies with significant discretion on how to consider the effects of GHG emissions and climate change in their evaluation of proposals for federal actions. It also provides an expectation of what should be considered and disclosed.

Agencies are directed to consider two separate issues when addressing climate change: the effects of a proposed action on climate change, as indicated by its GHG emissions, and the implications of climate change for the environmental effect of a proposed action. Agencies should consider the climate change effects of a proposal by comparing the GHG emissions of the proposed action and the reasonable alternatives. The effects of climate change on the proposed action and alternatives should be considered during the analysis of the affected environment. Land managers should consult the CEQ guidance for information on direct, indirect, and cumulative impact analyses.

In its Air Resources Technical Report for Oil and Gas Development (BLM 2014b), the BLM provides guidance related to NEPA analysis of oil and gas-related actions on BLM-administered lands. The environmental impacts of GHG emissions from oil and gas refining and from consumption, such as from vehicle operations, are not effects of BLM actions related to oil and gas development, as defined by the CEQ. This is because they do not occur at the same time and place as the action. Thus, GHG emissions from refining and consuming oil and gas do not constitute a direct effect that is analyzed under NEPA. In addition, refining and consumption are not indirect effects of oil and gas production. This is because production is not a proximate cause of GHG emissions resulting from refining and consumption. However, emissions from refining and consumption and other activities should be accounted for in the cumulative effects analysis.

Management actions to reduce criteria pollutant emissions from actions on BLM-administered lands, described above under Air Quality, Current Management, would also reduce emissions on GHGs in the planning area.

Management opportunities could include reviewing technologies and practices contained in the EPA's Natural Gas STAR Program to identify mitigation measures that the BLM could require of companies proposing natural gas-related activities on lands the BLM administers. The Natural Gas STAR Program is a voluntary partnership that encourages oil and natural gas companies to adopt proven, cost-effective technologies and practices that improve operational efficiency and reduce methane emissions. In conjunction with the oil and natural gas industry, the Natural Gas STAR Program has identified many technologies and practices that can be implemented to reduce methane emissions from all sectors of the oil and gas industry. The program includes recommended technologies and practices (EPA 2013b).

Noise

Profile

Noise is generally defined as unwanted or annoying sound that is typically associated with human activity and interferes with or disrupts normal activities. Although exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance.

The response of individuals to similar noise events is diverse. It is influenced by the type of noise, the perceived importance of the noise and its appropriateness in the setting, the time of day and type of activity during which the noise occurs, and the sensitivity of the individual.

The method commonly used to quantify environmental sounds involves evaluating all of the frequencies of a sound according to a weighting system. This system reflects that human hearing is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This is called "A" weighting, and the decibel (dB) level measured is called the A-weighted sound level (dBA). A sound level range of 0 to 10 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above about 120 dB begin to be felt inside the human ear as discomfort and, at still higher levels, as pain. Sound levels of typical noise sources from oil and gas activities are shown in **Table 2-6**.

Compressor station operations represent the largest and most long-term noise source associated with production. Sound levels measured at existing oil and gas facilities range from 44 to 69 dBA at a distance of 500 feet from a compressor station (BLM 2000d). Compressor stations operate throughout the life of an oil or gas well, but they can be designed and operated to reduce noise to acceptable levels.

Table 2-6 Noise Levels Associated with Oil and Gas Activity

Noise Source	Sound Level at 50 Feet[1]
Well drilling	83 dBA
Pump jack operation	82 dBA
Produced water injection facilities	71 dBA
Gas compressor facilities	89 dBA

Source: BLM 2000d
[1]Sound levels are based on highest measured sound and are normalized to a distance of 50 feet from the source.

Residents within approximately 2,800 feet and in direct line-of-sight of production activities could experience noise levels in excess of the 55 dBA in USEPA guidelines. Recreation areas within approximately 500 feet and in direct line-of-sight could have noise levels in excess of 70 dBA (BLM 2000d).

Indicators

Indicators for noise are any guidelines or limits on the level of noise allowable for actions on BLM-administered lands. This includes the Gold Book noise control guidelines described above and county and local municipal noise regulations.

Current Conditions

Noise from oil and gas compressors has been identified by the public as an issue of primary concern in the planning area. Sound levels are usually measured and expressed in decibels. As developments increase in the planning area, noise levels near sensitive receptors will likely remain an issue for the public.

Trends and Forecasts

No specific trend and forecast information related to noise has been identified for the planning area as a whole. In the 2003 RMP, the public identified noise from oil and gas compressors as an issue of primary concern in the planning area.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern noise:

- Noise Control Act of 1972
- Rio Arriba County Noise Ordinance, Section 6.15

- Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (commonly referred to as The Gold Book)

The 2003 RMP record of decision (ROD) included noise guidance from the BLM Notice to Lessees and Operators on Onshore Oil and Gas Leases in the Jurisdiction of the FFO NTL 03-1 FFO. This guidance was given as a stipulation for operations in 62 specially designated areas or in cases where noise could be a nuisance to residents or recreationists. The policy established a noise standard of 48.6 dBA for oil and gas lease operations that operate more than 8 hours per day for more than 1 week in duration. This noise standard must not be exceeded within 500 feet of an noise sensitive area boundary. The noise standard does not apply to nonstationary operations, such as construction, drilling, and completion or work over activities, or to short-term events, such as well venting or compressor start-up.

The BLM could consider new or revisions to BMPs or other mitigation measures to address noise concerns or issues in the planning area.

2.1.3 Soil Resources

Profile

Soil development is influenced by the duration of time the soil has been forming and the surrounding climate, topography, ecosystems, and organic and mineral material (parent material) deposited during formation. The characteristics and distribution of soil types in the planning area affect the use and management of the land and the quality of the surface water, air, forage, and tree growth.

Soil characteristics are important to consider when siting construction activities, such as oil and gas well development, road construction, and building placement. They are also important considerations when planning rangeland and timber stand improvements, surface water quality protection through minimizing erosion, surface stabilization, and recreation, such as off-highway vehicle (OHV) access and trail development.

The USDA Natural Resources Conservation Service (NRCS) has done soil surveys for the planning area and has classified the soils into map units. Soil map units may be designated based on the soil's series, slope, aspect, or texture. A soil series is two or more geographically associated soils that have similar formation, chemistry, or physical properties. Examples of soil series properties are runoff capabilities, erosion hazards, associated native vegetation, wildlife habitat use, and suitability for community development.

There are over 700 different map units that have been identified in the planning area, consisting of associations of different major soil series as found in the NRCS SURRGO data. Additionally, there are miscellaneous areas that have little or no soil material, such as rock outcrops, and thus support scant or no vegetation. There also are areas that are classified as suitable for farmland use or suitable for farmland use with irrigation.

Key landscape characteristics in the planning area are plateaus, basins and valleys, steep and rugged mountains, canyons, forests, deflation basins, arroyos, pediments, and alluvial fans (Griffith et al. 2006). Common processes on the landscape are desiccation, wind action, running water, mechanical weathering, and rapid mass movements.

Indicators

Indicators are key soil characteristics that are sensitive to change in the environment. Indicators of soil resource condition (quality) can be categorized into four general groups: visual, physical, chemical, and biological. Visual indicators are those that are caused by environmental factors, such as wind and water. Physical indicators are related to the arrangement of solid particles and pores. The soil's chemical condition affects soil-plant relations, water quality, buffering capacities, availability of nutrients and water to plants and other organisms, and mobility of contaminants. Also affected are some physical conditions,

such as the tendency for crust to form. Biological indicators reflect activities of living organisms and their influence on soil health.

Examples of these indicators are as follows:

- **Erodibility**—sensitivity of the soil structure to the effects of wind and water or susceptibility of soil to erosion
- **Reclamation potential**—ability of the soil to regain lost vegetative cover
- **Visual**—exposure of subsoil, change in soil color, ephemeral gullies, ponding, runoff, plant response, weed species, blowing soil, exposed plant roots, and deposition
- **Physical**—depth, bulk density, porosity, aggregate stability, texture, crusting, and compaction; physical indicators primarily reflect limitations to root growth, seedling emergence, infiltration, or movement of water in the soil profile
- **Chemical**—pH, salinity, organic matter, cation-exchange capacity, nutrient cycling, and the concentrations of elements that may be potential contaminants or those that are needed for plant growth and development
- **Biological**—measurements of microorganisms and macroorganisms, their activity, and byproducts

These indicators for soil resources are used in the planning area to determine soil and site stability. This is usually done as part of the Standards for Rangeland Health assessment. A checklist is followed, using observations for such factors as flow patterns and gullies and measurements for such factors as percent of bare ground and depth of soil horizons.

The Standards for Rangeland Health include Standard 1: Soils, which characterizes soil processes by appropriate soil types, climate, and landform, as indicated by the following measures:

- Surface litter is appropriate to the potential of the site
- Soil crusting formations in shrub interspaces and soil compaction are minimal or not in evidence, allowing for appropriate infiltration of water
- Hydrologic cycle, nutrient cycle, and energy flow are adequate for the vegetation communities
- Plant communities are diverse and vigorous, and there is evidence of recruitment
- Basal and canopy cover (vegetative) is appropriate for site potential

The amount and distribution of bare ground is one of the most important contributors to site stability relative to site potential. It is a direct indication of site susceptibility to accelerated wind and water erosion (Pellant et al. 2005). In general, a site with more bare ground will be less stable than a site with more vegetation and ground cover.

Some soils are covered with microbiotic soil crusts, which are also important indicators of rangeland health (Belnap et al. 2001; Butler et al. 2003; Johansen et al. 1984). These crusts may serve as an early indicator to ecological site decline because they appear to be more sensitive to disturbance from wildfire, livestock grazing, and OHV activity than vascular plants.

Biologic soil crusts are made up of tiny living plants and bacteria that grow together on the surface. They help keep the soil from washing or blowing away, fix nitrogen from the atmosphere into the soil, help keep out weeds, and promote the health of plant communities. In areas where biologic soil crusts have been lost, there is a greater risk of annual grass or other invasive species than in areas with intact crusts.

Microbiotic soil crusts and soils are also affected by soil compaction or compacted soil horizons. A compaction layer is a near-surface layer of dense soil caused by repeated impacts on the soil surface. Compaction is an important soil health indicator because it may directly affect and limit plant growth, water infiltration, and nutrient cycling processes (Pellant et al. 2005). Soil compaction may break down the soil structure and cause the development of a soil crust that physically restricts moisture infiltration and increases runoff probability.

Nonnative plants and invasive weeds disrupt or have the potential to disrupt or alter the natural ecosystem function, composition, or diversity of the site the plant occupies. This can affect soil resources by decreasing stabilizing native vegetation and increasing the potential for bare ground. The presence of

nonnative plants and invasive weeds deteriorates the health of the site, makes the efficient use of natural resources difficult, and may interfere with management objectives for the site. Areas that have been previously disturbed or have bare ground are more susceptible to weed invasion than areas with a healthy native plant cover and diversity.

Some areas may contain corrosive soils, which pertain to potential soil-induced electrochemical or chemical action that corrodes or weakens concrete. Without additional protective measures, these areas may be unsuitable for such uses as oil and gas development. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion.

In addition to the soil conditions mentioned above, the planning area contains some soils that are considered suitable for farmland applications. These soils are protected by the Farmland Protection Policy Act as a subtitle under the Agricultural Food Act of 1981. Farmlands are classified as prime or unique or farmlands of state or local importance. Prime and unique farmlands are those that have the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, or labor. The Farmland Protection Policy Act is intended to minimize the impact of federal programs by reducing the unnecessary and irreversible conversion of farmland to nonagricultural uses. If a project has the potential to convert important farmlands to nonagricultural uses, then a farmland conversion impact rating form must be filled out and submitted to the NRCS (NRCS 2012).

Current Condition

Soil information and classification for the planning area is obtained from the NRCS SURRGO data for New Mexico and covers 88 percent, or 1,986,300 acres, of the decision area. In addition, the FFO has created a fragile soil and a weeds dataset (incorporated below); data on microbiotic soil crust for a portion of the planning area was obtained from the Colorado Plateau REA.

As discussed under Indicators, sensitive soils in the planning area may have the following characteristics:

- Be susceptible to wind or water erosion
- Be located on steep slopes and are therefore more susceptible to erosion
- Have existing microbial crusts
- Are more susceptible to weed invasion or are classified as farmland

Currently, there are 216,800 acres of soils with high potential of soil microbial crusts in the decision area (REA GIS 2010) and 2,700 acres with invasive weeds.

Factors that influence soil erosion of soil include soil texture, soil structure, length and percent of slope, vegetative cover, and rainfall or wind intensity. Soils most susceptible to erosion by wind or water are typified by bare or sparse vegetative cover, noncohesive soil particles with low infiltration rates, and moderate to steep slopes. Wind erosion processes are less affected by slope angles but are highly influenced by wind intensity.

Soils are prone to degradation when surface litter and horizons are removed by erosion in excess of the potential for soil to be rebuilt through deposition. Wind erosion is particularly a hazard when surface disturbance, biological crusts, and vegetation are removed. Acres of soils susceptible to wind or water erosion in the decision area are outlined in **Table 2-7**.

Table 2-7 Acres of Soils Susceptible to Erosion

Not rated or no data	300,400
Slight	1,013,200
Moderate	624,200
Severe	303,200
Very severe	4,100
Sources: BLM GIS 2014; NRCS GIS 2014	

In addition to NRCS data, the FFO has identified 516,900 acres of fragile soils that may require mitigation measures.

The BLM manages uplands in the planning area that tend to have steep slopes, drainage densities, relief, and ruggedness, which may increase erosion rates. When coupled with the climate patterns experienced in the planning area, which includes intense rainfall, these characteristics can lead to high sediment loads and runoff rates during storms. Acres of soils by slope gradient are listed in **Table 2-8**.

Table 2-8 Acres of Soils by Slope Gradient

Not rated or no data	1,880,100
1-10	1,001,300
11-20	507,100
21-30	57,800
31-40	24,700
41-50	285,100
50+	4,100
Sources: BLM GIS 2014; NRCS GIS 2014	

Corrosive soils may limit or alter structure placement associated with development on the landscape. Soil moisture, texture, acidity, and soluble salts (electrical resistivity at field capacity or electrical conductivity of the saturated extract of the soil) are soil factors that relate to corrosion classes used in soil survey reports (NRCS 2004). Acres of corrosive soils in the planning area are listed in **Table 2-9**.

Table 2-9 Acres of Corrosive Soils

Not rated or no data	407,200
Low	1,530,900
Moderate	249,200
High	57,800
Sources: BLM GIS 2014; NRCS GIS 2014	

If a project has the potential to convert important farmlands to nonagricultural uses, then the project proponent must complete a farmland conversion impact rating form and submit it to the NRCS. **Table 2-10** lists acres of farmlands by type in the planning area.

Table 2-10 Acres of Farmlands

Not rated or no data	2,128,100
Farmlands of local importance	1,000
Farmlands of statewide importance	105,500
Areas that would be classified as farmlands if irrigated	10,500
Sources: BLM GIS 2014; NRCS GIS 2014	

Trends

Localized impacts on soil resources may develop as a result of the following:

- Improper livestock grazing
- Feral and unauthorized or trespass livestock
- Excess wild horses
- Cross-country motorized vehicle use
- Recreation facility development, such as trails or campgrounds
- Fuel wood cutting
- Unauthorized trail development
- ROW development
- Mineral development

Development of fluid and nonfluid mineral resources is the most significant regional or national demand placed on soils in the planning area. Extracting minerals generally involves surface-disturbing activities, and impacts on soil resources can be long term. Disturbance is associated with such activities as pipeline installation, power line construction, seismic exploration, and exploratory drilling.

Livestock grazing can result in a loss of vegetative cover, leading to increased soil erosion. Livestock can congregate around water sources, increasing soil compaction and soil disturbance. Building fences or installing livestock watering facilities can also disturb soil. The use of OHVs has the potential to damage vegetative cover, resulting in soil rutting, runoff concentration, and increased soil erosion. Building roads, campgrounds, and recreation facilities can result in long-term soil disturbance. The development of ROWs can include a number of surface-disturbing activities, such as road building, trenching, and construction site clearing.

All of these activities have the potential to create both short- and long-term impacts on soils. The cumulative amount of surface disturbance or vegetative manipulation that can be supported by soils in the planning area has not been determined. However, it is widely recognized that there is a limit to the level of disturbance that can accumulate in any watershed before natural flow conditions are significantly affected. The initial disturbance creates the larger impact; over the long term the disturbance diminishes through the use of such BMPs as interim reclamation.

Heavy grazing in the nineteenth and early twentieth centuries, coupled with the suppression of natural fires, has led to conditions that favor shrub dominance in the sagebrush grasslands. Additionally, climate change is predicted to affect vegetation cover by contracting shrubland communities and expanding grasses. This is due to changes in the seasonality and intensity of precipitation. The REA climate model predicted a trend toward wetter winters and springs. This would increase the spread of invasive weeds, which would in turn increase the rate of burning in the summer and fall, reinforcing the weeds' persistence over larger areas.

If shrubs become too dominant and outcompete native perennial grasses, the amount of bare ground increases. Also, if perennial grass cover is compromised, noxious and invasive species like cheatgrass are more likely to invade and continue to outcompete native species. Vegetation management and restoration planning include Tebuthiuron treatments to selectively thin sagebrush. These treatments are intended to promote native perennial grasses, thereby reducing soil erosion and increasing watershed function. This method has been successful in the past.

Revegetation includes sowing seed mixes with shrubs. In the planning area, there are 7- to 10-year-old well pads that have been colonized by native shrubs, including rubber rabbitbrush, snakeweed, and some sagebrush.

There are some areas in the planning area that did not have adequate understory cover of native herbaceous species after herbicide treatment; as a result, these areas have provided a seedbed for undesirable annual species and noxious weeds to invade. These areas are targeted for treatment and restoration, subject to available funding.

In addition to current noxious weed invasion, such surface-disturbing activities as vegetation clearing, ground compaction, and increased areas of bare soil can increase the areas' vulnerability to noxious weed invasion.

The State Surface Water Quality Bureau has identified nonpoint source pollution as a problem in the planning area that is directly affecting soil stability. Efforts to reduce nonpoint source pollution by implementing erosion controls and management practices are an important part of the BLM's land management activities. Some of these management practices are implemented through special stipulations that are attached to the application for permit to drill (APD) for oil and gas; others are incorporated into management prescriptions applied in OHV management units or Specially Designated Areas (SDAs).

No existing program measures the effectiveness of these soil conservation practices or BMPs in terms of soil prevented from moving off-site or the amount of sedimentation that is deposited into a waterway.

Forecast

All surface-disturbing activities approved on lands managed by the FFO will be subject to its bare soil reclamation procedure. Moreover, the revegetation criteria in this procedure are considered standards. These may be modified by the authorizing officer, depending on site-specific reclamation challenges, such as physical or biological constraints beyond the operator's control.

The bare soils reclamation procedure require the revegetation of disturbed lands and establishes standards for acceptable vegetation production, monitoring, documentation, and reporting of monitoring data. It provides the minimum information and operation standards that the FFO expects to be incorporated into the site-specific revegetation plans. It also ensures that revegetation will be at the level of detail necessary for the FFO to assess the technical adequacy and conformance of revegetation practices proposed by a permit applicant.

The following three procedures were developed to guide the revegetation of bare soil resulting from actions authorized by the FFO:

- **Vegetation Reclamation Procedure A—**Applies to bare mineral soil in areas of less than one acre but more than 0.1 acre during the life of the permit; does not require monitoring
- **Vegetation Reclamation Procedure B—**Applies to areas of bare mineral soil of one acre or larger; requires monitoring
- **Vegetation Reclamation Procedure C—**Applies to areas reduced to bare mineral soil that result from new authorizations that may be required for the continuing operation, maintenance, or relinquishment of an existing permit

As the population of the surrounding area continues to increase, public demand and use of the public lands will increase. This will add to long- and short-term impacts on the soil resources. In particular, soils could be negatively impacted by increasing OHV use and mineral exploration and development through vegetation clearing, soil compaction, and excavation.

Soil compaction is caused by heavy equipment, especially if the soil contains a high proportion of silt and clay or if it is wet. Soil compaction would damage soil crusts, decrease soil permeability and plant rooting depth, and increase surface water runoff. This would contribute to accelerated erosion and flooding downstream. Compaction would make revegetation of disturbed areas more difficult.

Other localized impacts on soils are mixed soil horizons, long-term areas of bare ground, and possible contamination of soils from various chemicals and other pollutants used during oil and gas activities.

Prime farmland soils are in areas projected to have high levels of new oil and gas activity. This includes parts of the watersheds of the Upper San Juan, Navajo Reservoir, La Plata, Animas, Pump Canyon, and the Middle San Juan and a small amount in the Chaco Wash.

Soils with farmland characteristics are generally avoided when siting oil and gas or other development features; however, excavating of topsoil and compacting prime farmland soils would change these soils. This could be prevented by stockpiling soil horizons separately and spreading them across the site in their original order during reclamation. Additionally, livestock congregating in such as around water troughs, in and around gates, and trailing areas, will continue to impact the soils, with varying degrees; however, mitigation and management measures are in place.

While the extent of noxious weeds in the planning area is limited, soil conditions are likely to worsen if they continue to invade. This could also increase the likelihood of more frequent and larger scale wildfire. Soil surfaces and biological soil crusts can be damaged by removing too much vegetation and organic matter from the soil surface, which can accelerate erosion by wind and water. The construction of new unpaved roads can result in concentrated flow of surface water; this could contribute to additional sedimentation into waterways from the road surface and road banks. This would depend on such factors

as the terrain at the site of the surface disturbance, the erodibility and permeability of each soil type, the vegetative cover, the steepness and length of the slope at the site, and the amount of precipitation.

Indirect impacts on soils include the potential for increased salinity and sedimentation in waterways due to natural and human-caused erosion. The Upper San Juan watershed contains a relatively high proportion of saline soils compared to others in the planning area. This is the area of the highest projected surface disturbance due to oil and gas development. Other watersheds with saline soils in the San Juan Basin subject to potential surface disturbance and resulting erosion are the La Plata, Animas, and Middle San Juan.

Key Features

Important features of soils in the planning area are those with low reclamation potential and high erodibility potential and soils on areas with steep slopes. Successful reclamation is critical in maintaining an effective multiple-use land management program.

Nearly all authorizations for surface-disturbing actions are based on the assumptions that an area can be, and ultimately will be, successfully reclaimed. Reclamation suitability criteria are based on soil resilience, which is the inherent ability of the soil to recover from impacts. Areas of low reclamation potential should be identified using the best available data and on-site evaluations. Authorized surface-disturbing activities would be evaluated to develop mitigation (if necessary), apply BMPs, and plan for reclamation. Authorization would be denied for activities on areas where erosion could not be effectively controlled or mitigated and where reclamation to BLM standards is likely to be unsuccessful.

Soils in the planning area are susceptible to wind or water erosion, especially once the vegetative cover has been lost. As a result of high summer temperatures, undependable rainfall, low soil fertility, and shallow topsoil depth, revegetation can be difficult if the native vegetation becomes seriously depleted.

Demands are placed on soils through the development of other resources. The most significant regional or national demand placed on soils in the planning area is the development of fluid and nonfluid mineral resources. Locally, soils are also impacted by a variety of surface uses, such as livestock grazing, cross-country motorized vehicle use, recreation facilities development, such as trails and campgrounds, and ROW and mineral development.

Soil can be disturbed by such actions as oil and gas development, mining operations, livestock grazing, fire suppression, prescribed fire use, and cross-country motorized vehicle use. The initial disturbance creates the larger impact, while over the long term these disturbance values diminish due to the estimated results of BMPs, such as interim reclamation and Restore New Mexico, over the life of the plan.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern soil resources:

- 43 CFR, Part 3809, Surface Management Regulations
- 43 CFR, Parts 3715 and 3800, Mining Regulations
- 43 CFR, Part 3600, Mineral Material Regulations
- 43 CFR, Part 3802, Exploration and Mining, Wilderness Review Program
- 43 CFR, Part 3715, Use and Occupancy under the Mining Laws
- 43 CFR, Parts 6300 and 8560, Wilderness Management
- BLM Manual 7150, guidance in the conduct and maintenance of water utilization and development, water quality, water yield and timing, and water rights
- BLM Manual 7100, defining the policy of BLM's Soil Resource Management Program
- BLM Manual 7160, providing general guidance for preventing water and wind erosion
- BLM Manual 7180, relating the restoration of disturbed areas directly to the policy on erosion control, protection, environmental quality maintenance, mined lands rehabilitation (BLM 3509 and 3605), and erosion prevention in road construction
- BLM Manual 7210, providing the basic framework for soil and watershed activities

- BLM Technical Notes 371: Determining Hydrologic Properties of Soil
- BLM Technical Reference 1737-19: Riparian Wetland Soils
- Desert Land Entry Act of 1877, as amended
- Soil Conservation and Domestic Allotment Act of 1935, as amended
- Soil Information Assistance for Community Planning and Resource Development Act of 1996
- Soil and Water Resources Conservation Act of 1977

The 2003 RMP management actions for soil resources were determined to be adequate for meeting the identified goals and objectives for soil resources. (See **Appendix**, Current Management.)

The current management is adequate to meet goals and objectives; nevertheless, the anticipated increased oil and gas development in this planning amendment may result in the need to consider additional management and mitigation measures to maintain soil productivity and minimize erosion.

Some of these measures include limiting pad size to a maximum area and not allowing surface occupancy on gypsum soils or open dunes. Surface disturbance or development on slopes greater than 20 percent could be prohibited, unless individual site plans were to meet certain requirements. An example of these requirements is providing engineered drawings for construction that include site drainage design and final rehabilitation contours. Accompanying the drawings would be a written rationale describing how the proposed controls would prevent slope failure and erosion, while maintaining viable topsoil for final reclamation. Site plans could be required to include a timeline identifying the actions that would be applied during the construction, production, and rehabilitation phases of the plan. This would be so the BLM could develop appropriate monitoring protocols to ensure that the plan is meeting the objectives.

Additionally, facilities could be prohibited within 656 feet of ephemeral and perennial drainages and wetland and riparian areas. Roads and pipelines crossing drainages could be required to have mitigations to minimize surface disturbance and reduce or eliminate erosion.

Guidance that has been developed since the 2003 RMP may also be incorporated into management.

2.1.4 Geology

Profile

The generalized geology of the San Juan Basin is an asymmetrical syncline that extends from northwestern New Mexico into southwestern Colorado. It is about 200 miles long and 130 miles wide and covers approximately 15,000 to 25,000 square miles. The surface geology of the basin consists primarily of Quaternary to Cretaceous (2.6-145 Ma) aged alluvium material. This includes unconsolidated silts, sands, clays and gravels, and sandstones, siltstones, shales, limestones, conglomerates, and coal.

The San Juan Basin is bordered on the north by the San Juan dome, on the south by the Chaco slope and the Zuni uplift, on the east by the Nacimiento uplift, and on the west by the Defiance uplift and the Chuska Mountains. There are basement rock outcrops, including eroded cores of the Zuni, Jemez, and Nacimiento uplifts that form the edge of the San Juan Basin on the south and east.

The stratigraphy of the San Juan Basin resulted from inundation by epicontinental seas between periods of major uplift. Depositional environments of the various rock units include deep marine, shoreline, continental, and fluvial. The San Juan Basin was an active seaway connecting the central New Mexico Sea with the Paradox Basin in Utah during most of pre-Permian time.

The lithological units in the San Juan Basin range in age from Cambrian to Quaternary. They include mainly shales and sandstones of varying grain size, as well as coals and some carbonates and igneous rocks. Sedimentary rocks display an aggregate thickness of over 14,000 feet on the Colorado-New Mexico state line. The top of the Precambrian basement rocks is more than 7,500 feet below sea level at the deepest part of the San Juan Basin.

Formations representing the Permian period through the Pennsylvanian period consist mainly of shales and sandstones. The Cretaceous-age rocks represent 6,000 feet of sandstones, siltstones, shales, and coals (Landes 1970).

Cretaceous formations were downwarped into the San Juan Basin during the late Cretaceous until the early Tertiary Laramide tectonic event. By the end of the Laramide uplift, Cretaceous rocks reached their maximum depth of burial, and the San Juan Basin achieved its current structural configuration. Subsequent regional heating enhanced the thermal maturation of deeply buried organic matter to a level that generated gas in the center of the San Juan Basin and oil at the San Juan Basin margins (Engler et al. 2001).

The predominant hydrocarbon reservoirs of the San Juan Basin are all Cretaceous; they are the Fruitland Formation, Pictured Cliffs Sandstone, Mesa Verde Group, and Dakota Sandstone. These formations contain both source rocks and natural reservoirs for oil and gas. Slow decomposition of plant and animal material in the source rocks resulted in hydrocarbon deposits.

Going down the stratigraphic column in northwestern New Mexico, the first major primary hydrocarbon reservoir is the Fruitland Coal. The Fruitland Formation overlies and interfingers with the Pictured Cliffs Sandstone. The interfingering is due to minor local transgression and regression of the Cretaceous shoreline. The Fruitland Formation consists of coastal swamp, alluvial, and lacustrine deposits that accumulated inland of the prograding and aggrading shoreline deposits of the Picture Cliffs Sandstone. The Fruitland Formation is composed of interbedded sandstones, siltstones, shale, carbonaceous shales, and coal; it contains the coal resources that produce coal bed methane (CBM), as well as minable coal (Landes 1970).

The Pictured Cliffs Sandstone is a gas reservoir consisting of a shoreline sandstone composed of an upper, medium to thick-bedded, ledge-forming sandstone and a lower, thick, very fine-grained sandstone with interbedded shales and siltstone.

The Mesaverde Group is a series of gas reservoirs that represents a single regression and transgression cycle of the epicontinental Cretaceous sea. These are not blanket sands but are discontinuous shoreline deposits. The main gas-producing sandstones are the Cliff House at the top of the group and the Point Lookout at the bottom.

The Dakota Sandstone is a gas reservoir consisting of a transgressive sequence composed of sandstone, shale, minor conglomerates, and coal. The upper sandstones in the Dakota represent shoreline and offshore marine sand deposits.

Oil plays and mineral resources are further discussed under Minerals. The planning area also contains unique geological features and stratigraphic units that are managed to protect these resources from degradation, which is the focus of this section.

Indicators

Indicators of unique geological features in the planning area are stratigraphic units. These are of interest to scientists and educators as a site comparison to similar units and additional study of the unit, or areas of unique sediment and erosion patterns that have resulted in formations, such as Angel Peak.

Current Condition

There are two formations with unique geologic significance in the planning area that are managed as SDAs to protect them from damage by surface- and subsurface-disturbing activities: Angel Peak and Beechatuda Tongue.

Angel Peak features a rare geologic feature in the shape of an angel with one uplifted wing. It visually dominates the area known as the Kutz Canyon Badlands and is an unusual example of extreme erosion patterns. The canyon is a barren badland of blue and gray-layered shale, carved through the centuries.

The tip of Angel Peak is hard sandstone, which stands alone as the land around it was washed and blown away. Various other mineral deposits add reds, yellows, browns, and lavenders to the blue and gray shale strata of the canyon walls.

The Beechatuda Tongue Geologic Formation of the Cliff House Sandstone is a rock stratigraphic unit mapped in, and named for, Beechatuda Draw in T.30N, R.15W, Section 5, W/4. This area is the type locality for the unit. As such, it is of interest to scientists and educators as a site for comparison and study of the unit and for possible further refinement of the stratigraphic nomenclature. It is important that the unit be preserved to allow these studies and comparisons. There are 100 acres within the boundary of the Beechatuda Tongue Geological Formation, all of which is BLM-administered land and all of which contains federal minerals.

Additionally there are named geologic formations and stratigraphic units in the planning area, such as the Mancos Shale and Morrison Formation, but these areas are not managed specifically for their protection or preservation.

Trends

The current management of the Angel Peak ACEC and Beechatuda Tongue stratigraphic units is expected to continue, which protects these features from development.

Forecast

These features are expected to continue normal erosion patterns and to continue to be sites of interest to the public. The Angel Peak ACEC is expected to continue to draw visitors as a recreation opportunity, and the Beechatuda Tongue stratigraphic unit is expected to continue to receive visitors of the scientific community for comparison values to other nearby stratigraphic units.

Key Features

Unique geologic features have been identified in the planning area and are being managed for their protection and contributions to science.

Current Management and Management Opportunities

There are no statutory authorities specific to managing an area's geology or geologic formations; authority for this is related to special designations, such as ACECs or Wilderness Study Areas, or visual resource management or recreation management guidance.

Current management of unique or sensitive geologic areas in the 2003 RMP includes the Angel Peak ACEC and Beechatuda Tongue area. Management goals, objectives, and actions for both areas are found in the **Appendix**. Current management of both areas is adequate to preserve these unique geological resources, and no changes are warranted at this time.

2.1.5 Water Resources

Profile

Water resources are surface water and groundwater. Surface waters include lakes and ponds, rivers, and springs; groundwater includes all water that occurs below the ground surface. Groundwater exists in the pore spaces of unconsolidated materials, such as alluvial sediments that fill river valleys, but also in consolidated materials such as sandstone and shale. Permeable materials that readily yield groundwater to a well are called aquifers. Less permeable materials that yield water very slowly, are called aquitards. Very low permeability or impermeable materials that prevent the flow of groundwater are called aquicludes. Several aquifers may exist in a vertical sequence below the surface, separated from each other by aquitards and aquicludes.

Groundwater flows in the subsurface from areas of higher pressure to areas of lower pressure. Higher pressures are typically associated with mountainous areas on basin margins where precipitation is higher; lower pressures are associated with areas of discharge, which may include stream channels or well fields. The path of groundwater flow is influenced by the characteristics of the geologic materials, including the orientation of geologic strata, the presence of faults and folds and fractures, and the thickness and permeability of the aquifer materials. The quality of groundwater can be influenced by contaminants at the surface that are mobilized in recharge. It can also be influenced by soluble minerals in the subsurface rocks that the groundwater comes in contact with.

Surface Water

New Mexico can be divided into 12 major hydrologic basins, defined by the watersheds of the rivers that drain the state. Most of the planning area lies in the San Juan River basin; the eastern side of the planning area extends into the Upper Rio Grande basin, and the southeastern corner extends into the Middle Rio Grande basin (ISC 2003). The watersheds of the major streams draining the planning area are shown on **Figure 2-1**, Lakes, Rivers, and Streams, and **Figure 2-2**, Hydrologic Unit Code Level 8 Watersheds.

The San Juan River arises on the western slope of the Continental Divide in southwestern Colorado. It flows from the San Juan Mountains north of Pagosa Springs, Colorado. It enters northwestern New Mexico through the Navajo Reservoir in Rio Arriba County, west of the Jicarilla Apache Reservation and the Carson National Forest. The course of the San Juan River turns westward for approximately 140 miles through New Mexico before returning to Colorado in the four-corners area. The San Juan River then continues west through southern Utah to its confluence with the Colorado River. The San Juan River basin encompasses lands in four New Mexico counties: all of San Juan County, most of the northern half of McKinley and the western half of Rio Arriba Counties, and a small portion of Sandoval County. Parts of the Navajo and Jicarilla Apache reservations are in the basin. In this basin, the USBR operates Navajo Dam and Reservoir for water conservation, storage, and flood control. The reservoir also supplies irrigation water for the Navajo Nation's use on the Navajo Indian Irrigation Project.

The Rio Grande bisects the north-central portion of New Mexico from north to south for about 143 miles. The river is fed by several tributaries, including the Rio Chama.

The Upper Rio Grande basin extends over portions of seven counties in New Mexico: Rio Arriba, Taos, Santa Fe, Los Alamos, Sandoval, Mora, and San Miguel. It is bounded on the north by the Colorado state line and extends south to the Angostura Diversion Works, just above the confluence of the Rio Grande and Jemez River. The eastern boundary of the section runs along the major ridge line of the Sangre de Cristo Mountains, while the western boundary follows the Continental Divide through Rio Arriba County, then southeast through Sandoval County to the San Felipe Pueblo.

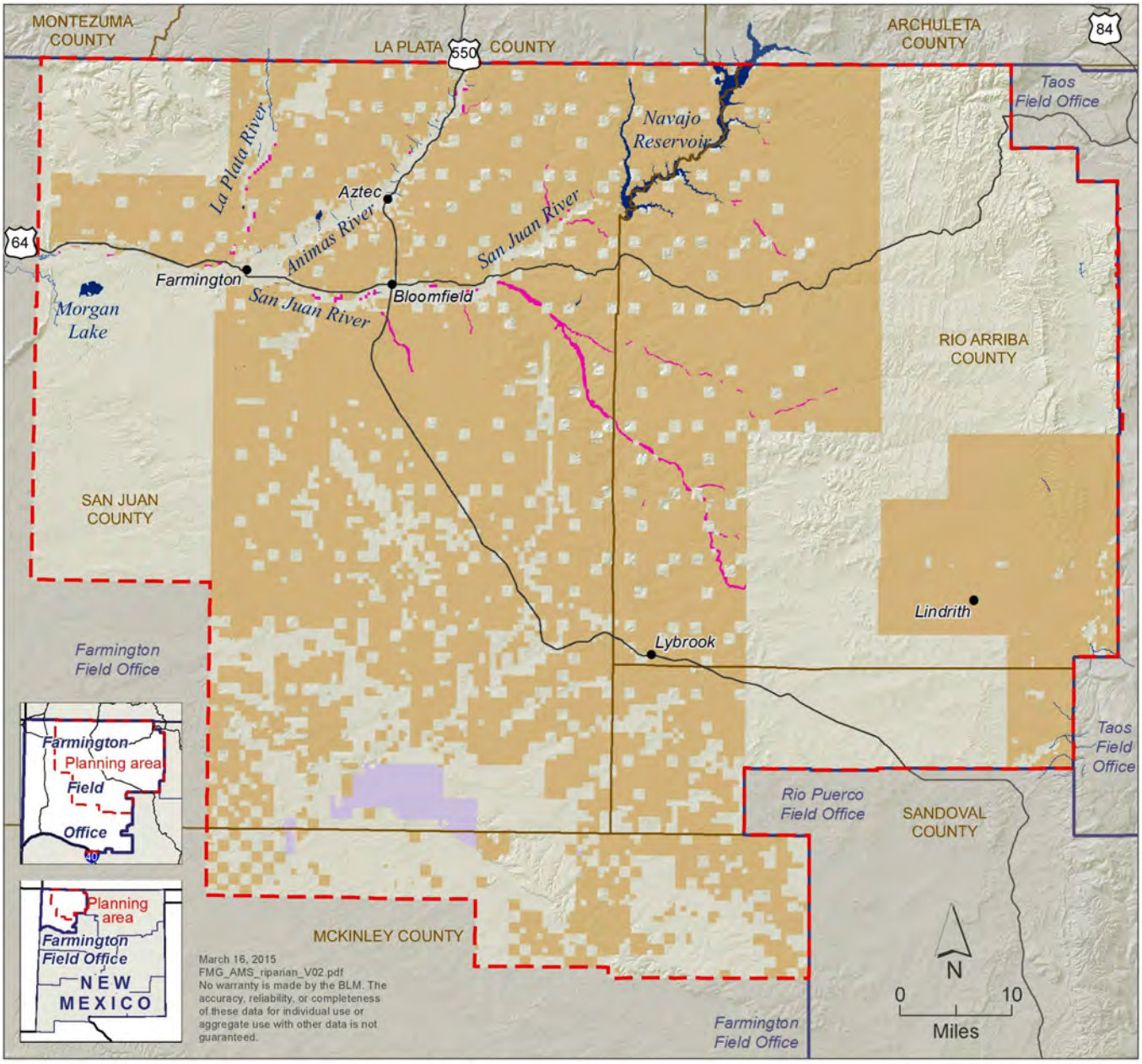
The Middle Rio Grande basin covers parts of nine counties, including Rio Arriba, McKinley, Sandoval and Bernalillo. Most of the surface water in the Middle Rio Grande is supplied by runoff and streamflow from the Upper Rio Grande. Exceptions are perennial tributaries in the Jemez Mountains, which contribute to the Jemez River and its principal tributary, the Guadalupe River, as well as the upper reaches of the Rio Puerco and its principal tributary, the Rio San Jose.

The eastern portion of the analysis area is in a third-order watershed of the Rio Grande, called Rio Grande-Elephant Butte, which is designated as HUC 130202. The analysis area lies in three subareas of the Rio Grande-Elephant Butte watershed: the Rio Puerco, the Arroyo Chico, and the Rio San Jose. The watersheds overlain by the analysis area, their Hydrologic Unit Code (HUC), and surface areas are listed in **Table 2-11**.

The principal perennial surface water drainages in the planning area are the San Juan River, the Animas River, La Plata River, and the Rio Grande. **Table 2-11** identifies all watersheds in the planning area and the HUC associated with each watershed. The table also indicates the number and miles of streams (both perennial and ephemeral) in each HUC.

Figure 2-1 Lakes, Rivers, and Streams

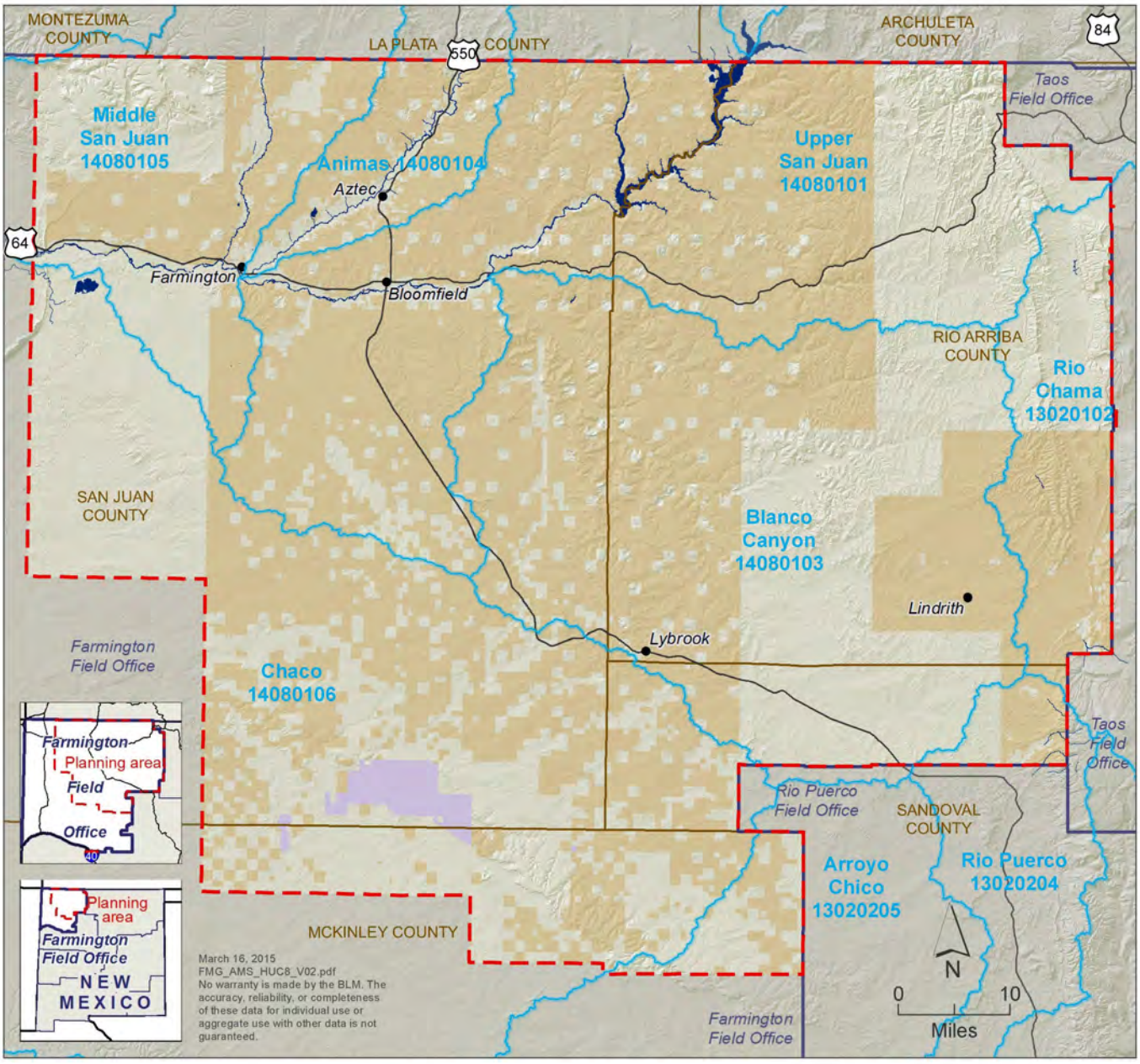
Riparian areas are transitional wetlands between permanently saturated wetlands and upland areas. Riparian areas exhibit vegetation or physical characteristics that reflect the influence of permanent surface or subsurface water. Typical riparian areas include lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, and the shores of lakes and reservoirs with stable water levels.



Source: BLM GIS 2014, NHD GIS 2014

River
Lake or reservoir
Riparian areas
Planning area
Decision area
National Park Service
Field office boundary

Figure 2-2 Hydrologic Unit Code Level 8 Watersheds



Source: BLM GIS 2014, NHD GIS 2014, USGS GIS 2014

- Hydrologic Unit Code (HUC) level 8 watershed
- River
- Lake or reservoir
- Planning area
- Decision area
- National Park Service
- Field office boundary

Table 2-11 Watersheds in the Planning Area

Watershed Name	Hydrologic Unit Code	Streams in HUC[1] (Miles)	Perennial/Ephemeral (Miles)
Rio Grande Basin			
Rio Puerco	13020204	15	2,284/80.9
Arroyo Chico	13020205	12	1,223/5/43
San Juan River Basin			
Upper San Juan Gobernador Kutz Canyon Navajo Reservoir Pump Canyon	14080101	25	3,368/1,062.9
Blanco Canyon Largo Carrizo	14080103	5	1,739.2/52.6
Animas	14080104	24	1,323.9/744.1
Middle San Juan La Plata	14080105	21	2,348.8/318.3
Chaco Wash	14080106	21	5,567.2/199

Source: USGS 2014
[1]Portions of some watersheds extend outside the planning area so not all stream miles are in the planning area.

The Upper San Juan hydrologic unit includes the subwatersheds of Pump Canyon, Navajo Reservoir, Kutz Canyon, and Gobernador; the Blanco Canyon hydrologic unit includes the subwatersheds of Blanco, Largo, and Carrizo; and the Middle San Juan hydrologic unit includes the La Plata subwatershed.

The San Juan River headwaters are on the Continental Divide north of Pagosa Springs, Colorado. The San Juan flows westward through the planning area. The headwaters of a number of perennial tributaries to the San Juan River in New Mexico rise in southern Colorado; major perennial tributaries are the Animas and the La Plata Rivers. Other major tributaries that rise in the southern portion of the San Juan Basin are Canyon Largo, Gallegos Canyon, and the Chaco River, which are all ephemeral streams.

The BLM manages about 37% percent of the approximately 4,298 square miles in the San Juan River watershed above the Hogback and in New Mexico (NMED/SWQB 2005). The Navajo Nation and the Ute Mountain Ute manage about 45 percent, private owners manage about 7 percent, the US Forest Service manages about 6 percent, and the State of New Mexico manages about 5 percent.

Management percentages vary in the individual watersheds. The BLM manages about 60 percent of the land in the Animas River watershed; about 34 percent is private and 6 percent belongs to the State. The BLM also manages about 45 percent of the Middle San Juan River watershed (containing the La Plata River and the San Juan River, between the Hogback and the Animas River); about 29 percent is private, 20 percent is Native Lands of the Ute Mountain Ute, and about 6 percent belongs to the State. The BLM manages about 31 percent of the Upper San Juan River watershed, the Navajo Nation manages about 49 percent, the US Forest Service about 8 percent, private owners 7 percent, and the State 5 percent.

Groundwater

Although most of the potable water supply in the planning area comes from surface water, including the Animas River and the San Juan River, groundwater is the only source of water in most of the San Juan structural basin (Levings et al. 1996). Industrial use of groundwater increased during the 1970s and 1980s with development of uranium and coal.

The quantity of good quality groundwater is limited and is not necessarily adequate to supply all of the demands for water in the region. For this reason, the New Mexico State Engineer has defined groundwater basins and adjudicated, or is in the process of adjudicating, the claims to the groundwater in

those basins. The process of adjudication is typically very complex, based on the priority of the claims and estimates of the quantity of available water. The goal of adjudication is to fairly allocate the limited water resource among the holders of water rights without depleting the resource over the long term. Considering that accurately estimating the quantity of groundwater is difficult, it is clear that the amount of water allocated must be modified from time to time. This should be based on an observation of the effects of the allocations on the amount and quality of groundwater stored in the aquifers.

The BLM has no direct role in allocating water to holders of water rights in basins subject to adjudication. Its role is limited to ensuring that applicants for mineral permits demonstrate that they have obtained sufficient rights to the water that they will need to develop their claims.

Most of the planning area is in the San Juan Structural Basin, an approximately 21,600-square-mile area, about 140 miles wide and 200 miles long. The basin contains sedimentary rocks ranging from Cambrian to Tertiary age. The maximum thickness of the sedimentary sequence is about 14,000 feet near the center of the basin. The rocks dip downward toward the center of the basin, with steeper dips at the margins. As a result, the oldest sedimentary rocks are exposed at the margins of the basin, although these are overlain in places by Tertiary and Quaternary volcanic rocks. The Tertiary to Triassic age rocks form a sequence of sandstone aquifers separated by shale aquitards. The progressively widening rings of increasingly older sedimentary rocks outward from the center of the basin influence the recharge of the individual aquifers (Craigg et al.1989; Craigg et al. 1990; Dam et al.1990a, 1990b; Conde et al.1989; Conde et al.1990; Levings et al.1990a, 1990b; Kernodle et al.1989; Kernodle et al.1990).

The San Jose, Nacimiento, and Animas Formations together form the youngest aquifer in the basin. They extend across the least area, occupying approximately the northeast quarter of the analysis area, between Farmington on the west and Dulce on the east, Durango on the north and Cuba on the south (Levings et al.1990a).

The Animas Formation consists primarily of Paleocene to Cretaceous tuffaceous sandstone. It ranges from about 230 feet thick near Durango to about 2,700 feet thick near the La Plata-Archuleta County line.

The Nacimiento Formation consists of coarse-grained sandstone interbedded with shale deposited in a lacustrine environment. It ranges from 500 to 1,300 feet thick and pops out at the surface over much of the center of the basin. It is composed mainly of fluvial sandstone, siltstone, and shale.

The San Jose Formation is Eocene in age and ranges from about 2,400 feet thick in the east-central basin to about 200 feet in the west-central basin. Together, the thickness of the Unita-Animas aquifer generally increases toward the central part of each basin. In the northeastern part of the San Juan Basin, the maximum thickness of the aquifer is about 3,500 feet (USGS 2001a). The structural bottom of the aquifer dips from an elevation of about 8,000 feet along the east and northeast to about 4,000 feet in the southwest. Water in the Unita-Animas aquifer reportedly occurs in both unconfined and artesian conditions. Its water quality varies widely; total dissolved solids (TDS) range from about 100 milligrams per liter (mg/L) in some wells in the northern area, near the Colorado border, to over 3,000 mg/L in some areas, such as near the Canyon Largo's confluence with the San Juan River. Generally, TDS are below 1,000 mg/L north of the San Juan River and greater than 1,000 mg/L south of it.

The following aquifers that have demonstrated 100 gallons per minute potential for properly constructed wells: the San Andres-Glorieta system, the Entrada Sandstone, the Morrison Formation, the Gallup Sandstone, the Ojo Alamo Sandstone, the Nacimiento Formation, and the San Jose Formation.

The Mesaverde aquifer comprises water-yielding units in the Upper Cretaceous Mesaverde Group, its equivalents, and some adjacent Tertiary and Upper Cretaceous formations. The aquifer is at or near land surface in extensive areas of the Colorado Plateaus and underlies the Unita-Animas aquifer (USGS 2001a). The aquifer is of regional importance in the San Juan Basin. Some of the rocks that form it contain coal beds, some of which have been mined for at least a century. The hydrologic effects of mining have been an increasing concern in the areas underlain by the aquifer.

In the San Juan Basin, the Mesaverde aquifer consists of sandstone, coal, siltstone, and shale of the Mesaverde Group. The formations of the Mesaverde Group interweave extensively with the Mancos Shale and, to a lesser extent, with the Lewis Shale. The Point Lookout Sandstone is the most extensive of the Mesaverde Group formations in the San Juan Basin. The Mesaverde aquifer has a maximum thickness of about 4,500 feet in its southern part (USGS 2001a).

The unconsolidated sand and gravel basin fill aquifers of the Rio Grande aquifer system are present in intermountain basins between mountains and tablelands in northern New Mexico; the Rio Grande Rift is the principal geologic feature. The rift affected the configuration of the bounding highlands, which in turn has affected precipitation, runoff, groundwater recharge, source material of the basin fill, aquifer characteristics, and water quality. The rift is a northward-trending series of interconnected, down-faulted, and rotated blocks between uplifted blocks to the east and west. Various blocks have been displaced downward thousands of feet, and most of the rift has been filled with alluvium and volcanic rock. The thickness of the basin fill is unknown in most areas but is estimated to be as much as 30,000 feet in the San Luis Valley and about 20,000 feet near Albuquerque (USGS 2001b).

Groundwater is available nearly everywhere in the planning area. Although many aquifers are known to yield water to wells somewhere in the basin, most yields are low (less than 20 gallons per minute; BLM 1987). The better aquifers are found in sandstone units of Jurassic, Cretaceous, and Tertiary age. Quaternary alluvium deposits filling stream channels are also capable of yielding sufficient quantities of water for local use.

Groundwater in the Unita-Animas aquifer generally recharges in the areas of higher altitude along the margins of each basin. Annual precipitation ranges from less than 8 inches in the northwestern quarter of the analysis area to over 30 inches in the higher elevations on the eastern side of the analysis area.

Groundwater is discharged mainly to streams and springs and by transpiration from vegetation growing along stream valleys. In the San Juan Basin, water recharges the Unita-Animas aquifer in the higher-altitude areas, which nearly encircle the basin. Groundwater generally flows toward the San Juan River and its tributaries, where it is discharged to streamflow, to the alluvium in the valleys, or to evapotranspiration (USGS 2001a). Evaporation rates are high throughout the analysis area, ranging from over 60 inches per year in the Chaco River valley and west of Farmington to less than 30 inches in the higher elevations in the Upper San Juan watershed.

Water generally recharges the Mesa Verde aquifer in upland areas, which receive more precipitation than lower altitude areas. The available data in the San Juan Basin indicates that recharge occurs in the area of the Zuni uplift, in the Chuska Mountains, and in northern Sandoval County (USGS 2001a). Groundwater discharges from the aquifer directly to streams, springs, and seeps, by upward movement through confining layers and into overlying aquifers, or by extraction from wells. The natural discharge areas generally are along streams and rivers, such as the San Juan River and the Chaco River and their tributaries (USGS 2001a).

Groundwater recharge to the Rio Grande aquifer system primarily originates as precipitation in the mountainous areas that surround the basins. Runoff from snowmelt or rainfall enters the basins and generally flows for short distances across permeable alluvial fans before it percolates downward through streambeds or evaporates. Most of the precipitation that falls in the valleys is lost to evaporation and transpiration, with little water percolating to a sufficient depth to recharge the aquifers (USGS 2001b).

The BLM has little direct role in water resource management. It is limited to implementing its own policies, complying with state and federal regulations, and cooperating with other agencies to implement regional or multiagency programs and initiatives (such as the Colorado River Basin Salinity Control Program). Through its mineral, range, and land management actions, however, the BLM indirectly influences water quantity and quality outcomes.

Specific Mandates and Authority

In general, managing water resources in the planning area is the responsibility of the State of New Mexico. The agencies with jurisdiction over water resources include the New Mexico Interstate Stream Commission; the Office of the State Engineer; the New Mexico Environment Department (NMED); the Water Quality Control Commission (WQCC); the Energy, Minerals, and Natural Resources Department (EMNRD); the Department of Game and Fish (NMDGF); the New Mexico Department of Agriculture; the New Mexico Acequia Commission; and the Water Trust Board. As discussed in the State Water Plan (ISC 2013, 2008, 2003).

These agencies are responsible for the following:

- Conducting and completing water rights adjudications and managing the waters of the state
- Regulating potentially polluting discharges to the state's surface and groundwater
- Maintaining compliance with interstate stream compact delivery requirements and ensuring delivery by upstream states
- Addressing federal mandates, such as the Clean Water Act, Endangered Species Act, Resource Conservation and Recovery Act, Safe Drinking Water Act, and Wild and Scenic Rivers Act
- Developing and maintaining comprehensive databases and information systems
- Quantifying and regulating water resources and water quality
- Coordinating with federal agencies in the Departments of Interior, Energy, and Agriculture and with the US Army Corps of Engineers (USACE)
- Evaluating and regulating the use of New Mexico's saline and brackish water
- Evaluating and regulating the use of water produced from oil and gas operations

Indicators

Indicators of the condition of water resources are both direct and indirect and may be either qualitative or quantitative. The two major categories of interest are water supply (the quantity of water available for beneficial use) and water quality (its suitability for beneficial uses). In addition, the location of the water relative to intended beneficial uses and existing infrastructure can be an important consideration.

Surface water and groundwater are not necessarily distinct or independent. Surface water infiltrates permeable media and recharges groundwater, which is defined simply as water that exists below the ground surface. Surface water may be in contact with groundwater. Streams may have both losing and gaining reaches, depending on whether water is moving from the stream to groundwater or from groundwater to the stream. Springs represent locations where groundwater flow intersects the surface.

Both surface water and groundwater quantity and abundance are intimately tied to water quality. This is because the potential beneficial uses of the water are usually limited to certain ranges of quality.

Indicators are used to evaluate the current condition of water resources and to compare current conditions to the range of recorded and inferred past conditions.

Indicators of surface water quantity or abundance are as follows:

- Stream or lake hydrographs
- Precipitation, runoff, and evaporation records and estimates
- Occurrence and discharge of springs
- Flood magnitude and frequency records
- Water rights allocations
- Water consumption records
- Storage and conveyance system operation records
- Hydrologic simulation modeling results
- Infrared aerial photo analysis
- Vegetation survey data

Indicators of surface water quality are as follows:
- Measurement of chemical, biological, and physical parameters
- Presence of target aquatic species
- Diversity and abundance of aquatic species

Indicators of groundwater quantity or abundance are as follows:
- Depth to or elevation of groundwater
- Changes in hydraulic head
- Estimates of aquifer storage capacity and storage volume

Indicators of groundwater quality are as follows:
- Measurements of chemical, biological, and physical parameters
- Comparison to federal drinking water standards

Indicators of watershed condition are as follows:
- Road density
- Number of stream crossings
- Riparian vegetation condition
- Peak/base flow
- Water yield
- Sediment yield
- Degree of disturbance

Indicators of channel and floodplain condition are as follows:
- Channel geometry (width/depth ratio)
- Sinuosity and stream gradient
- Stream bank stability
- Floodplain connectivity
- Sediment deposition

Sources of data are watershed and stream surveys, published and unpublished hydrologic data reports, and compliance reports.

Current Condition

Surface Water Quality

Like streamflow data, the availability of water quality data is largely limited to the perennial streams in the northern part of the planning area. The water quality of the perennial streams varies from upstream to downstream and is strongly influenced by the type of rock and soils that the water has been in contact with. In their upper reaches, the perennial streams have relatively low concentrations of dissolved solids. In their middle and lower reaches, the streams contain progressively more magnesium, calcium, sodium, and sulfate concentrations. Water quality also varies according to flow conditions; generally there are higher concentrations of ions at lower flow conditions.

Under Section 303(d) of the Clean Water Act, states are required to monitor the quality of their surface waters and to identify and report segments in which the designated beneficial uses are not supported due to water quality impairments. A list of these impaired water bodies and a discussion of the status of each stream is presented in the most recent 303(d) reports (NMED 2012).

The impaired water bodies identified in the analysis area are presented in **Table 2-12**. The table lists the stream segments that are impaired and the likely sources of the impairments.

Table 2-12 Impaired Water Quality by Watershed

Watershed Name/HUC	State Assessment Unit ID	Segment	Impaired Designated Uses	Probable Causes of Impairment	Comments	TMDL Status
Rio Puerco/13020204	NM-2105_20	Non-pueblo Rio Grande to Arroyo Chijuilla (147 miles)	Primary contact, wildlife habitat	*E. coli*, mercury		2014
	NM-2107.A-43	Perennial reaches above Highway 126 (2.9 miles)	Cold water aquatic life	Low flow alteration, turbidity	Intermittent flow in reach due to irrigation diversion (may not be perennial)	2016
	NM-2107.A-54	Nacimiento Mine to headwaters (2.9 miles)	Cold water aquatic life	Turbidity	Benthic macroinvertebrate data needed to confirm interim turbidity listing	2016
Upper San Juan/14080101	NM-2406_00	Navajo Reservoir (13,151.19 acres)	Cold water aquatic life	Mercury in fish tissue, temperature	Mercury listed based on fish consumption advisories; cold water aquatic life based on "all waters must be fishable"	
	NM-2407.A-00	Navajo River (Jicarilla Apache Nation to Colorado border; 6.6 miles)	Cold water aquatic life	Temperature	Fisheries data indicate "cool water" may be more appropriate aquatic life use ALU	
		San Juan River (Animas River To Canyon Largo; 21.44 miles)	Marginal cold water aquatic life	Sedimentation and siltation, turbidity	Drought-related impacts, loss of riparian habitat, petroleum/natural gas, and production activities	2004, 2013
	COSJSJ05	Mainstem of the San Juan River and the East Fork and West Fork of the San Juan River, from the boundary of the Weminuche Wilderness Area (West Fork) and the source (East Fork) to Fourmile Creek; San Juan/Dolores Rivers, San Juan Segment 5		Lead	Uncertain (monitoring and evaluation list)	
	COSJSJ06a	San Juan River from Fourmile Creek to Southern Ute Indian Reservation; Mill Creek from source to San Juan River; San Juan Segment 6a, Echo Canyon Reservoir	Aquatic life use	pH, copper, dissolved O_2, temperature, mercury in fish tissue	Insufficient sample size, high priority	

Table 2-12 Impaired Water Quality by Watershed

Watershed Name/HUC	State Assessment Unit ID	Segment	Impaired Designated Uses	Probable Causes of Impairment	Comments	TMDL Status
	COSJSJ08	Navajo Reservoir	Aquatic life use	Mercury in fish tissue	Insufficient sample size	
	COSJSJ09a	Mainstem of the Rio Blanco, from the boundary of South San Juan Wilderness Area to the Southern Ute Indian Reservation boundary		Silver, lead		
	COSJSJ10	Mainstem of the Rio Blanco, from Echo Ditch to the confluence with the Rio Blanco		*E. coli*		
Piedra/14080102	COSJPI05	All tributaries to the Piedra River, including all wetlands, lakes, and reservoirs, from the boundary of the Weminuche Wilderness Area to a point immediately below the confluence with Devil Creek; Williams Creek Reservoir		pH, zinc, total recoverable iron, dissolved O_2, copper		
	COSJPI06a	Tributaries to the Piedra River; Stollsteimer Creek above Southern Ute boundary; Stollsteimer Creek above Southern Ute boundary		Sediment, *E. coli,* total recoverable iron, sulfate		
	COSJPN03	Vallecito Reservoir	Aquatic life use	Mercury in fish tissue	High priority	
Animas/14080104	NM-2401_00	Animas River (Estes Arroyo to So. Ute Indian Tribe boundary; 19.6 miles)	Cold water aquatic life; primary contact	*E. coli*, total phosphorous, sedimentation and siltation, temperature, turbidity	Channelization, drought-related impact, irrigated crop production, loss of riparian habitat, municipal urbanization, rangeland grazing, streambank modifications and destabilization; cold water aquatic life use may not be existing or attainable	2004
	NM-2403.A_00	Animas River (San Juan River to Estes Arroyo; 16.92 miles)	Marginal cold water aquatic life,	*E. coli*, nutrient and	Drought-related impact, flow alterations from water	2004, 2013, 1013

Table 2-12 Impaired Water Quality by Watershed

Watershed Name/HUC	State Assessment Unit ID	Segment	Impaired Designated Uses	Probable Causes of Impairment	Comments	TMDL Status
			primary contact, warm water aquatic life	eutrophication biological indicators, temperature, turbidity	diversions, municipal urbanization, municipal point source discharges, streambank modifications and destabilization	
	NM-9000.B_006	Lake Farmington (Beeline Reservoir)	Cold water aquatic life	Mercury in fish tissue, temperature	Atmospheric deposition; this is city of Farmington's drinking water supply reservoir, mercury issue based on current fish consumption advisories and "not fishable"	
	COSJAF05a	Mainstem of the Animas River, including wetlands, from Bakers Bridge to the Southern Ute Indian Reservation boundary	Based on secondary water supply standard for manganese of 50 micrograms per liter	Manganese (water supply)	Low priority; no actual water supply use in the lower reach below the intake to the Animas-La Plata Project	
	COSJAF12a	All tributaries to the Animas River, from a point immediately above the confluence with Elk Creek to a point immediately below the confluence with Hermosa Creek; all tributaries to the Florida River, from the source to the outlet of Lemon Reservoir mainstems of True, Red, and Shearer Creeks from their sources to their confluences with the Florida River	Electra Reservoir	Silver, zinc	Uncertain (monitoring and evaluation list) Colorado standard	
	COSJAF13a	Mainstem of Junction Creek, including all tributaries, from National Forest boundary to confluence with Animas River	Junction Creek	Silver, *E. coli*	Based on limited sampling data; Colorado standard	

Table 2-12 Impaired Water Quality by Watershed

Watershed Name/HUC	State Assessment Unit ID	Segment	Impaired Designated Uses	Probable Causes of Impairment	Comments	TMDL Status
Middle San Juan/14080105	NM-2402.A_01	La Plata River (McDermott Arroyo to South Ute Indian Tribe boundary; 7.07 miles)	Marginal cold water aquatic life, marginal warm water aquatic life, primary contact	*E. coli*, nutrient and eutrophication biological indicators	Animal feeding operations (NPS), drought-related impacts, flow alterations from water diversions, loss of riparian habitat, on-site treatment systems (such as septic systems), rangeland grazing, streambank modifications, and destabilization	2004, 2013
	NM-2402.A_00	La Plata River (San Juan River to McDermott Arroyo; 16.77 miles)	Marginal cold water aquatic life, primary contact	*E. coli*, dissolved oxygen, sedimentation and siltation, turbidity	Animal feeding operations (NPS), drought-related impacts, flow alterations from water diversions, loss of riparian habitat, rangeland grazing, streambank modifications and destabilization	2004, 2004
	NM-2401_10	San Juan River (Navajo boundary at Hog back to Animas River; 32.27 miles)	Marginal cold water aquatic life, primary contact	*E. coli*; sedimentation and siltation, turbidity	Drought-related impacts, municipal point source discharges, on-site treatment systems (such as septic systems), rangeland grazing	TMDLs were prepared for fecal and *E. coli*.
	COSJLP01	Mainstem of the La Plata River, from the source to the Hay Gulch diversion south of Hesperus; San Juan and Dolores Rivers, La Plata Segment 1	All	Silver	High priority	
	COSJLP03a	All tributaries to the La Plata River, from Hay Gulch to the Southern Ute Indian reservation boundary (Cherry Creek)		Copper (state only), iron (trec)	High priority	

Source: NMWQCC 2012 (Appendix A)

In order to correct persistent impairments, the Clean Water Act requires that the total maximum daily load (TMDL) be determined as a first step in setting discharge limitations on the contaminants of concern. (TMDL is the maximum quantity of a contaminant that can be discharged each day to the water body without causing an impairment.)

Table 2-12 identifies TMDLs that have been prepared and those that are planned. The State of New Mexico has prepared three TMDL documents to address surface water quality in the analysis area: one for impairments of the La Plata, Animas, and San Juan Rivers from the Navajo Nation boundary at the Hogback to Navajo Dam; and two others that address impairments on the Rio Puerco, in the Middle Rio Grande watershed (NMED/SWQB 2005, 2007a, 2007b). Although a number of impairments are listed for water bodies in watersheds of the San Juan River in Colorado, the State of Colorado has prepared no TMDLs to date.

Fecal coliform was identified as a common cause of impairment in all segments, and a combination of sources was identified. The most significant sources were nonpoint source discharges from animal feeding operations, improperly installed or maintained septic systems, livestock grazing, wildlife (particularly geese), and municipal point source discharges (wastewater treatment plants). Ephemeral streams, such as Canyon Largo and Kutz Canyon, were also implicated as sources of high loadings of bacteria. Improving the water quality in these segments will likely require efforts on several fronts, including correctly identifying the most significant sources.

Quality data for the ephemeral runoff south of the San Juan River are limited to only a few observations at sampling stations associated with the USGS coal hydrology program and from measurements made by the San Juan Watershed Group. Ephemeral flows are generally very poor quality due to the highly erosive and saline nature of the soils, sparse vegetative cover, and rapid runoff conditions that are characteristic of the area. Surface runoff in the area usually contains greater than 10,000 mg/L of suspended sediment and greater than 1,000 mg/L of dissolved solids.

Groundwater Quality

The quality of groundwater in the San Juan Basin generally ranges from fair to poor. In most places the TDS content exceeds 1,000 mg/L; it can range from 500 to 4,000 mg/L (BLM 1987; USGS 2001a). The Unita-Animas Basin contains fresh to moderately saline water. Dissolved solids concentrations generally increase along the groundwater flow path in the San Juan Basin. The water is hard to very hard, with actual chemical composition, depending on location and on the producing aquifer. Calcium or sodium is usually the predominant cation, and bicarbonate or sulfate is the predominant anion (BLM 1987).

The quality of the Mesa Verde aquifer is extremely variable. In general, areas of the aquifer that are recharged by infiltration from precipitation or surface water contain relatively fresh water. Sparse data indicate that the dissolved solids concentration ranges from about 1,000 to 4,000 mg/L in the San Juan Basin.

The composition and TDS concentration of water in the Rio Grande aquifer system are affected by the quality of the water that enters the aquifer, the type and solubility of minerals in the basin fill, and the quantity of water lost by evaporation and transpiration.

Soluble minerals in the rocks of the mountains next to the basins affect the quality of the water draining from the mountains, which, in turn, affects the quality of the recharge entering the aquifers. Water in the aquifer system is of varied chemical composition, in part because of the varied geology of the nearby mountains. Surface water in the Rio Grande in the reach from the headwaters to Albuquerque generally has low TDS concentrations and is of the calcium bicarbonate or calcium sulfate type.

Trends

Water Supply

Groundwater is expected to continue to be the primary source of municipal, industrial, and agricultural water in the analysis area. Climate warming could have long-term effects on streamflows, snowpack, and

groundwater recharge. Some of the potential effects of climate change, such as increased frequency of wildfires, increased evaporation, changes in vegetation patterns, increased erosion, and reduced snowpack, may reduce groundwater recharge.

The Colorado River Basin has experienced drought conditions since 1999. As the amount of runoff from the upper portions of the watersheds of the major river systems decreases, downstream users will increasingly look for ways to increase water supplies. This could include reducing consumption, reducing waste, and possibly prioritizing uses and limiting those with lower priority.

Groundwater Demand

Demand for potable groundwater in the San Juan Basin has been increasing and is expected to continue to increase. Annual population growth for the city of Gallup was estimated at 1.82 percent in the Final EIS for the Navajo-Gallup Water Supply Project. Groundwater elevations in the aquifers underlying the region have shown declining trends. In response, the New Mexico State Engineer has imposed limitations on groundwater extraction through adjudication of water rights in the San Juan Basin and other basins in the analysis area. Similar trends have occurred in the portions of the San Juan Basin in Arizona, Utah, and Colorado.

The State of New Mexico reached a final settlement with the Navajo Nation in 2009. As a result of the settlement, the Navajo-Gallup Water Supply Project was initiated to divert 37,764 acre-feet per year of water from the San Juan River, based on an assumed demand rate of 160 gallons per day per person. It also assumes a projected population of 250,000 by 2040 in the Navajo Nation, the Jicarilla Apache Nation, and the city of Gallup. The project assumes 1,871 acre-feet per year of return flows to the San Juan River (USBR 2009). Similarly, demand for water outside the basin is expected to continue to increase while supply continues to decrease.

Hydraulic fracking, which is expected to increase in the analysis area, can consume large volumes of water, which if multiplied at many drilling sites over the region, could increase demand for water. Using nonaqueous or reduced-water fracking techniques and recycling/reusing water produced from hydraulic fracking or from normal production may reduce the demand for high quality groundwater for fracking.

Groundwater Quality

Groundwater quality has been improving as a result of protection measures, such as reducing or collecting and treating wastewater and reducing the rate of decline in groundwater levels. At the same time, increased urban, industrial, and agricultural development could increase point and nonpoint pollutant loadings to both surface water and groundwater. Reduction in recharge from precipitation, increased water use, and discharged treated municipal and industrial water and irrigation return flows could increase concentrations of salts.

Groundwater in the northern portion of the San Juan Basin has seen impacts from production of CBM from the Fruitland Formation during the mid to late 1990s. These impacts are from when the formation water in the coal beds was removed to stimulate gas production from the formation. This induced inflow of freshwater from upgradient sources, reduced water levels in upgradient wells, and reduced flows from upgradient springs (BLM 1999a). Large-scale dewatering of the Fruitland Formation coal beds triggered off-gassing of CBM in areas where the coal beds outcrop at the land surface, and in some cases apparently triggered fires in the exposed coal outcrops (Ayers 1994). CBM production has tapered off slightly from its peak in 1998 to 2000, but the San Juan Basin is still the largest producer of CBM in the United States.

The rapid increase in use of well stimulation techniques to obtain oil and gas from tight formations or from depleted fields has triggered public demand for more assurances that the methods are safe and will not impact groundwater and the environment in general. Better understanding of the causes of past environmental problems associated with well stimulation, improved drilling and well construction techniques, and increased regulatory oversight have led to lower risk of releases; however, the field is rapidly changing. While state regulatory agencies have gradually increased their levels of oversight and

standards, the BLM has also proposed additional more stringent requirements for lessees. This is to ensure that minimum standards are upheld and to reassure the public. This trend is likely to continue.

Rapid expansion of drilling and fracking into fields where they were previously less feasible will require more monitoring. To hold down the cost of government, a greater portion of the administrative burden needs to be shifted to the applicants; that is, the applicants rather than regulatory staff should be responsible for demonstrating compliance and for ensuring protection of water and other resources.

Surface Water Quality

Treated municipal and industrial wastewater and irrigation return flows and increased nonpoint discharges (such as runoff from municipal and industrial areas) could increase salt loading to perennial streams. Surface water quality has been declining in urban areas. Urban growth is tied to economic activity, and a lot of the economic activity in the region is from oil and gas production and mining. Gas development is expected to increase in the region due to improved extraction technologies that allow additional gas to be extracted from depleted fields.

Forecast

If current trends continue, there will be a continued increase in urban development and in municipal and industrial water demand, triggered in part by expansion of oil and gas activity in the San Juan Basin. Overall, future urban and commercial development will put more pressure on groundwater resources, requiring continued tradeoffs between water uses. Water resources could be adversely affected by prolonged extraction of groundwater at rates that exceed the long-term rate of recharge. The State Engineer has the sole discretion to allocate the available water resources among holders of water rights. He or she will be able to rely on increasingly accurate estimates of the available resources as more hydrologic data and better forecasting tools are developed.

Historic meteorological data, as well as evidence from the geologic record, suggest that climate conditions have been highly variable in the region and that prolonged cycles of drought or high rainfall are possible. With urban development and increased demand for water, water managers are likely to search for additional sources of water to meet demand. This includes imposing conservation measures on households and industry, putting greater emphasis on protecting existing resources, encouraging recycling and reuse of water, and treating poor quality water.

Optimum watershed resource management is constrained by the requirement to manage public lands for multiple uses. With increased demand for water, the BLM will focus greater attention on applicants' plans and assurances relating to the consumptive use requirements of the projects and to the potential impacts on water quality. Continued coordination with State of New Mexico agencies will help to ensure that the impacts of mineral development on water resources are minimized. These projects are required to undergo an environmental review process in which the BLM acts as the lead agency for evaluating the project impacts. In this role, the BLM has a substantial role in ensuring that future projects are consistent with environmental protection objectives.

The process of identifying impaired water bodies and determining TMDLs will continue, with one result likely to be improved resolution of the causes of the impairment. Among the possible outcomes of better identification of the causes of the impairments may be increased requirements for landowners and managers to monitor and account for nonpoint pollutant loadings.

The BLM has increasingly focused on collecting data on the effects of management actions on soil, vegetation, stream geomorphology, and water quality in watersheds. Evaluation of these data is expected to result in better and earlier identification of the effects of changes in management and to enable management strategies to be better adapted to specific objectives. Improved adaptive management of watersheds is expected to lead to gradual and widespread improvements in water quality and watershed conditions. Strategies for managing water resources involve multidisciplinary approaches; for example, water quality is expected to improve as impacts of grazing on vegetation cover are reduced through such means as growing season restrictions on grazing in riparian areas.

Key Features

The San Juan Structural Basin extends across the border of New Mexico into Colorado, Arizona, and Utah. Each state has different regulations governing water resource protection, drilling and well construction, and plans and reports preparation. Due to the configuration of the San Juan Structural Basin, the areas surrounding the planning area are mainly upstream and upgradient. Therefore, except for the San Juan River downstream, actions taken in the planning area have little impact on adjacent lands; however, actions taken in surrounding lands could have an effect on water resources in the planning area.

The BLM interprets the Indian Mineral Leasing Act as subjecting all oil and gas operations on trust or restricted Indian lands to the Secretary of the Interior's regulations, leaving no opportunity to allow tribes to opt out of the regulations. A large percentage of the land in the analysis area is tribal land.

The current RMP does not address hydraulic fracturing technology being used in the oil and gas industry. New BLM regulations are being promulgated to create minimum standards that applicants will need to comply with.

Among the differences in state requirements, current New Mexico oil and gas rules do not require baseline groundwater testing to establish conditions before leasing. Baseline conditions are valuable for comparing conditions before a site is developed and after it is abandoned. Colorado does require baseline testing and periodic monitoring. Baseline testing is also not a feature of the BLM's Proposed Hydrofracking Rules.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern water resources:

- BLM-M-7250, Water Rights Manual
- Clean Water Act of 1987, as amended
- EO 11288, Water Quality Management and Pollution Abatement Plans
- EO 11738, Enforce the Clean Air Act and the Clean Water Act in the Procurement of Goods, Materials, and Services
- IB 98-116, Clean Water Action
- Soil and Water Resources Conservation Act of 1977
- State Water Quality Act of 1978
- Water Resources Development Act of 1974

Management goals, objectives, and actions for water resources are found in the **Appendix**. While the current goals and objectives are considered adequate, issues about hydraulic fracturing were raised during scoping, as well as concern about impacts on water quantity and quality from increased oil and gas development.

Current BLM regulations governing hydraulic fracturing operations (at 43 CFR, Part 3162.3-2) were last revised in 1988. As such, they were not written to address modern hydraulic fracturing technologies and practices. On May 24, 2013, the BLM published a revised Proposed Rule on Hydraulic Fracturing on Federal and Indian Lands (78 FR 31636). It is intended to ensure that hydraulic fracturing operators follow certain best practices, as follows:

- The public disclosure of chemicals used in hydraulic fracturing operations on federal and Indian lands (FracFocus.org website)
- Confirmation that wells used in fracturing meet appropriate construction standards
- A requirement that operators put appropriate plans in place for managing flowback waters from fracturing operations

The proposed rule provides an opportunity to ensure that minimum standards are applied to new oil and gas leases, which may be further considered if the rule is finalized during development of the land use plan amendment.

Additionally, in order to achieve water quality monitoring objectives, the BLM may consider additional COAs such as requiring industry to provide all water quality data from wells and water sources. Guidance that has been developed since the 2003 RMP may also be incorporated into management.

2.1.6 Riparian Areas and Wetlands

Profile

Riparian areas are those next to rivers, creeks, lakes, springs, and wetlands. They are transition zones between upland and aquatic ecosystems. Riparian areas occur where water is perennial, intermittent, or ephemeral. The BLM defines a riparian area as "a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittent flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels are typical riparian areas" (Leonard et al. 1992).

Wetlands occur in spaces between terrestrial and aquatic systems, where the water table is usually at or near the surface or the land is covered by shallow water (Cowardin et al. 1979). Soil, water conditions, and vegetation type distinguish wetlands from all other ecosystems. Wetlands are regulated by the USACE and are defined as "those areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (USACE 1987).

Wetlands must have one or more of the following three attributes:

- At least periodically, the land supports predominantly hydrophytes (plants that grow only in water or very moist soil)
- The substrate is predominantly undrained hydric soil (soil formed under conditions of saturation, flooding, or ponding)
- The substrate is not solid, is saturated with water, or is covered by shallow water at some time during the growing season of each year

Both riparian areas and wetlands are composed of aquatic vegetation and with unique soil characteristics that developed under the influence of perennial water. The increased moisture found in these areas produces unique plant communities that differ noticeably from the surrounding upland vegetation.

Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows. This condition reduces erosion and improves water quality; filters sediment, captures bedload, and aids floodplain development; improves floodwater retention and groundwater recharge; develops root masses that stabilize streambanks against cutting action; develops diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production and waterfowl breeding; and supports greater biodiversity (BLM 1998).

Indicators

The BLM uses proper functioning condition (PFC), a qualitative method for assessing the condition of riparian areas and wetlands. PFC refers to both the assessment process and the on-the-ground condition of riparian areas and wetlands. The assessment process consists of an approach that considers the hydrology, vegetation, and erosion/deposition attributes of the area; the on-the-ground condition refers to how well the physical processes are functioning. This condition is a state of resiliency that allows a riparian area or wetland to hold together during high-flow events with a high degree of reliability. This resiliency allows an area to then produce desired values over time, including fish habitat, neotropical bird habitat, and forage. Riparian areas and wetlands that are not functioning properly cannot sustain these values.

If a riparian area or wetland is not in PFC, it is placed into one of the following three categories:

- **Functional-At Risk—**Riparian areas and wetlands are in functional condition, but an existing soil, water, or vegetation attribute makes them susceptible to degradation
- **Nonfunctional—**Riparian areas and wetlands are not providing adequate vegetation or landforms to dissipate stream energy from high flows and thus are not maintaining or improving the condition of the area
- **Unknown—**Sufficient information on which to make any determination for riparian areas and wetlands is lacking

In addition, all BLM activities are expected to meet the New Mexico Standards for Public Land Health. These were accepted by the Secretary of the Interior as part of the record of decision for the Statewide RMP Amendment/EIS for Standards for Public Land Health and Guidelines for Livestock Grazing Management (BLM 2000c). This is a qualitative measure of the health of riparian sites.

According to the Riparian Sites Standard, healthy riparian areas are in a productive, properly functioning, and sustainable condition within the capability of each site. Also, there is present adequate vegetation of diverse age and composition to withstand high streamflow, capture sediment, provide for groundwater recharge, provide habitat, and assist in meeting state and tribal water quality standards.

Indicators for this standard may include the following:

- Stream channel morphology and stability, as determined by gradient, width/depth ratio, channel roughness, and sinuosity
- Stream bank stability, as determined by degree of shearing, sloughing, and vegetative cover on the bank
- Appropriate riparian vegetation, which includes a mix of communities composed of species with a range of age, density, and growth form

Current Condition

Thirty river tracts and portions of nine ephemeral stream reaches contain BLM-administered riparian areas in the planning area, as shown in **Figure 2-1**, Lakes, Rivers, and Streams. Riparian areas associated with the river tracts comprise nearly 1,000 acres next to the Animas, San Juan, and La Plata Rivers (**Table 2-13**). An estimated 96 miles of ephemeral streams occur, including Blanco Reach, Carrizo Canyon, Ditch Canyon, Gobernador Canyon, Kutz

Table 2-13 Riparian Areas in the Planning Area

Riparian Areas (Number of Segments)	Length (Miles)	Size (Acres)	Rating
River Tracts			
Animas River (3)	1.14	42.82	All segments in PFC
Wheeler	0.28	4.71	PFC
Bradshaw	0.75	31.45	PFC
Schneider	0.24	17.22	PFC
Jewett Valley	0.48	21.74	PFC
Subdivision	0.76	14.04	PFC
La Plata (San Juan)	0.38	12.49	PFC
Gallegos	0.86	99.11	PFC
Desert Hills	0.38	35.31	PFC
Bull Calf	0.35	36.55	PFC
Kutz	0.86	76.65	PFC
South Bloomfield	0.62	68.64	PFC
Bloomfield	0.38	44.99	FAR (static)
Valdez	0.76	97.78	FAR (downward)
Blanco	0.67	193.99	FAR (upward)
Santa Rosa	0.24	12.55	FAR (static)

Table 2-13 Riparian Areas in the Planning Area

Riparian Areas (Number of Segments)	Length (Miles)	Size (Acres)	Rating
Archuleta	0.1	12.96	PFC
Old Road	0.1	3.57	PFC
Simon River Tract	1	46.42	PFC
La Plata River (11)	3.17	126.69	8 PFC, 2 FAR (static), and 1 FAR (upward)
Ephemeral and Intermittent Systems			
Carrizo Canyon (8)	23.25	950.82	1 PFC, 5 FAR (upward), and 2 FAR (static)
Largo Canyon (11)	32.25	3,783.68	1 PFC, 9 FAR (upward), and 1 FAR (static)
Pump (6)	5.55	221.51	2 PFC, 3 FAR (upward), and 1 NF
La Jara (5)	6.5	224.02	3 FAR (upward) and 2 FAR (static)
Blanco Wash	0.75	29.96	FAR (upward)
Gobernador (3)	3.95	191.36	2 FAR (upward) and 1 FAR (static)
Ditch Canyon	4	47.22	FAR (upward)
Palluche	0.5	27.16	FAR (static)
Simon Canyon Wash	1	15.14	PFC
La Fragua	0.6	18.84	FAR (static)
Cutter Canyon	0.75	24.43	PFC
Tapicito (3)	2.5	92.18	2 FAR (upward) and 1 FAR (static)
Bancos Canyon	1	8.05	PFC
Cabresto Canyon	0.75	16.92	FAR (static)
McDermott Wash	0.5	3.37	FAR (upward)
Gonzales Wash	2.5	25.28	FAR (upward)
Armenta Wash	3	71.26	FAR (downward)
Desert Hills Overflow	0.75	11.01	PFC
Decker Spring	0.25	3.61	FAR (upward)
Kutz Wash (2)	6	499.75	Both FAR (upward)
Wetlands			
Desert Hills Wetland	--	10.88	PFC
Carrizo Oxbow wetland	--	20.79	PFC

Source: BLM 2014d
PFC = proper functioning condition; NF = nonfunctional; FAR = functioning at risk; upward = upward trend in condition; downward = downward trend in condition; static = no apparent trend in condition

Canyon, La Jara Canyon, Largo Canyon, Palluche Canyon, and Simon Canyon (BLM 2000b). Naturally occurring wetlands include the 15-acre Carrizo Oxbow wetland and the 10-acre Desert Hills wetland. Man-made wetlands have been constructed in coordination with the USACE, New Mexico Highway Department, and the City of Bloomfield to fulfill Clean Water Act mitigation requirements. These include the 10-acre Valdez wetland and the 6-acre Blanco wetland.

Springs also occur in the FFO and are mapped (**Figure 2-1**). Springs are important components of the desert ecosystem for a number of reasons. Historically, springs were the only reliable source of water for humans and animals. They have become known as “biodiversity hotspots” that support a large proportion of the aquatic and riparian species in arid regions. Several hundred species or subspecies of fishes, mollusks, crustaceans, aquatic insects, and plant species are endemic to western US springs (Sada and Pohlman 2002).

Plant community structure and function are determined largely by the hydrology of the system: depth to water table, frequency of flooding and ponding, and the occasional complete alteration of the channel; for example, channel position and function may be altered by floods as the channel constantly seeks equilibrium with its flow regime and constraining landscape features. Flooding of the riparian zone affects soil chemistry by producing anaerobic conditions, importing and removing organic matter, and replenishing nutrients. The varying hydrology for active floodplains and one-hundred year floodplains result in different plant communities.

Active Floodplain

Species assemblages in the active floodplain are variable. They are based more on seasonality of water and elevation than soil type but generally include a cottonwood/willow-dominated community. Shrubs and trees include willows (coyote [*Salix exigua*]), Goodding's [*S. gooddingii*], peachleaf [*S. amygdaloides*], and Bebbs [*S. bebbiana*]), cottonwood (Rio Grande [*Populus deltoides* ssp. *Wislizeni*] and narrow leaf cottonwood [*P. angustifolius*]), stretchberry (the native New Mexico olive [*Forestiera pubescens*]), and invasives and nonnatives Russian olive (*Elaeagnus angustifolia*) and tamarisk (saltcedar [*Tamarix chinensis*]). Tree species diversity is low, but age class and structural diversity is high. Younger recruits are found closer to the active channel, while older more mature cottonwoods can be hundreds of yards from the active channel.

The character of the understory depends on previous disturbances, for example, fire, human disturbance, livestock grazing, and flooding. But typically it includes forbs, grasses, and graminoids, such as horsetail (*Equisetum arvense*), rush (*Juncus* spp.), cattails (*Typha latifolia*), spikerush (*Eleocharis* spp.), sedges (*Carex* spp.), James galleta (*Pleuraphis jamesii*), sunflowers (*Helianthus* spp.), Rocky Mountain beeplant (*Cleome serrulata*), saltgrass (*Distichlis spicata*), scratchgrass (alkali muhly [*Muhlenbergia asperifolia*]), reed canarygrass (*Phalaris arundinacea*), common reed (*Phragmites australis*). Also in disturbed sites there may be the invasive nonnatives Russian thistle (*Salsola tragus*), Russian knapweed (*Acroptilon repens*) and or other knapweed species, and downy brome (cheatgrass [*Bromus tectorum*]).

One-Hundred Year Floodplain

Species assemblages in the one-hundred year floodplain are generally more associated with Blancot or Notal soil types. They support a more grass-dominated community but can include shrubs and trees. Species are those that are tolerant of drier conditions yet have a root structure capable of withstanding infrequent high water flows.

Species may include willows (coyote, peachleaf, Bebbs, and others), cottonwood (Rio Grande and narrow leaf), stretchberry (the native New Mexico olive), and invasive and nonnative Russian olive and tamarisk (saltcedar). Graminoids include spikerush, sedges, rushes (in wetter low-lying areas in the floodplain). Other grasses and forbs include scratchgrass (alkali muhly), alkali sacaton (*Sporobolus airoides*), spike dropseed (*S. contractus*), giant dropseed (*S. giganteus*), sand dropseed (*S. cryptandrus*), Indian ricegrass (*Achnatherum hymenoides*), reed canarygrass, Rocky Mountain beeplant, lupine (*Lupinus* spp.), evening primrose (*Oenothera* spp.), buckwheat (*Eriogonum* spp.), Indian paintbrush (*Castilleja* spp.), and hoary tansyaster (*Machaeranthera canescens*). Potentially found in disturbed sites are invasive/nonnative downy brome (cheatgrass) and Russian thistle and Russian knapweed or other knapweed species. In dryer portions of the floodplain can be found the native shrubs rubber rabbitbrush (*Ericameria nauseosa*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), big sagebrush (*Artemisia tridentata*), skunkbush (*Rhus aromatica*), black greasewood (*Sarcobatus vermiculatus*), and four-wing saltbush (*Atriplex canescens*).

Generally a riparian-wetland area in a physically nonfunctioning condition does not provide quality habitat. A riparian-wetland area that has recovered to a PFC would either be providing quality habitat or would be moving in that direction if recovery were allowed to continue. A riparian-wetland area that is FAR would likely lose any habitat that exists in a 25- to 30-year flow event.

Upland plants, such as rabbitbrush (*Ericameria nauseosa*), have moved into some of the riparian areas. However, native vegetation is evident and increasing in some areas due to the exclusion of livestock or limitations on grazing during the plant growing season from May 1 to September 30. Vegetation in these areas typically grows in zones from wetter to drier, starting with sedges and rushes common in the wettest zone and willows, grasses, salt cedar, rabbitbrush, and salt grass growing in progressively drier areas. A few scattered remnant cottonwoods are present (BLM 2000c).

PFC surveys were first conducted on BLM-administered lands in the planning area in 1994. Since 1998, PFC surveys have been conducted annually, assessing a portion of the reaches each year. During the latest PFC surveys from 2010 to 2012, 23 of the river tracts were rated as PFC, 2 were rated as FAR with

an upward trend, 4 were rated as FAR with no apparent trend, and one was rated as FAR with a downward trend (**Table 2-15**). Of the intermittent and ephemeral systems, 8 were rated as PFC, 31 were rated as FAR with an upward trend, 10 were rated as FAR with no apparent trend, 1 was were rated as FAR with a downward trend, and 1 was rated NF. Both wetlands were rated as PFC. No surveys were conducted in 2013 due to unavailable resources.

The PFC surveys in the 1990s revealed that significant portions of riparian areas were in less than PFC. BLM staff began evaluating the cause and effect of management techniques in relation to riparian conditions. Management actions implemented as a result of the evaluation are as follows:

- A decision in 1998 to defer all designated riparian areas from grazing during the plant growing season from May 1 to September 30
- The development of an EIS for Riparian and Aquatic Habitat Management in the Farmington Field Office (BLM 2000b)
- The development of a riparian monitoring plan

Trends

In some riparian areas, native species, such as cottonwoods and willows, have been significantly encroached on by woody nonnative invaders, such as salt cedar and Russian olive. Several factors have led to the invasion of other noxious weeds, such as Canada thistle and Russian knapweed, including unauthorized livestock grazing, wildlife, recreation, illegal OHV use, encroachment from uplands, wild and feral horses, and transport via humans, wind, and water. Other sources of riparian degradation are unauthorized livestock grazing during the deferment period, irrigation diversions, flow regulations in the San Juan River, and fluctuations in subsurface hydrology, likely due to drought (BLM 2000b).

Field data from PFC studies compiled throughout the planning area since 1998 indicate that overall trends in riparian and wetland habitats have been improving. This is likely due to the implementation of the Riparian and Aquatic Habitat Management Plan since 2000.

Nonnative trees, such as Russian olive and salt cedar, have been removed from nearly 7,000 acres of riparian habitat; routine maintenance will be required. Initial treatments involve either hand (chainsaw) or mechanical (heavy equipment) removal, immediately followed by an herbicide application to the stump.

Forecast

Overall, the current trend of improvement is likely to continue. This is provided that livestock grazing in riparian areas and wetlands during the growing season (May 1 to September 30) continues to be eliminated and that grazing seasons in riparian areas and wetlands continue to be outside the plant growing season.

Invasive species and noxious weeds are likely to continue to decrease in distribution and abundance as they are controlled and treated. Vehicle and OHV use in riparian areas, if left unmanaged, may denude areas of vegetation and lead to overall degradation of riparian habitats. Also, nonnative invasive species may be introduced or spread through horse manure. This would be of particular concern in water bodies that are classified as impaired. If unmanaged recreation occurs, the associated actions would contribute to limiting the health of the riparian areas.

The Tamarisk leaf beetle (*Diorhabda carinulata*) was initially released by the USDA-ARS in Lovelock, Nevada, in 2001 as a biocontrol agent for tamarisk. The range quickly expanded and populations of *Diorhabda* began appearing along the San Juan and La Plata rivers in 2008 and 2009. Since then, *Diorhabda* has further spread throughout the planning area. Studies have shown that defoliation can cause mortality in 3 to 5 years (Clements et al. 2012). The BLM has been monitoring for its presence and absence since 2010, looking for opportunities for rehabilitation and removal of standing dead tamarisk.

Key Features

The Carrizo Oxbow and Desert Hills wetlands and the man-made wetlands at Blanco and Valdez are key areas due to the inherent uniqueness and importance of wetlands in the arid setting of the planning area. Riparian areas that have been the target of Russian olive removal projects will continue to be key features. Monitoring and maintenance of previous projects will continue to be a high priority. These areas are Largo, Carrizo, Kutz, Gobernador, Simon, and Pump Canyons and several of the river tracts along the La Plata, Animas, and San Juan Rivers. Other key features include those SDAs with riparian habitat.

Riparian and wetland areas provide keystone habitat for riparian and wetland obligate and dependent bird species. Long-distance migration requires exceptional energy reserves, and migratory birds must rest and replenish fat reserves while traveling between wintering and breeding areas. Riparian and wetland areas provide migration stopover sites. Riparian areas contain trees and shrubs that are required for roosting or foraging by most riparian birds. Riparian forests support a greater diversity of wildlife than nearly all nonaquatic areas or upland forests. Mammals depend on the vegetation found in riparian areas for food and shelter. The increased humidity of riparian areas makes them important habitat for amphibians, snakes, and turtles.

Fishes in riparian stream areas in the Southwest are intimately linked to the habitat afforded to them. Vegetation rooted at the water's edge provides escape cover, shade, and food for fish. This is especially critical along intermittent streams, where remnant summer pools provide refugia for fish.

Riparian areas are crucial to the protection and enhancement of the water resources of the United States. They are extremely complex ecosystems that help provide optimum food and habitat for stream communities and are useful in mitigating or controlling nonpoint source pollution.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern riparian areas and wetlands:

- BLM Assessment, Inventory, and Monitoring (AIM) Strategy
- The Public Rangelands Improvement Act (43 U.S.C. 869 et seq.)
- BLM Handbook 1740-2, Integrated Vegetation Management
- BLM Manual 4180, Rangeland Health Standards
- Final Vegetation Treatments using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental impact Statement (June 2007).
- Healthy Lands Initiative
- IM 2012-124, Land Health Standards
- IM 78-410, Protection of Wetlands and Riparian Areas
- IM 87-251, Implementation of the Riparian Area Management

Management goals, objectives, and actions for riparian areas and wetlands are found in **Appendix A**, Current Management. Since the RMP was signed into effect in 2003, BLM policies have been updated, and other relevant guidance documents were released. These include but are not limited to: BLM Handbook 1740-2, IM 2012-124, and the Final Vegetation Treatments using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental impact Statement.

Although current management direction is considered adequate, there are opportunities to address impacts on riparian areas and wetlands related to future development in accordance with current policy. This could include evaluating and updating the definition of riparian areas, and updating existing Habitat Management Plans as appropriate.

Future management could also incorporate a upland and riparian vegetation monitoring program, based on AIM strategy guidance. The AIM strategy outlines a process for the BLM to collect quantitative information on the status, condition, trend, quantity, location, and spatial pattern of natural resources, and provides a means for reporting on vegetation conditions. For riparian communities, this could mean incorporating aquatic core indicators during the development of monitoring plans and implementation

programs to help to inform land management decisions and assess impacts associated with oil and gas development activity.

Other specific management opportunities include:

- Addressing standing defoliated salt cedar in riparian areas
- Consider criteria-based management to protect riparian vegetation found outside existing SDAs and ACECs
- Consider additional methods for riparian vegetation treatments based on the best available science.
- Consider exclosures in areas where restoration of riparian vegetation is occurring
- Consider management protections for natural springs

Based on these findings, BLM could consider additional management opportunities including new criteria to identify and manage existing and new riparian areas in the future, new vegetation management tools to address invasive and noxious species, applying vegetation management decisions across vegetation communities rather than bind them to Special Designation Area polygons, and add more recent and newer treatment methods to enhance riparian and wetland communities.

2.1.7 Forestry

Profile

Forests in the analysis area provide important wildlife habitat, carbon sequestration, recreational values, and special forest products, such as firewood, Christmas trees, wood posts and poles, and piñon nuts. Plant community woodlands managed by the BLM are juniper savannah, piñon-juniper woodlands, and limited ponderosa pine stands. The Forest Service manages piñon-juniper woodlands, ponderosa pine forests, and subalpine coniferous forests. Both the BLM and the Forest Service manage woodlands to maintain and improve forest health; to protect, restore, and enhance forest ecosystem components; to enhance efforts to protect watersheds; and to reduce wildfire risks (Healthy Forests Restoration Act of 2003).

In addition, the BLM manages forests on the basis of multiple use and sustained yield (FLPMA) and under the Material Disposal Act of 1947, as amended, to dispose of forest products. The BLM issues commercial and noncommercial permits to the public for woodland products, such as firewood, Christmas trees, fence posts, and for nut gathering in accordance with the New Mexico Special Forest Products Standard Operating Plan (BLM 2013x). **Table 2-14**, Woodland Product Sales, identifies woodland product sales in the Farmington Field Office over the past five years.

Table 2-14 Woodland Product Sales

Year	Commodity	Total No. of Permits	Total Cords Personal	Total Cords Commercial	Total Sales
2013	Firewood	2,763	3,338	585.	$48,831
	Fence Posts				$506.
	Christmas Trees				$1,660.
2012	Firewood	2,690	3,226	445	$49,131
	Fence Posts				$410.
	Christmas Trees				$2,375.
2011	Firewood	2,869	3,533	396.	$49,201.
	Fence Posts				$342.
	Christmas Trees				$1,825.
2010	Firewood	3,187	3,855	517.	$48,596.
	Fence Posts				$3,228.
	Christmas Trees				$2,690.
2009	Firewood		3,541	416	$47,652.
	Fence Posts				$100.
	Christmas Trees				$2,815.

Source: BLM 2014

Free-use permits for woodland products may be issued to federal or state governmental agencies provided that wood products will be used to support public projects. Free use permits are also issued for traditional plant gathering for ceremonial, medicinal, or religious purposes to Native American individuals.

There are four forest woodland community types located in the planning area boundary. These include; Juniper savannah, Piñon-juniper woodlands, Ponderosa Pine and Subalpine coniferous forests. Of these, piñon–juniper woodlands comprise the largest woodlands type covering approximately 928,700 acres of BLM and Forest Service Lands. **Table 2-15**, Acres of Forest Woodland Community Types, identifies the forest woodland types and acres managed by federal agencies in the assessment area.

Table 2-15 Acres of Forest Woodland Community Types

Woodland Type	BLM	Forest Service	USBR	Total
Juniper savannah	192,500	0	0	192,500
Piñon-juniper	724,100	191,700	12,900	928,700
Ponderosa pine forest	7,900	43,300	0	51,200
Subalpine coniferous forest	0	6,700	0	6,700
Total	**924,500**	**241,700**	**12,900**	**1,179,100**

Source: BLM 2003a

The juniper savannah plant community lies primarily in a band along the southern boundary of the planning area. It covers approximately 56,000 acres within FFO boundaries and 136,000 acres within the Albuquerque District Office boundaries. This woodland is dominated with either piñon –pine and/or juniper trees with a continuous grass cover understory. Piñon-juniper savannas are prevalent in the basins and foothill areas where reliable precipitation comes from the summer monsoon rainy season. Piñon-juniper savannahs are further characterized by having lower tree densities and occur on moderately deep and coarse to fine-textured soils. Piñon-juniper savannahs are known to expand into former grassland areas through tree expansion or have been replaced by tree expansion into relatively dense stands of Juniper. Expansion or infill of savannas have not been found to be uniform throughout the west (Romme et al. 2008).

The piñon-juniper woodland plant community occurs primarily in the northeastern portion of the planning area and along the southern boundary, approximately 928,000 acres. Piñon or juniper species are more dominate depending on elevation. For lower elevations generally Utah juniper dominates and the upper elevations are more likely to be dominated by Piñon pine. Trees in this woodland can form a dense canopy or be fairly open. Dense stands generally occur above 6,600 feet in elevation. Common understory vegetation beneath these woodlands include shrubs or forbs with fewer graminoids (Romme et al. 2008). The understory for higher elevations of Piñon pine include prairie June grass. More open stands are located on drier sites below 6,600 feet elevation, where piñon, Utah juniper, big sagebrush, and antelope bitterbush (*Purshia tridentata*) are common. The understory grasses typical to lower elevation Piñon-juniper include blue gramma and mutton grass. Relatively large stands of big sagebrush can occur in the open woodlands (BLM 1997, 2014).

The Ponderosa pine forest occurs principally on Forest Service land along the eastern boundary of the planning area, although there is a small amount on FFO land. This forest occurs on BLM-administered land, primarily in deep canyons on north- and east-facing slopes. Common tree species are ponderosa pine, piñon, and Douglas fir (*Pseudotsuga menziesii*). The shrub component is dominated by antelope bitterbush, true mountain mahogany, and Gambel's oak; grass cover is includes western wheatgrass in heavier soils, by mutton grass and prairie June grass (BLM 2014). On the Jicarilla Ranger District and the Cuba Ranger District, this vegetation type occurs in scattered locations in deep canyons on north and east facing slopes. Dominant plant species at these locations are similar to those found on BLM-administered lands. Based on spotted owl assessments and other data, stands of Ponderosa pine displaying old growth (200-400 years old) characteristics based on the structure and composition characteristic of the forest type include; late successional development stage, large trees, decadent trees with broken tops, and woody debris accumulation (Kaufmann, et al. 2007) have been located in the assessment area, primarily at the head of sandstone canyons.

The subalpine coniferous forest unit occurs along the eastern boundary of the planning area in the Santa Fe National Forest. The vegetation unit is characterized by elevations of approximately 8,000 feet to the timberline, which is approximately 12,000 feet (Dick-Peddie 1993 and Evans, et al. 2011). Common flora include Englemann spruce (*Picea englemanii*), Douglas fir, juniper species, corkbark fir (*Abies lasiocarpa*), currants (*Ribes* sp.), fringed brome (*Bromus ciliatus*), mountain trisetum (*Trisetum spicatum*), and bluegrass (Dick-Peddie 1993). Vegetation communities vary among alpine regions due to elevation and moisture differences.

Indicators

The following indicators are used to assess current woodland condition:

- Fire Regime Condition Class – the degree of departure of fire regimes on the land from historic ranges
  - Class 1 – Generally within historic ranges
  - Class 2 – Moderate departure from historic range, either increased or decreased fire frequency
  - Class 3 – High departure or significant alteration from historic ranges
- Number of acres moved from one fire regime condition class (FRCC) to another FRCC
- Presence of management actions to restore ecosystem health to forests
- Drought conditions and susceptibility to insects and diseases on forests (acres monitored, treated, and at risk)
- Pre-fire conditions of old growth conditions characteristic of the forest type, taking into account the stand to landscape fire adaptation, watershed health, and retaining the large trees contributing to old growth structure
- Intensity of Woodland harvesting – acres monitored and at risk

Current Condition

Forest health in the assessment area is variable across the landscape. Many factors including; wildfire management, climate, and grazing practices (Jacobs 2008) have caused some forests or woodland communities to have departed outside of their historic range of conditions as determined by fire regime condition class (FRCC). A FRCC is the amount of departure from the natural fire regime (Hann and Bunnell 2001). This departure results in changes to one (or more) of the following ecological components; vegetation characteristics (e.g. species composition, structural stages, canopy closure and fuel loading); fuel composition; fire frequency, severity, and pattern; and other associated disturbance (e.g. grazing and drought). FRCC 1 represents a low departure, FRCC 2 is a moderate departure, and FRCC 3 is a high departure from historical or natural fire regimes. In the FFO, Approximately 1,442,200 acres are in FRCC 2 and 3 (**Table 2-16**, Vegetation Type by Vegetation Condition Class (Acres) and **Figure 2-3**, Vegetation Condition Class).

Table 2-16 Vegetation Type by Vegetation Condition Class (Acres)

Vegetation Type	VCC 1	VCC 2	VCC 3	Total
Agricultural Vegetation	1,700	2,300	400	4,400
Cool Semi-Desert Alkali-Saline Wetland	9,000	32,800	3,500	45,300
Great Basin and Intermountain Dry Shrubland and Grassland	107,000	500,400	41,100	648,500
Great Basin and Intermountain Tall Sagebrush Shrubland and Steppe	26,300	126,100	14,000	166,400
Great Basin Saltbrush Scrub	6,200	25,500	900	32,600
Intermountain Basin Cliff, Scree, and Rock Vegetation	42,300	88,200	12,900	143,400
Rocky Mountain Two-needle Piñon-Juniper Woodland	395,700	382,300	74,500	852,500

Table 2-16 Vegetation Type by Vegetation Condition Class (Acres)

Vegetation Type	VCC 1	VCC 2	VCC 3	Total
Southern Rocky Mountain Lower Montane Forest	36,400	81,100	24,100	141,600
Other Vegetation	10,300	22,500	3,300	36,100
Other (non-vegetation)	1,400	5,900	400	7,700
Total	636,300	1,267,100	175,100	
Sources: BLM GIS 2014; LANDFIRE GIS 2014; NVC GIS 2014				

Trends

In the past 50 years, large blocks of intact vegetation characterized in the Colorado Plateau ecoregion (which includes the assessment area) have been fragmented by the following: wildland fire, energy development, recreation use, urban development, road building, and OHV use (Colorado Plateau-Rapid Eco-regional Assessment 2013).

Declining ecosystem conditions have contributed to changes in FRCCs changing historic intact vegetation. According to results from the National Landscape Dynamics Modeling, national forests in the lower 48 states experienced a steep drop from condition class 1 (historic range) with increases in conditional classes 2 and 3 in the early twentieth century (Hann and Bunnell 2001). Changes in FRCC alter fire return intervals of vegetative communities, affect species composition, change wildlife habitat conditions, and in general cause declines in ecosystem health.

Changes in FRCCs are continuing in the assessment area due to changes in disturbance on the landscape. Recent fire regime departure data shows the assessment area as having a moderate to moderately high departure from historic regimes (Colorado Plateau-Rapid Eco-regional Assessment 2013). Recent disturbance data of piñon-juniper woodlands in the Colorado Plateau shows about a 3 percent change to woodlands from invasive grasses, wildland fire, and vegetation treatments (Colorado Plateau-Rapid Eco-regional Assessment 2013). Oil and gas development has increased the density of wells by 50 percent (BLM 2003b), further leading to forest woodland disturbance and decline in ecosystem health.

Forecast

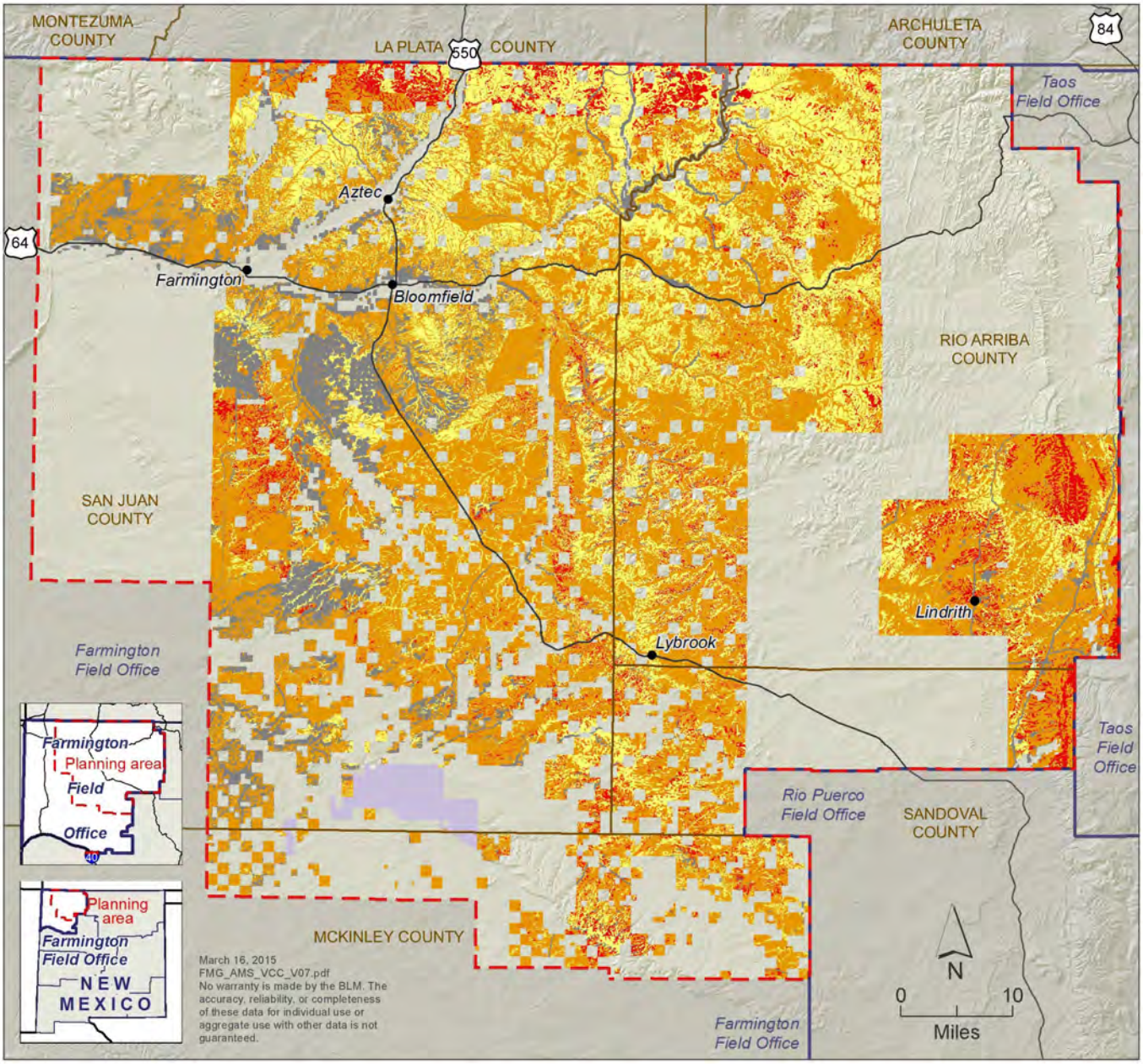
Threats to forest health will continue as a result of change agents. Wildland fires would increase over time, based on climate and establishment and spread of invasive species. The assessment area is projected to have high future energy potential development for oil and gas. About 40 percent of the current distribution piñon-juniper woodland would be at high risk for energy development (Colorado Plateau Rapid Eco-regional Assessment 2013). Continued population growth and expansion of wildland urban interface areas would increase public use of federal lands. Disturbance to woodlands would increase, potentially affecting ecological health of woodlands as the potential for human-caused fires and disturbance from OHV usage would increase. Areas containing old growth forest have not been identified, protected, or improved.

Key Features

Woodlands in the assessment area need to be assessed and delineated to determine areas containing old growth characteristics for Ponderosa pine. Important forest woodland communities should be identified, conserved, protected and restored if they provide; important wildlife habitat, watershed values, recreational values or include structure and composition characteristics of old growth stands.

Figure 2-3 Vegetation Condition Class

The Vegetation Condition Class (VCC) quantifies the amount that current vegetation has departed from the simulated historical vegetation reference conditions. Three condition classes describe low departure (VCC 1), moderate departure (VCC 2), and high departure (VCC 3). On-the-ground assessment has not been completed for the FFO and the data may not reflect actual conditions on the ground.



Source: BLM GIS 2014, LANDFIRE GIS 2014

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern forestry:

- BLM-H-9214-1, Prescribed Fire Management
- Healthy Forests Restoration Act of 2003
- IM 2003-226, Fire Program Analysis System—Development of Fire Management Objectives
- Interagency Standards for Fire and Fire Aviation Operations (The Red Book) (2010)
- Interagency Prescribed Fire Planning and Implementation Procedures Guide (July 2008)
- Review and Update of the 195 Federal Wildland Fire Management Policy (2001)

Current management goals, objectives, and actions for riparian areas and wetlands are found in Appendix A. The current goals and objectives are considered adequate to address the issues from this planning amendment. In order to maintain and improve forest health and resiliency and protect old growth forests, the BLM may define and delineate vegetation management goals, objectives, and strategies to reduce adverse impacts on forest resources. Some of the strategies the BLM may consider include applying use restrictions, mitigation measures, or fluid leasing stipulations.

2.1.8 Upland Vegetation

Profile

Vegetation provides an enormous variety of functions in an ecosystem, and also provides for a variety of human and animal uses. Vegetation stabilizes soils, prevents erosion, uses carbon dioxide, releases oxygen, increases species diversity, and provides habitat and food for animals and resources for human use.

Ecosystems reflect complex sets of interactions between plants, animals, soil, water, air, temperature, topography, fire and humans. Influences exerted on one component affects other components in the system. Vegetation provides many functions in ecosystems. Many of the BLM's land management policies are directed toward managing for healthy vegetative communities which support resistant and resilient ecological systems.

Indicators

BLM Standards and Guidelines can be used as qualitative measurements for the rangelands in the planning area. Details follow for the two standards that rangeland sites should meet.

Upland Sites Standard: Upland ecological sites are in a productive and sustainable condition within the capability of the site. Upland soils are stabilized and exhibit infiltration and permeability rates that are appropriate for the soil type, climate, and landform. The kind, amount, and pattern of vegetation provide protection on a given site to minimize erosion and to assist in meeting state and tribal water quality standards.

Biotic Communities Standard: Biotic communities are native, endangered, threatened, and special status species. Ecological processes, such as hydrologic cycle, nutrient cycle, and energy flow, support productive and diverse native biotic communities. Desired plant community goals are maintaining and conserving productive and diverse populations of plants and animals within the capability of the ecological site, which sustain ecological functions and processes.

Current Condition

Ecoregions

The analysis area is in portions of three EPA level III ecoregions: Colorado Plateau, Arizona/New Mexico Plateau, and Southern Rockies (EPA 2011a).

The Colorado Plateau ecoregion is an uplifted, eroded, and deeply dissected tableland. Its benches, mesas, buttes, salt valleys, cliffs, and canyons are formed in and are underlain by thick layers of sedimentary rock. Precipitous sidewalls mark abrupt changes in local relief, often from 1,000 to 2,000 feet. The region contains large areas of piñon-juniper and Gambel oak woodlands, as well as saltbrush-greasewood and many endemic plants occur. Summer moisture from thunderstorms supports warm season grasses (EPA 2011a).

The Arizona/New Mexico Plateau represents a large transitional region between the semiarid grasslands and low relief tablelands to the east, the drier shrublands and woodland-covered higher relief tablelands of the Colorado Plateau in the north, and the lower, hotter, less vegetated areas in the west and southeast. Local relief in the region varies from a few feet on plains and mesa tops to well over 1,000 feet along tableland side slopes EPA 2011a).

The Southern Rockies are composed of steep, rugged mountains with high elevations. Coniferous forests cover much of the region; nevertheless, as in most of the mountainous regions in the western United States, vegetation, soil, and land use follow a pattern of elevational banding. The lowest elevations are generally grass or shrub covered and are typically key primary areas for grazing. Low to middle elevations are also grazed and covered by a variety of vegetation types, including Douglas fir, ponderosa pine, aspen, and juniper-oak woodlands. Middle to high elevations are largely covered by coniferous forests and have less grazing activity. The highest elevations have alpine characteristics (EPA 2011a).

Plant Communities

Public lands in San Juan, McKinley, Rio Arriba, and Sandoval Counties support a diversity of upland and riparian plant communities. These plant communities or vegetation types are controlled in large part by site-specific topography, soil type, and climatic conditions. The planning area contains seven major plant community types, as well as the nonnative cover type represented by the agricultural vegetation type (**Table 2-17**, Acres of Plant Community Types on Federal Mineral Estate in the Analysis Area, and **Figure 2-4**, Vegetation Communities). Presented in **Table 2-18**, the SWReGAP communities were cross walked to the National Vegetation Classification Standard(NVC) macro groups.

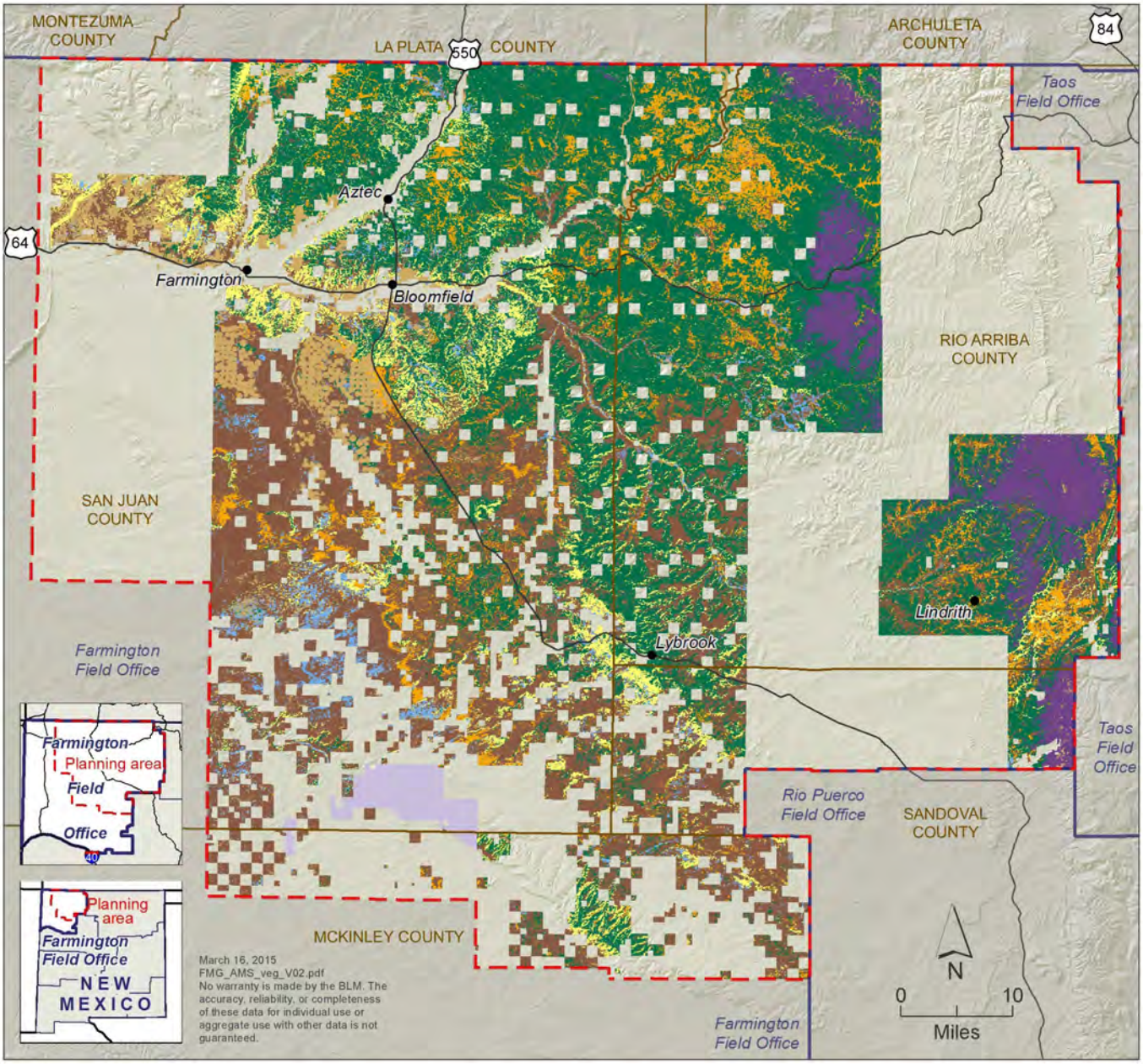
The Rocky Mountain Two-needle Piñon-Juniper Woodland plant community type covers an estimated 874,500 acres in the planning area, the greatest of all vegetation communities. Trees in these woodlands can form a dense canopy or be fairly open. Dense stands generally occur above 6,600 feet in elevation and the dominant tree species are Piñon (*Pinus edulis*), Utah juniper, Gambel's oak (*Quercus gambellii*), and true mountain mahogany (*Cercocarpus montanus*), with occasional stringers of ponderosa pine (*Pinus ponderosa*). Common ground cover species are mutton grass (*Poa fendleriana*), prairie June grass (*Koeleria macrantha*), buckwheat (*Eriogonum* spp.), and penstemon (*Penstemon* spp.; BLM 1997). More open stands are located on drier sites below 6,600 feet elevation where Piñon, Utah juniper, big sagebrush, and antelope bitterbush (*Purshia tridentata*) are common. Blue grama and galleta are the principal grass species. Relatively large stands of big sagebrush can occur in the open woodlands (BLM 1997).

Table 2-17 Acres of Plant Community Types on Federal Mineral Estate in the Analysis Area

NVCS Macro Group	NVCS Code	Acres	% of Analysis Area
Rocky Mountain Two-Needle Piñon-Juniper Woodland	M027	874,500	39
Great Basin and Intermountain Dry Shrubland and Grassland	M171	696,300	31
Intermountain Basin Cliff, Scree, and Rock Vegetation	M118	175,900	7.8
Great Basin and Intermountain Tall Sagebrush Shrubland and Steppe	M169	171,600	7.6
Southern Rocky Mountain Lower Montane Forest	M022	141,900	6.3
Cool Semi-Desert Alkali-Saline Wetland	M082	56,200	2.5
Great Basin Saltbrush Scrub	M093	40,700	1.8
Agricultural Vegetation	M330 and M331	38,900	1.7
Source: BLM GIS 2014; SWReGAP GIS 2004; NVC GIS 2014			

Figure 2-4 Vegetation Communities

The SWReGAP project used satellite imagery from 2000 - 2001 and digital elevation model (DEM) derived datasets (e.g. elevation, landform, aspect) to model and classify natural and semi-natural vegetation. Vegetation communities for the planning area are classified according to the National Vegetation Classification Standard.



An estimated 696,300 acres of Great Basin and Intermountain Dry Shrubland and Grassland are found in the FFO boundaries. There are large tracts of desert grassland vegetation throughout the central portion of the planning area. Blue grama (*Bouteloua gracilis*), bottlebrush squirreltail (*Elymus elymoides*), needle-and-thread (*Stipa comata*), Indian ricegrass, galleta (*Hilaria jamesii*), and dropseeds (*Sporobolus* spp.) are common. Broom snakeweed (*Gutierrezia sarothrae*) occurs in most areas, along with scattered big sagebrush (*Artemisia tridentata*) and one-seed juniper (*Juniperus monosperma*) on ridges and rocky areas (BLM 1988).

The Intermountain Basin Cliff, Scree, and Rock Vegetation community covers approximately 175,900 acres in the planning area. This community generally occurs at elevations ranging from approximately 4,800 to 7,000 feet. It is generally a rough, broken badlands, sparsely vegetated, highly dissected and eroded into a series of low badland hills and gullies interspersed by somewhat sandy alluvial deposits. There is more of the surface area comprised of bare ground and rock than that which is vegetated. Large bare areas with only biological crust are not uncommon. Plant communities of the badland complex are typically sparsely vegetated, often with less than 10 percent vegetation cover but occasionally up to 30 percent. Many endemic species in northwest New Mexico occur in this vegetation community. Species composition is highly variable but may include Utah juniper, Colorado piñon, four-wing saltbush, Indian ricegrass, galleta, winterfat, Mormon tea, alkali sacaton, globemallow, and snakeweed.

The Great Basin and Intermountain Tall Sagebrush Shrubland and Steppe plant community covers approximately 171,600 acres in the planning area. The major shrub species in this type are Wyoming big sagebrush, with fewer basin big sagebrush and black sage (*Artemisia nova*). Four-wing saltbush, antelope bitterbrush, and winterfat also occur. Other grass and forb species include galleta, blue grama, Indian ricegrass, sand dropseed, biscuit root, woolly plantain, milkvetch species, asters, daisies, and borage species. Big sagebrush naturally occurs in canopy covers of 25-35 percent in the absence of grazing and co-occurs with understory grassland species (Welch and Criddle 2003).

Southern Rocky Mountain Lower Montane Forest covers approximately 141,900 acres of federal mineral estate in the analysis area. It is characterized by mixed conifer forests, including ponderosa pine. Common tree species are ponderosa pine, Piñon pine, and Douglas fir (*Pseudotsuga menziesii*). The shrub component is dominated by antelope bitterbrush, true mountain mahogany, and Gambel's oak, with grass cover dominated by mutton grass and western wheatgrass.

Old growth forest is described in more detail in **Section 2.1.7**, Forestry.

Cool Semi-Desert Alkali-Saline Wetland covers 56,200 acres and is dominated by black greasewood vegetation. This community contains fourwing saltbush, Mormon tea, Douglas rabbitbrush, and big sagebrush to a lesser degree. Other species are alkali sacaton, western wheatgrass, galleta, Indian ricegrass, and sand dropseed. This vegetation community is found predominantly in valley bottoms but can also be on fans with slopes less than eight percent, as well as on plateaus and mesas.

Great Basin Saltbrush Scrub covers 40,700 acres and is characterized by saltbush shadscale and winterfat. Other common species that occur include fourwing saltbush, Mormon tea, big sagebrush, galleta, Indian ricegrass, scarlet globemallow, snakeweed, and mustard.

Agricultural Vegetation covers 38,900 acres in the analysis area, mainly irrigated cropland adjacent to the San Juan, Animas, La Plata, and Los Piñas Rivers.

Traditional Plant Uses

EO 13007, Indian Sacred Sites (May 24, 1996) directs federal agencies to manage federal lands in a manner that accommodates Indian religious practitioners access to and ceremonial use of Indian sacred sites. The agencies also must avoid adversely affecting the physical integrity of such sacred sites, to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions. The Order "is intended only to improve the internal management of the executive branch and is not intended to, nor does it, create any right, benefit, or trust responsibility, substantive or procedural, enforceable at law or equity by any party against the United States, its agencies, officers, or any person" (Sec. 4). Plant

gathering (typically by hand and in small amounts) of grasses, shrubs, and forbs for medicinal, ceremonial, and other uses will be allowed as described in **Section 2.1.15**, Cultural Resources.

Biological Soil Crust

Soils between the widely spaced vascular plants on the Colorado Plateau are generally dominated by a community of cyanobacteria, microfungi, lichens, and mosses collectively known as biological soil crusts. Biological soil crusts dominate the landscape in this region, can represent up to 70 percent of the living cover (Belnap 1995, p. 179), and can heavily influence system function in most ecosystems. Biological soil crusts are susceptible to damage by compression caused by grazing, or off road driving. Fire also can negatively affect biological soil crusts.

Trends

Vegetation communities in the planning area have been affected by oil and gas development for approximately the past 60 years, as well as associated roads and other rights-of-way; introduction and continued invasion of noxious weeds such as cheatgrass, Russian knapweed, and halogeton; conversion from urbanization rural home development, intensive agriculture, and expanding OHV use. The area is extremely fragmented, which likely prevents large fires from occurring.

Forecast

The Colorado Plateau REA (BLM 2012d, p. 118) identified oil and gas leasing as an issue that could affect future vegetation conditions in the region. The REA preparers found that big sagebrush shrubland and piñon-juniper woodland show the highest potential for change caused by energy development. These same communities were also predicted to have the greatest declines in intactness as well (BLM 2012d, p. 118).

Climate change may also affect vegetation particularly as temperature increases interact with water limitations. In many vegetation communities, canopy cover of perennial plants has been shown to be sensitive to temperature, whereas canopy cover of annual plants responds to cool season precipitation (Munson et al. 2011, p. 1). REA models predict increasing temperatures in all seasons. For 2015 to 2030, less annual precipitation is expected in winter and especially in summer (reduction in the monsoon); for 2045 to 2060, a slight increase in annual precipitation is expected, particularly during winter. Winter precipitation is critical to perennial native plants and it enhances annual productivity for certain species (BLM 2012d, p. 145). If both winter and summer precipitation is reduced, trees, especially piñon pine, and grasses may be reduced (Schwinning et al. 2008 in BLM 2012d, p.145; Munson et al. 2011, p. 1), while shrubs are likely to continue to expand (Munson et al. 2011, p. 1). For woody species, drought-induced water stress has been linked to bark beetle infestations leading to die-off (Breshears et al. 2005, p. 15147). However, interspecific competition may play a role in mediating the effects of climate change (Derner et al. 2003, p. 458).

By 2060, the REA model predicts the contraction of some of the drier shrublands (sagebrush in particular), savanna piñon-juniper, and some evergreen forest, while grasses are expected to expand (BLM 2012d, p. 145). For both the 2015 to 2030 and 2045 to 2050 periods, the seasonality and intensity of precipitation will be a key factor. If the trend is toward wetter winters or springs, the invasive grasses, such as cheatgrass, will spread and will burn in the summer and fall, reinforcing their persistence over larger areas. If multiple wet years occur, grasses may have the advantage over shrubs in establishment and survival (Peters 2011 in BLM 2012d, p. 145).

Key Features

Several areas in the planning area are important for upland vegetation, including the Hogback ACEC, Reese Canyon RNA, Carracas Mesa SDA, Nacimiento Formation, Bisti and De Na Zin Wilderness areas and the Ah-shi-sle-pah WSA. These features are described in more detail in **Section 2.1.11**.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern upland vegetation:

- BLM Assessment, Inventory, and Monitoring (AIM) Strategy
- BLM-H-1740-2, Integrated Vegetation Management
- BLM-M-4180, Rangeland Health Standards
- Final Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental impact Statement (June 2007).
- Healthy Forests Restoration Act of 2003
- Healthy Lands Initiative
- IM 2012-124, Land Health Standards
- IM 78-410, Protection of Wetlands and Riparian Areas
- IM 87-251, Implementation of the Riparian Area Management
- Public Rangelands Improvement Act of 1978

There is no management in the 2003 RMP directly related to upland vegetation. Relevant management is discussed in the fish and wildlife section as it relates to habitat management, as well as in the livestock grazing management as it relates to forage production (see **Appendix A**).

Although there have not been specific management goals, objectives, or actions in the 2003 RMP, the BLM engages in partnerships to help conserve native vegetation, and follows current policy guidance and Instruction Memoranda. The BLM participates in Seeds of Success, its national program that collects, conserves, and develops geographically appropriate native plant materials for restoration. The Seeds of Success program is a partnership of federal and nonfederal institutions, all with shared interests in collecting, conserving, and developing native seeds. The purpose is to conserve native plants in order to maintain the full complement of biological diversity, as each component is essential to maintaining ecosystem integrity and may be useful in gauging climate adaptation and resilience. The native plant materials will be used for reclamation, restoration, and emergency fire rehabilitation. Partners in the program include botanical gardens, plant materials centers, tree growers, universities, and native-plant societies throughout the United States.

The BLM also allows for commercial collection of native seeds for restoration, reclamation, and emergency fire rehabilitation, in accordance with BLM IM 2013-176. The IM established a framework to standardize vegetation and wildland seed collection procedures, as well as a pricing list and process for updating prices charged for permits. The IM includes suggested permit stipulations that can be attached to all seed collection permits and contracts.

This resource management plan amendment provides an opportunity to develop a comprehensive vegetation management strategy. The strategy is needed due to a lack of management goals, objectives, and actions for upland vegetation and concern for how to manage this resource under the pressure of additional oil and gas development and lands and realty authorizations.

Goals and objectives for vegetation management would focus on desired future conditions in accordance with current BLM policy. Management for desired native plant communities with diverse age classes and structure could help achieve other resource program goals and objectives, such as wildlife, migratory birds, and livestock grazing. Other objectives for consideration may include no net habitat loss in key management areas.

Actions may include the use of native plants for reclamation, restoration, range improvements, and grazing activities to support wildlife, migratory birds, and pollinators. Use of native plants would also facilitate colonization of soil crusts after they have been disturbed. Continuing to allow for commercial seed collection under IM 2013-176, Seed Collection Policy and Pricing, would support access to regionally adapted plants for use in reclamation. Management could also set criteria for collection and/or allow for the use of nonnative plants subject to risk assessments.

Future management could also incorporate an upland and riparian vegetation monitoring program, based on AIM strategy guidance. The AIM strategy outlines a process for the BLM to collect quantitative information on the status, condition, trend, quantity, location, and spatial pattern of natural resources. It also provides a means for reporting on vegetation conditions. This type of monitoring program would help to inform land management decisions and to assess impacts of oil and gas development.

Current management establishes survey requirements during ground-disturbing activities for some special status plant species. However, there are concerns that not all rare plants are adequately protected under existing management. Requirements could be updated to include survey protocol information during ground-disturbing activities, to better protect rare plants. Monitoring and mitigation requirements could also be updated and expanded.

Rangeland improvement treatments could be addressed in this amendment, as mitigation for rangelands removed from production due to new oil and gas developments. If rangeland improvements are considered, criteria would be established describing when such treatments would occur.

Additionally, this amendment could provide an opportunity for Native Americans to identify plant gathering areas that should receive particular protection. Such areas would be identified through consultation with tribes.

2.1.9 Noxious Weeds and Invasive Species

Profile

Invasive plants disrupt or have the potential to disrupt or alter the natural ecosystem function, composition, and diversity of the site they occupy. These species can complicate the use of local natural resources and may interfere with management objectives for the site. Noxious weeds are native or nonnative plants that are unwanted in a particular area at a particular time, as designated by the New Mexico Department of Agriculture (NMDA), in accordance with the Noxious Weed Management Act of 1998. Although noxious weeds are usually nonnative, a distinction is made in this document because they can and do include undesirable native plants.

Invasive plants are widespread and can damage crops, affect entire industries, and harm the environment and public health. For centuries, people have moved plants, animals, and microbes around the world. Most countries now rely on plants and animals from other regions of the world to meet their dietary needs. Organisms that have been moved from their native habitat to a new location, especially from a different country, are typically referred to as nonnative.

Prevention is generally recognized as the most cost-effective and efficient method of reducing the likelihood for weed introduction and spread, as opposed to eradication and control (Davies and Sheley 2007, p. 178). One way to help target prevention efforts is to identify vectors (e.g., attachment on animals or humans, transportation via wind or water, self-propulsion) that are major dispersers of an invasive plant species (Davies and Sheley 2007, pp. 179-181).

Fire is a vector for invasive plants as it can destroy native vegetation and leave bare ground susceptible to weed invasion. In addition, some invasive plants, such as cheatgrass, have been found to shorten fire return intervals and increase fire risk (Northern Arizona University 2007, p. 3).

Restoration of native plant communities can be difficult in the Colorado Plateau region, given the extreme temperatures, limited moisture, and low fertility of desert soils (Bernstein et al. 2014, p. 1). As such, many considerations must be factored into restoration, such as the following examples:

- Evaluation of existing conditions
- Management actions that will limit the reintroduction of invasive plants and prevent soil surface disturbance or trampling by such land uses such as livestock grazing and OHVs
- Presence or lack of biological soil crusts (Rosentreter 1999, pp. 94-95)

Post-fire recovery of native species may reduce invasion of nonnative species in some instances (Pyke et al. 2013, p. 417). Further, post-fire restoration of perennial grasses and biological soil crusts has been found to be greatest on seeded sites compared to unseeded sites; however, success may depend on high winter-spring precipitation (Hilty et al. 2004, p. 89; Bernstein et al. 2014, p. 7).

On BLM-administered lands, the degree of impact from invasive plants depends on the growth characteristics of that species, density, size of infestation, land cover type being invaded, resources threatened, potential economic impacts, and cost of control or eradication.

Indicators

Indicators include the presence of a noxious weeds or invasive plants, the size of the population, acres of treatment completed to control these populations, and success of the control treatment.

For the areas with associated mapping, no comprehensive inventories for noxious weeds have been completed (**Figure 2-5**, Weed Infestations). Inventories are not static; this is because populations of weeds are treated, weeds appear due to disturbance, or seeds germinate from previously treated infestations. The BLM cooperates with the San Juan Soil and Water Conservation District and industry to target and treat noxious weeds. In addition, BLM field staff and public land users, such as grazing permittees, oil and gas operators, recreationists, and others, often report the location of these populations. Once a population is found, the BLM coordinates with various land users to plan and implement treatment methods to remove or control the population.

Current Condition

Invasive plants are found in the San Juan Basin, particularly in areas disturbed by surface activities. These plants displace native plant communities and degrade wildlife habitat. Two hundred and twelve invasive and poisonous weeds have been identified on BLM-administered land (Heil and White 2000). **Table 2-18** lists the New Mexico designated noxious weeds, the current management classes for each species, and their occurrence in the planning area. The New Mexico statewide list is the baseline document that the BLM uses to establish primary noxious weed species of concern.

The State of New Mexico places designated invasive plants into four categories, as follows:

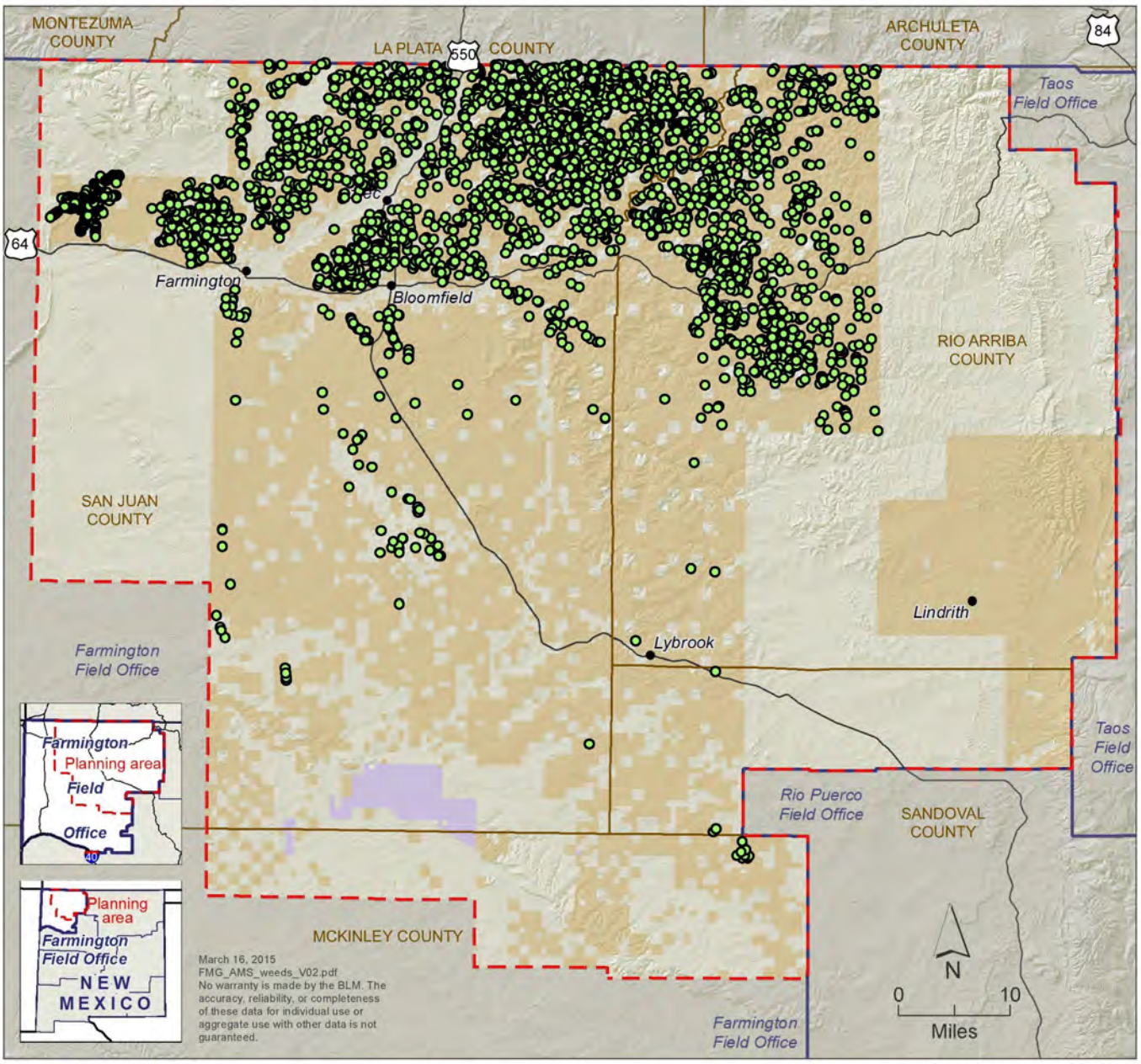
- **Class A—**Currently not present in New Mexico or has limited distribution
- **Class B—**Limited to portions of the state; in areas with severe infestations, management should be designed to contain the infestation and stop any further spread
- **Class C—**Widespread; management decisions for these species should be determined at the local level based on feasibility of control and level of infestation
- **Watch List—**Species of concern with the potential to become problematic; more data are needed to determine if these species should be listed

The BLM controls invasive plant species on the lands it administers through cooperative agreements with the San Juan County Soil and Water Conservation District. In addition to county agencies, the BLM works with other federal and state agencies, management groups, private landowners, and industry. The BLM also addresses invasive plant management by incorporating prevention and control measures in realty, wildlife, range, recreation, oil and gas, and other mineral-related actions. Generally speaking, county agencies and resource users proposing pesticide use have not been able to meet all the weed control needs in the planning area.

Table 2-19 lists the noxious weeds that have been inventoried in the planning area.

Figure 2-5 Weed Infestations

Mapped weed infestations between 2011-2013. Inventoried species include: Hardheads, Cheatgrass, Whitetop, Nodding Plumeless Thistle, White Knapweed, Spotted Knapweed, Canada Thistle, Russian Olive, Leafy Spurge, Saltlover, Black Henbane, Scotch Cottonthistle, Saltcedar, and others.



Source: BLM GIS 2014

- Weed infestation
- Decision Area
- Planning area
- National Park Service
- Field office boundary

Table 2-18 New Mexico Noxious Weeds

Common Name	Scientific Name	Class	Occurrence[1]
African rue	*Peganum harmala*	B	X
Alfombrilla	*Drymaria arenariodes*	A	
Black henbane	*Hyoscyamus niger*	B	X
Bull thistle	*Cirsium vulgare*	C	X
Camelthorn	*Alhagi pseudalhagi*	A	X
Canada thistle	*Cirsium arvense*	A	X
Cheatgrass	*Bromus tectorum*	C	X
Chicory	*Cichorium intybus*	B	X
Crimson fountaingrass	*Pennisetum setaceum*	WL	
Dalmatian toadflax	*Linaria dalmatica*	A	
Diffuse knapweed	*Centaurea diffusa*	A	X
Dyers weed	*Isatis tinctoria*	A	
Eurasian watermilfoil	*Myriophyllum spicatum*	A	
Giant cane	*Arundo donax*	WL	
Giant salvinia	*Salvinia molesta*	A	
Halogeton	*Halogeton glomeratus*	B	X
Hoary cress	*Cardaria* spp.	A	X
Hydrilla	*Hydrilla verticillata*	A	
Jointed goatgrass	*Aegilops cylindrica*	C	X
Leafy spurge	*Euphorbia esula*	A	X
Malta starthistle	*Centaurea melitensis*	B	
Meadow knapweed	*C. pratensis*	WL	
Musk thistle	*Carduus nutans*	B	X
Oxeye daisy	*Leucanthemum vulgare*	A	
Pampas grass	*Cortaderia sellonana*	WL	
Parrotfeather	*Myriophyllum aquaticum*	A	
Perennial pepperweed	*Lepidium latifolium*	B	X
Poison hemlock	*Conium maculatum*	B	
Purple loosestrife	*Lythrum salicaria*	A	
Purple starthistle	*Centaurea calcitrapa*	A	
Quackgrass	*Elytrigia repens*	WL	
Ravenna grass	*Saccharum ravennae*	A	
Russian knapweed	*Acroptilon repens*	B	X
Russian olive	*Elaeagnus angustifolia*	C	X
Sahara mustard	*Brassica tournefortii*	WL	
Salt cedar	*Tamarix* spp.	C	X
Scotch thistle	*Onopordum acanthium*	A	X
Siberian elm	*Ulmus pumila*	C	X
Spiny cocklebur	*Xanthium spinosum*	WL	
Spotted knapweed	*Centaurea biebersteinii*	A	X
Teasel	*Dipsacus fullonum*	B	
Tree of heaven	*Ailanthus altissima*	B	X
Wall rocket	*Diplotaxis tenuifolia*	WL	
Yellow starthistle	*Centaurea solstitialis*	A	X
Yellow toadflax	*Linaria vulgaris*	A	

Sources: BLM 2014f; NMDA 2009
[1]Includes species that occur or have occurred in the planning area.

Table 2-19 Noxious Weeds Inventoried in the Planning Area

Common Name	County	Acres
Black henbane	Rio Arriba	0.1
Canada thistle	Rio Arriba	41
	San Juan	15
Cheatgrass	Rio Arriba	0.2
	San Juan	1.9
Diffuse knapweed	San Juan	0.3
Halogeton	McKinley	18
	Rio Arriba	27
	San Juan	1,020
	Sandoval	0.4
Hoary cress	Rio Arriba	2.5
	San Juan	4.5
Musk thistle	Rio Arriba	252
	San Juan	555
Russian knapweed	Rio Arriba	110
	San Juan	463
	Sandoval	0.1
Russian olive	Rio Arriba	0.4
	San Juan	54
Salt cedar	Rio Arriba	28
	San Juan	14
Scotch thistle	Rio Arriba	24
	San Juan	63
Spotted knapweed	San Juan	1
Source: BLM GIS 2014		

Trends

Observations indicate some invasive plants are spreading or increasing in density in some parts of the planning area, especially in oil and gas fields, along roadways, and some watersheds. Typically, as ground disturbance increases in areas of known populations, the likelihood that invasive plants would move into this disturbance goes up. Focused efforts have limited the spread and reduced the size of invasive plant populations in areas. Examples of such efforts are as follows:

- Spot treating noxious weeds
- Applying herbicide before seeding (targeting cheatgrass)
- Mowing or Dixie harrowing and seeding
- Using prescribed fire
- Following up seeding with native species post-treatment

In addition, routine monitoring and treatments by oil and gas companies has slowed or removed populations of weeds, such as Russian knapweed, musk thistle, Canada thistle, and Scotch thistle.

Although federal, state, county, and private entities are working to control many invasive plant species, invasive control objectives are not being fully met. This is because of the scale of infestations and lack of resources.

Forecast

Invasive plant species are expected to continue to spread. The degree to which they spread is directly correlated to human activities and control efforts in the area. Some of these species are very invasive and readily transported to uninfested areas. Surface-disturbing activities and vehicular travel mainly contribute to weed proliferation, although natural elements, such as wind and wildlife, also contribute. Range

animals, such as livestock and wild and domesticated horses, also increase the opportunities for invasive plant species to spread and become established through transfer or if ranges are unsatisfactory managed through overgrazing.

Halogeton is currently expanding rapidly and is being detected in varying habitats. It has been documented in San Juan, Rio Arriba, McKinley, and Sandoval Counties (US Department of Agriculture Plants 2014). Cheatgrass is also expanding southward and into the new oil and gas development area.

The potential for invasive plant expansion is very high in areas of oil field development due to the level of ground disturbance. The potential for establishment is high in newly disturbed areas, especially near existing populations. Without some control, the infestation can move into undisturbed lands. This infestation would contribute to the loss of rangeland productivity due to competition for water and nutrients, increased soil erosion, reduced water quantity and quality, reduced structural and species diversity, and loss of wildlife habitat. Invasive plants would continue to serve as fuel for fires; with the right environmental conditions, such as early spring rains/late winter snow, they could promote larger and more frequent fires. Further, invasive plants would continue to invade post-fire, interfere with recreation, and be hazardous to human health and welfare. This would result in economic and public safety impacts and degradation of rangelands and riparian areas.

While it is difficult to predict future introductions of other listed invasive species, the most likely areas for introduction are those where new disturbances occur. Historic evidence would indicate that new invasive species would be introduced in the planning area and become established if not eradicated immediately.

Control of invasive plants would depend on the cost and feasibility of available treatment methods. Resource management strategies would help maintain current levels or reduce the expansion of these species. Examples of these strategies are minimizing surface disturbance and surface-disturbing activities, requiring prompt reclamation of these disturbed areas, reducing traffic through infested areas, and using fire suppression tactics.

Research continues in developing new herbicide formulations and the use and effectiveness of biological agents, including pathogens, as tools to control invasive plant species that could spread into and outcompete native plant communities.

Key Features

Any vegetative community is susceptible to invasive plants, but sites that are especially vulnerable are those where soils have been disturbed and the native plant community has been displaced or destroyed. Developed corridors, such as roads, oil and gas-related facilities, and pipelines, are vulnerable because vehicles can transport seeds from other locations. Riparian areas also provide the perfect growing medium, including nutrient-rich soils, ample moisture, and remote locations. Other areas that can easily be invaded are those where native or desirable vegetation has been compromised or destroyed through overgrazing, recreation, mining, mineral development, and wildland fires.

Key features for invasive species are areas of known infestations identified on BLM maps, as well as areas of potential infestations. These include oil and gas facilities and associated developments, riparian zones, and transportation and utility corridors.

In particular, the Hogback area, including the ACEC, and other shale or badland soils seem to be particularly vulnerable to invasion by halogeton. There is the potential for impacts on the federally threatened Mesa Verde cactus and its habitat in these areas. Further, past reclamation has used yellow sweet clover in seed mixes, and this species can become invasive. This is of concern in the Reese Canyon ACEC, where the species could impact the federally endangered Knowlton’s cactus.

Russian olive has increased in riparian zones where the tamarisk leaf beetle has killed tamarisk trees. Other noxious weeds have invaded these areas, such as Russian knapweed, whitetop, and musk thistle.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern noxious weeds and invasive species:

- BLM Assessment, Inventory, and Monitoring (AIM) Strategy
- BLM-M-4180, Rangeland Health Standards
- BLM-H-1740-2, Integrated Vegetation Management
- EO 13112, Invasive Species
- Federal Noxious Weed Act of 1974, as amended
- Final Vegetation Treatments using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental impact Statement (June 2007).
- Healthy Lands Initiative
- IM 2012-124, Land Health Standards
- New Mexico EO 00-02
- Noxious Weed Control Act of 2004
- Public Rangelands Improvement Act of 1978

Management goals, objectives, and actions for noxious weeds and invasive species are found in Appendix A. While the current goals and objectives are considered adequate, the BLM may develop stipulations, conditions of approval, and BMPs for new and existing leases. Along with continuing to map noxious weed populations as they are found, the BLM may consider methods for treating new infestations to prevent further expansion. It also may consider planning ground-disturbing activities for several years out, including weed treatment, immediate seeding and follow-up monitoring, and possible retreatment to ensure successful restoration. Long-term monitoring may be used to determine weed treatment success.

2.1.10 Fish and Wildlife

Profile

This section addresses fish, wildlife, and migratory bird species in the planning area, except for special status species, which are addressed in the next section.

Fisheries

The FFO administers a small amount of fishery habitat on generally isolated tracts of BLM-administered land, mostly along the San Juan River. Some of this land, on the San Juan upstream from Archuleta, New Mexico, provides good habitat for rainbow trout (*Oncorhynchus mykiss*). Farther downstream, the water temperature rises and the river bottom is covered with mostly mud, as opposed to the gravel/cobble substrate upstream. The general absence of a substrate suitable for the production of macroinvertebrates precludes the establishment of any significant trout populations in the area downstream from Archuleta. However, native species such as the flannelmouth (*Catostomus latipinnis*) and bluehead (*C. discobolus*) suckers are abundant in this area.

The State of New Mexico classifies the Navajo Reservoir as both a cold water and a warm water fishery (USBR 1999). The State of Colorado classified the reservoir as a Class 1, supporting warm aquatic life (USBR 1999). Kokanee salmon (*Oncorhynchus nerka*), rainbow trout, brown trout (*Salmo trutta*), and northern pike (*Esox lucius*) are the primary cold water game fish in the reservoir. Warm water game fish include smallmouth bass (*Micropterus dolomieui*), largemouth bass (*M. salmoides*), bluegill (*Lepomis macrochirus*), white and black crappie (*Pomoxis annularis* and *P. nigromaculatus*), channel catfish (*Ictalurus punctatus*), and black bullhead (*Ameriurus melas*). Roundtail chub (*Gila robusta*), bluehead sucker, and flannelmouth sucker are nongame species of concern (USBR 1999). Refer to **Section 2.1.11**, Special Status Species, regarding sensitive fish species.

Stocking efforts from the Colorado Parks and Wildlife and the NMDGF supports kokanee salmon populations in the reservoir. Rainbow trout levels are attributed to NMDGF stocking, while brown trout and northern pike populations are supported through migrations from adjacent tributaries.

The warm water fishery of the Navajo Reservoir is sustained through natural reproduction. Fish harvesting patterns fluctuate temporally due to accompanying species patterns. To protect specific spawning behaviors, restrictions are implemented for kokanee salmon in the fall and for trout and other fishes in the spring.

Wildlife

The BLM strives to maintain a biologically diverse complement of endemic wildlife species. As a consequence of this, a variety of monitoring and survey types are undertaken each year. Generally, the focus has been on those species with a special status designation—threatened, endangered, and sensitive—or game animals, such as mule deer, elk, antelope, and wild turkey. However, in recent years, nongame species (primarily birds) have received more attention. See the Migratory Bird section for more information about avian populations in the FFO.

Important wildlife species in the planning area are mule deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), and pronghorn antelope (*Antilocapra americana*). Mountain lion (*Felis concolor*) and black bear (*Ursus americanus*) also inhabit the planning area.

The piñon-juniper and Great Basin Desert Scrub plant communities in the northeastern part of the planning area provide habitat for herds of wintering and resident populations of mule deer and elk. Most of the National Forest land in the project boundary is managed as year-long big game and critical wintering habitat.

Bat surveys on FFO land have detected 14 species, the most common of which are the California myotis (*Myotis californicum*), longlegged myotis (*M. volans*), big brown bat (*Eptesicus fuscus*), and long-eared myotis (*M. evotis*; Gannon 1997, 1998). Bat surveys were also conducted in the Jicarilla Ranger District in 1998, with 251 individuals captured, representing nine species. The big brown bat, long-eared bat, pallid bat (*Antrozous pallidus*), and fringed myotis (*Myotis thysanodes*) were the most common species identified in these surveys (Gannon 1998).

Mule deer and elk are found most often on FFO north of US Highway 550; they are much less common south of the highway due to the lack of suitable habitat (BLM 1988). Deer and elk population density on the FFO varies by location and time of year because of migrations of mule deer and elk. Much of the deer habitat on FFO land is considered critical winter range; this is often protected in nine SDAs, established in the 2003 RMP for the protection of wildlife habitat.

Deer and elk populations are monitored in SDAs using helicopter surveys and camera trapping; habitat conditions are monitored by browse studies of vegetation (BLM 2003, Appendix C). Several small populations of pronghorn antelope reside in the area north and east of US Highway 550, near Angel Peak and Ensenada Mesa. There are also remnants of a once thriving population of antelope in the Twin Mounds area. The numbers of these animals have been declining over the past 10 years, likely attributable to habitat quality and predation. In addition, antelope are also often victims of poaching or target shooting (Hansen 2014). In recent years, Game Management Unit 2 in the FFO area has gone from no antelope hunting to a hunt that allows only six permits.

Mountain lion and black bear are also considered big game animals that occur in the planning area. The mountain lion population in the FFO area is stable to increasing, indicated by the NMDGF harvest quota for Game Management Units (GMUs) 2 and 7. Since the 2003 RMP, mountain lion harvest objectives in the FFO have increased in GMUs 2 and 7, from 11 lions to 42, no more than 13 of which may be female. Also since the 2003 RMP, black bear hunting, which was also closed in GMU 2, is now open, with an allowable harvest of 15 bears, no more than 6 of which may be female (Hansen 2014).

Migratory Birds

A variety of migratory songbird species use habitats in the planning area for breeding, nesting, and foraging. Migratory birds are protected under the Migratory Bird Treaty Act of 1918 (MBTA). Unless permitted by regulations, the MBTA makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell,

purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products. In addition to the MBTA, EO 13186 sets forth the responsibilities of federal agencies to further implement the provisions of the MBTA. It calls for integrating bird conservation principles and practices into agency activities and for ensuring that federal agencies evaluate the effects of actions and plans on migratory birds.

The New Mexico Partners in Flight (PIF) Bird Conservation Plan identifies a number of bird species in the Colorado Plateau physiographic region as priority species. A number of the highest priority species have been detected in the FFO, including sage sparrow, mountain bluebird, loggerhead shrike, and gray vireo. The PIF has identified the piñon jay and western bluebird as having a high percentage (over 10 percent) of their US population occurring in the FFO. PIF suggests that New Mexico land managers have a "high level of responsibility" to maintain or increase the current populations of these species. The FFO will consider PIF's recommendations in its future management actions. In this regard, the FFO has been working with the University of New Mexico during the past two years to locate and define colonial nest site characteristics. The purpose is to construct a habitat model that could be used as a planning tool to minimize the future impacts on Piñon jays. A third season of field work was conducted in 2014.

Waterfowl habitat in the planning area is limited to stock ponds, sumps, a few acres of wetlands in Carrizo and Pump Canyons, and scattered parcels of BLM-administered land along the San Juan, Animas, and La Plata Rivers. Potholes enclosed by a fence to exclude livestock have been constructed in the Largo Canyon drainage to provide waterfowl with nesting habitat. Species typically encountered on the water impoundments and rivers are mallards (*Anas platyrhynchos*), American widgeon (*A. americana*), green wing teal (*A. crecca*), common merganser (*Mergus merganser*), American coot (*Fulica americana*), common goldeneye (*Bucephala clangula*), and cinnamon teal (*Anas cyanoptera*). Canada geese (*Branta canadensis*) are abundant on the San Juan and Animas Rivers and the on lands next to them.

There are several species of upland game birds found on BLM-administered lands in the planning area. Gambel's quail (*Callipepla gambelii*) is common in many of the drainages that are well vegetated, while scaled quail (*C. squamata*) tends to be more prevalent on drier sage/grass sites in the southern portion of the FFO. Scattered tracts of public land next to private agricultural lands support small numbers of ring-necked pheasants (*Phasianus colchicus*). Merriam's wild turkey (*Meleagris gallopavo*) are found year-long in the ponderosa and piñon-juniper/Gambel's oak habitat types in the Laguna Seca Mesa, Middle Mesa, and Rattlesnake Canyon wildlife SDAs. Merriam's turkeys are also found seasonally in the Lone Tree Mountain area. Turkeys that are believed to be hybrids of the Rio Grande and possibly several species of domestic turkeys have also become common on scattered BLM tracts along the San Juan River (downstream from Blanco, New Mexico) and to a lesser extent along the Animas River.

The FFO has inventoried and monitored golden eagles (*Aquila chysaetos*), ferruginous hawks (*Buteo regalis*), and prairie falcons (*Falco mexicanus*) since 1981 (Hawks Aloft 1998, 1999a, 2006; Animas Biological Studies 2012). Abundance and nesting success has fluctuated, probably due to weather and cyclic prey abundance. An example of this is the drop in the desert cottontail population in 2009-2010. Populations of ferruginous hawks and golden eagles have remained relatively stable, but golden eagles continue to show limited nesting success (Animas Biological Studies 2012). Recorded during Mexican spotted owl surveys were the long-eared owl (*Asio otus*), northern saw-whet owl (*Aegolius acadicus*), flammulated owl (*Otus flammeolus*), and great-horned owl (*Bubo virginianus*; BLM 1995a).

Indicators

Fisheries

Impacts specific to aquatic species and their habitats are the following:

- Sediment and turbidity—Increased sediment loading in waters containing sediment-intolerant fish species, loss of recruitment, stress, habitat alteration, and habitat loss
- Habitat alteration—Changes in habitat that make it nonfunctional for select species or more conducive to competitive species
- Loss or reduction of streamside vegetation/cover—Increased temperatures, stress, reduced productivity, and impacts on food webs

- Water quality alteration—Actions that alter important water quality parameters, including pH, dissolved oxygen, temperature, hardness, alkalinity/salinity, and turbidity
- Water depletions—Loss of physical habitat, changes in water quality, sediment accumulation, habitat alteration, loss of habitat complexity, and food source reduction
- Potential direct mortalities to aquatic wildlife from motorized vehicles

Wildlife and Migratory Birds

Impacts on wildlife and migratory birds are the following:

- Disturbance or loss of plant communities, food supplies, cover, breeding sites, and other habitat components necessary for population maintenance and used by any species to a degree that would lead to substantial population declines
- Disturbance or loss of seasonally important habitat (e.g., critical for overwintering or successful breeding) to a degree that would lead to substantial population declines
- Interference with a species' movement pattern that decreases its ability to breed or overwinter successfully to a degree that would lead to substantial population declines

Indicators of impacts on fish, wildlife, and migratory birds are as follows:

- Amount and condition of available habitat
- Likelihood of mortality, injury, or direct disturbance
- Likelihood of habitat disturbance

Current Condition

Fisheries

The San Juan River, before the completion of the Navajo Dam in 1962, was warm with high sediment flows typical of rivers in the American Southwest (Wethington and Wilkinson 2005). The original hydrograph was characterized by large spring peak flows from snowmelt, low summer and winter base flows, and acute high-volume summer and fall flows from storms. These conditions supported native warm-water fish species. See **Table 2-20** for a list of native warm-water fish with the potential to inhabit the FFO; nonnative fish species are listed in **Table 2-21**.

Dam operations following the opening of the Navajo Dam substantially altered the hydrograph impacting native fish species downstream of the dam (Wethington and Wilkinson 2005). High sediment loads were captured in the newly formed reservoir behind the dam. Deep-water releases from the reservoir changed the once warm-water San Juan River to a cold-water river with cobble substrate below the dam. The physical alterations to the river provided the conditions to support a flourishing trout fishery for rainbow (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*) from 1962 until 1991 (Wethington and Wilkinson 2005).

Table 2-20 Native Fish Species of the San Juan River Basin

Species	Status
Bluehead sucker	Abundant; generally distributed and typically numerous
Bonytail	Endangered, United States
Colorado pikeminnow	Endangered, United States
Colorado River cutthroat trout	Protected, Colorado
Flannelmouth sucker	Abundant; generally distributed and typically numerous
Mottled sculpin	Rare; not generally distributed and never numerous
Razorback sucker	Endangered, United States
Roundtail chub	Protected, New Mexico
Speckled dace	Common; generally distributed but typically not numerous
Source: San Juan River Basin Recovery Implementation Program 2012	

Table 2-21 Nonnative Fish Species of the San Juan River Basin

Species	Status
Black crappie	Navajo Reservoir; may rarely enter riverine habitats
Black bullhead	Rare; not generally distributed and never numerous
Bluegill	Rare; not generally distributed and never numerous
Brown trout	Common; generally distributed and typically not numerous
Channel catfish	Abundant; generally distributed and typically numerous
Common carp	Abundant; generally distributed and typically numerous
Snake River cutthroat trout	Common; generally distributed and typically not numerous
Fathead minnow	Common; generally distributed and typically not numerous
Golden shiner	Navajo Reservoir; may rarely enter riverine habitats
Green sunfish	Rare; not generally distributed and never numerous
Kokanee salmon	Navajo Reservoir; may rarely enter riverine habitats
Largemouth bass	Rare; not generally distributed and never numerous
Mosquitofish	Common; generally distributed and typically not numerous
Northern pike	Lake Powell and Navajo Reservoir; may rarely enter riverine habitats
Plains killifish	Rare; not generally distributed and never numerous
Rainbow trout	Common; generally distributed and typically not numerous
Red shiner	Common; generally distributed and typically not numerous
Sand shiner	Rare not generally distributed and never numerous
Smallmouth bass	Rare; not generally distributed and never numerous
Striped bass	Lake Powell; may rarely enter riverine habitats
Threadfin shad	Lake Powell; may rarely enter riverine habitats
White crappie	Lake Powell and Navajo Reservoir; may rarely enter riverine habitats
White sucker	Rare; not generally distributed and never numerous
Source: San Juan River Basin Recovery Implementation Program 2012	

The San Juan River Basin Recovery Implementation Program was established in 1991 to protect and recover Colorado pikeminnow and razorback sucker in the San Juan River Basin, while water development proceeds. This is in compliance with all applicable federal and state laws, including fulfillment of federal trust responsibilities to the Southern Ute, Ute Mountain Ute, Jicarilla, and Navajo Indian tribes. The actions taken under this program to recover Colorado pikeminnow and razorback sucker also are anticipated to benefit other native fishes in the basin and to prevent future listings under the ESA (San Juan River Basin Recovery Implementation Program 2002).

In 1992, the San Juan River base flows were reduced. This was done to mimic the original hydrograph for meeting the habitat requirements of federally protected native fish species downstream (Wethington and Wilkinson 2005). For further discussion regarding threatened, endangered, and special status fish species, refer to **Section 2.1.11**, Special Status Species. From 1992 until recently, the base flows of the San Juan River averaged around 500 cubic feet per second (cfs); habitat studies conducted by the USBR showed that trout habitat downstream of the Navajo Dam was maximized when discharge ranged from 1,000 to 2,000 cfs (Wethington and Wilkinson 2005). Since September 24, 2013, the USBR has been releasing 250 cfs from the Navajo Reservoir to meet the San Juan River Basin Recovery Implementation Program's recommended target base flow of between 500 and 1,000 cfs (USBR 2014). The NMDGF (2005) estimated that a reduction in base flows in the San Juan River to 250 cfs would reduce trout habitat by 34 percent and that it would reduce available aquatic insects as well.

Macroinvertebrate surveys are conducted annually in the cold-water fishery section of the San Juan River to assess the abundance of species suitable for trout food and the overall water quality and health of the aquatic ecosystem. To date these surveys have revealed a healthy insect population, with a good representation of species. Mayflies (*Ephemeroptera* sp.), caddisflies (*Trichoptera* sp.), stoneflies (*Plecoptera* sp.), and black flies (*Simulidae* sp.) are among the more prominent species found on the BLM stretch of the river near Simon Canyon. Electrofishing surveys conducted by the NMDGF found about 40 percent of the trout in the Simon Canyon area to be rainbow trout and 60 percent to be brown trout. Fish

densities in this stretch of the river range from about 5,500 to 6,500 per mile (Wethington and Wilkinson 2014).

Wildlife

The primary wildlife species in the FFO are mule deer, elk, and pronghorn antelope. Mountain lion (*Felis concolor*) and black bear (*Ursus americanus*) also inhabit the planning area. The BLM has established SDAs for protecting wildlife habitat in the planning area. The 2003 RMP designated nine wildlife SDAs; the BLM designated two additional SDAs for recreation and wildlife. Management prescriptions include seasonal restrictions for drilling, seismic studies, and well maintenance activities in the winter to coincide with critical activity of wildlife.

The objective of designating SDAs in the FFO was to protect, maintain, and enhance the special resource values on BLM-administered lands. Some uses may be restricted in areas that have special resource values in order to protect the resources. These areas are BLM-administered lands, such as areas of critical environmental concern (ACECs), wilderness areas (WAs), wilderness study areas (WSAs), special recreation management areas (SRMAs), and research natural areas (RNAs) and other designations, such as wildlife areas and riparian areas.

The Rattlesnake SDA in the north provides habitat for big game and also hosts Piñon jay nesting colonies. It contains mixed Piñon-juniper woodlands; sagebrush in this area has been treated by prescribed fire and mechanical means to reduce Piñon-juniper and allow for more forage for livestock and wildlife. Water features (also called guzzlers) have also been installed as a water source for wildlife. Where cattle are present, these features are fenced to prevent cattle intrusion.

The Crow Mesa in the south is also an SDA, but it has been leased. Wells and associated development dot the lowlands and mesa. The remaining wildlife habitat hosts big game and migratory birds, including Piñon jay nesting colonies. The remaining wildlife habitat in this SDA is at risk from future planned well development on existing leases.

Deer populations in the planning area have been stable to decreasing, while elk populations have shown increases. The Rosa Mesa Wildlife Area SDA and Thomas Canyon Wildlife SDA in the FFO serve as critical winter habitat for deer. The BLM is obligated to maintain the connectivity and habitat quality of the wildlife migration corridor. A well-established deer migration corridor extends from Rosa Mesa and Thomas Canyon to summer range habitat in Colorado, providing an important route for deer in the FFO. Other resident deer populations in more southerly drier parts of the planning area have shown declines, but the Rosa Mesa population appears stable, despite severe browse use (Hansen 2014).

Carracas Mesa Herd Area for wild horses overlaps part of the Rosa Mesa SDA. The appropriate management level for the wild horses on the herd area is 23; however, the population is currently in excess of 300 horses between the BLM lands and the adjoining Forest Service Jicarillla Wild Horse Territory on the Carson National Forest Jicarilla Ranger District. The estimated horse population is derived from a 2011 direct count survey, estimated foal recruitment, and horse removals. The wild horses use the same forage areas as wildlife, especially in the winter on BLM-administered land. Their numbers in excess of allocated forage are likely contributors to documented severe browse use in the area.

For several years, the BLM has been working with Dr. Hall Sawyer from WEST, Inc., to track radio-collared mule deer that migrate between the Rosa Mesa Wildlife Area and their summer range in Colorado. The initial focus of this study was to observe deer populations wintering in the Rosa Mesa Wildlife Area and their response to oil and gas development during season timing limitation stipulations.

Due to a drop in oil prices, the operator (WPX Energy) decided against participating in winter drilling; nevertheless, the marked deer still generated valuable information on their habitat preferences, including use patterns relative to roads and wells, preferred habitat types, percent slope, aspect, elevation, and migration routes.

Monthly status updates from Dr. Sawyer illustrate the active use of the migration route by mule deer between Rosa Mesa and the Colorado summer range. Updates also show the importance of not increasing habitat fragmentation throughout the landscape. Currently, approximately 290,000 global positioning system (GPS) locations of mule deer in the Rosa Mesa study area and their summer range have been recorded. Analysis of these data will yield additional insight into the deer's response to varying levels of fragmentation, in conjunction with other variables, such as vegetative cover, topography, time of day, and other factors.

Dr. Sawyer has shown that semipermeable anthropogenic perturbations may have negative impacts on migratory deer by inducing avoidance behavior (Sawyer et al. 2013). Deer were found to avoid areas or to increase their rate of travel (thereby expending more energy) past a certain threshold of fragmentation or anthropogenic activity. These findings could apply both to Rosa Mesa and other parts of the FFO planning area.

Migratory Birds

In 1999, the BLM initiated a monitoring program to assess the status of avian species, using the key habitat types common to the planning area. This monitoring consisted of point count surveys in the following habitat types during the spring breeding period and again during the winter:

- Piñon-juniper
- Ponderosa pine/Piñon pine/Gambel's oak
- Riparian (cottonwood, willow, saltcedar)
- Wyoming big sagebrush/grass (untreated)
- Wyoming big sagebrush/grass (treated)

The results of these surveys are generally consistent with the trends reported in the breeding bird surveys conducted by the USFWS and with the information presented in the Partners In Flight Draft Landbird Conservation Plan for the State of New Mexico (Rich et al. 2004).

From 2004 through 2006, the BLM investigated nesting season migratory birds in sagebrush areas that had been treated with the herbicide tebuthiuron and control areas in San Juan County. The purpose was to investigate whether declines in species diversity were associated with an application of herbicide to sagebrush (Schmitt 2009). Results indicated declines in sagebrush-obligate bird species associated with herbicide treatment.

Twenty-five bird species were detected during the surveys, seven of which—black-chinned hummingbird (*Archilochus alexandri*), sage sparrow (*Amphispiza belli*), Brewer's sparrow (*Pooecetes gramineus*), mountain bluebird (*Silia currucoides*), Piñon jay (*Corvus corax*), loggerhead shrike (*Lanius ludovicianus*), and sage thrasher (*Oreoscoptes montanus*—are PIF priority species (Schmitt 2009).

The BLM has continued monitoring avian species, including Piñon-juniper obligates (Johnson et al. 2013; Francis et al. 2011). The data collected enable the BLM to more effectively assess avian habitat needs and meet its obligations under the MBTA, the USFWS MOU (BLM 2010a), and the FFO Interim Management Policy (BLM 2010b).

The New Mexico PIF Priority Species List and the USFWS's Birds of Conservation Concern (BCC) List for Region 16 (Colorado Plateau) were used to identify potential priority species that could use habitats in the decision area. **Table 2-22** lists the New Mexico PIF Priority Species and the USFWS BCC species that are a concern in the FFO and that are likely to inhabit the decision area.

Table 2-22 New Mexico PIF Priority Species and USFWS BCC in the FFO

Species	New Mexico PIF Priority Species	USFWS BCC, Region 16
American bittern	X	X
Baird's sparrow	X	
Bald eagle	X	X

Table 2-22 New Mexico PIF Priority Species and USFWS BCC in the FFO

Species	New Mexico PIF Priority Species	USFWS BCC, Region 16
Band-tailed pigeon	X	
Bank swallow	X	
Bell's vireo	X	
Belted kingfisher	X	
Bendire's thrasher	X	X
Black rosy-finch		X
Black swift	X	
Black-chinned hummingbird	X	
Black-throated gray warbler	X	
Black-throated sparrow	X	
Bobolink	X	
Brewer's sparrow		X
Broad-tailed hummingbird	X	
Brown-capped rosy-finch	X	X
Bullock's oriole	X	
Burrowing owl		X
Cassin's finch	X	X
Chestnut-collared longspur (nb)		X
Clark's grebe	X	
Common black-hawk	X	
Cordilleran flycatcher	X	
Dickcissel	X	
Eared grebe	X	
Ferruginous hawk	X	X
Flammulated owl	X	X
Golden eagle	X	X
Grace's warbler	X	X
Grasshopper sparrow	X	X
Gray vireo	X	X
Hooded oriole	X	
Juniper titmouse	X	X
Lazuli bunting	X	
Least bittern	X	
Least tern	X	
Lewis's woodpecker	X	X
Loggerhead shrike	X	
Long-billed curlew	X	X
Lucy's warbler	X	
McCown's Longspur	X	
Mississippi kite	X	
Mountain bluebird	X	
Mountain plover	X	X
Northern harrier	X	
Northern pygmy-owl	X	
Olive-sided flycatcher	X	
Painted bunting	X	
Peregrine falcon	X	X
Piñon jay	X	X
Plumbeous vireo	X	
Prairie falcon	X	X

Table 2-22 New Mexico PIF Priority Species and USFWS BCC in the FFO

Species	New Mexico PIF Priority Species	USFWS BCC, Region 16
Red-headed woodpecker	X	
Red-naped sapsucker	X	
Sage sparrow	X	
Sage thrasher	X	
Scaled quail	X	
Snowy egret	X	
Snowy plover	X	X
Sprague's pipit	X	
Summer tanager	X	
Swainson's hawk	X	
Vesper sparrow	X	
Virginia's warbler	X	
Warbling vireo	X	
Western bluebird	X	
Western grebe	X	
Western scrub-jay	X	
Whip-poor-will	X	
White-throated swift	X	
Williamson's sapsucker	X	
Willow flycatcher	X	X
Wilson's warbler	X	
Yellow-billed cuckoo	X	X
Sources: USFWS 2008; New Mexico Partners in Flight 2007		

Trends

Fisheries

The BLM manages some key portions of the cold-water fishery on the San Juan River below Navajo Reservoir; however, overall, relatively little of the fisheries habitat on the San Juan and Animas Rivers is under BLM management.

Actions taken under the San Juan River Basin Recovery Implementation Program to recover Colorado pikeminnow and razorback sucker also are anticipated to benefit other native fishes in the basin and prevent future listings under the ESA (San Juan River Basin Recovery Implementation Program 2002). Stocking efforts support kokanee salmon and rainbow trout populations in the reservoir, while brown trout and northern pike populations are supported through migrations from adjacent tributaries. Trends are stable for the warm-water fishery on the Navajo Reservoir.

Wildlife

In general, elk and pronghorn antelope populations are doing well and are increasing in numbers throughout the FFO. Mule deer have been stable in various regions in the planning area. In Game Management Unit 2A, surveys of deer populations between 2000 and 2010 have estimated a fawn-to-doe ratio of 61:100. In the Rosa Mesa Wildlife Area, where there is active oil and gas development, the fawn-to-doe ratio is estimated at 59.1:100. This is a fairly high number, despite human activity in that area. However, in other areas in the FFO, mule deer populations have been declining. Other wildlife, including black bear, mountain lion, and turkey, are doing well and are increasing in numbers (Hansen 2014). Current and proposed oil and gas development continues to increase habitat loss and fragmentation for wildlife species.

Migratory Birds

Across North America and in the Western Hemisphere in general, bird populations have declined, particularly neotropical migratory birds (Parrish et al. 2002). These declines are largely attributed to the loss of habitat due to fragmentation and other landscape modifications, including urbanization. Most human-induced changes in bird populations and distributions have occurred in the recent past. Other primary factors that are associated with migratory bird species declines are natural disasters, loss or alteration of habitat in nonbreeding areas and along migratory routes, and brood parasitism (Parrish et al. 2002).

The FFO has been collecting long-term population data for sagebrush obligate bird species. Since 2003, sage sparrow populations in the FFO have been stable to slightly increasing, Brewer's sparrow numbers have been increasing, and sage thrasher populations have been declining (BLM 2014c).

A number of programs have been initiated to reverse the decline in bird populations, as follows:

- North American Waterfowl Management Plan
- International PIF program
- North American Bird Conservation Initiative
- EO 13186, signed in 2001, which requires all federal agencies that might have a measurable negative effect on migratory birds to develop an MOU with the USFWS to promote the recommendations of North American Waterfowl Management Plan

Forecast

Fisheries

Fishery populations are anticipated to remain relatively steady in the foreseeable future. However, as the human population grows in the San Juan Basin, there will undoubtedly be more demand for trout fishing opportunities.

Wildlife

The forecast for wildlife populations (big game and small mammals) in the FFO may hinge on the level of habitat fragmentation that the area incurs in the coming years. This factor, along with climate change, may cause widespread changes to the landscape. These changes could disrupt travel corridors and secure areas for fawning and calving, reduce the amount of forage, and in general cause animals to avoid areas, thereby shrinking the amount of effective habitat available to them. The BLM's FFO is attempting to define maximum threshold levels of effective habitat loss to assist in developing mitigation measures.

Migratory Birds

Migratory bird populations will continue to be impacted by habitat and fragmentation and climate change, reducing effective habitat available for nesting, migratory stopovers, and winter habitat for many bird species.

Key Features

Fisheries

The Farmington BLM fisheries program consists of managing the fisheries habitat on isolated tracts of BLM-administered lands next to the San Juan, Los Piños, and Animas Rivers. Opportunities for habitat management are limited primarily to those portions of the San Juan River, downstream from Navajo Reservoir for about six miles. As described above in the Current Conditions section, this segment of the San Juan River is a cold-water fishery. It is so designated by virtue of its proximity to the Navajo Reservoir and the hypolimnetic effect that it has on the deep water being discharged. Good trout habitat is provided by the cold water (39-46 ºF), coupled with periodic high flows from the reservoir that scour silt from adjacent drainages, such as Simon Canyon.

Beginning in 2005 the Farmington BLM worked with the NMDGF to improve the fisheries habitat in the cold-water section of the San Juan River. One of the limiting factors was insufficient structural or hiding cover for the trout in the middle of the river, especially during low-flow periods. To improve this situation a series of boulder clusters, cross vanes, J-hooks, and woody debris jams were emplaced over several years and holes were deepened. Thus far, three different habitat improvement projects have been completed. Monitoring studies conducted since the completion of the habitat improvements have found an increase in angler use of about 15 to 20 percent, with a corresponding 20 percent increase in fish numbers per mile. In addition, the structures have increased sediment transport, thereby maintaining a cleaner gravel/cobble substrate, which is beneficial to the production of insects.

Wildlife

The piñon-juniper and Great Basin desert scrub communities in the northeastern part of the planning area provide habitat for a wide array of wildlife species. Examples are large mammals, such as mule deer, elk, black bear, and mountain lion, and small mammals, such as coyote, bobcat, and gray fox. The population density of any of these species varies with the quality of the habitat; that is, the juxtaposition of food, water, and cover.

Pronghorn antelope are also endemic to the area, with two principal populations; one on Ensenada Mesa, which appears to be increasing slightly, and the other near Twin Mounds, which is struggling to hold its own, due primarily to poaching. A third population near Angel Peak has declined dramatically, due in large part to poaching. Both mountain lions and bears appear to be doing well in the FFO. The current annual harvest goals established by the NMDGF for the area encompassed by the FFO are 20 bears and 42 mountain lions.

Habitat Management Plans were prepared and implemented for the Crow Mesa and Rattlesnake Canyon Wildlife SDAs. The objectives of these plans, which focused primarily on increasing deer, elk, black bear, and Merriam turkey numbers, have been largely achieved. Close cooperation of private sector sportsmen's' organizations with the NMDGF and the use of Sikes Act funds has greatly facilitated these accomplishments.

Migratory Birds

The FFO initiated a bird monitoring program in 1999 to assess the status of birds using the key habitat types common to the FFO. This monitoring consists of conducting point count surveys during the spring breeding period and during winter in the following habitat types: piñon-juniper, ponderosa pine/piñon pine/Gambel's oak, riparian (cottonwood, willow, and salt cedar), Wyoming big sagebrush/grass (untreated), and Wyoming big sagebrush/grass (treated).

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern fish and wildlife:

- Bald and Golden Eagle Protection Act of 1940, as amended
- BLM-M-6840, Special Status Species Management
- Memorandum of Understanding to Promote the Conservation of Migratory Birds and FFO Interim Management Policy
- Migratory Bird Treaty Act of 1918, as amended
- New Mexico Wildlife Conservation Act
- Endangered Species Act of 1973, as amended
- EO 13168, Responsibilities of Federal Agencies to Protect Migratory Birds

The 2003 RMP for the planning area contained the following objective for wildlife resources: ensure optimum populations and a natural abundance and diversity of fish and wildlife values by restoring, maintaining, and enhancing habitat conditions for consumptive and non-consumptive uses. See the **Appendix**, Current Management, for details on wildlife objectives and management actions.

Wildlife

While the current management is considered adequate, the concerns about priority species and habitats could lead to additional actions as part of this RMPA. Under current management, wildlife habitat is managed through an SDA delineation. However these areas could be revised as part of the amendment to allow for more flexible wildlife habitat management beyond the boundaries of the SDAs through descriptions of priority species and vegetation communities.

The FFO could identify where priority species and habitats occur that require special management and could describe and identify the desired future conditions of sensitive wildlife areas. Habitat loss and fragmentation is of particular concern in the FFO due to current and proposed oil and gas development. The BLM may consider actions such as new stipulations and conditions of approval to address fragmentation resulting from increased oil and gas development.

Critical wildlife areas could be protected and enhanced in part through wildlife management prescriptions, habitat improvement projects, and mitigation measures on key wildlife lands where oil and gas reserves are being developed. New management opportunities could build on this framework by defining a quantitative process for determining when and where such mitigation measures would be required. Additionally, future management of key wildlife habitat could focus on habitat or vegetation types on the landscape or watershed scale to better meet biological goals and objectives.

Should the BLM include objectives that would set specific thresholds for effective habitat loss, then management prescriptions would also be considered. Examples of these are closing roads, implementing a liquid gathering system to reduce truck traffic, restricting seasonal drilling, and implementing additional habitat improvements.

Migratory Birds

In the 2003 RMP, specific management objectives or direction for migratory birds were not provided. Since the publication of the RMP, BLM has signed an MOU with USFWS (2010) to promote the conservation of migratory birds. The FFO needs to consider the inclusion of management objectives and direction to conserve migratory birds. Potential impacts from oil and gas development need to be considered in areas of continuous habitat. This is to develop a policy to better protect nesting birds, particularly obligate species that require specific habitat requirements.

The Instruction Memorandum No. NM-F00-2010-001, sent to the FFO on February 22, 2010, provided interim guidance for the BLM to meet its responsibilities under the MBTA, the Washington Office Interim Management Guidance (Instruction Memorandum No. 2008-050), and EO 13186. Under the MBTA and EO 13186, federal agencies are required to consider impacts on migratory birds from management activities. In keeping with this mandate, the BLM's FFO should consult bird conservation plans to identify species at greater conservation risk based on threats to the species or their habitats. The FFO should consider the goals and objectives established in these bird conservation plans in its NEPA analysis of actions. Specifically, it should consider the plans that could negatively or positively affect migratory bird species of concern. These plans are as follows:

- USFWS's BCC list
- New Mexico PIF New Mexico Bird Conservation Plan
- Comprehensive Wildlife Conservation Strategy for New Mexico
- Gray Vireo Recovery Plan
- The North American Waterbird Conservation Plan
- Recovery plans and conservation plans/strategies prepared for federally listed candidate species

An MOU between the BLM and USFWS (BLM MOU WO-230-2010-04) provides direction for managing migratory birds to promote their conservation. At the project level, the MOU direction includes evaluating the effects of the BLM's actions on migratory birds during the NEPA process; identifying potential measurable negative effects on migratory bird populations; and focusing first on species of concern, priority habitats, and key risk factors. In such situations, the BLM would implement approaches to lessen such take.

Identifying species of concern, priority habitats, and key risk factors includes the following:

- Identifying species on the USFWS's BCC list that are most likely to be present in the project area
- Evaluating and considering management objectives and recommendations for migratory birds resulting from comprehensive planning efforts, such as the New Mexico PIF Conservation Plan

The New Mexico PIF developed this conservation plan in the mid-1990s, with input from experts and interested individuals throughout the state. Meetings were held to solicit core information on the status and trends of New Mexico's birds. A technical committee in the PIF took on the task of assessing species and designating priority species for New Mexico's birds, according to PIF guidelines. In 2003, the New Mexico Bird Conservation Plan was updated with a new species assessment, a list of priority species, more substantive species accounts, habitat prioritization, and a regional approach to conservation planning.

Management opportunities could include new objectives and actions specific to the protection of migratory birds in accordance with the updated policy measures described above. Specific actions might emphasize landscape-level protection of habitat and establishment of disturbance thresholds, whereas the BLM could implement closures, restrictions, or mitigation prescriptions if thresholds were met or exceeded. Additional actions could include establishing disturbance buffers around nesting colonies and other sensitive wildlife habitat, as well as noise disturbance thresholds to limit impacts on nesting species.

2.1.11 Special Status Species

Profile

Special status species include federally listed and proposed species, federal candidate species, and state listed species. Other sensitive species include BLM sensitive species and special management species.

The BLM focuses on protecting and enhancing the habitats of threatened, endangered, and other special status species to ensure their continued existence. BLM special status species are as follows:

- Species listed or proposed for listing under the ESA—The ESA provides a program for the conservation of threatened and endangered plants and animals and their habitats. The lead federal agencies for implementing the ESA are the USFWS and the NOAA Fisheries Service. The USFWS maintains a worldwide list of endangered species, which includes birds, insects, fish, reptiles, mammals, crustaceans, flowers, grasses, and trees.
- Species designated as sensitive by the BLM State Director—These require special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. All federal candidate species, proposed species, and species delisted for five years or less are considered BLM sensitive species.

Indicators

A species is listed under the ESA when it is determined to be endangered or threatened because of any of the following factors:

- The present or threatened destruction, modification, or curtailment of its habitat or range
- Overuse for commercial, recreational, scientific, or educational purposes
- Disease or predation
- Inadequacy of existing regulatory mechanisms
- Other natural or man-made factors affecting its survival

Some important habitat features are vertical and horizontal structure, moisture, sunlight, and temperature. If only one of these conditions is inappropriate, a species may not be able to survive. Some species depend on more than one habitat type and need a variety of habitats near each other to survive. Note that habitat does not have to be completely eliminated to lose its usefulness to an organism.

Current Conditions

Critical habitat for the Mexican spotted owl occurs in the planning area. Critical habitat for the Colorado pikeminnow occurs in part of the San Juan River and in the 100- year floodplain, from the State Highway 371 Bridge in Farmington to Lake Powell, downstream of the planning area. Razorback sucker critical habitat on the San Juan River occurs from the Hogback Diversion, about 20 river miles downstream of Farmington, to Lake Powell. Listed fish species have the potential to occur in the San Juan River in the area of FFO river tracts. Rio Grande silvery minnow critical habitat begins below the Cochiti Dam, approximately 40 miles southeast of the FFO.

Listed plant species occur on FFO land, and transplanted Knowlton's cactus (*Pediocactus knowltonii*) occurs on USBR lands. The Mexican spotted owl has the potential to occur in the planning area.

Federally Listed and Proposed Species

According to the ESA, an endangered species is any species that is in danger of extinction throughout all or a significant portion of its range; a threatened species is any that is likely to become endangered in the foreseeable future throughout all or a significant portion of its range. Species proposed for listing as threatened or endangered are managed with the same level of protection as species that are already listed. Candidate species do not have ESA protection and are managed as BLM sensitive species; the BLM policy for candidate species is contained in BLM Manual 6840. The BLM carries out management consistent with the principles of multiple-use for the conservation of candidate species and their habitat.

The FFO manages habitats for species listed by the USFWS as endangered, threatened, or proposed under the authority of the ESA. Currently, there are eight endangered, three threatened, and four proposed species that occur, or have the potential to occur, on lands managed by FFO (**Table 2-23**). In addition, the USFWS has designated portions of FFO lands as critical habitat for the Mexican spotted owl, the Rio Grande silvery minnow, the razorback sucker, and the Colorado pikeminnow.

Table 2-23 Federally Listed, Proposed, and Candidate Species and Critical Habitat that Occur or Potentially Occur in McKinley, Rio Arriba, San Juan, and Sandoval Counties

Species	Status[1]	Comments
Knowlton's cactus *Pediocactus knowltonii*	E	Endemic to New Mexico on rolling gravel hills in the Piñon-juniper/sagebrush plant community. Entire wild population is fenced and protected from disturbances.
Mancos milkvetch *Astragalus humillimus*	E	Found in Piñon-juniper woodlands and desert shrublands on sandstone rimrock ledges and mesa tops in San Juan County and adjacent Colorado. All populations in the planning area are protected in the Hogback ACEC.
Mesa Verde cactus *Sclerocactus mesae-verdae*	T	Found in soils derived from Mancos, Fruitland, and Lewis shale. Largest population on Ute and Navajo tribal lands. All populations in the planning area are protected in the Hogback ACEC.
Zuni fleabane *Erigeron rhizomatus*	T	Found in Piñon-juniper woodlands on steep easily eroded sandstone slopes and clay banks, usually in close association with the Chinle and Baca Formations, at 7,200-7,900 feet.
Colorado pikeminnow *Ptychocheilus lucius*	E	Inhabits sections of the San Juan River and other rivers in the Upper Colorado River Basin. No wild Colorado pikeminnows have been detected in the planning area.
Colorado pikeminnow designated critical habitat	N/A	Colorado pikeminnow designated critical habitat consists of portions of the San Juan River, beginning at the New Mexico Highway 371 bridge in Farmington and continuing downstream to Lake Powell.
Razorback sucker *Xyrauchen texanus*	E	Inhabits off-channel backwaters and shallow flooded areas of the San Juan River and other rivers in the Upper Colorado River Basin. No razorback suckers have been detected in the planning area.

Table 2-23 Federally Listed, Proposed, and Candidate Species and Critical Habitat that Occur or Potentially Occur in McKinley, Rio Arriba, San Juan, and Sandoval Counties

Species	Status[1]	Comments
Razorback sucker critical habitat	N/A	Critical habitat for this species in New Mexico is in 39 miles of the lower San Juan River, where the wild population has been extirpated and is being reestablished through stocking.
Rio Grande cutthroat trout *Oncorhynchus clarkia virginalis*	C	Subspecies of cutthroat trout found in small headwater streams and pools of the Pecos River and Rio Grande drainages in Rio Arriba and Sandoval Counties; spawns in clean gravel.
Rio Grande silvery minnow *Hybognathus amarus*	E	Found in pools and backwaters of creeks and rivers in the Rio Grande and Pecos River drainages in Rio Arriba and Sandoval Counties. Extirpated from most historic habitat.
Rio Grande silvery minnow designated critical habitat		Critical habitat for the silvery minnow extends from Cochiti Dam on the Rio Grande in Sandoval County downstream 157 miles to the middle Rio Grande.
Zuni bluehead sucker *Catostomus discobolus yarrow*	PE	Sedentary sucker found in shady pools in low velocity runs of rivers and creeks of the Rio Nutria drainage of the Little Colorado River in McKinley County.
Jemez Mountains salamander *Plethodon neomexicanus*	E	Restricted to the Jemez Mountains in Sandoval and Rio Arriba Counties, it is found in mixed coniferous forests with rotted logs and rocks for cover.
Least tern, interior population *Sterna antillarum athalassos*	E	Breeds locally along the Colorado River and other southern river systems; not known to occur in any of the planning area counties.
Mexican spotted owl *Strix occidentalis lucida*	T	Found in the southwestern United States, principally in New Mexico and Arizona. After extensive surveys, no nesting has been confirmed in the planning area.
Mexican spotted owl designated critical habitat	N/A	Critical habitat designated in 2001; all designated critical habitat in the planning area is within the boundaries of the Mexican spotted owl ACEC.
Sprague's pipit *Anthus spragueii*	C	Grassland ground-nesting bird found in pastures and weedy fields, including agricultural fields. Rare visitor to the planning area during migration; winters in southern United States, including southern New Mexico.
Yellow-billed cuckoo *Coccyzus americanus*	PT	Western subspecies breeds in Arizona, California, and New Mexico. Nests in cottonwood/willow riparian habitat along rivers; rare in the San Juan River valley. Potential habitat in the planning area was surveyed for this species in 2002.
Southwestern willow flycatcher *Empidonax trailii extimus*	E	No breeding southwestern willow flycatchers have ever been detected in the planning area. All designated potential habitat is protected and managed under the 1998 Southwestern Willow Flycatcher Habitat Management Plan.
Southwestern willow flycatcher designated critical habitat	N/A	Critical habitat for this species is in riparian corridors along the San Juan River in San Juan County (outside of the analysis area).
Canada lynx *Lynx canadensis*	PT	Medium-sized cat found in boreal and montane forests; feeds primarily on snowshoe hare and other small mammals and birds. Distributed through western and northern US into the southern Rocky Mountains; it has been observed in the planning area along the San Juan River corridor.
New Mexico meadow jumping mouse *Zapus hudsonius luteus*	PE	Found in wet meadows and willow zones along streams in the Jemez mountains, in the Rio Grande watershed in Rio Arriba and Sandoval Counties.

Sources: BLM 2003a; NatureServe 2014
[1]E = endangered, T = threatened, PE = proposed endangered, PT = proposed threatened, C = candidate species

Other Special Status Species

Special status species are those that are not yet rare enough to be listed under the ESA but still warrant some protection, or for which insufficient data have been collected for the USFWS to make a determination for listing. Other special status species could include USFWS candidate species, New Mexico state-listed species, BLM sensitive species, species that are protected by other laws (e.g., bald/golden eagles), and other species that may warrant protection (e.g., rare plants, important pollinators, and species that may be important as hosts or prey for other species, such as prairie dogs). Federal land management agencies are mandated to manage special status species so that they should not need to be listed under the ESA in the future.

The BLM must ensure that actions authorized, funded, or carried out do not contribute to the need to list any of these species as threatened or endangered. It also must ensure that its actions would not adversely affect the likelihood of recovery of any threatened or endangered species. Protection and management of all special status species would continue to be a high priority and coordinated with other programs and activities as needed to meet management objectives.

Lists of special status species are maintained by the USFWS, the BLM, the Forest Service, and the State of New Mexico. There are 23 special status species that could occur in the planning area (**Table 2-24**). The FFO has coordinated with the other agencies to determine which of these species warrant special management or field studies to collect data.

Table 2-24 BLM Sensitive and FFO Special Management Status Species that Occur in the Planning Area

Species	Status[1]		Comments
	BLM	State	
Plants			
Acoma fleabane *Erigeron acomanus*	Sensitive	SOC	Grows in sandy soil at base of Entrada sandstone cliffs. Endemic to McKinley County, on and in the planning area.
Aztec gilia *Aliciella formosa*	Sensitive, SMS	E	Grows in salt desert shrublands on soil from Nacimiento Formation. Known from San Juan County in New Mexico in the planning area in the tri-cities area.
Brack's hardwall cactus *Sclerocactus cloveriae* var. *brackii*	Sensitive, SMS	E	Occurs on sandy-clay hills of the Nacimiento Formation in desert scrub habitat.
Grama grass cactus *S. papyracanthus*	Sensitive		Found in north-central New Mexico, southern juniper-piñon woodlands, and Chihuahuan Desert grassland, usually on sandy soils with a calcareous or gypseous component, on open flats or gentle slopes from 4,900-7,200 feet.
Mancos saltbush *Proatriplex pleiantha*	Sensitive	SOC	Desert badlands in saline clay soils of the Mancos and Fruitland shale formations. Found in clay slopes of mesas and barren clay flats.
Parish's alkali grass *Puccinellia parishii*	Sensitive	E	Grows in alkaline springs, seeps, and seasonally wet areas at the heads of drainages or on gentle slopes at 2,600-7,200 feet. Requires continuously damp soils during its late winter to spring growing period. Recently documented on the Carson-Jicarilla District Forest Service lands next to the FFO. Has the potential to occur in the planning area.
San Juan milkweed *Asclepias sanjuanensis*	Sensitive	SOC	Found in sandy loam soils, usually in disturbed sites, in juniper savanna and Great Basin desert scrub, 5,000-5,500 feet.

Table 2-24 BLM Sensitive and FFO Special Management Status Species that Occur in the Planning Area

Species	Status[1]		Comments
	BLM	State	
Birds			
American peregrine falcon *Falco peregrinus anatum*	SMS	T	Nests in the western and eastern United States (the arctic peregrine falcon breeds north of the tree line). The American peregrine falcon nests in New Mexico, and both subspecies migrate through the state. There are at least three nest sites in the planning area.
Bald eagle *Haliaeetus leucocephalus*	Sensitive, SMS	T	Widespread distribution, found throughout North America nesting in tall trees or cliffs. Breeding habitat most commonly includes areas close to coastal areas, bays, rivers, lakes, reservoirs, or other bodies of water with available food sources, which include fish, waterfowl, and seabirds.
Bendire's thrasher *Toxostoma bendirei*	Sensitive		Found in sparse desert habitats from sea level to 5,900 feet. Breeders favor relatively open grassland, shrubland, or woodland with scattered shrubs or trees; it is not found in dense vegetation.
Chestnut-collared longspur *Calcarius ornatus*	Sensitive		Found in level to rolling mixed-grass and shortgrass uplands, and, in drier habitats, moist lowlands. Prefers open prairie and avoids excessively shrubby area.
Ferruginous hawk *Buteo regalis*	SMS		Breeds from the Canadian provinces south to New Mexico in grassland habitat. One to two known active nesting territories in the planning area.
Golden eagle *Aquila chrysaetos*	SMS		Generally inhabits open and semi-open country, such as prairies, sagebrush, arctic and alpine tundra, savannah or sparse woodland, and barren areas, especially in hilly or mountainous regions, in areas with sufficient mammalian prey base, and near suitable nesting sites.
Mountain plover *Charadrius montanus*	SMS		Found in high plains/shortgrass prairie, desert tablelands, and sagebrush habitats. Commonly associated with prairie dog towns.
Piñon jay *Gymnorhinus cyanocephalus*	Sensitive		Piñon-juniper woodland, less frequently pine; in nonbreeding season, also occurs in scrub oak and sagebrush.
Prairie falcon *Falco mexicanus*	SMS		Primarily open situations, especially in mountainous areas, steppe, plains, or prairies. Typically nests in well-sheltered ledge on rocky cliff or steep earth embankment, 30 to more than 300 feet aboveground.
Western burrowing owl *Athene cunicularia*	Sensitive, SMS		Breeds in much of the western United States and Canada. Populations in New Mexico consist of breeding and wintering birds. Nests in grasslands and desert scrub habitats in association with prairie dogs or other burrowing rodents. Burrowing owls were observed during wildlife surveys in the planning area.
Mammals			
Cebolleta pocket gopher *Thomomys bottae (umbrinus) paguatae*	Sensitive	T	Habitat appears to be limited only by a soil layer deep and tractable enough to hold burrow systems and enough succulent plants to form a food base.
Gunnison's prairie dog *Cynomys gunnisoni*	Sensitive		High mountain valleys and plateaus at elevations of 6,000-12,000 feet; open or slightly brushy country, scattered junipers, and pines. Mainly in areas with high abundance of native plants. Burrows usually on slopes or in hummocks.

Table 2-24 BLM Sensitive and FFO Special Management Status Species that Occur in the Planning Area

Species	Status[1]		Comments
	BLM	State	
New Mexico jumping mouse *Zapus hudsonius luteus*	Sensitive	E	This subspecies occurs in Arizona and New Mexico, where it inhabits herbaceous wetland habitats in valley and mountain areas. It may occur in riparian habitat in the planning area.
Spotted bat *Euderma maculatum*	Sensitive	T	Occurs in the western United States, with historic records from all counties in the planning area. Found mostly in forested habitat but can also be found at lower elevation sites. The spotted bat was audibly detected once in the planning area and once on the Jicarilla Ranger District.
Townsend's big-eared bat *Plecotus townsendii pallescens*	Sensitive		Occurs in the western United States, including the western half of New Mexico. Found in a variety of habitats and is closely tied to caves and mine shafts where it roosts and hibernates. Captured at two locations in the planning area.

Source: BLM 2003a, 2008b
[1]E= endangered, T= threatened, SMS = BLM Special Management Species

The following ten species known to occur in the planning area receive special management and are referred to as special management species (BLM 2008b):

- Beautiful gilia, also known as Aztec gilia (*Aliciella formosa*)
- Brack's fishhook cactus (*Sclerocactus cloveriae* var. *brackii*)
- American peregrine falcon (*Falco peregrinus anatum*)
- Ferruginous hawk (*Buteo regalis*)
- Yellow-billed cuckoo (*Coccygus americanus*)
- Golden eagle (*Aquila chrysaetos*)
- Bald eagle (*Haliaeetus leucocephalus*)
- Burrowing owl (*Athene cunicularia*)
- Prairie falcon (*Falco mexicanus*)
- Mountain plover (*Charadrius montanus*)

Management policies have been developed for each of these species, described under Current Management below.

The FFO also monitors nesting of special status raptors, including golden eagle, ferruginous hawk, prairie falcon (Hawks Aloft 1998, 1999, 2006; Animas Biological Studies 2012), and burrowing owl. BLM SMS policy provides for 1/3-mile nest buffers from construction, drilling, or completion activities for active or historic golden eagle nests during the breeding season. Nest buffers are currently enforced from February 1 through June 30 annually (BLM 2008b).

Trends and Forecasts

Wildlife and Fish

Special status species diversity and abundance is directly related to maintaining habitat availability, diversity, and quality. The species of major concern, listed above, all have their own specialized habitat requirements. Much of these habitat types have been drastically altered or reduced from their historic native ranges.

Continuing threats to native ecosystems and species diversity in the planning area include fragmentation and loss of critical or important habitat due to human activities. The cumulative impact from all disturbances is of concern. Additionally, invasive species may continue to displace native vegetation, which indirectly impacts the distribution and populations of wildlife species.

Restore New Mexico was initiated in 2005 to restore the state's grasslands and riparian areas to a healthy and productive condition. Other objectives are to prevent the listing of sensitive species, improve health and biological diversity of the land after energy development has taken place, remove salt cedar from waterways, increase natural biodiversity of riparian areas, and reintroduce fire to the landscape. These goals are being accomplished by treating invasive brush species by applying herbicide by air, using prescribed fire, and decreasing habitat fragmentation areas impacted from oil field development. This has led to larger areas of suitable habitat for special status species and for numerous other wildlife species.

The FFO is working on a multitude of management practices to minimize habitat degradation from other resource uses. FFO staff are working closely with industry representatives to use BMPs and to locate projects away from areas and resources of concern. This has minimized the impacts on multiple special status species. Several other BMPs, stipulations, and restrictions (e.g., timing stipulations) have also been created in attempts to further minimize the adverse effects from human activity on special status species and their habitat.

As discussed in **Section 2.1.10**, Fish and Wildlife, the San Juan River Basin Recovery Implementation Program was initiated in 1991 to protect Colorado pikeminnow and razorback sucker populations, while proceeding with water development in the San Juan River Basin. This is in compliance with federal and state laws, interstate compacts, Supreme Court decrees, and federal trust responsibilities to the Southern Utes, Ute Mountain Utes, Jicarillas, and Navajos. In 1992, base flows of the San Juan River were reduced to create a more natural hydrograph and to improve habitat for native fish species downstream (Wethington and Wilkinson 2005).

The efforts to recover native fish downstream of the Navajo Dam have reduced the quantity of available habitat for nonnative trout species. The San Juan River Basin Recovery Implementation Program is expected to increase available habitat for Colorado pikeminnow and razorback sucker populations (San Juan River Basin Recovery Implementation Program 2002).

Several areas in the planning area are important for special status wildlife species that have special management prescribed for them. The Bald Eagle ACEC is designated to protect bald eagle use areas with buffer zones to prevent disturbance to birds. There are timing limitations on mineral development in this ACEC, from November 1 through March 31. The Mexican Spotted Owl ACEC protects critical habitat in the planning area for that species. The San Luis Mesa Raptor Area ACEC is protected from July 2 through January 31 to protect nest sites. These sites are also protected from development during nesting season.

Plants

Drought is expected to continue and to affect rare plants and their habitat. There is the potential for herbivory by insects on *Sclerocactus* species such as Mesa Verde cactus. Noxious and invasive weeds are expected to expand and may threaten special status species habitat in the Hogback area and Reese Canyon ACEC (see **Section 2.1.9**). New oil and gas development is expected in Brack's hardwall cactus and Aztec gilia habitat (Nacimiento Formation2) and around the Hogback ACEC perimeter, potentially affecting rare plants in these areas.

Key Features

Wildlife and Fish

Key features in the planning area consist of specific geographic areas and habitats associated with special status species. The protection and management of these key habitat features is very important to the protection and conservation of the species. Some habitat has even been deemed as critical, which is a specific geographic area that is essential for the conservation of a threatened or endangered species. Critical habitat may require special management, and protection may include an area that the species does not currently occupy but that would be needed for its recovery. These key features are further described in the species profiles of the Current Condition section.

Key features for special status wildlife species are described in more detail in **Section 2.1.10**, Fish and Wildlife. These include areas with special habitat designations for wildlife protection, such as SDAs and ACECs, and areas critical for migration or nesting success. The Rosa Mesa Wildlife Area SDA in the FFO provides critical winter habitat. The Rattlesnake SDA in the north provides habitat for big game and also hosts Piñon jay nesting colonies. Crow Mesa also hosts big game and migratory birds, including Piñon jay nesting colonies, even though the habitat in this area is at risk from future planned well development on existing leases.

Plants

Several areas in the planning area are important for special status plant species; some have special management prescribed for special status plants. The Hogback ACEC is designated to protect threatened and endangered species and has rare plants, such as Mancos milkvetch and Mesa Verde cactus, as well as Colorado Plateau endemic species.

There are restrictions on mineral development in this ACEC, including controlled surface use in leased areas, closure to new leasing, closure to salable minerals, and withdrawal from mineral entry. ROWs are permitted on a case-by-case basis with stipulations and mitigation measures. The Reese Canyon RNA has similar restrictions and is habitat for the Knowlton's cactus. Both the Reese Canyon RNA and Carracas Mesa SDA have the potential for plants that are rare for Colorado.

The Nacimiento Formation extends from the northern part of the planning area south into the area where most of the new oil and gas development is occurring. Rare plants occur in this area, such as Aztec gilia and Brack's hardwall cactus, as well as Colorado Plateau endemic species.

The Bisti and De Na Zin Wilderness areas and the Ah-shi-sle-pah WSA are badlands, with endemic plant species and rare plants, such as Aztec gilia.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern special status species:

- BLM Assessment, Inventory, and Monitoring (AIM) Strategy
- BLM-M-6840, Special Status Species Management
- Endangered Species Act of 1973, as amended

The 2003 RMP for the planning area contained objectives specific to special status species management. These objectives were to comply with federal and state requirements for protecting threatened and endangered species and their habitat and for protecting the habitat of sensitive non-listed species to prevent the need for listing them as threatened or endangered. See the **Appendix**, Current Management, for details on special status species goals, objectives, and management.

Since the RMP was adopted in 2003, changes have been made for special status species designations and critical habitat, new or updated recovery plans have been released, and updated special status species policy has been developed (specifically BLM-M-6840, Special Status Species Management, issued in 2012).

Although current management is considered adequate, there are some opportunities for addressing special status species impacts related to future development. These could include incorporating the most current information available pertaining to known locations, threats, and habitat requirements for individual species and developing mitigation measures to ensure continued protection.

Specifically, adaptive management measures could be adopted for special status raptor species (not just those species that were listed at the time the 2003 RMP was released). Such measures could include nest buffers, timing restrictions, and noise stipulations. Implementation of these adaptive management measures would be based on the type of project, duration, level of disturbance, location, and other factors, while considering that some species are more sensitive to noise and disturbance impacts than others.

Additionally, the RMPA could incorporate new policy updates to address the protection of BLM sensitive species. This could include revised survey protocols for rare plants.

2.1.12 Lands with Wilderness Characteristics Outside Existing Wilderness Study Areas

Profile

The BLM's authority to conduct wilderness reviews, including the establishment of new WSAs, expired on October 21, 1993, in accordance with Section 603 of the FLPMA. However, the BLM has retained authority under Section 201 of the FLPMA to inventory BLM-administered lands for wilderness characteristics and to consider such information during land use planning. Policy guidance is provided by BLM Manual 6310, Conducting Wilderness Characteristics Inventory on BLM Lands (BLM 2012b), and BLM Manual 6320, Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process (BLM 2012c).

Indicators

Lands with wilderness characteristics are parcels that meet a size requirement of 5,000 acres (or exception criteria) and contain naturalness and either outstanding opportunities for solitude or primitive and unconfined recreation. In addition, they may possess supplemental values, such as ecological, geological, or other features of scientific, educational, scenic, or historical value. They are identified through a process described in BLM Manual 6310 (BLM 2012b) and are considered in the land use planning process under BLM Manual 6320 (BLM 2012c).

Size

A parcel inventoried for lands with wilderness characteristics must be a roadless area with over 5,000 acres of contiguous BLM-administered lands. This acreage determination does not include state or private lands. An exception to the 5,000-acre minimum size requirement is areas that are contiguous with lands that have been formally determined to have wilderness or potential wilderness values. Another exception is any federal lands managed for the protection of wilderness characteristics. Examples of these exceptions are designated wilderness, WSAs, USFWS areas proposed for wilderness designation, and National Park Service areas recommended or proposed for designation.

Naturalness

Lands and resources exhibit a high degree of naturalness, are affected primarily by the forces of nature, and are where the imprint of human activity is substantially unnoticeable. The BLM has the authority to inventory, assess, and monitor the attributes of the lands and resources on public lands, which, taken together, are an indication of an area's naturalness. These attributes may include the presence or absence of roads and trails, fences, and other improvements, the nature and extent of landscape modifications, the presence of native vegetation communities, and the connectivity of habitats.

Outstanding Opportunities for Solitude

Visitors may have outstanding opportunities for solitude when the sights, sounds, and evidence of other people are rare or infrequent and where visitors can be isolated, alone, or secluded from others.

Outstanding Opportunities for Primitive and Unconfined Types of Recreation

Visitors may have outstanding opportunities for primitive and unconfined types of recreation where the use of the area is through nonmotorized nonmechanical means and where no or minimal developed recreation facilities are encountered.

Public lands possessing the above values may be managed to maintain some or all of those characteristics. Such wilderness characteristics as solitude, primitive recreation, and naturalness are a part of the land use planning process and will be evaluated along with all other resource values and uses.

The BLM is authorized to consider this information when developing the affected environment section and the range of alternatives and to analyze the environmental impacts on other resources.

In general, wilderness characteristics tend to be more qualitative, measured by the overall visual quality and naturalness of an area that may be affected by changes to levels of recreation, development, and surrounding land use. Indicators that can be measured quantitatively are as follows:

- Changes to the frequency and number of routes, including the number of unauthorized trails
- The number of encounters with other users
- Increased requests for use of areas with wilderness characteristics for renewable or nonrenewable resource development

Current Condition

In the decision area, an intensive wilderness inventory was completed for the State of New Mexico in 1986. Areas with wilderness characteristics were identified and set aside by Congress as WSAs (see **Section 2.3.1**, Wilderness Areas and Wilderness Study Areas). The FLPMA requires the continued inventory of public lands for potential wilderness characteristics even though there is no authority to establish new WSAs if any are found. At the conclusion of the RMP process, a decision may be made to protect or preserve certain lands in their natural condition, if appropriate, or to provide outstanding opportunities for solitude or for primitive and unconfined types of recreation.

Trends

Conditions in some areas outside of the established WSAs may have changed since past inventories and may not have wilderness characteristics. If so, increased residential and commercial development, ROWs, and increased OHV use over the last few decades may have negatively impacted the naturalness and outstanding opportunities for solitude or primitive recreation. The continued popularity of all-terrain vehicles (ATVs) and utility vehicles over the last decade has led to an increase in OHV use on BLM-administered lands. Interest in energy programs, such as mineral exploration and oil and gas development, may also affect the availability of natural areas that provide solitude or unconfined recreation opportunities.

Forecast

An inventory to identify lands with wilderness characteristics in the planning area was conducted 2014, but results have not been finalized at printing. The final determinations will be available from BLM at a future time.

Key Features

The key features that determine wilderness characteristics are naturalness, outstanding opportunities for solitude, and opportunities for primitive or unconfined types of recreation. Typically these areas must be 5,000 acres or greater.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern lands with wilderness characteristics outside existing wilderness study areas:

- BLM Manual 6310, Conducting Wilderness Characteristics Inventory on BLM Lands (BLM 2012b)
- BLM Manual 6320, Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process (BLM 2012c)

The 2003 RMP did not address management for lands with wilderness characteristics. If lands with wilderness characteristics are identified, alternative management prescriptions will be analyzed to determine how these lands will be managed.

Through this planning process the BLM will determine whether areas with wilderness characteristics would be managed to maintain those characteristics. While it is in the land use planning process, the BLM will manage lands so as not to forgo management options if new information is presented, evaluated, and incorporated into the planning process as part of one or more RMPA alternatives. The agency will consider whether these lands with existing wilderness characteristics will be managed to preserve some or all of their values with other land management tools (e.g., SRMAs, OHV designation, limitations on oil and gas leasing, visual resource management, transportation planning, and management of recreation settings and activities).

2.1.13 Cultural Resources

Profile

Archaeologists, anthropologists, ethnographers, historians, and other researchers study the remains of the past in an effort to identify the forces that have shaped human history. Research also defines how cultures originate, develop, and interact with the environment. Cultural resources, particularly archaeological sites, rock art, historic structures, historic trails, or sacred sites, can provide people with visible links to their past and are reminders of their ancestral heritage. In turn, this can help to foster a sense of belonging and pride in our cultural and historical backgrounds.

Historic properties are tangible evidence or expressions of past human activity in the form of material items produced by human workmanship or use. They also include elements of the natural environment that were altered by people's activities. Examples of cultural resources in the planning area are artifact scatters consisting of lithic and ceramic debris, burned rock features, rock art, rock shelter sites, and historic structures and sites associated with western expansion and early oil and gas and potash exploration and extraction.

Humans have occupied northwestern New Mexico for at least the past 10,000 years, leaving behind diverse cultural resources. The area has been the setting for the following:

- Development of farming villages nearly 2,000 years ago
- Expansion of the regional system associated with Chaco Canyon roughly 900 to 1,000 years ago
- Formation of large Mesa Verde Period pueblos after Chacoan period
- Establishment of the Navajo homeland of Dinetah during the protohistoric period
- Spanish/Mexican exploration
- Historic expansion of ranching and the oil and gas industry in the twentieth century

Understanding these varied and complex trends is critical in determining the historical significance and eligibility of cultural resources in the study area for listing on the National Register of Historic Places (NRHP).

The cultural history of the Southwest, including northwest New Mexico, can be divided into five general cultural periods: Paleo-Indian, Archaic, Formative, Protohistoric, and Historic. Each of these periods typically is further subdivided into specific phases, summarized in **Table 2-25**. These periods are distinguished by changing settlement patterns, subsistence strategies, technology, and social structure and interaction.

Table 2-25 Archaeological Periods and Default Date Ranges

Culture	Period	Default Date Range
Paleo-Indian	Pre-Clovis	Before 9500 BC
	Clovis	9500-9000 BC
	Folsom/Midland	9000-8000 BC
	Late Paleo-Indian	8000-6600 BC
	Terminal Paleo-Indian	6600-5500 BC
Archaic	Early Archaic	5500-3000 BC
	Middle Archaic	3000-1800 BC
	Late Archaic	1800 BC-200 AD

Table 2-25 Archaeological Periods and Default Date Ranges

Culture	Period	Default Date Range
Anasazi (Pecos Classification)/Mixed Anasazi and Mogollon	Basketmaker II	AD 1-500
	Basketmaker III	AD 500-700
	Pueblo I	AD 700-900
	Pueblo II	AD 900-1100
	Pueblo III	AD 1100-1300
	Pueblo IV	AD 1300-1600
Navajo	Pre-Pueblo Revolt	Before AD 1692
	Post-Pueblo Revolt	AD 1692-1753
	Pre-Reservation	AD 1753-1868
	Early Reservation	AD 1868-1880
	Middle Reservation	AD 1880-1920
	Late Reservation	AD 1920-1945
	Recent	AD 1945-Present
Hispanic, Anglo, Pueblo, Ute, and Apache	Spanish Contact/Colonial	AD 1539-1680
	Pueblo Revolt	AD 1680-1692
	Post-Pueblo Revolt	AD 1692-1821
	Mexican/Santa Fe Trail	AD 1821-1846
	US Territorial	AD 1846-1912
	Statehood-WWII	AD 1912-1945
	Recent	AD 1945-Present

Source: New Mexico Cultural Resource Information System 2013

Most researchers consider the Paleo-Indians to be the earliest recognizable culture in the Southwest and North America. This culture occurred during a period when the climate was quite different than it is now and included extensive areas of glaciation. These peoples practiced a highly mobile hunting and gathering way of life. They successfully pursued mammoths, camel-like animals, giant sloths, and other Pleistocene large animals. Perhaps they even contributed to these species' extinctions as the climate grew more arid at the beginning of 5500 BC.

This climatic shift also marked the beginning of the Archaic Period as groups began to employ more generalized, broad-spectrum subsistence strategies, with a greater reliance on small-bodied game and wild plants (Huckell 1996). People remained highly mobile, but this mobility appears to have been seasonal and more restricted. More plant resources were used, settlement patterns became more complex, the number of sites increased, and simple pithouse residences came into use. Around 2000 BC, maize, beans, and squash were introduced into the Southwest from Mesoamerica. The final phase of the Archaic Period was characterized by significant changes in land use patterns, widespread (although sporadic) adoption of cultivated plants, increases in seasonal sedentism and aggregation, and an increase in structures and agricultural villages. Upland locations were largely abandoned, and sites became concentrated on terraces, valley bottoms, and alluvial fans.

The Formative Period that followed the Archaic is generally subdivided into smaller units identified in the Pecos Classification (Kidder 1927). This chronology provides a general framework to categorize developments in Southwest prehistory, specifically that of the Puebloan[1] tradition and culture. The beginning of the Puebloan tradition is characterized by the culmination of several trends that first emerged during the Late Archaic Period, including population growth, greater sedentism and associated architectural and sociopolitical development, the emergence of ceramic technology, and an increasing dependence on agriculture and the storage of agricultural products.

[1]Differing opinions exist among various groups over appropriate terminology for the peoples occupying the greater San Juan Basin in the first millennium AD—Anasazi versus Ancestral Puebloan, for example. In many instances scholars use the terms interchangeably; Puebloan is used herein, although it is somewhat problematic to certain groups.

The Basketmaker III Period (AD 500 to 700) is defined by the development of formalized pithouses and a suite of new technologies, including ceramics, the bow and arrow, and two-hand manos and slab metates (Reed 2000). Basketmaker III sites are common in the La Plata Valley, where large pit structures date to the late AD 600s, and in the Animas Valley farther to the east. Basketmaker III components comprise approximately 5.3 percent of the total components in the planning area; they exhibit greater size and complexity than the sites of the preceding Basketmaker II Period. Basketmaker III settlements are found in the Navajo Reservoir area, the Chuska Slope and Chaco Canyon area in the Chaco Canyon drainage, and in the La Plata, Animas, Upper San Juan, Largo, Carrizo, and Gobernador drainage basins.

On FFO lands, there are eight ACECs that are managed to protect outstanding examples of cultural resources from the Basketmaker III Period. Other examples may be found that merit special designations. Still other examples of resources from this period are managed according to continuing management guidelines.

The Pueblo I (PI) Period (AD 700 to 900) on the Colorado Plateau generally is typified by an increase in the number of sites, an increase in average site size, the appearance of aboveground jacal (thatched hut) and stone architecture alongside semisubterranean pithouses, and larger storage facilities. Aboveground structures typically exhibit linear or oval configurations and contain about eight rooms per site. So-called proto-kivas first make their appearance at some PI sites in the planning area. With the exception of the Chaco region, these trends are not thought to reflect population growth, but rather consolidation of previously distinct residential groups into larger villages.

In the San Juan Basin, however, the overall number of PI sites is relatively low. This is attributed, in part, to deteriorating environmental conditions on the Colorado Plateau, specifically reduced rainfall and an increase in the overall variability of rainfall. Rainfall estimates appear relatively high between AD 700 and 750 but began a steady decline through the early 800s. Between AD 830 and 900, drought conditions are thought to have prevailed over much of the planning area.

PI components comprise over 19 percent of the total components in the planning area, with occupations clustering in the Navajo Reservoir area, the Largo, Carrizo, Upper San Juan, and Gobernador watersheds, and on the Chuska Slope and Chaco Canyon areas in the Chaco River drainage basin. Recent research on PI communities in the Navajo Reservoir area have identified several large complex communities aggregated around great pit houses, the early predecessor to the great kivas known from the later Pueblo II (PII) and Pueblo III (PIII) Periods. Population growth and aggregation during this period is a critical factor in the development of the later complex communities and social structures present in the Pueblo II and Pueblo III Periods in the planning area.

On FFO lands, there are eight ACECs that are actively managed to protect outstanding examples of cultural resources from the Pueblo I Period.

The PII Period (AD 900 to 1100) is characterized by an increase in the number of sites, an increase in average site size, a shift toward aboveground coursed masonry architecture, the appearance of larger numbers and larger sizes of storage facilities, and the appearance of formal kivas. Sites typically contain between six and nine rooms, most arranged in a linear fashion. Larger sites containing more numerous rooms are often laid out in a quadrilateral pattern around central plazas.

It is during PII times that the Chaco phenomenon truly flourishes, accompanied by the establishment of very large towns, the appearance of multistoried room blocks, increasingly complex architectural elaboration of kivas, the advent of field systems in an effort to boost agricultural production, and the development of road systems to facilitate trade and exchange.

These changes seem to signal a return to accelerating population growth in response to dramatically improved climatic conditions. Unlike the PI Period, climatic reconstructions for AD 900 to 1050 indicate a return to higher rainfall levels, although this was accompanied by episodic droughts, the intensity of which varied from place to place. In areas less affected by droughts, settlements were pushed into areas that would have been marginal in PI times. Differential spatial distributions of critical resources probably became more pronounced in PII times over much of the San Juan Basin.

One of the most remarkable aspects of cultural resources in the planning area is the extensive system of finely engineered roads radiating from Chaco Canyon and extending a considerable distance to outlying sites throughout the San Juan Basin and beyond. These roads are remarkably straight and carefully constructed.

Although many road segments have been identified from aerial photographs and confirmed on the ground, only a few of these segments have been found to connect to each other to form roads that run continuously for significant distances. The best documented examples of long roads are the Great North Road, which starts at Chaco Canyon and runs north to the Aztec ruins. In the planning area it passes Halfway House, Twin Angels, and Pierre's Site, three world heritage sites.

PII components account for approximately 15.5 percent of the total known components in the planning area. However, dual PII-PIII components are quite common across the planning area, adding another eight percent of the components that date to this broad time interval. During this period the Navajo Reservoir and the Largo, Carrizo, Upper San Juan and Blanco watersheds are virtually abandoned, with populations shifting to the north, south, and west. Population aggregation and community development is enhanced in these areas during the PII Period. Large and complex communities are linked by formalized road networks in the San Juan Basin, with Chacoan great houses and communities tied to the central hub in Chaco Canyon.

The PIII Period (AD 1100-1300) is typified by the aggregation of populations into progressively larger centers, accompanied by the gradual collapse of the Chaco phenomenon that so defines early and middle PIII times. Some researchers suggest that populations began to move northward into the northern San Juan Basin near Aztec and southward out of the Mesa Verde region.

Concurrent with Chaco's gradual decline in importance is a seeming realignment of social interaction spheres northward toward Mesa Verde. For example, sites along the Chuska Mountains seem to enter a period of increased building, accompanied by the replacement of Chacoan ceramics with those more typical of Mesa Verde. As well, the appearance of bi- and tri-wall buildings, nominally characteristic of the Mesa Verde region at sites in the San Juan Basin, suggests the gradual outward expansion of Mesa Verde peoples into areas formerly containing Chaco components. Over much of this period, sites contain between 13 and 30 rooms, with larger sites exhibiting upwards of 200 rooms.

Approximately 12.4 percent of total known components in the planning area date to PIII times, yet they are some of the largest and most complex Puebloan settlements in the region. Further, as noted in the PII discussion, dual PII-PIII components are quite common across the planning area, adding another eight percent to the total known components dating to this somewhat broad interval. PIII components are virtually absent from the Navajo Reservoir area, while the Upper Largo and Rio Chama drainages exhibit large clusters of Gallina phase settlements. Concentrations of sites and large communities are found on the Chuska Slope and the Chaco River watershed, the Upper Puerco, Rio Chama, San Jose, and Rio Puerco drainages, and the Lower San Juan and its tributary drainages, including the Animas, La Plata, and Mancos.

In the planning area, there are 21 ACECs that are managed to protect outstanding examples of cultural resources from this period.

Further movements of peoples into riverine valleys where relatively more reliable surface water supplies are found characterize the Pueblo IV (PIV) Period (AD 1300-1600). This marks an end to higher elevation agricultural endeavors that depended on rainfall and, perhaps, the explicit recognition that agriculture, if it was to be successful, had to rely on surface water. Sites dating to this period are generally small, containing between one and four rooms. A small subset of sites contains 100 rooms, while an even smaller subset of the largest sites contains upwards of 500 rooms.

Material culture also became more elaborate. For example, PIV coincides with the introduction of glaze-decorated ceramics and the use of red and yellow slips. Other examples of PIV material culture are mural paintings, petroglyphs, stone effigies, decorated pipes, and carved bone tools. The descendants of some of these groups are the contemporary Puebloan villagers. The PIV occupation of the planning area is

primarily limited to the Rio Chama watershed, where concentrations of PIV components comprise 1.1 percent of the total number of components. Additionally, 3.6 percent of the sites are unspecified Puebloan.

The historic period covers AD 1540 to the present. The period is separated into Navajo chronology and Euro-American eras. Navajo chronology is generally expressed in a series of phases that include the Dinétah (1540 to mid-1600s), Gobernador (mid-1600s to 1770), Cabezon (1770 to 1863), and Reservation (1863 to present). Euro-American eras are separated into Spanish, Mexican, and Anglo Periods (AD 1848-present). There is obvious overlap between events that occurred during the preceding Navajo historic periods and events more closely associated with Euro-Anglo occupations of the planning area.

Navajo cultural sites in the planning area constitute a high percentage of the historic period. Approximately 25.7 percent of all recorded cultural site components in the planning area are Navajo affiliated. These sites encompass a full range of types and include scatters of artifacts, game drives, small and large habitations, trails, and rock art. The culture and history of the Navajo people is also intertwined with a varied and diverse landscape that recognizes places that have pan-tribal as well as local significance. While there is some debate on the chronology of the early Navajo and their entry into the American Southwest, the archaeological evidence indicates that they were here by at least the mid-16th century.

Navajo traditional histories place them in northwest New Mexico even earlier. By about 1710, most Navajos were probably located west of Abiquiu and the Chama River, having been driven out by conflicts with Spanish, Ute, and Comanche combatants.

All of the Navajo phases are manifested in the planning area to varying degrees. Some areas have been extensively investigated, and the distribution of Navajo sites of varying ages and types is well documented. Other areas have received only sporadic investigations and the distribution and character of Navajo sites is less well defined. Almost half of all known Navajo sites cannot be assigned to any of these three general phases and are identified simply as “unknown Navajo.”

The earliest evidence of Spanish entry into New Mexico is associated with the appearance of Coronado’s expedition in 1540 (Winship 1990). Initial contacts with the inhabitants were not promising insofar as the Spaniards, prompted by Friar Marcos de Niza’s reports of great wealth, viewed the region’s inhabitants as potential sources of wealth or information about where such wealth could be found (Winship 1990). Greeted by showers of arrows at some pueblos, Coronado’s men soon found that reports of gold were overstated and that their likely reception in other villages would be equally confrontational (Winship 1990).

In 1542, after smaller expeditions into the surrounding country revealed no great wealth, Coronado’s expedition withdrew to Mexico. In 1598, Oñate arrived with a large party of colonists, soldiers, and priests, to establish the village of San Gabriel, near the modern-day Pueblo of San Juan. This marked the first serious attempt to establish permanent settlements in the region. Spanish activities during the eighteenth century focused primarily on consolidating their holdings in the Rio Grande valley. Settlements in the heart of the planning area were almost nonexistent. Exceptions to this generality include, for example, the settlement of Ranch de la Posta (1780). Yet, two activities—new land grants and new trading routes—emerge as important events affecting the planning area during this period. Spanish Colonial components comprise less than one-half of one percent of the total components known in the planning area.

On FFO lands, the Santos Peak ACEC is the only actively managed special designation to protect cultural resources from this period. Santos Peak is significant as the location for one of the decisive battles during Captain Roque de Madrid’s campaign against the Navajo in retaliation for raids on Spanish and Pueblo settlements. For the first twenty days in August of 1705, Captain de Madrid led about 100 Spanish soldiers and citizens together with some 300 Pueblo Indian allies on a 312-mile march in retaliation for Navajo raiding. The campaign ranged across the planning area. The Spanish and their allies met the Navajo in battle at Santos Peak; after two battles, the Spaniards and their allies defeated the Navajo. The Spaniards pursued the Navajo for another week, eventually claiming victory and returning to Santa Fe.

Mexico's declaration of independence from Spain in 1821 was accompanied by the opening of the Santa Fe Trail. This inaugurated a period of progressively greater interaction between Euro-Anglos from America and New Mexico's Native American and Hispanic residents. Trading across the Old Spanish Trail began and intensified during the Mexican Period and included both Mexican and Anglo traders (Swadesh 1974). Many of the alternate routes along the trail, which shortened its distance, were identified and used by traders traveling to California.

Like their Spanish Colonial predecessors, Mexican Period components are notably scarce across the planning area, comprising less than one-half of one percent of the total components known in the planning area. On FFO lands in the planning area, there are no ACECs that are managed to protect outstanding examples of cultural resources from this period.

In 1846, Doniphan's California Column entered New Mexico, ushering in a new era in the region's history. With the subsequent defeat of the Mexican Army, New Mexico officially became a territory of the United States. Many initial economic activities typical of the mid to late nineteenth century focused on farming and ranching. Farming varied from rainfall-based dryland farming in upland areas to irrigated agriculture in river valleys that had relatively permanent flows.

The establishment of the settlements was almost invariably accompanied by the immediate construction of irrigation ditches (Ackerly 2002). For example, the La Plata Indian and McDermott ditches in the La Plata basin are believed to date to the late 1870s. In the Animas basin, the Star ditch is believed to date to the late 1870s. Irrigation systems drawing water from the San Juan River and dating to circa 1880 are the Hammond Conservancy District, Castiano Ditch, San Juan #4, and Cuadi Ditch.

Ranching focused almost exclusively on sheep, although some cattle were also raised. Sheep ranching expanded rapidly, with totals in the state increasing from 250,000 in 1830 to upwards of 4,000,000 in 1880. Beginning in the 1850s and persisting through the 1860s, there were trail drives of large herds westward along a route that closely paralleled the Old Spanish Trail (Williams 1986). By the early twentieth century, there were 1.8 million head of sheep on the Navajo Reservation, comprising almost 93 percent of all livestock (Acrey 1994).

Historic Euro-Anglo components comprise 1.6 percent of the known components in the planning area. Most are situated along the eastern margins of the planning area, mirroring the locations of early settlements, as described above. On FFO lands, there are 11 ACECs that are managed to protect outstanding examples of cultural resources from this period.

Traditional cultural properties (TCPs) is another class of cultural resources that occur in the planning area. These are places that have cultural values that transcend, for instance, the values of scientific importance that are normally ascribed to cultural resources, such as archaeological sites. The National Park Service has defined TCPs as follows:

> A traditional cultural property can be defined generally as one [a property] that is eligible for the National Register because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community (National Register Bulletin 38).

TCPs may or may not coincide with places that yield artifacts, such as archaeological sites. Mountains, buttes, mesas, hills, or other high points in an area are often potential TCPs. Places that cause echoes ("talking rocks") may be favored as places of worship for the ability to amplify prayers and songs. Eagle nesting sites may also have great significance.

Prehistoric and historic Native American archaeological sites are quite often considered TCPs by some tribes or pueblos. For example, the Zuni Tribe views all prehistoric Pueblo sites as sacred and significant to the Zuni people. Many of the larger prehistoric Pueblo sites in the San Juan Basin, such as the Chaco outliers, have Navajo names and are linked in some cases to origin stories and ceremonies and are recognized as part of a local community's landscape. Another form of archaeological site, rock art, is of

particular interest to several tribes who regard them as places of ongoing traditional and spiritual significance. For instance, the Hopi believe that certain design elements are evidence of the migrations of clans that have ancient and modern ties to the Hopi people.

In some cases, the importance is seemingly more secular than sacred. As an example, the location and associated oral history of an old Native American battle site can be just as powerful to a community's sense of identity as any number of Civil War battlefields are to their associated communities and descendants.

Traditional cultural properties are not restricted to Native American cultural associations. Native Americans have in the past been the most likely to identify TCPs. Perhaps this is because they may be the only community that most federal agency representatives approach. Cultural resources regulations and legislation specifically identify Native American tribes as a required point of contact on certain occasions, and this may have biased the TCP identification efforts.

There are good reasons to expect that non-Native American communities may have TCPs in the planning area. Hispanic and other Euro-American properties may qualify as candidates for TCP status. Portions of the planning area had a significant period of Hispanic homesteading settlement in the mid to late nineteenth and early twentieth century. As an example, the Largo Cemetery is a place that several Hispanic families in the area maintain. They have collected historical information about the cemetery and several historic homesteads in Largo Canyon.

In most cases, TCP surveys are not regularly conducted on federal lands in the planning area, particularly on small-scale undertakings. In the planning area, it is often only the larger actions (e.g., coal mines, major pipelines) or undertakings potentially affecting known or previously suspected TCP areas that carry such requirements. In the past decade or so, the development of large gas delivery systems has regularly included TCP studies as part of the overall cultural resource survey. On some tribal lands in the planning area (e.g., Navajo Nation), all cultural resource surveys are required to consider and attempt to identify TCPs. When large undertakings involve lands of varying jurisdiction in the so-called checkerboard area of the San Juan Basin and the planning area, TCPs are identified on all affected lands.

Identification not only entails on-the-ground inspections but consultation with knowledgeable individuals and a review of the existing literature. Non-Native American approaches to identifying TCPs are different than those studies conducted by Native American investigators. An archaeologist trained from a perspective of western science will operate within a well-defined set of scientific principles and methods at conducting research. A Native American investigator or consultant would probably be the first to admit that TCPs cannot often be identified scientifically but only by relying on the knowledge of traditional practitioners. In many cases, seasonality can affect identification because only during certain times of the year is it appropriate to discuss sacred matters.

In other cases, the traditional consultant will ask to remain anonymous and will disclose information only if details are kept confidential and not made public. For many traditionalists, this is a conundrum to disclose information that should be withheld and run the risk of compromising the important place, or to withhold information and risk damage or destruction of the important place.

Indicators

One of the purposes of this AMS is to provide a snapshot in time of a resource's condition (see **Section 1.2**, Purpose of the Analysis of Management Situation). In order to do this, the BLM uses indicators that provide standards, benchmarks, or guidelines to determine the extent or degree to which cultural resources are preserved or damaged, how much of their physical integrity has been lost, or whether the property's setting integrity remains intact (36 CFR, Part 800; see also the *Current Management and Management Opportunities* section below). Additionally, indicators can provide thresholds to aid in determining whether future opportunities for scientific research, preservation, or public appreciation are foreclosed or otherwise adversely affected.

The following indicators are used when assessing the current condition of cultural resources:

- A site's or district's eligibility determination—As noted below in the *Current Management and Management Opportunities* section, cultural resources are afforded protection based on their eligibility for listing on the NRHP. Sites on the NRHP or eligible for listing are protected under the NHPA. Most of the cultural resources in the planning area that have been determined to be eligible for listing on the NHRP are the remains of past human occupation. Resources that have not been formally determined eligible or not eligible remain in an unknown status and must be managed as an eligible property until a formal determination of eligibility can be conducted. Resources determined to be not eligible are not managed.
- A site's or district's use category—A use category designation is a BLM assessment of the appropriate use for a cultural property. It is a mechanism for assisting management decisions about land use. Use categories are scientific use, conservation for future use, traditional use, public use, experimental use, and discharge from management. A site/district use category would allow certain uses; the BLM determines the level of use, based on the property's eligibility status and cannot jeopardize the site's integrity or other elements that make the site listed on or eligible for listing on the NRHP.

In addition to the BLM's guidance and management of cultural sites, natural forces and ground-disturbing activities, both authorized and unauthorized, have the potential to disturb or destroy these resources.

The indicators below address the physical condition of cultural resources in the planning area:

- The amount and distribution of natural ground cover in the vicinity of the cultural resource are sufficient to support soil stability; examples are plants, plant litter, and biological crusts
- Land use authorizations are effective to ensure avoidance as a method of mitigating direct impacts on cultural resources and that there are no indirect impacts, such as illegal damage to or collection of artifacts

Current Condition

Due to steady increases in oil and gas development, several thousand acres have been surveyed for cultural resources, and several thousand new sites have been recorded. However, this information has not been broadly synthesized into an overview report (Class I Cultural Resource Study) or a geographic information system (GIS) modeling exercise.

As of November 2013, there have almost 22,000 archaeological inventories have been conducted in the planning area.[2] An average of 771 archaeological sites are recorded or updated each year as a result of various undertakings, including oil and gas exploration and production. All of these archaeological sites are assessed for their eligibility for the NRHP. Over 33,302 archaeological sites have been recorded in the planning area. Of these, 39.9 percent have been determined eligible under Criterion D for listing on the NRHP; 7.6 percent have been determined not eligible and therefore are not managed; 5.7 percent were minimally recorded, resulting in a designation of undetermined eligibility; and 46.8 sites have an unknown determination of eligibility.

Most oil and gas development archaeological work has consisted of "flag and avoid" undertakings, where sites are minimally recorded and avoided. Many of these undertakings have been in areas that have previously been inventoried, and many sites have been updated repeatedly. Unfortunately, because archaeological sites have been minimally or poorly recorded, evaluation for listing them on the NRHP is difficult.

The time and effort necessary to manage the "undetermined" properties inhibits proactive monitoring and protection of significant resources. Monitoring impacts on cultural resources resulting from any activity that is not subject to Section 106 compliance, such as trespassing or dispersed recreation, is also inhibited by poor recording practices. Unauthorized collection and vandalism at the site may be occurring, and many significant sites in the planning area have not been regularly monitored.

[2]The data used for the EIS comes from the New Mexico Cultural Resource Information System.

Most minerals development-related inventory and associated report writing in the FFO is performed by contractors who hold a BLM cultural resource use permit. The contracted reports are used to determine if archaeological sites that are eligible for the NRHP will be impacted by the proposed action (eligible sites are also referred to as historic properties). Sites that are not eligible for the NRHP are not avoided and may be destroyed during construction. Contractors minimally record sites and defer to an undetermined eligibility recommendation because projects can be easily moved to avoid impacts. It is the BLM's policy (as outlined in BLM Manual 8140) that impacts on historic properties be avoided if possible; if they cannot be avoided, they must be mitigated. Site mitigation most often takes the form of data recovery through excavation. Site identification, determinations of effect, and avoidance are conducted through the protocol of the BLM/New Mexico State Historic Preservation Office, under whose consultation all mitigation projects are designed and conducted.

Trends

Based on the current condition of the resource, there are several trends to note. This is particularly the case for the rate of site discovery and recording and the changes in site or district conditions. These changes could be the result of undertakings or permitted or unpermitted actions, such as recreational activities.

The rate of site discoveries has steadily increased due to steady increases in oil and gas development. As these activities have boomed, many more new sites are discovered and previously recorded sites are re-recorded or updated.

Changes in site conditions can be tracked during these opportunities for re-recording or updating information on previously known sites; however, recording practices are generally poor, and a thorough analysis of the actual rate of change has not be completed. One could anticipate that the likelihood for damage to a site increases with more traffic, workers, and general activities near known previously recorded sites. Just as the trends in site condition changes is difficult to determine from permitted activities, the trends for the effects of unpermitted activities on cultural properties is more difficult to determine. This is due to the same poor recording practices and to not tracking the activities as closely as would be done for permitted actions. However, for both permitted and unpermitted actions, sites may be subject to unauthorized collection and vandalism, resulting in a general downward trend in site integrity and scientific potential.

Forecasts

As the demand for production of federally owned minerals increases, there will be an increased demand to identify and manage significant cultural resources. As roads are improved, increased access to areas will be available for other recreation activities, such as OHV use, horseback riding, and hunting. This increased access may indirectly damage cultural resources through unauthorized collection or vandalism. This could change a determination from eligible to ineligible.

Grazing or any range improvement activity that denudes vegetation or erodes soil can cause impacts on cultural resources. Soil disturbance by livestock in concentrated areas (such as those near water sources, supplemental feeding areas, and fence corners) and livestock trail formation may result in impacts on cultural resources.

As part of the eligibility determination, the site condition is assessed. Site condition can change over time due to such activities as erosion, the level of grazing, unauthorized collection, and vandalism. Since the condition of a site can readily change, monitoring is necessary. Due to the increased energy development, the FFO has focused on Section 106 review and permitting requirements. Because of this, BLM staff have done little site condition monitoring.

The emphasis on energy permitting in the planning area will continue for several years; therefore, it is likely that thousands of new sites will be discovered over the next 10 to 20 years. If this happens, the resources staff may not be available to perform follow-up monitoring to assess site conditions after the permitting process is completed.

Key Features

Alluvial deposits and colluvial deposits typically have a high potential to contain intact buried cultural resources. The San Juan River corridor and its tributaries, including the Animas River, the La Plata River, Los Piños, and lesser intermittent waterways, are areas of high potential for both surface and subsurface archaeological sites. This is due to their location near reliable water sources. In addition, areas of eolian paleosols, such as the Chaco Dune Field, retain high potential for intact subsurface cultural materials of Archaic and intrusive features of Puebloan people (Hall 1990).

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern cultural resources:

- American Indian Religious Freedom Act of 1978
- Archaeological Resources Protection Act of 1979, as amended
- BLM-M-8100, Cultural Resource Management
- EO 13007, Indian Sacred Sites
- EO 13084, Consultation and Coordination with Indian Tribal Governments
- Historic Sites Act of 1935
- IB 2002-101, Cultural Resource Information
- National Historic Preservation Act of 1966, as amended
- Native American Graves Protection and Repatriation Act of 1990, as amended
- Rangeland Programmatic Memorandum of Agreement among the BLM, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers

Cultural resources are afforded protection based on their eligibility for listing on the NRHP, and they receive a determination of not eligible, undetermined, or eligible. This determination involves examining three criteria, as follows:

- **Age—**Is the property old enough to be considered historic (generally at least 50 years old)?
- **Integrity—**Does the property still look much the way it did in the past?
- **Significance—**Does the resource have significance in American history, architecture, archaeology, engineering, and culture? Is the resource in a district, building, structure, or object or on a site that possesses integrity of location, design, setting, materials, workmanship, feeling, and association?

The resource is eligible when it meets any one or any combination of four NRHP Criteria for Evaluation:

- **Criterion A—**Associated with events that have made a significant contribution to the broad patterns of our history
- **Criterion B—**Associated with the lives of significant persons in or past
- **Criterion C—**Embodies the distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic values; or represents a significant and distinguishable entity whose components may lack individual distinction
- **Criterion D—**Has yielded or may be likely to yield information important in history or prehistory

Most of the cultural resources in the planning area that have been determined to be eligible for listing on the NHRP are the physical remains of past human occupation, thereby meeting Criterion D. Resources determined to be ineligible are not managed. Resources that have not been formally determined eligible or not eligible remain in an unknown status and must be managed as an eligible property until a formal determination can be conducted.

Management goals, objectives, and actions for cultural Resources are found in the **Appendix**, Current Management. For the scope of this amendment, there is no need for changes to existing management; however, there is the need to update the existing and affected environment for cultural resources. This is due to the large number of survey acres, recorded sites, and new scientific and cultural knowledge of resources in the analysis area. Additionally, the BLM would consider defining the Chacoan landscape and creating new stipulations and conditions of approval for this area.

2.1.14 Paleontological Resources

Profile

Paleontological resources constitute a fragile and nonrenewable scientific record of the history of life on earth. BLM policy is to manage paleontological resources for scientific, educational, and recreational values and to protect or mitigate these resources from adverse impacts. To accomplish this goal, paleontological resources must be professionally identified and evaluated, and paleontological data should be considered as early as possible in the decision making process. Paleontological resources are managed according to the BLM 8270 Handbook and BLM Manual for the Management of Paleontological Resources.

Paleontological resources are known to occur throughout the planning area. Fossils are identified in the geological units in which they occur and are extensively distributed both vertically and horizontally. Locating, evaluating, and classifying paleontological resources and developing management strategies must be based on the best science available (BLM Manual H-8270-1.A.1).

Indicators

Resource condition is assessed by field observations, paleontological reports, commercial site reports, and project review.

The BLM considers as significant any vertebrate fossils or other noteworthy occurrences of invertebrate and plant fossils. Invertebrate and plant fossils are typically more abundant, and the BLM does not ordinarily consider them to be of significance.

Indicators for the condition of paleontological resources are as follows:

- Type of fossil resource present (i.e., vertebrate, invertebrate, or plant)
- Prevalence of the fossil resource in the area
- Geologic formations in the planning area likely to contain fossils
- Physical condition of the fossil
- Scientific, educational, or recreational merit of the resource

Geologic formations are the basic units of geology, indicating a discrete rock type and representing a certain depositional environment or method of development. Paleontological resources are closely tied to the geologic formations containing them; rocks of different age contain fossils of different types. A basic tenet in paleontology holds that if fossils are found in a formation elsewhere, they could also occur in the same formations in the planning area.

A classification scale, termed the Potential Fossil Yield Classification (PFYC), is a system for categorizing the probability of geologic units to contain scientifically significant paleontological resources or noteworthy fossil occurrences. This system has been developed to estimate the potential for discovering significant fossils during any surface-disturbing activity in specific geologic formations.

The PFYC has five levels or classes, with Class 1 applied to geologic units that are not likely to contain significant fossils through Class 5 for geologic formations that have a high potential to yield scientifically significant fossils (see BLM Instruction Memorandum No. 2008-009). This classification does not reflect rare or isolated occurrences of significant fossils or individual localities; it refers only to the relative occurrence on a formation- or member-wide basis. Any rare occurrences may require additional assessment and mitigation if they fall in the area of anticipated impacts.

Table 2-26 summarizes management concerns by PFYC.

Table 2-26 Management Concerns by Potential Fossil Yield Classification

PFYC	Level of Concern	Management Concerns
1	Very low	Management concern for paleontological resources is usually negligible or not applicable. Assessment or mitigation is usually unnecessary, except in very rare or isolated circumstances.
2	Low	Management concern for paleontological resources is generally low. Assessment or mitigation is usually unnecessary except in rare or isolated circumstances.
3	Moderate or unknown	Management concern for paleontological resources is moderate or cannot be determined from existing data. Surface-disturbing activities may require field assessment to determine appropriate course of action.
4	High	Management concern for paleontological resources is moderate to high, depending on the proposed action. A field survey by a qualified paleontologist is often needed to assess local conditions. Management prescriptions for resource preservation and conservation through controlled access or special management designation should be considered.
5	Very high	Management concern for paleontological resources is high to very high. A field survey by a qualified paleontologist is usually necessary before surface-disturbing activities or land tenure adjustments. Mitigation will often be necessary before or during these actions. Official designation of areas of avoidance, special interest, and concern may be appropriate.
Source: BLM Manual H-8270-1.A.1		

Current Condition

Fossil resources are part of the geologic formation in which they occur. Most fossils occur in sedimentary rock formations, where they may be distributed extensively both vertically and horizontally throughout the formations or may occur in discontinuous pockets. Few geologic formations are uniformly rich in fossils throughout, and some are richer in fossils than others. Experienced paleontologists can predict which formations will contain fossils and, in general, what types of fossils will be found based on the age of the formation and its depositional environment. However, predicting the exact location where fossils will be found without field surveys is not possible. Development of the PFYC is based in part on known fossil occurrences and geology (see **Figure 2-6**, Potential Fossil Yield Classification). Acreages of each class can be expected to change as more data are collected from ongoing field surveys and inventories.

In the decision area, PFYC Class 1 makes up approximately 3,300 acres, PFYC Class 2 makes up approximately 19,700 acres, and Class 3 geologic formations account for approximately 275,600 acres on federal mineral estate. PFYC Class 4 formations comprise only 8,100 acres of the decision area. There are 1,955,400 acres of PFYC Class 5 identified for the decision area (BLM GIS 2014).

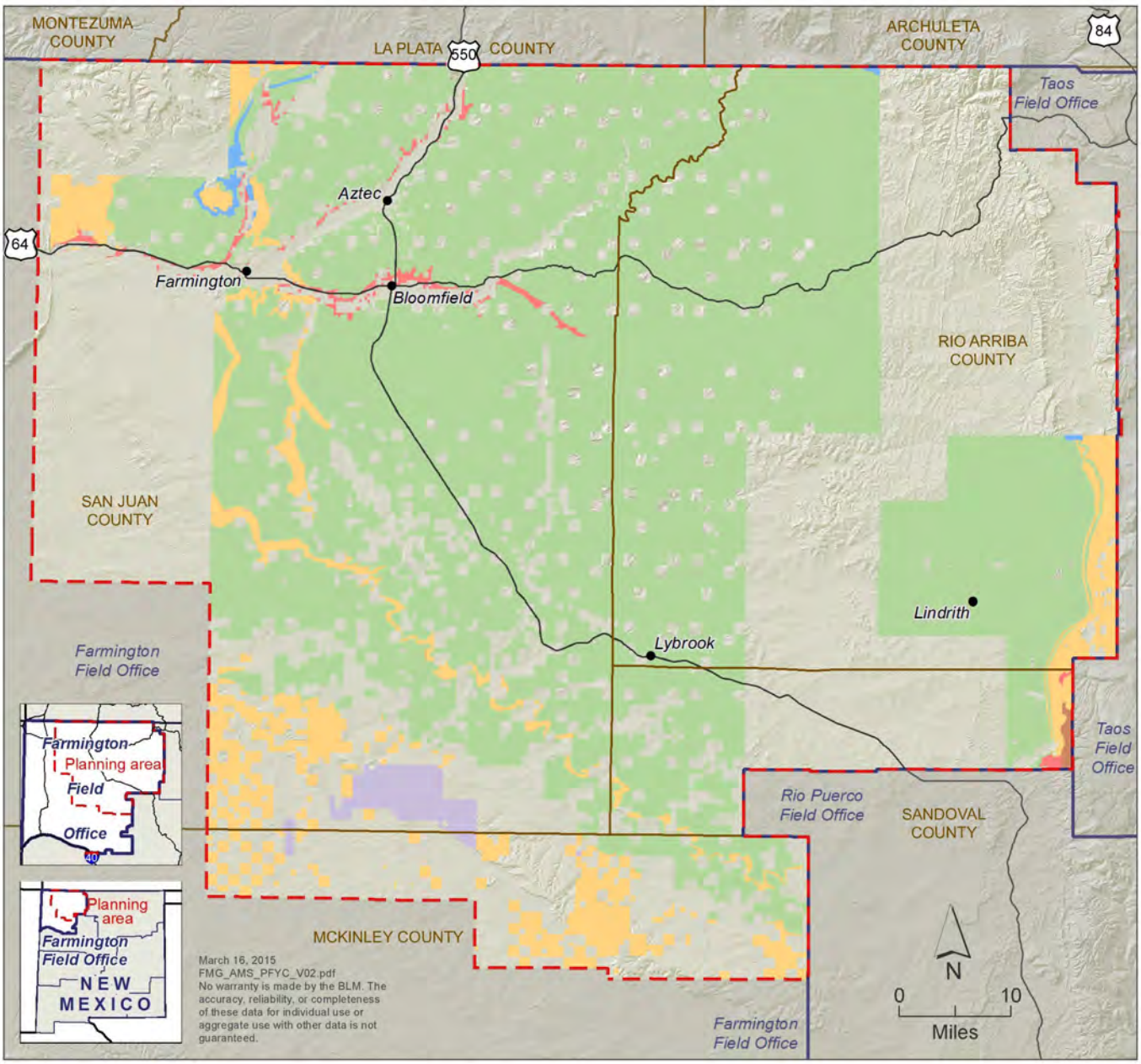
In addition to the PFYC, three physiographic provinces can be used to discuss the geology and paleontology of the planning area.

San Juan Basin

The San Juan Basin represents the largest physiographic province in the planning area. It is an asymmetrical structural basin with abrupt margins on the northwest (Hogback Monocline), northeast (southwest limb of the Archuleta Arch), and east (Nacimiento Uplift). The Chaco homocline is to the south of the basin, where the strata gently dip to the north (Cather 2004). Rocks include shales, siltstones, sandstones, conglomerates, coals, and some limestones deposited during the late Cretaceous and early Paleogene Periods. Depositional environments during these times varied among shallow marine and barrier island complexes, paludal, deltaic, and fluvial environments as the Western Interior Seaway transgressed and regressed multiple times over the planning area. North America was closer to the equator and the climate was significantly warmer than today.

Figure 2-6 Potential Fossil Yield Classification

Potential Fossil Yield Classification (PFYC) System is used by the BLM to classify geologic units based on the relative abundance of vertebrate fossils or scientifically significant invertebrate or plant fossils and their sensitivity to adverse impacts, with a higher class number indicating a higher potential.



Source: BLM GIS 2014

- PFYC 5 very high fossil occurrence that consistently and predictably produce fossils
- PFYC 4 high occurrence of significant fossils
- PFYC 3 moderate potential where fossil content varies in significance, abundance, and predictable occurrence, or unknown fossil potential
- PFYC 2 low potential for vertebrate fossils or scientifically significant nonvertebrate fossils
- PFYC 1 very low potential for recognizable fossil remains

- Planning area
- National Park Service
- Field office boundary

Because it is a structural basin, the oldest rocks are exposed toward the flanks, while the youngest rocks are exposed in the center of the basin. Late Cretaceous rocks exposed in the San Juan Basin are the Mancos Shale, Mesa Verde Group, Lewis Shale, Pictured Cliffs Formation, Fruitland Formation, and Kirtland Shale. These units preserve two major transgressions followed by regressions, with the Pictured Cliff Sandstone representing the final rock unit deposited in marine conditions in the San Juan Basin (Hutchinson and Kues 1985). Early Paleogene units include the Ojo Alamo Formation, Animas Formation, Nacimiento Formation, and San Jose Formation, deposited primarily in fluvial environments. Abundant fossils are found in the San Juan Basin (Kues 2008; Lucas et al. 1981).

The Mancos Shale Formation through the Pictured Cliffs Formation are listed as PFYC 3 because these rocks often represent marine depositional conditions, and known occurrences of vertebrate fossils are sporadic. Known fossils include bivalves, ammonites, trace fossils, and rare fish and marine reptiles (Sealey and Lucas 1997; Lucas et al. 1988). The Ojo Alamo Formation is also listed as PFYC 3. It is a nonmarine unit containing intermittent fossils with low predictability, primarily containing petrified wood. Of note, a hadrosaurian femur was collected from the Ojo Alamo Formation and has led to debate about the possibility of dinosaurs surviving the end-Cretaceous extinction event in the San Juan Basin (Fassett and Lucas 2000; Lucas et al. 2009).

The Fruitland Formation and Kirtland Shale are the final two rocks deposited in the San Juan Basin during the Cretaceous. Both are PFYC 5 due to high concentrations of vertebrate fossil localities known in the basin, especially in the Bisti-De-Na-Zin Wilderness Area and Ah-shi-sle-pah Wilderness Area. Invertebrate fossils include insects, snails and slugs (gastropods), hinged-shell mollusks (bivalves), crustaceans, and filter feeders (bryozoans; Kues 2008; Wolberg et al. 1988a). Vertebrate fossils are diverse in these two formations, including bony fish, sharks and rays, lizards, snakes, frogs, salamanders, turtles, crocodiles, dinosaurs, and mammals. Additionally, dinosaur skin impressions, coprolites (fossilized dung), and tracks are known from these rocks (Hall et al. 1988; Wolberg et al. 1988b). Plant fossils include logs, stumps, leaves, and palm fronds (Hunt and Lucas 1992).

The early Paleogene Nacimiento and San Jose Formations are also PFYC 5 due to high occurrences of vertebrate fossils. These include bony fish, rays, salamanders, frogs, lizards, snakes, turtles, crocodiles, champsosaurs, birds, and abundant mammals (Lucas and Williamson 1992; Williamson and Lucas 1992; Williamson 1996). Vertebrates from the Nacimiento Formation in the San Juan Basin form the basis for the Puercan and Torrejonian North American land mammal ages (Archibald et al. 1987). Invertebrate fossils include gastropods. Many stumps, logs, and leaves are found in these rock units.

Nacimiento Uplift and Archuleta Arch

The eastern margin of the San Juan Basin is bounded by the Nacimiento-Gallina fault system. This was responsible for the Nacimiento Uplift to the southeast of the basin and the Archuleta Arch to the northeast; it marks the western boundary of each (Woodward et al. 1992). Precambrian rocks are exposed in the Nacimiento Uplift and lack any known fossil localities.

Late Cretaceous and Paleogene strata are preserved on the west side of the Nacimiento-Gallina fault system. These are the Mancos Shale, Mesa Verde Group, Lewis Shale, Pictured Cliffs Formation, Fruitland Formation, Kirtland Shale, Ojo Alamo Sandstone, Nacimiento Formation, and San Jose Formation.

Additionally, small exposures of Cretaceous Dakota Formation, Jurassic (undivided), and Triassic Chinle are found along the Nacimiento Uplift. The only locality in these units is in the Chinle Formation, where carbonized wood, amber, and wood casts were found (BLM unpublished).

Chaco Slope

The Chaco slope is on the south-southwest margin of the San Juan Basin, north-northeast of the Zuni Uplift. Late Cretaceous strata are preserved, including Mesa Verde Group, Lewis Shale, and Pictured Cliffs Formation. The Menefee Formation of the Mesa Verde Group has the most exposure on the Chaco Slope, with several vertebrate fossil localities documented (BLM unpublished).

Table 2-27 lists the significant resources that are managed and subject to scientific research in the planning area.

Table 2-27 Paleontological Areas Identified for Management

Locality Name	Size (Acres)	Environmental Education/Scientific Research
Ah-shi-sle-pah	6,560	Wilderness study area
Betonnie Tsosie	8,070	Fossil area
Bisti/De-Na-Zin Wilderness	39,960	Wilderness area
Bohanon Canyon Complex	12,530	Fossil area
Carson Fossil Pocket	960	Fossil area
Fossil Forest	2,800	Research natural area
Gobernador and Cereza	25,470	Fossil area
Kutz Canyon Paleontological Area	47,700	Fossil area
Lybrook Fossil Area	19,850	Fossil area
Source: BLM 2008a; BLM GIS 2014		

Trends

Researchers and academics have visited and continue to visit the fossil-rich formations found in the planning area. There are currently BLM-permitted paleontological studies of fossils found from the Fruitland Formation and Kirtland Shale in the Ah-shi-sle-pah Wilderness Study Area and Bisti/De-Na-Zin Wilderness Area. Fossils in these areas and in the San Juan Basin record the end-Cretaceous extinction event.

Additionally, there has been significant recent activity toward the southern end of the San Juan Basin related to exploration of the Mancos Shale for hydrocarbons. The Paleocene Nacimiento Formation is exposed at the surface in the areas where most of this work is occurring. The resulting paleontological surveys and monitoring have led to an increased knowledge of fossil distribution, particularly those beds in the formation that have an especially high concentration of fossils. Fossils are provided extra protection early in new project planning, as fossil-bearing beds are mapped along their trend and are avoided.

Forecast

As the BLM-administered lands in the planning area become subject to more use for a variety of purposes, significant fossil resources might be more likely to be affected. Increased activity associated with hydrocarbon removal from the Mancos Shale in the San Juan Basin is expected. Exploration and development of the Mancos Shale will be concentrated among known vertebrate fossil localities. The increase of use in key areas would require additional measures to be taken in order to manage these resources according to BLM policy and laws. The scientific, educational, and recreational value of any discovered or known paleontological resource should be determined by careful examination and evaluation by a paleontological resource specialist.

Key Features

There are key features in the planning area where fossil-bearing units are well exposed at the earth's surface, along canyon walls, cliff faces, and in badland topography. Exposure of the rock at the surface allows for easier viewing and discovery of these resources. Where thin soils cover older sedimentary rocks, surface disturbance may encounter fossil-bearing units. Some important known localities would require monitoring and more intense management to conserve and manage these resources according to BLM policy.

A case-by-case assessment of proposed actions that expose fossil-bearing units or occur near or on key features would follow current BLM policy and would provide for management of paleontological resources.

San Juan Basin

Key features in the San Juan Basin include extensive badlands (e.g., the Bisti/De-Na-Zin Wilderness Area), as well as abundant canyon walls and cliff faces with widespread exposures of fossil-bearing late Cretaceous and Paleogene sandstones and mudrocks.

Nacimiento Uplift and Archuleta Arch

Key features in the area are known localities from late Cretaceous and Paleogene strata, which are PFYC 3.

Chaco Slope

Key features in the area are known localities from late Cretaceous and Paleogene strata, which are PFYC 3.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern paleontological resources:

- BLM-M-8270, Paleontological Resources Management
- IM 2008-009, Potential Fossil Yield Classification System for Paleontological Resources on Public Lands
- Paleontological Resources Preservation Act of 2009

Management goals, objectives, and actions for paleontological resources are found in the **Appendix**, Current Management. They include special designated areas in the San Juan Basin that protect some areas with higher concentrations of known fossil localities.

For the scope of this amendment, there is no need for changes to existing management; however, there is the need to update the existing and affected environment. Additionally, the BLM could create special management stipulations to expand protection of the fossil resources. For this to happen, the BLM would consider the exposed mudrocks of the late Cretaceous and early Paleogene formations in the San Juan Basin during project planning, especially for oil and gas development projects.

With the increased activity in the Mancos Shale, paleontological resources will be adversely impacted without additional personnel to survey and monitor for fossils. College students in the area majoring in geosciences or biology, trained by and under the oversight of professional paleontologists, may help alleviate this lack of personnel.

2.1.15 Visual Resources

Profile

The landscape in the San Juan Basin is diverse, exhibiting many distinctive features and landforms found in arid regions where water and wind erosion have sculpted the land. The San Juan Basin is an area of young plateaus and broad valleys. Distinctive features include steep and colorful escarpments, broad vistas, rugged canyons, and pastel-colored badlands dissected into plateaus and pinnacles. Sagebrush and grassland expanses are prominent in the central and southern portion of the FFO. Piñon-juniper woodlands, rivers, and man-made structures, such as reservoirs, roads, and oil and gas wells, dominate the northern portion. Sightseeing is popular in the region, where scenic vistas are frequent along highways, high places, and riverfronts.

Visual Resource Management System

The BLM visual resource management (VRM) system is a way to identify and evaluate scenic values in order to determine appropriate levels of management. VRM is a tool to identify and map essential landscape settings to meet public preferences and recreation experiences today and into the future. The

VRM system helps to ensure that actions taken on BLM-administered lands today will benefit the visual qualities associated with the landscapes, while protecting these visual resources for years to come.

Visual Resource Inventory

A visual resource inventory (VRI) involves identifying the visual resources of an area and assigning them to inventory classes using the BLM's resource inventory process. The process involves rating the visual appeal of a tract of land, measuring public concern for scenic quality, and determining whether the tract of land is visible from travel routes or observation points. This process is described in detail in BLM Handbook H-8410-1, Visual Resource Inventory (BLM 1986a).

The results of the VRI become an important component of the RMP for the area. The RMP establishes how BLM-administered lands will be used and allocated for different purposes; it is developed through public participation and collaboration. Visual values are considered throughout the RMP process, and the area's visual resources are then assigned to the management classes with established objectives.

Lands in the planning area were placed into one of four VRI classes, based on the three inventory components. These class assignments are informational and provide the basis for considering visual values during the RMP process. They do not establish management direction and are not used as a basis for constraining or limiting surface-disturbing activities; instead they are considered a baseline for existing conditions.

Visual Resource Management

The assignment of VRM classes is ultimately based on management decisions made during the RMP process, which must take into consideration the value of visual resources. During the process, inventory class boundaries can be adjusted as necessary to reflect these resource allocation decisions. The goal of VRM is to minimize the visual impacts of all surface-disturbing activities, regardless of the class to which an area is assigned.

Objectives for each of the four Visual Resource Classes are detailed below.

Class I is to preserve the existing character of the landscape. This class provides for natural ecological changes, but it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.

Class II is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III is to partially retain the character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and 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 basic element repetition.

The analysis of a visual contrast rating process is used to resolve visual impacts. The process involves comparing the project features with the existing landscape features, using basic elements of form, line, color, and texture. The process is described in detail in BLM Handbook H-8431-1, Visual Resource Contrast Rating (BLM 1986b).

Indicators

The indicator of impacts on visual resources is the degree of contrast that an action would cause to the visual landscape. Greater degrees of contrast would result in greater impacts on visual resources.

Current Condition

A VRI of the planning area was completed in 2009 (Otak 2009) and updated by the BLM in 2013 according to guidelines in BLM Handbook H-8410-1, Visual Resource Inventory (BLM 1986a). The inventory consisted of three components: scenic quality evaluation, sensitivity level analysis, and distance zone delineation.

The scenic quality, sensitivity, distance zones, and resulting VRI class distribution for the FFO is presented in **Table 2-28** and in **Figure 2-7**.

Table 2-28 Visual Resource Inventory Component Distribution

Visual Resource Inventory Component	Acres	Percent of Decision Area
Scenic Quality		
A	35,800	3
B	319,300	24
C	906,800	69
Not rated	51,000	4
Sensitivity		
High	158,900	12
Medium	625,700	48
Low	522,300	40
Not rated	5,600	0
Distance Zone		
Foreground/middle ground	1,261,900	96
Background	0	0
Seldom seen	0	0
Not rated	50,800	4
VRI Class		
Class I	45,000	3
Class II	86,100	7
Class III	299,400	23
Class IV	876,400	67
Not rated	5,400	0
Source: BLM GIS 2013; Otak 2009		

Trends

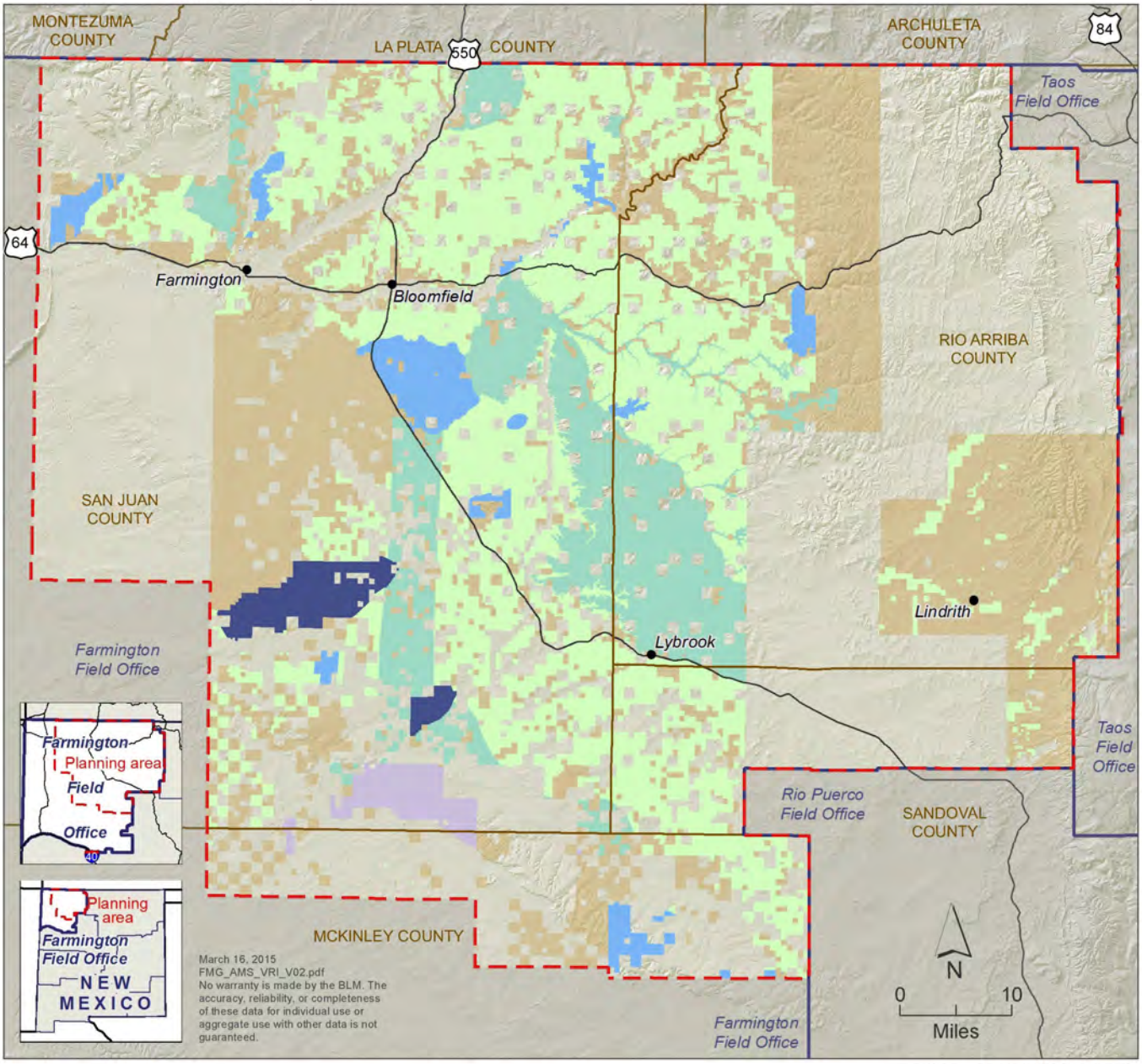
The visual landscape of the FFO has been considerably modified due to the proliferation of gas wells, pipelines, and access roads. The visual character of areas with substantial oil and gas development has progressively changed over the last several decades.

Forecast

As development in the planning area continues, particularly oil and gas development and related infrastructure, impacts on the scenic resources will continue. Impacts on visual resources would be the greatest where development occurs in the foreground/middle ground distance zone. This would be in areas with low levels of cultural modifications or low levels in diversity of landform, vegetation, and color.

Figure 2-7 Visual Resource Inventory

Visual resource inventory (VRI) classes represent the relative value of the visual resources. Lands are placed into one of four classes based upon the results of the resource contrast rating, sensitivity levels, and distance zones. VRI Class I is generally assigned to special areas such as national wilderness and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape.



Source: BLM GIS 2014, BLM GIS 2013, Otak 2009

VRI Class I
VRI Class II
VRI Class III
VRI Class IV
Not Rated
most valued
least valued
Decision Area
National Park Service
Field office boundary

Key Features

The Bisti/De-na-zin Wilderness Area, Ah-shi-sle-pah WSA, and 19 special designation areas comprise the Class I designations, as follows:

- Andrew's Ranch ACEC
- Bee Burrow ACEC
- Bis Sa'ani ACEC
- Casa Del Rio Chaco Culture Archaeological Protection Site
- Casamero Community ACEC
- Fossil Forest RNA
- Greenlee Ruin Chaco Culture Archaeological Protection Site
- Halfway House ACEC
- Indian Creek ACEC
- Jacques Chacoan Community ACEC
- Kin Nizhoni ACEC
- Lake Valley Chaco Culture Archaeological Protection Site
- Morris 41 ACEC
- Negro Canyon Special Designation Area
- Pierre's Site ACEC
- Thomas Canyon Recreation/Wildlife Area
- Toh-La-Kai ACEC
- Twin Angels ACEC
- Upper Kin Klizhin ACEC

Class I areas with high intrinsic scenic value and visual sensitivity in the FFO are the Bisti/De-na-zin Wilderness Area, Ah-shi-sle-pah WSA, Fossil Forest RNA, Negro Canyon Special Designation Area, Thomas Canyon Recreation/Wildlife Area, and Carracas Mesa Recreation/Wildlife Area. Protecting vistas from outside influences in these areas is a concern. Also, the visual context is an important component of the cultural resource values of the Chacoan Outliers, Native American Use and Sacred Areas ACECs, and additional traditional cultural properties.

Chaco Canyon National Historic Park representatives have expressed concerns about night sky conditions and impacts on the National Park from development on BLM-administered lands. Chaco Canyon National Historic Park has a night sky initiative that offers astronomy as part of its interpretive programs. These programs emphasize the practices of the Chacoan people a thousand years ago, as well as modern approaches to viewing the same night sky they viewed. In order to maintain the night sky in similar conditions it is important that the area remain in a remote environment with clear dark skies, free from light pollution. The park was certified as an International Dark Sky Park by the International Dark-Sky Association on August 19, 2013, the twelfth park to receive the designation worldwide and only the fourth unit of the US National Park System (National Park Service 2014).

Current Management and Management Opportunities

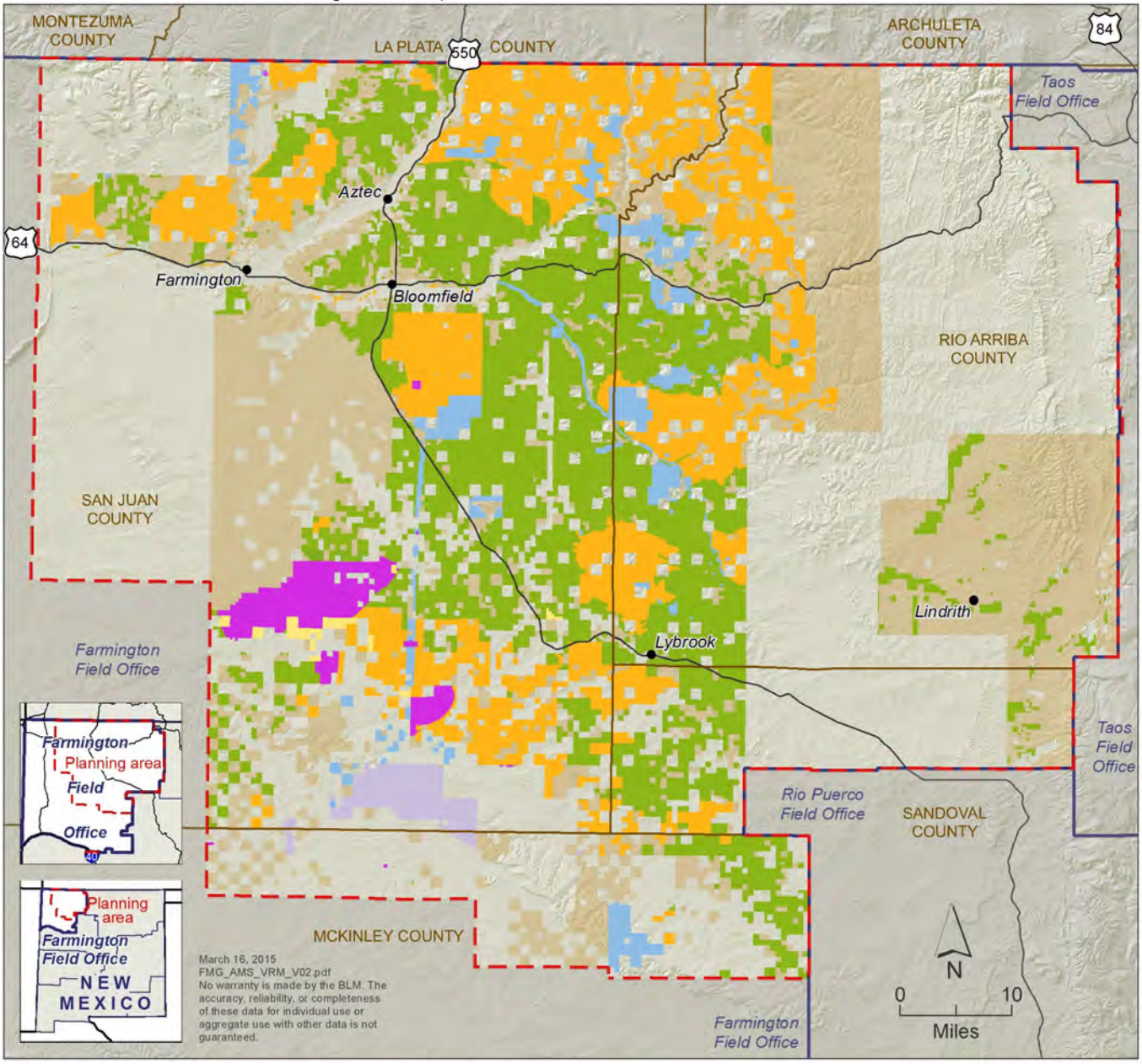
The following statutes, regulations, handbooks, and other policies govern visual resources:

- BLM H-1601-1, Land Use Planning
- BLM H-1790-1, NEPA Handbook
- BLM H-8410-1, Visual Resource Inventory
- BLM H-8431-1, Visual Resource Contrast Rating
- BLM-M-8400, Visual Resource Management
- IM No. 2000-096, Use of VRM Class I Designation in Wilderness Study Areas

Management objectives and actions for visual resources are found in the **Appendix**, Current Management. VRM classes are summarized in **Table 2-29** and are displayed on **Figure 2-8**.

Figure 2-8 Visual Resource Management

Visual resource management (VRM) classes define the degree of acceptable visual change within a characteristic landscape. A class is based on the physical and sociological characteristics of any given homogeneous area and serves as a management objective. Categories assigned to public lands are based on scenic quality, sensitivity level, and distance zones. Each class has an objective that prescribes the amount of change allowed in the characteristic landscape (from H-1601-1, BLM Land Use Planning Handbook).



Source: BLM GIS 2014

- VRM Class I preserve existing landscape
- VRM Class II retain existing landscape
- VRM Class III partially retain existing landscape
- VRM Class IV allow major modifications to existing landscape
- BLM-administered surface land, newly acquired and without VRM Class
- Decision area (federally owned minerals but non-BLM surface ownership where the BLM cannot make VRM classification)
- Planning area
- National Park Service
- Field office boundary

Table 2-29 Visual Resource Management Classes

VRM Class	Acres
Class I	48,900
Class II	90,900
Class III	473,900
Class IV	693,600
Undesignated	5,400
Source: BLM GIS 2014	

Since the RMP was adopted in 2003, the BLM has approved a visual RMPA, which updated the VRM classes of the planning area. Current management direction combined with the recent visual RMPA is adequate to address visual resource issues associated with the anticipated new development in the Mancos-Shale area. No additional decisions will be made as part of this amendment process, but the BLM will continue to incorporate future VRM policy changes. For example, Information Bulletin No. 2008-116, Standard Environmental Colors Chart – Updated (September 30, 2008), updated the standard color chart for project proponents to choose from in selecting the most appropriate colors for facilities on BLM-administered lands when mitigating visual impacts. Proponents may either use an approved color from the standard color chart or propose an alternative color for approval.

Additional BMPs for facilities that affect night sky conditions (e.g., in the vicinity of Chaco Canyon National Historic Park) may also be developed. Light pollution can be defined as any adverse effect of artificial light, including sky glow, glare, spill light, light clutter, decreased visibility at night, and energy waste (International Dark-Sky Association 2014).

2.2 RESOURCE USES

2.2.1 Minerals

Minerals are classified into three main categories: leasable, locatable, and salable. In the planning area, the minerals most commonly found by category are as follows:

- **Leasable—**oil and gas (including coal bed methane) and coal
- **Salable—**sand, gravel, rock, fill dirt

Leasable Minerals

Current Level and Location of Use

Oil and Gas

Current Level and Location of Use

Hydrocarbon production in the planning area is primarily from natural gas, coal bed methane, and a small amount of oil/condensate, all in the San Juan Basin. The Fruitland Coal, Pictured Cliffs, Mesa Verde, and Dakota Formations have historically been the primary natural gas-producing formations in the San Juan Basin; the Fruitland Sand and Chacra also produce notable amounts of natural gas. However, with advances in horizontal drilling and stimulation, interest and exploration in the Mancos Shale/Gallup Formations has increased. All of these formations range in age from 65 to 95 million years before the present time (Upper Cretaceous).

The 2001 RFD for the FFO and Chapter 3 of the Farmington PRMP/FEIS describe the overall production amounts and level of oil and gas activities in the FFO (Engler et al. 2001; BLM 2003a, pp. 3-9 to 3-12). In general, most of the natural gas produced in New Mexico is from the planning area. Statewide natural gas production in 2012 was 1,252 billion cubic feet.

San Juan County is the largest natural gas producing county in the state, producing 456 billion cubic feet in 2012. Rio Arriba County is the second largest producing county, with 333 billion cubic feet in 2012.

These two counties combined produced 63 percent of the total natural gas in New Mexico in 2012 (New Mexico Energy, Minerals and Natural Resources Department 2013, p. 53).

The planning area produces less of New Mexico's oil. Out of a 2012 statewide total of 85.2 million barrels, San Juan and Rio Arriba Counties produced 1.6 million barrels each. These two counties produced a combined total of 4 percent of statewide oil production in 2012 (New Mexico Energy, Minerals and Natural Resources Department 2013, p. 53).

Changes Since 2003

The 2003 PRMP/FEIS analyzed the impacts of development of up to 9,942 new oil and gas wells on federal mineral estate in the FFO over the next 20 years (BLM 2003a, p. 4-105). Since 2003, 3,860 new oil and gas wells have been drilled on federal mineral estate in the FFO. The primary change in conditions since 2003 publication of the Farmington PRMP/FEIS is the technological advancement in horizontal drilling and resulting increased interest in the Mancos Shale/Gallup formations.

The 2001 RFD, which estimated future oil and gas development in the FFO, predicted that oil and gas production from these formations, while historically significant, would decrease. This would result as existing reservoirs in the formations approached depletion and became marginally economic with existing technology (Engler et al. 2001, page 5.24). As a result, the RFD predicted development of only 300 new oil and gas wells in the Mancos/Gallup Formations over the next 20 years (Engler et al. 2001, p. 5.27). In reality, 443 new oil and gas wells have been drilled on these formations alone on federal mineral estate since 2003. Larger operators have begun producing from horizontal wells in the formations, while some smaller operators are developing vertical wells. Of the new wells drilled since 2003, 74 were directional, 47 were horizontal, and 322 were vertical. Of the new wells, 363 are oil wells and 80 are gas wells.

Approximately 113,100 acres were closed to fluid mineral development; 40,300 acres were identified as no surface occupancy and are open to fluid mineral leasing. However, surface occupancy or surface-disturbing activities associated with fluid mineral leasing cannot be conducted on the surface of these lands. Controlled surface use was applied to 554,800 acres. These areas are open to fluid mineral leasing but the stipulation allows the BLM to require special operational constraints. The remaining approximately 72 percent of the decision area is open to fluid mineral leasing but is subject to standard lease terms and conditions (see **Figure 2-10**).

The number of active vertical wells in these formations has remained relatively constant at 1,300 since 2000. These wells have resulted in monthly production of 50,000 barrels of oil and 1 billion cubic feet of gas. In the past four full years, new vertical well completions have averaged 45 per year in the Mancos Shale/Gallup Formations (Engler et al. 2013, p. 8). Horizontal well activity has increased significantly in the last two years. Productivity of the horizontal oil wells has varied, with most producing less than 5,000 barrels over three months. Oil development in the formations is still in exploratory phases. Early performance of horizontal gas wells has been outstanding, with cumulative production for two wells at 1.8 and 2.0 billion cubic feet (Engler et al. 2013, p. 10).

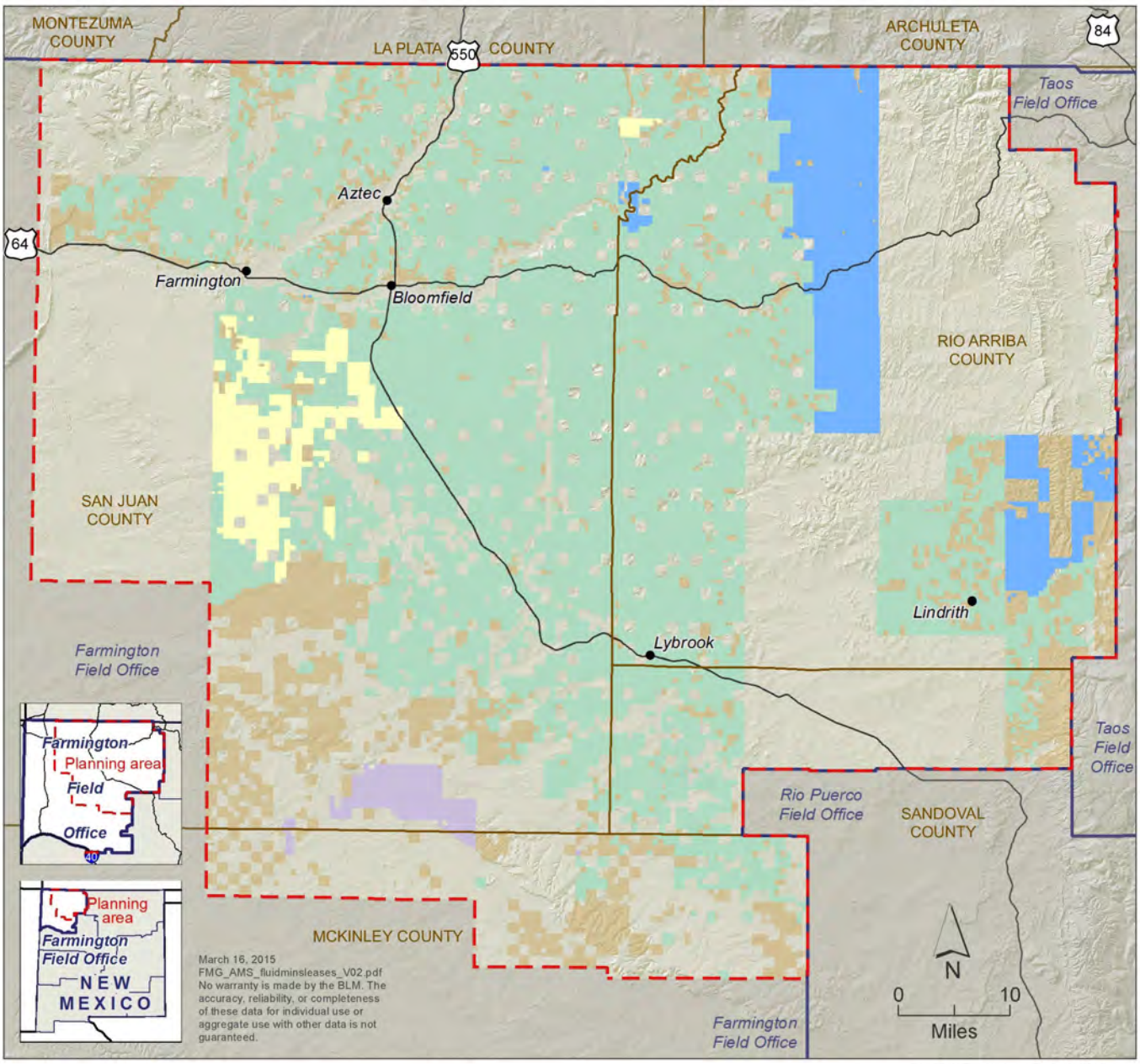
A significant leasing effort has taken place in the planning area since the 2003 RMP. Approximately 79 percent of the planning area is now leased (see **Figure 2-9**). Oil drilling is occurring in the Mancos/Gallup Formations, but drilling for gas wells in the formations is less active. Many leases in the vicinity of the Mancos/Gallup Formations are producing gas from other formations.

Coal

Chapter 3 of the Farmington PRMP/FEIS describes the major coal-bearing formations and coal activity in the FFO (BLM 2003a, pp. 3-12 to 3-13).The primary coal resources in the planning area exist in the Fruitland and Menefee Formations. There are a total of 10,500 acres of active coal mines in the decision area and 31,900 acres of preferred rights to renewal of lease (see **Figure 2-11**). The San Juan underground coal mine is active in the northwest portion of the planning area and produces approximately 7 million tons annually via underground mining. The La Plata coal mine was active at the time of

Figure 2-9 Federal and Tribal Oil and Gas Leases

A lease is an agreement outlining the basic terms of developing lands or minerals such as royalty to be paid, length of time, description of lands. Section 302 of the Federal Land Policy and Management Act of 1976 provides the authority to issue leases for the use, occupancy, and development of public lands. Leases are issued for a variety of purposes, including oil and gas development. The BLM regulations establishing procedures for processing these leases and permits are found in 43 CFR 2920.

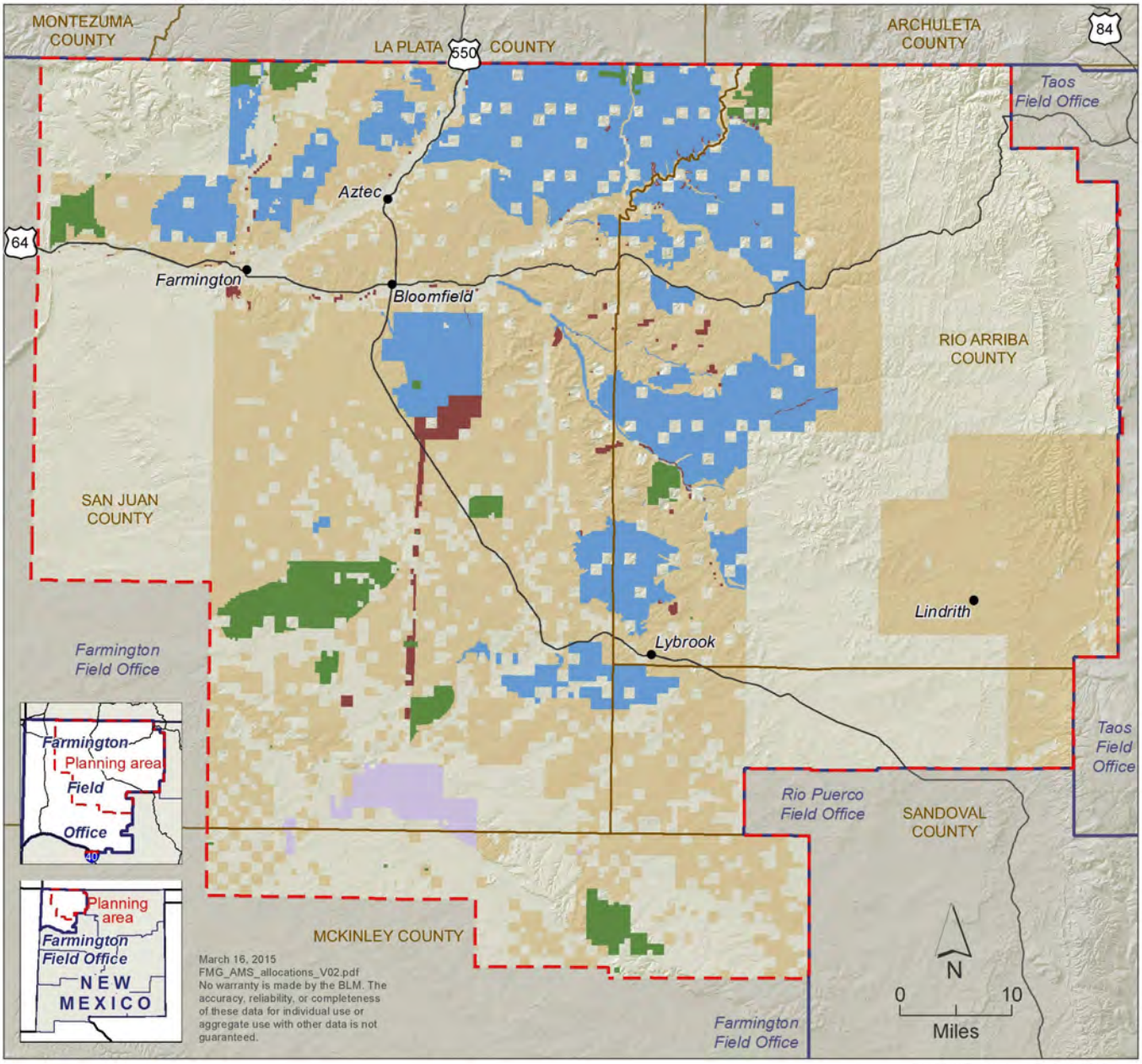


Source: BLM GIS 2014

BLM-managed leases
Other federal leases
Tribal leases
Decision Area
Planning area
National Park Service
Field office boundary

Figure 2-10 Oil and Gas Leasing Allocations

Closed areas do not allow fluid mineral development. Areas identified as no surface occupancy (NSO) are open to fluid mineral leasing, but surface occupancy or surface-disturbing activities associated with fluid mineral leasing cannot be conducted on the surface of the land. Controlled surface use (CSU) areas are open to fluid mineral leasing but the stipulation allows the BLM to require special operational constraints. The remaining BLM-administered lands in the planning area are open subject to standard lease terms and conditions.

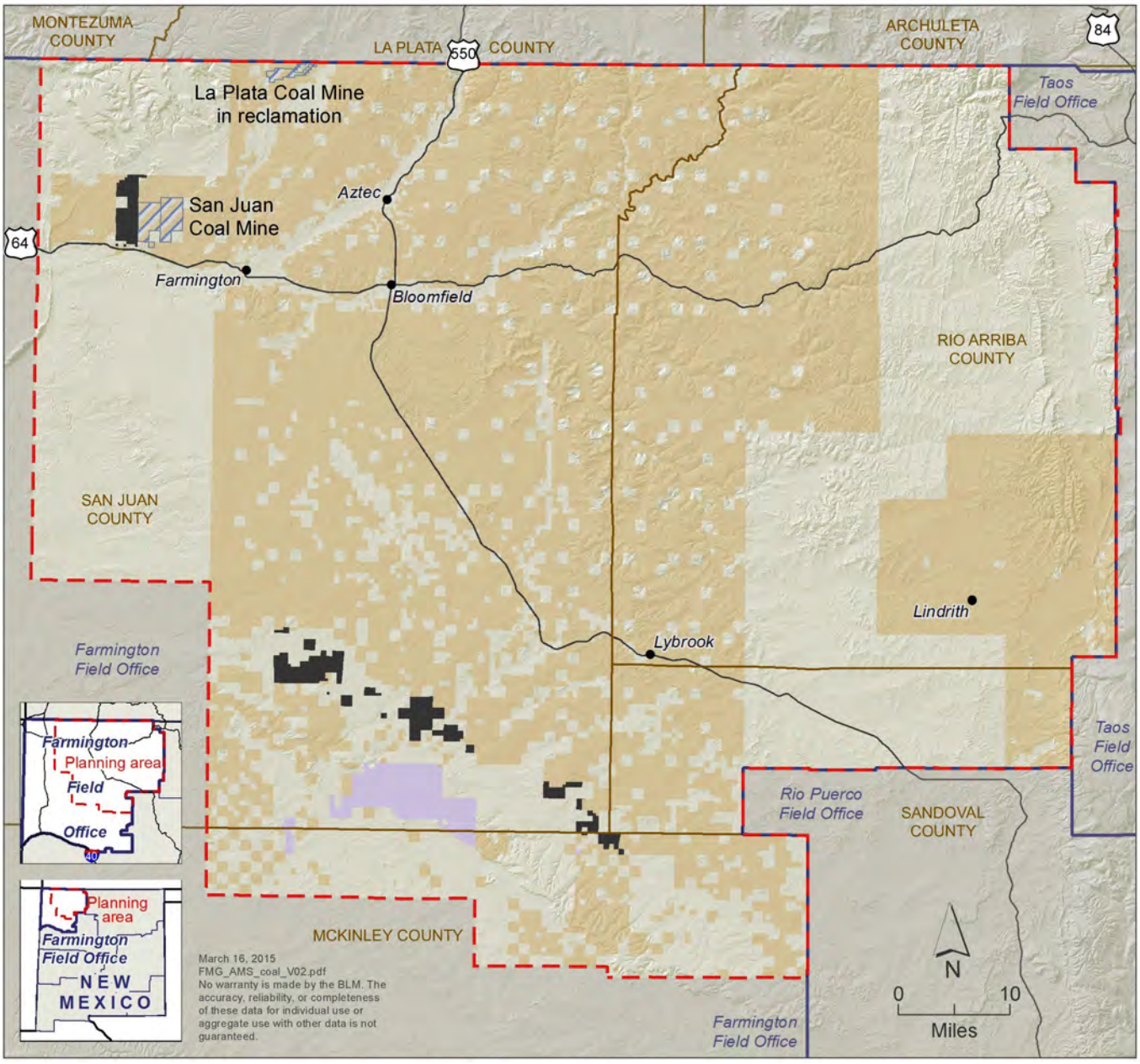


Source: BLM GIS 2014

Closed
NSO
CSU
Decision Area
Planning area
National Park Service
Field office boundary

Figure 2-11 Coal

Leasable minerals are those minerals or materials designated as leasable under the Mineral Leasing Act of 1920. Coal is currently the only solid leasable mineral developed in the planning area.



Leasable minerals
- Active coal mine
- Preferred rights to renewal of lease

- Decision Area
- Planning area
- National Park Service
- Field office boundary

Source: BLM GIS 2014

publication of the 2003 PRMP/FEIS but is now in reclamation. The surface operation of the San Juan coal mine is also in reclamation.

Forecast

Oil and Gas

Current oil exploration and development in the formations is being appraised for the most productive areas. Natural gas production is much more consistent at this time. However, natural gas production from the Mancos/Gallup Formations is unlikely to increase until the price of natural gas rises. Additionally, the southern portion of the planning area near Lybrook and Cuba contains remote areas that lack infrastructure (such as water pipelines, oil pipelines, and gas pipelines; power lines; and resource roads, local roads, and collector roads). These facilities are necessary to develop the portions of the Mancos/Gallup Formations in that area.

Much of the current oil exploration is in this southern portion of the planning area. The lack of infrastructure will challenge oil and gas development in the short term and may limit the initial pace of new development in these formations.

Checkerboard landownership (where adjacent parcels of land are owned by entities other than the federal government) in the area of the Mancos/Gallup Formations, particularly within Indian Allotted lands, is creating further difficulties for adding infrastructure and facilitating development in the formations. This is because it is more difficult to permit a road or pipeline that crosses both federal and Indian Allotted land than it would be to permit one crossing only federal land. Permission for the road or pipeline must be granted by each party whose land would be crossed, and BIA and BLM permits both must be secured.

More information on the forecast for oil and gas activity in the planning area is available in the recently published RFD (October 2014, available on the BLM project website: http://www.blm.gov/nm/st/en/fo/Farmington_Field_Office/ffo_planning/farmington_rmp/rmpa_mancos.html).

Coal

The operator of the San Juan Coal Mine, BHP Billiton, has a contract to supply the San Juan Generating Station coal-fired power plant with coal from the San Juan Coal Mine. That contract will expire in 2017, after which BHP Billiton is expected to reduce production from the San Juan Coal Mine by approximately 50 percent, to 3.5 million tons per year. Therefore, no additional coal leases are expected to be issued for the San Juan Coal Mine over the life of the FFO RMP.

Key Features/Areas of High Potential for Use

The key feature for oil and gas leasing in the planning area are the Mancos/Gallup Formations. The key feature for coal leasing in the planning area is the San Juan Coal Mine which is expected to produce coal throughout the life of the FFO RMP. However, the 14 preference right lease applications, 17 competitive coal lease tracts, and areas withinin the Coal Belt Special Management Area may be key features[3] if further coal leasing and development occurred in those areas in the future. The area encompassed by the Coal Belt SMA contains an estimated 4 billion tons of coal (BLM 1988) and is likely to be extracted using surface mining methods BLM 2003a).

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern leasable minerals:

- BLM-H-3150-1, Onshore Oil and Gas Geophysical Exploration
- BLM-H-3420-1, Competitive Coal Leasing

[3]The Coal Belt Special Management Area was discussed in the Proposed RMP/Final EIS (BLM 2003a) but the management area was not carried forward in the 2003 ROD (BLM 2003b). It is mentioned here to note that there are extensive coal reserves in the area that may become key features for coal development in the future.

- BLM-M-2881, Mineral Leasing Act – General
- Geothermal Steam Act of 1970, as amended
- IM 2002-174, Oil and Gas Leasing Stipulations
- IM 2003-127, Integration of the Energy Policy and Conservation Act Inventory Results into Land Use Planning and Energy use Authorizations
- Mineral Leasing Act for Acquired Lands of 1947, as amended
- Mineral Leasing Act of 1920, as amended
- Mining and Minerals Policy Act of 1970
- New Mexico Oil and Gas Act
- New Mexico Oil Conservation Division Environmental Handbook
- New Mexico Surface Owners Protection Act
- Oil and Gas Onshore Orders
- Onshore Oil and Gas Leasing Reform Act of 1987
- Surface Mining Control and Reclamation Act of 1977
- Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (commonly referred to as The Gold Book)
- Title 19 New Mexico Administrative Code Chapter 8, Coal Mining, and Chapter 15, Oil and Gas
- Title 43 CFR Parts 3100, 3200, 3400, 3500

Management goals, objectives, and actions for minerals are found in the **Appendix**, Current Management. Allocation decisions and mitigation measures are also described in this appendix.

Since the RMP was adopted in 2003, new leasable mineral policies have been released or updated including:

- The fourth edition of the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development in 2007 which provides guidance and standards to operators
- The FFO Bare Soils Reclamation Procedures, which contains requirements for revegetating disturbed lands. It also establishes standards for acceptable vegetation production, monitoring, documentation, and reporting of monitoring data
- BLM Manual MS 9113, Roads

Management of oil and gas resources needs to be reviewed and evaluated in light of the increased projected development in the Mancos/Gallup Formations. Opportunities exist to develop actions that are better aligned with current policy and guidance and that consider advances in technology and resource protection. New mitigation measures could be developed (such as constructing pipelines along existing ROWs and implementing a liquid gathering system to reduce truck traffic). Additionally, vague mitigation terminology, such as “where possible,” “special topographic areas,” and “steep or broken terrain,” could be update or better defined. Criteria could be developed for describing when pipelines and power lines could be constructed cross-country rather than along existing roads. To protect other resources, new management may include closing areas to leasing or applying stipulations. For example, no surface occupancy stipulations associated with Chacoan road segments would help protect those areas that are not within the boundaries of ACECs.

Salable Minerals

Current Level and Location of Use

Salable minerals are common variety materials, such as sand, gravel, rock, and fill. Sand and gravel make up most of the salable materials sold by the FFO, though humate also exists in the planning area. The sand and gravel is mostly on mesa tops that consist of remnants of the Quaternary stream-cut terrace. The rock and stone materials are fragments of the weathered Ojo Alamo Sandstone and Farmington Sandstone Member. The humate in the planning area is a thermally immature coal from the Fruitland Coal Formation.

There are 27 active permitted operations in the planning area (**Table 2-30** and **Figure 2-12**). In addition, quarry locations o less than the five acres associated with oil and gas well sites are used to supply gravel to surface access roads.

In addition to the permitted sites listed above, the FFO is permitting eight pending mineral materials operations.

Table 2-30 Locations of Permitted Salable Mineral Operations in the Planning Area

Township	Range	Section	Material	Type of Permit
19N	5W	19, 30, 34	Humate	Commercial
19N	5W	2, 3, 5	Humate	Commercial
19N	5W	4	Humate	Commercial
19N	6W	10	Humate	Commercial
28N	11W	16	Sand and gravel	Free use
29N	9W	28	Sand and gravel	Free use
29N	10W	13	Sand and gravel	Free use
29N	10W	13	Sand and gravel	Free use
29N	10W	23	Sand and gravel	Commercial
29N	11W	16	Sand and gravel	Free use
29N	11W	19	Sand and gravel	Free use
29N	11W	31	Sand and gravel	Free use
29N	12W	12	Sand and gravel	Commercial
29N	12W	13	Sand and gravel	Free use
29N	12W	13	Sand and gravel	Commercial
29N	12W	13	Sand and gravel	Commercial
29N	12W	17	Sand and gravel	Commercial
29N	12W	23	Sand and gravel	Free use
29N	13W	20	Sand and gravel	Commercial
29N	13W	20	Sand and gravel	Free use
29N	14W	10	Sand and gravel	Commercial
29N	14W	10	Sand and gravel	Commercial
30N	12W	11	Sand and gravel	Free use
30N	15W	35	Sand and gravel	Commercial
31N	10W	19	Sand and gravel	Commercial
31N	10W	19	Sand and gravel	Commercial
31N	10W	30	Sand and gravel	Commercial

Source: BLM LR2000 database

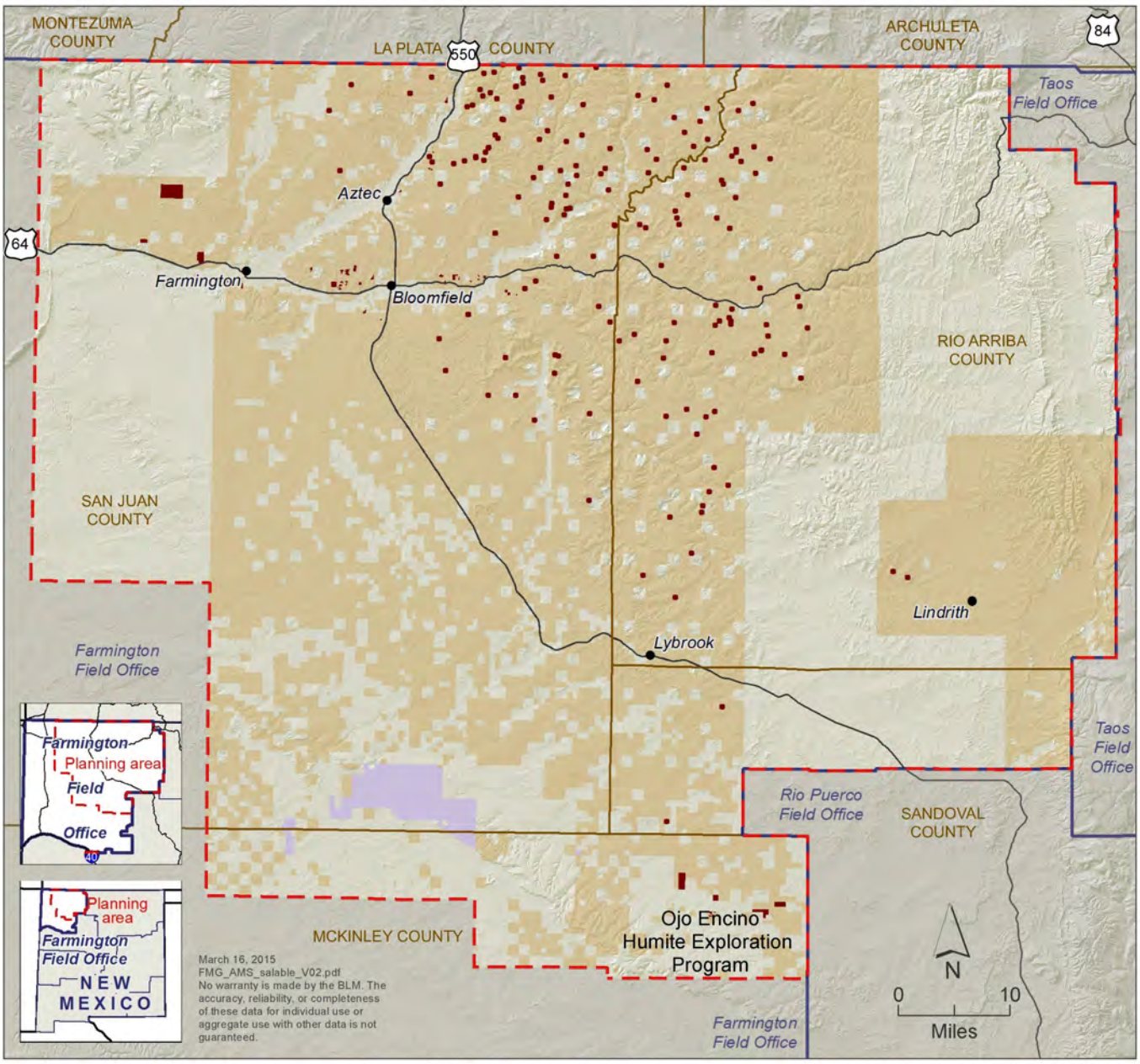
Forecast

As demonstrated by the eight pending salable minerals permits in the planning area, salable mineral activity is likely to continue close to current levels. Future demand will vary, depending on market conditions for salable minerals, which differ according to economic conditions and construction activity. Construction projects within approximately 50 miles of salable mineral deposits may lead to their development of those.

One driver of construction in the planning area is roads for oil and gas development. As new oil and gas development in the Mancos/Gallup Formations continues, salable mineral activity is expected to continue at roughly the same level. However, the lack of roads in the vicinity of the Mancos/Gallup Formations may increase salable mineral development in that area as oil and gas continues to be developed and associated access roads are constructed.

Figure 2-12 Salable Minerals

Salable minerals include common varieties of mineral materials, such as soil, sand and gravel, stone, pumice, pumicite, and clay that can be acquired under the Materials Act of 1947, as amended.



Source: BLM GIS 2014

Gravel or rock pit
Rock pit
Decision Area
Planning area
National Park Service
Field office boundary

Key Features/Areas of High Potential for Use

The sand and gravel operations are spread across the north-central portion of the planning area, north of Bloomfield and Farmington. The humate operations are concentrated in the southern end of the planning area.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern salable minerals:

- 43 CFR, Part 3600
- BLM-H-3600-1, Mineral Materials
- BLM-M-3600, Mineral Materials Disposal
- Common Varieties of Mineral Materials Act of 1947

Management actions and allocations for salable minerals are found in the **Appendix**, Current Management.

Current management direction is adequate to address salable mineral impacts; however, the 2003 RMP did not make allocation decisions about which areas would be closed or open to salable mineral disposal. These types of decisions may be considered in this or a future planning effort. Additionally, there may be an opportunity to better define or develop solid mineral management prescriptions and stipulations.

Locatable Minerals

Current Level and Location of Use

There are no active mines for locatable minerals in the planning area, and no locatable mineral activity is anticipated for the life of the RMP. Therefore, locatable minerals are not discussed further in this AMS.

2.2.2 Lands and Realty

Land Tenure

Current Level and Locations of Use

The distribution of BLM-administered lands directly influences the current level and locations of uses in the planning area. BLM-administered lands are contiguous in northeastern San Juan County, while a scattered, checkerboard pattern characterizes landownership throughout the rest of the planning area. Surface ownership in the planning area includes the BLM, the Forest Service, the USBR, National Park Service, and tribal, state, and private entities (see **Table 2-31**).

Table 2-31 Surface Landownership in the Planning Area

Land Status	Acres
BLM	1,312,700
Forest Service	251,500
USBR	26,600
National Park Service	34,000
State	203,700
Tribal	1,898,200
Private	461,900
Total	4,188,600

National Forest System lands in the planning area are in the Carson National Forest (Jicarilla Ranger District) and the Santa Fe National Forest (parts of the Cuba and Coyote Ranger Districts). The USBR

land is around Navajo Lake and is managed as the Navajo Lake State Park. The planning area also includes some BLM-administered land and federal minerals in Sandoval County.

BLM-administered lands are retained in federal ownership, as mandated by the FLPMA, with the exception of lands identified in a land use plan for disposal. To be eligible for disposal, lands must meet certain FLPMA criteria, such as being isolated or difficult to manage, or they must have the potential to support community expansion, economic development, or other public purposes. BLM-administered lands classified as withdrawn remain under title with the BLM but are managed by another federal entity and are not available for sale or exchange.

Forecast

The FLPMA states that BLM-administered lands should be retained in federal ownership unless adjustment is in the public interest. Therefore, public surface will remain under BLM administration if resources of national, state, or regional significance are found on them and the possible adverse effects of the adjustment action cannot be mitigated at reasonable cost. Examples of such resources are habitat for threatened or endangered species, riparian areas, wetlands, mining claims, and important cultural resources.

Disposals will continue to be considered if such actions would accomplish any of the following:

- Support the multiple use mandate
- Meet the implementation of special acts and support the growth and development of communities or agriculture
- Settle trespass
- Dispose of lands with little or no value to the public
- Transfer ownership of lands that have been used as landfills or other lands that may be a liability to the public interest

The BLM will continue to acquire, sell, and exchange land in the FFO on a case-by-case basis. All proposals will be given full consideration of public benefits and land management goals. The BLM will prioritize acquisitions that block up the lands it administers to facilitate and enhance its management; support the multiple use mandate, including lands with high oil and gas or other energy-related or resource potential; or that result in the creation of easements to support resource management.

Demand for land tenure adjustments is anticipated to increase, particularly in the tri-cities area. Acquisition of land or easements for public access has not been a major focus for the FFO in recent years, in part due to limited opportunities. However, as the demand for securing public access for recreation on BLM-administered lands near growing communities continues to increase, acquisitions for access could also increase.

Key Features/Areas of High Potential for Use

One of the major lands and realty issues in the northern portion of the planning area is urban expansion. Farmington, Aztec, and Bloomfield, which comprise the tri-cities urban area, have a combined population of 99,400 (US Census Bureau 2012b). Growth in the tri-cities area is evident in the concentration of commercial and industrial uses along the major highways linking the three municipalities. Each city controls development through land use zoning and has prepared or is updating a comprehensive land use plan.

Recently, there is a trend for development in unincorporated areas where land use controls are less stringent and land costs are lower. However, those in unincorporated areas still rely on the urban centers for public services. While San Juan County enforces subdivision regulations in the unincorporated areas, it has no zoning ordinance or comprehensive development plan. Accordingly, in cooperation with San Juan County, the cities have planning authority within an extraterritorial zone (ETZ), extending between three and five miles beyond each incorporated boundary. In some locations, the ETZs overlap, creating zones with multiple jurisdictional interests. Within these ETZs, the Northwest New Mexico Council of Governments is working with the cities of Aztec and Bloomfield to consider transportation needs,

development of the Bloomfield-Aztec corridor for commerce and industry, and planning for overlapping ETZs.

With so many people interfacing with BLM-administered lands it is sometimes challenging to ensure their protection and conservation, while balancing prudent use levels. Checkered land patterns caused by the implementation of previous disposals, special acts, patents and land grants create overlapping interests. BLM-administered lands sharing borders with commercial, private, and fiduciary trust land holdings create additional challenges.

Other key land use issues for the tri-cities urban interface areas are providing for and developing outdoor recreation sites, trails, and access to riparian areas, while preserving riparian and other resource values. Development on private lands within the floodplain of the Animas and San Juan Rivers has curtailed river access and is fragmenting riparian habitat.

Because BLM-administered lands surround the tri-cities area, there is increased demand on the FFO Lands and Realty Program for ROWs, including those for roads, utilities, and communication lines. The FFO has issued a number of Recreation and Public Purposes Act (R&PP Act) leases and patents, with additional proposals in various stages of implementation.

Other smaller population centers in the northern portion of the planning area are the communities of Blanco, Kirtland, Gobernador, and Nageezi. Urban development is much less influential on the Lands and Realty Program in the southern portion of the planning area; here, small communities, such as Lindrith and Counselor, are among the few population centers south of US Route 64.

Agricultural use is also present along the Animas and San Juan Rivers and south of the tri-cities areas, along State Highway 371 and US Highway 550. At build out, the Navajo Indian Irrigation Project will provide up to 116,000 acre-feet of water from Navajo Dam to an agricultural area east of US Highway 550. Currently, the project, which transfers water through a series of canals, irrigates approximately 64,000 acres of agricultural land.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern land tenure:

- BLM Handbook 2100-1, Acquisitions
- BLM Handbook 2200, Land Exchanges
- BLM Manual 2200, Land Exchanges
- Federal Land Policy Management Act of 1976
- Recreation and Public Purposes Act of 1926, as amended
- R&PP Amendment Act of 1988
- 43 CFR 2100, 2200, 2300, 2700, 2800, 2900, 3100, 3200, 3400, 3500, 3600, and 3800

Management goals, objectives, and actions for land tenure adjustments are found in the **Appendix**, Current Management. In general, under all land tenure adjustments, the BLM will protect valid existing rights. These include authorized permits, leases, and ROWs. The FFO will continue a prevention program, developed by the BLM, the Navajo Nation, and the Bureau of Indian Affairs, to prevent unauthorized occupation.

Under current management, land tenure adjustments must be in the best interest of the public. Areas with anticipated higher potential for land tenure adjustments are those where opportunities exist to acquire lands for access easements or lands that contain or are next to areas possessing unique qualities. These areas include inholdings or lands in or next to specially designated areas, such as ACECs, and existing or potential recreation sites.

Land tenure adjustments consolidate lands for better management by bringing those lands into public ownership. In addition, public lands interfacing with areas of increasing population growth, parcels that are landlocked, and parcels that are difficult or uneconomic to manage may be targeted for potential land tenure adjustments.

Current management direction for land tenure is considered adequate; however, additional management opportunities may exist to identify small isolated land tracts lacking adequate access, parcels that would resolve trespass issues, and parcels that would meet requirements in Public Law 96-550, Part V – Chaco Culture National Historic Park . Additionally, management actions could allow for closure of acquired lands, if such lands require a management plan to protect public health or safety, resources, or the environment. The only decision that falls within scope for this amendment effort is identification of parcels that would meet the requirements of Public Law 96-550.

Use Authorizations

Current Level and Locations of Use

Land use authorizations in the planning area consist of high voltage (greater than 115kV) electrical transmission line ROWs, pipeline ROWs, and leased communication sites. Approximately nine large transmission lines (345-500kV) originating from outside the planning area enter the planning area and converge in the tri-cities area. Other smaller lines originating at the generation facility at the Navajo Dam extend southwestward from the Navajo Reservoir.

Additional lines enter the planning area from the northwest and northeast. These lines intersect at a substation west of the city of Farmington near the town of Waterflow (New Mexico Task Force on Statewide Electricity Transmission Planning 2010). Underground natural gas pipelines typically follow other existing linear features, such as roadways and transmission lines. Communication facilities are located throughout the planning area, typically on elevated sites with higher concentrations surrounding the tri-cities area.

Forecast

Demand for land use authorizations in the FFO is anticipated to increase in correlation with future oil and gas development, renewable energy development in and next to the FFO, and demand from residential, commercial, and agricultural activity in the tri-cities area. Demands for future lands actions are expected to be greatest for those that support the continued development of the oil and gas industry, including on- and off-lease efforts. These actions would continue to meet the needs of energy-related product extraction to benefit the public. This trend is expected to be sustainable and long term, with growth associated with the Mancos Shale development a potential.

Key Features/Areas of High Potential for Use

Land use authorizations in the planning area consist of high voltage electrical transmission lines, pipelines, communication sites, and oil and gas distribution lines. The BLM evaluates additional authorizations in ROWs for compatibility with the existing. In general, there is a higher concentration of ROWs and communication sites near the tri-cities area. The potential for conflict with other land uses is therefore higher in these areas.

Current Management and Management Opportunities

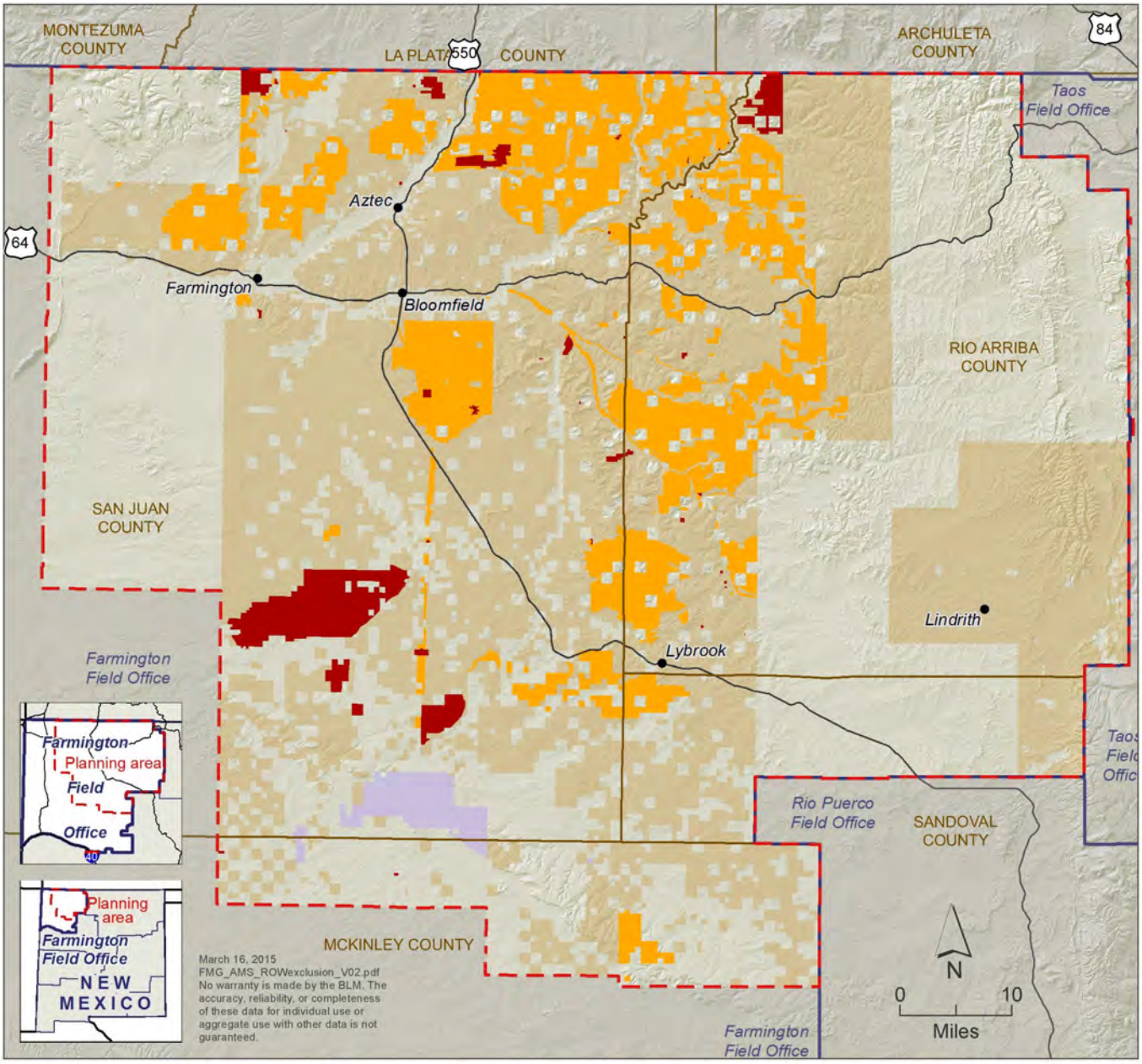
The following statutes, regulations, handbooks, and other policies govern use authorizations:

- 43 CFR, Part 2920, Leases, Permits and Easements
- Federal Land Policy Management Act of 1976
- IM 2014-080, Policy Guidance for Use of Corridors Designated Pursuant to Section 368 of the Energy Policy Act of 2005

Management goals, objectives, and actions for land use authorizations are found in the **Appendix**, Current Management. Since the 2003 RMP was approved, policy changes in the lands and realty program have resulted in managing areas for ROW exclusion and avoidance, although these terms are not used in the 2003 RMP. The FFO has allocated certain specially designated areas as ROW exclusion (82,300 acres) or ROW avoidance (504,000 acres) areas, as shown on **Figure 2-13** (BLM GIS 2014).

Figure 2-13 Right-of-way Exclusion and Avoidance Areas

Right-of-way (ROW) exclusion areas are not available for ROW location under any conditions. ROW avoidance areas should be avoided for ROW location if at all possible. ROW exclusion and avoidance areas are derived from specially designated areas.



Source: BLM GIS 2014

Right-of-way exclusion
Right-of-way avoidance
Decision Area
Planning area
National Park Service
Field office boundary

Additionally, in 2009, the BLM allocated Section 368 energy corridors throughout the West (BLM 2009). The ROD directed the BLM to place new ROWs in or parallel to existing ROWs or in the new Section 368 energy corridors. The purpose was to minimize resource impacts to the extent possible.

San Juan County operated the Lee Acres Landfill, under BLM permit, as a municipal solid waste disposal site from 1962 to 1986. A release of liquid waste and hydrogen sulfide gas caused closure of the landfill in 1986. Subsequent evaluations resulted in the EPA listing the landfill on the National Priorities List. The BLM is negotiating with the EPA and NMED to develop a plan to remediate the potential hazardous materials. Under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the remediation plan and associated ROD will guide the final cleanup, monitoring, and implementation of any necessary follow-up actions at the landfill.

In order to assist with the institutional controls required to implement the ROD, the BLM has already withdrawn the 134 acres around the landfill from settlement, sale, location, and entry, as described in Public Land Order No. 7234 (62 *Federal Register* 2177, January 15, 1997). The current withdrawal will remain in effect until January 15, 2047. The intention is to prevent pumping of groundwater from beneath the site in order to avoid unacceptable risks to human health or the environment. At the BLM's discretion, other activities may occur in the withdrawal area if they do not interfere with protecting public health and environment (BLM 2003a).

The current management direction for lands and realty is considered adequate to ensure continued management of lands in the plan amendment area. However, due to the increase in oil and gas development along with the associated infrastructure, it is likely that land use authorizations in rural areas would also increase. As a result, there is the need to revise and update the affected environment and anticipated impacts from this development as part of the amendment. Management decisions in the RMPA could identify ROW avoidance or exclusion areas to better protect resources. Public utility corridors for power lines, pipelines, communication sites, and communication ROWs could be identified as well.

2.2.3 Transportation and Travel Management

Current Level and Locations of Use

A regional network of federal and state highways provides the basic transportation infrastructure in the planning area. US Highway 550 is a major highway linking the tri-cities area with the interstate system and with major urban centers outside the planning area. Other important roadways in the planning area are US Routes 64 and 491 and New Mexico Highways 170, 574, 544, 537, 173, 371, 511, 96, and 595.

There are an estimated 15,000 miles of roadway in the planning area, 13,000 miles of which are in San Juan County. Most of these roads are unpaved. In San Juan County about 650 miles are county roads, 400 miles of which are unpaved (Keck 2001). Most of the road network consists of unpaved roads providing access to resources on federal lands, predominantly oil and gas facilities. In areas with a high level of oil and gas development, there is a dense network of roads, estimated at approximately four miles per square mile in the FFO area. Other parts of the planning area have road densities as low as one mile per square mile.

Roadway maintenance is the responsibility of the government, private, or industry entity that owns the roadway. Many roads pass over federal, non-federal, and tribal land, complicating maintenance responsibilities. Several county roads are heavily used for access to oil and gas facilities, particularly in the north and northeast part of the FFO area.

San Juan County roads that are primarily used to access oil fields are San Juan County 2300, 2310, 2770, 2772, 4450, 7007, 7145, 4600, 4599, and 7250. Traffic counts are not taken for these roadways. County roads are categorized as full county-maintained (maintained at best level possible with resources available), lesser county-maintained (bladed twice a year), and unmaintained roads. Generally, roads that serve school bus routes or residences are full county maintained. There is a trend for the county to redesignate roads serving primarily oil and gas facilities as lesser maintained because of limited

resources (Keck 2001). The Farmington Metropolitan Planning Organization is the regional forum responsible for transportation planning for the cities of Aztec, Bloomfield, and Farmington and the urbanized areas of San Juan County. The Farmington Metropolitan Planning Organization is updating the Metropolitan Transportation Plan, the long-range plan for the cities of Farmington, Aztec, and Bloomfield and San Juan County. The 2040 Metropolitan Transportation Plan will be developed throughout the year, with expected adoption in April 2015 (City of Farmington 2014).

Forecast

Travel and related demands on the BLM's transportation network are expected to continue to grow as urban centers expand and development makes more parts of the planning area accessible. There has been an increase in route proliferation and use around towns and cities, including Farmington, Aztec, and Bloomfield. Residents, looking for easily accessible travel and recreation opportunities, have placed increased pressure on the existing route system; this has created new unplanned routes. Without targeted planning, this trend has already outstripped the transportation network's ability to accommodate current use; increasing future use will place even more stress on the network.

Throughout the planning area, oil and gas development has improved accessibility to previously remote areas. Development relies on maintained roads for access to well pads and ancillary facilities and is increasing throughout the planning area. Operators are responsible for maintaining and keeping up the roads, which are also popular with the general public.

Users explore these new roads and corridors and sometimes create their own unauthorized roads. This is not desirable from a management standpoint, it leads to the degradation of soils and lands, and use is technically trespass because motorized travel is limited to existing routes. For example, hunting groups often create new routes to reach desirable hunting and camping areas by hiking or packing deeper into rural areas from new roads created and maintained by the oil and gas industry.

In addition to four-wheel drive vehicles and OHVs, people are increasingly using side-by-side vehicles, such as utility trail vehicles (UTVs), when driving for pleasure on oil and gas roads. Utility ROWs are not open for recreational UTV use, and corridors are not to be used as byways for mechanized vehicles.

New development in the Lybrook, Bisti, and Southeast Fringe areas is expected to bring with it an increase in travel. These areas are relatively undeveloped and currently offer backcountry recreation opportunities; increased road construction would make these areas more accessible. However, increased access also increases the potential for illegal activity, such as poaching, woodcutting, and vandalism. Trespassing roads and excessive use will possibly need to be regulated and monitored more aggressively to prevent undesirable effects.

Key Features/Areas of High Potential for Use

The primary authorized use of the transportation system is associated with oil and gas development. The companies pay rent for their use on authorized ROWs, and they build, construct, and maintain the roads. This creates an opportunity for recreationalists. As oil and gas development spreads, the route system expands and is used both commercially by industry and casually by the general public.

In the northern portion of the planning area, much of the transportation system was not built specifically to support recreation. As the route network has expanded for oil and gas development, access to range facilities, and other interests (ROWs, mining), the recreating public began using these routes. at this time recreation is a major unauthorized and allowed casual use of the transportation system.

Authorized roads and pipeline construction scars from oil and gas production are frequently used for recreation. Recreation is considered casual use and does not require further authorization. However, if increases in population and the increase in unauthorized, casual user-created roads continues, regulations and restrictions may be needed. Their purpose would be to conserve soils, vegetation, and habitats and to promote safety.

Many popular recreation areas are also areas of high potential for use for the transportation system. These include areas like the Glade Run and Piñon Mesa Recreation Areas. The public's use of the transportation systems in these areas is typically of a short duration and sporadic, such as for a few hours after work and perhaps longer on weekends. The Glade Run Recreation Area and Piñon Mesa Recreation Area are of concern; because of the increased use, they are watched and monitored more closely. Many of these areas are close to urban centers, where route density and use are high. Glade Run Recreation Area and Piñon Mesa Recreation Area are described in more detail in **Section 2.2.5**, Recreation.

Use of the transportation system in the southern portion of the planning area is very different from that in the north. The majority of use not related to oil, gas, or mineral extraction is by local residents for access to homes and range facilities. Visitors also use the transportation system to access the wilderness, the WSA, or similar types of recreation areas (including Chaco Culture National Historical Park).

Oil and gas development, occurring throughout the planning area, is expected to expand to presently undeveloped areas in the southern portion of the FFO (e.g., Bisti, Lybrook, and the Southeast Fringe). As it spreads, access and the level of maintenance on existing and new infrastructure will increase.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern transportation and travel management:

- 43 CFR, Part 8340, Off-Road Vehicles
- 43 CFR, Part 8342, Off-Road Vehicles: Designation Procedures
- 43 CFR, Part 8364, Visitor Services: Closure and Restriction Orders
- BLM Manual 1626, Travel and Transportation
- BLM Manual 8340, OHV Management
- BLM Handbook 9112-1, Bridge Construction, Design and Maintenance
- BLM Handbook 9113-1, Road Design Handbook
- BLM Handbook 9113-2, Roads Condition Assessment Protocols
- BLM Handbook 9114-1, Trails
- BLM Manual 9112, Bridges
- BLM Manual 9113, Roads
- BLM Manual 9114, Trails
- BLM Manual 9130, Sign Manual
- BLM Technical Reference 9113-1, Planning and Conducting Route Inventories
- BLM's National Management Strategy for Motorized Off-highway Vehicle Use on Public Lands (January 2001).
- EO 11644, Use of Off-Road Vehicles on the Public Lands
- EO 11989, Off-Road Vehicles on Public Lands
- EO 13195, Trails for America
- IM 2004-005, Clarification of OHV Designations and Travel Management in the BLM Land Use Planning Process
- IM 2008-014, Clarification of Guidance and Integration of Comprehensive Travel and Transportation Management Planning into the Land Use Planning
- Roads and Trails Terminology, US Department of the Interior, Bureau of Land Management, Washington DC, 20240 (Technical Note 422).

Management goals, objectives, and actions for transportation and travel management are found in the **Appendix**, Current Management, and are considered to be adequate. Since the 2003 RMP was approved, there have been several policy changes in the transportation and travel management program that are not reflected in the RMP decisions; these are BLM's Technical Reference 9113-1, BLM Manuals 1626 and 8340, and Washington Office IMs 2004-005 and 2008-014 to name a few. Although they are not noted in the RMP, the BLM manages the transportation and travel management program under these policies.

In the plan amendment area, the travel management areas are all identified as limited to maintained roads, designated trails, routes and areas (see **Section 2.2.4**, Recreation, Motorized Recreation, for acres of each type of designation).

Since the 2003 RMP, supplementary rules have been approved for the Glade Run Recreation Area to limit motorized and mechanical vehicles to designated routes (*Fed. Reg.* Vol. 62, No. 183, Sept. 22, 1997). Also, travel management plans were updated for the La Plata and Dunes OHV Unit Management Areas, which limit motorized travel to designated routes. (see **Figure 2-14**). There are no policies for mechanized, pedestrian, or equestrian use, although these modes of travel are allowed, except where specifically prohibited (e.g., mechanized use in designated wilderness).

The BLM has a current ongoing recreation and transportation management planning effort for the Glade Run Recreation Area (see **Section 2.2.4**, Recreation, for more details). Also, the BLM is a partner in the San Juan Basin Public Roads Committee, a multiparty group that maintains many roads in the oil and gas fields in the planning area.

Due to the many changes in transportation and travel management policy since 2003, there are numerous goals, objectives, and management actions where the 2003 RMP could be updated. Some of these are as follows:

- Modifying the route selection criteria for future travel planning efforts
- Updating language and policy practices as they relate to travel planning
- Providing a route inventory for public review
- Identifying areas where OHV designations may need to be changed or added
- Providing a better assessment of the impacts the transportation network is having or could have on other resources
- Allowing law enforcement to better enforce transportation regulations
- Completing a transportation system inventory and publishing a map of all routes in the planning area to help the public understand which routes are considered existing and thus open to motorized use
- Improving enforcement and education regarding travel regulations, especially pertaining to user-created routes, are areas of great opportunity to reduce route proliferation

2.2.4 Recreation

Current Level and Location of Use

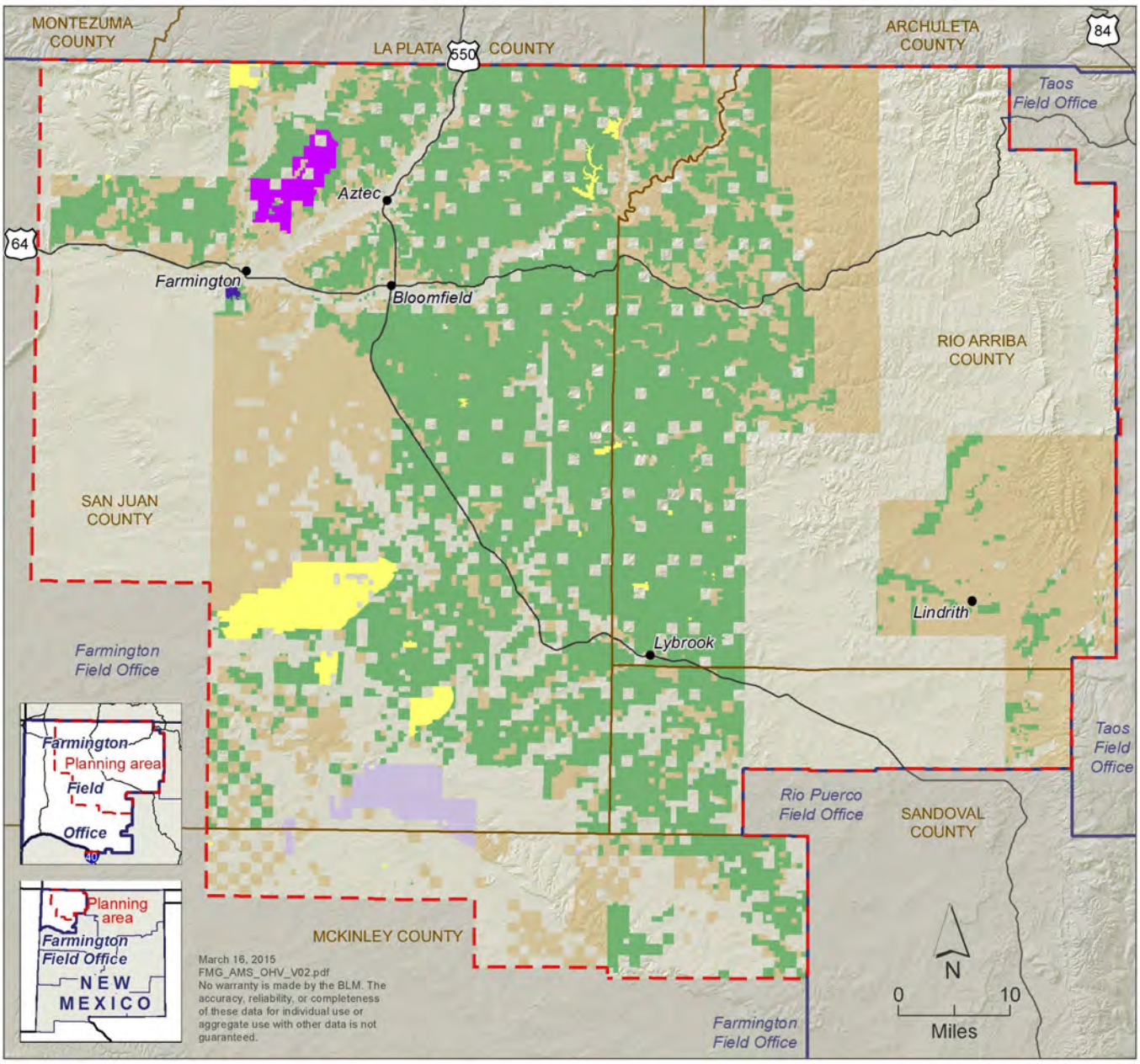
The climate, natural landscape, archaeological sites, and cultural traditions of the planning area provide features and attractions for a wide range of activities. The Farmington Field Office and other attractions nearby, most notably Chaco Culture Historical Park and Aztec Ruins National Monument, attract tourists from New Mexico and beyond. Residents and regional and out-of state visitors enjoy outstanding conditions for sporting and recreation. Regionally, favorite activities are camping, hiking, hunting and shooting, fishing, nature viewing, sightseeing, horseback riding, mountain biking, and engaging in winter and motorized sports. With growing visibility of the region, the FFO is also experiencing an increase in the numbers of persons who are finding recreation in the management area.

Some public lands contain unique or outstanding recreation values that require special or intensive management to protect the special value and to accommodate public use.

In the FFO, a multitude of recreation opportunities exist, ranging from the primitive and unconfined in the Bisti/De-na-zin Wilderness to the motorized challenge of rock-crawling in the Glade Run Recreation Area. The 2003 RMP designated 12 recreation areas that are managed for specific purposes. **Table 2-32** lists these areas and describes their opportunities and features.

Figure 2-14 Off-highway Vehicle Area Designations

BLM-managed surface lands in the FFO are designated as closed, limited, or open for off-highway vehicle (OHV) use. Closed areas prohibit the use of OHVs. Limited areas are restricted at certain times, in certain areas, and/or to certain vehicular use. Open areas permit all types of vehicle use at all times subject to the operating regulations and vehicle standards.



Source: BLM GIS 2014

Closed
Limited
Limited/Open
Open
Decision Area
Planning area
National Park Service
Field office boundary

Table 2-32 Recreation Areas in the FFO

Name	Size in Acres[1]	Recreation Opportunity	Dominant Features
Alien Run Mountain Bike Trails	3,334	Mountain biking	From the main trailhead, there are two loop trails and an out-and-back trail that combine for 19 miles of single-track riding.
Angel Peak Scenic Area	10,226	Camping, hiking, rockhounding, sightseeing, horseback riding, and picnicking	Angel Peak geologic feature: Kutz Canyon Badlands, with extreme erosional patterns of blue and gray shale
Carracas Mesa Recreation/Wildlife Area	8,616	Hiking, hunting, primitive camping, wild horse viewing, and sightseeing	Consists of piñon-juniper and ponderosa pine habitat, with moderate to steep walled canyons draining into Navajo Lake.
Dunes Vehicle Recreation Area	825	Minimal supervision for ORV free-play and competitive events	Steep canyon walls, talus slopes, sandy washes, rock-filled arroyos, and moderate to steep slopes
Glade Run Recreation Area	21,544	Used for a diverse range of recreation, on- and off-trail, including motorized trail-bike riders, ATV use, four-wheel drive use, equestrian use, mountain bike use, rock climbing, and major competitive events.	Rolling hills, sandy arroyo bottoms, sandstone slick-rock; vegetation is sparse and varied, including piñon-juniper, sagebrush, and grasses.
Head Canyon Motocross Track	140	ORV competitive events and motocross on a developed track	Sparse vegetation, with relatively flat terrain sloping to hilly terrain in the south
Navajo Lake Horse Trails	6,752	Equestrian use	Network of horse trails close to Navajo Lake State Park and developed facilities, including a campground
Negro Canyon SDA	1,992	Hiking, backpacking, wildlife viewing, and primitive camping	Piñon-juniper woodland, with the rugged, steep-walled Negro Canyon and its tributaries dominating the landscape
Piñon Mesa Recreation Area	9,454	Equestrian use, mountain biking, and OHV use	Single-track trails, sparse vegetation, rolling hills
Rock Garden Recreation Area	10,857	OHV, equestrian, and other recreational use on designated trails, routes, and areas	Trail-based recreation
Simon Canyon ACEC	3,928	Picnicking, camping, fishing, hiking, sightseeing, and backpacking	Moderately steep to very steep, rough, broken, and hilly terrain; Simon Canyon varies from 5,800 feet at the bottom to 6,275 feet at the top of the rim.
Thomas Canyon Recreation/Wildlife Area	15,644	Hiking, hunting, sightseeing, primitive camping, and backpacking	Forested terrain (piñon-juniper and ponderosa pine) with steep canyons and rugged terrain, sloping up from east to west

Source: BLM 2003b
[1]Acres as reported in BLM planning documents; may vary from acreage calculated in GIS.

Public lands in the FFO offer the opportunity to enjoy outdoor developed, dispersed, and motorized recreation. These categories are described below.

Developed Recreation

Developed recreation benefits from improvements at Angel Peak (e.g., picnic facilities, camping, and viewing opportunities) and Simon Canyon Recreation Areas (e.g., camping, day-use facilities, fishing, and hiking). Maintained trails have been developed in some areas (e.g., the Glade Run Recreation Area, Navajo Lake, Alien Run, and the Head Canyon Recreation Area) to promote specific modes of use, such as biking, horseback riding, walking, and motoring.

Dispersed Recreation

Management of some areas, such as Negro Canyon, Carracas Mesa, Thomas Canyon, the Bisti/De-na-zin Wilderness, and the Ah-shi-sle-pah WSA are aimed at preserving the quiet and natural character that is important for dispersed activities, such as hiking, backpacking, and hunting. With the extensive network of roads for oil and gas developments, there are very few inaccessible areas in the FFO. This has altered both the visual landscape and the opportunity for solitude. On the other hand, it affords public access to backcountry for dispersed recreation throughout the FFO.

Motorized Recreation

Motorized recreation on public lands includes opportunities for off-highway travel (on existing maintained or primitive roads), and off-road travel (cross-country, off existing roads). Motorized vehicles include various classes and types of motorcycles, dune buggies, ATVs, and four-wheel drives.

OHV use has increased in popularity as more versatile vehicles have become affordable and available, making access to more remote areas of public lands possible. This has introduced human presence into remote areas and left a mark on the landscape with noise, dust, smells, visual intrusions, and roads and trails created through repeated use. In some cases, OHV use is associated with woodcutting, hunting, mineral exploration and development, livestock operations, and administrative functions throughout the FFO. Recreation and sporting activities occur mostly near the urban centers.

Recreational conflicts occur when participation in one activity reduces the experience of another. For example, most nonmotorized recreationists are usually seeking quiet and believe the noise and fumes of vehicles diminish their experience. Many motorized recreationists who stay on roads and trails believe that those who travel cross-country on motorized vehicles are not practicing good land ethics.

Currently, 800 acres of public land is designated as open for OHV use, 18,800 acres is designated as limited to existing/open (Glade Run), and 1,234,700 acres is designated as limited to existing routes. The exception is where conditions are determined to be suitable for cross-country travel. Another 58,400 acres are designated in the 2003 RMP as closed to OHV travel.

To meet the needs of diverse users, the FFO has developed special facilities for motorized and nonmotorized vehicle use. Trails for motorcycles and mountain bikes, open areas for OHV users, and rock-crawling routes are provided in the Glade Run Recreation Area; the Dunes Vehicle Recreation Area is open for motorized use; and the Head Canyon ACEC includes a developed motocross track for motorcycles and ATVs that are less than 50 inches wide. Trails have been designated in the FFO, often to minimize conflicts between different activities. In addition to those locations mentioned above, popular trail networks are those on Piñon Mesa, in the Alien Run area north of Aztec, the Bloomfield/Aztec trail, and the horse trails at Navajo Lake.

Recreation is becoming increasingly popular near urban centers. Trails and developed recreation facilities near Farmington, Aztec, and Bloomfield are increasingly used, especially for nonmotorized recreation. Driven by an increasing population and a growing number of regional visitors, this trend is expected to continue for the foreseeable future. One consequence of increased use in these areas is that equestrians are often pushed out by other users, both motorized and nonmotorized, and must find new areas in which

to recreate. This trend is also expected to continue, and there will be a need to provide recreation areas for specific user groups.

The visitor demographic is also becoming older, and with it the BLM is seeing an increase in more comfortable side-by-side vehicles, such as UTVs. These users are often interested in close-to-home recreation on maintained roads and trails.

Oil and gas and ROW development is also spurring a change in the locations where people recreate. Following the creation of new roads in previously undeveloped areas, visitors are exploring via four-wheel-drive vehicles to experience new parts of the planning area. Because the new system of roads reaches further into rural areas, hunting groups are accessing new camping areas and are packing and hiking to new destinations that were rarely visited before. In the southern portion of the planning area, new and planned oil and gas development will accelerate the recent increases in visitation though better accessibility. Hunters, hikers, and other local users are attracted to the backcountry landscapes in this area.

Key Features/Areas of High Potential for Use

Glade Run Recreation Area

The Glade Run Recreation Area is on the northern edge of the rapidly urbanizing city of Farmington. Its proximity to Farmington and other communities makes it a convenient place for local residents to pursue recreation after work, on weekends, or when higher elevation recreation areas are still covered in snow. The area receives approximately 30,000 to 35,000 user-days each year and holds three to five major recreation events throughout the year. For example, the Road Apple Rally, which is the oldest annual mountain bike race in the world, uses some of the trails in the Glade Run Recreation Area.

As the population grows, so does the demand for recreation. Visitors practice a variety of recreation activities, including mountain biking, motorcycling, OHV riding (e.g., ATVs, UTVs, and side-by-side riding), four-wheeling, rope-based rock climbing, camping, running, hiking, and horseback riding.

Many local residents use the roads and trails in this area regularly for a variety of recreation pursuits. Concerns are arising over this use, including those on the impacts on soil and vegetation from user-created trails, impacts on cultural sites, impacts on wildlife from concentrated recreation, and habitat fragmentation. Additionally, as urban development encroaches on public lands, city-based recreation pressures can negatively impact natural and cultural resources, as well as other authorized uses, such as grazing and oil and gas activities.

In addition to the Glade Run Recreation Area being used for recreation, it is completely leased for oil and gas development. This has resulted in the development of over 641 predominately gas well pads. Development of well pads also includes the construction of access roads. These types of development add to the transportation network in the Glade Run Recreation Area and increase the overall access of the area to the public.

Piñon Mesa Recreation Area

The Piñon Mesa Recreation Area, approximately two miles north of Farmington, provides a variety of recreation opportunities. The BLM's management focus is on equestrian use, followed by mountain biking, and finally opportunities for OHV users. Most visitors come from the surrounding area, but mild winter conditions draw visitors from around the region in cooler months. The area is home to the Piñon Mesa Competitive Trail Ride, a two-day, sanctioned, endurance equestrian event held each spring.

Although equestrian and mountain biking use are the primary and secondary management focuses, Piñon Mesa is becoming increasingly popular for rock crawling, motorcycling, and ATV riding. Rockhounding, and petrified wood collection in particular, has also grown in popularity. In areas near the urban interface, day hiking and dog walking are common activities.

Alien Run Mountain Bike Trails

Located in Hart Canyon near Aztec, the Alien Run mountain bike trails are locally and regionally popular with mountain biking and hiking enthusiasts. The well-known mountain bike race, the Alien Run Mountain Bike Competition, is held each spring; 2014 was the 14th annual race. From the main trailhead, there are two loop trails and an out-and-back trail that combine for 19 miles of single-track riding. These trails have received accolades from mountain biking magazines and other media.

Navajo Lake

The BLM's Navajo Lake Horse Trail system is accessed from Navajo Lake State Park, which has state-owned facilities for camping and lake access. Other special recreation areas are on Simon Mesa and along the Pine and San Juan Rivers.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern recreation:

- 43 CFR, Part 8364, Visitor Services: Closure and Restriction Orders
- BLM-M-2930, Recreation Permits and Fees
- BLM-M-8300, Recreation Management
- BLM-H-8320, Planning for Recreation and Visitor Services
- BLM's Priorities for Recreation and Visitor Services (Purple Book, May 2003)
- BLM's Unified Strategy to Implement "BLM's Priorities for Recreation and Visitor Services" (January 2007).
- IM 2011-004, Transmittal of Revised Recreation and Visitor Services Land Use Planning Guidance, Updated Checklist, and Three Land Use Planning Templates
- National Mountain Bicycling Strategic Action Plan (BLM/WY/PL-0303/001+1220).
- R&PP Amendment Act of 1988
- Recreation and Public Purposes Act of 1926, as amended

Management goals, objectives, allocations, and actions for recreation management are found in the **Appendix**, Current Management; they are considered to be adequate.

The FFO issues permits for a range of recreation activities annually. These include commercial guide services, hunting guides, competitive events (such as mountain bike races, OHV rock-crawling events, motocross races, and equestrian events), special large group events, and educational activities. The FFO issues SRPs to authorize certain recreational uses of lands administered by the BLM. Permits are issued for competitive events, commercial events, and organized group activities.

As described above, the BLM is preparing a Recreation and Travel Management Plan for the Glade Run Recreation Area. This plan will provide specific management actions for maintaining and improving recreation opportunities in the Glade Run Recreation Area. There are no other recreation plans currently implemented or in the planning phase.

Since the 2003 RMP was approved, recreation regulations and policies have been changed or updated. These include BLM Manuals 2930 and 8300; BLM Handbook 8320; BLM's Unified Strategy to Implement "BLM's Priorities for Recreation and Visitor Services"; and IM 2011-004. Current management direction is adequate to address recreation issues associated with new development in the Mancos Shale project area. However, there are opportunities to better facilitate future use in accordance with policies that have been updated since the 2003 RMP, as discussed below.

Recreation management in the FFO is intertwined with travel and transportation; actions implemented to improve recreation are usually made in response to increased travel in certain areas. As such, a comprehensive route inventory can help define areas that would benefit from comprehensive recreation management.

In response to changing conditions, the BLM could consider allocations and actions that provide specific recreation opportunities and experiences. By planning for recreation, the BLM can help visitors find targeted opportunities that will enhance their experiences, while at the same time educate the public regarding the proper use of public lands to prevent the degradation of habitats, soils, and vegetation, as well as unauthorized use, occupation and development, and illegal dumping. However, these decisions are outside the scope of the current amendment, although they may be revisited in a later amendment or RMP revision effort.

The road network associated with oil and gas and ROW development provides ready-made access to new areas; however, it may need extra protection, including signs and fencing, to help guard against unauthorized disturbances and focus uses on authorized areas, such as roads and trails. Through conscious management, existing roads and trails can be maintained in good condition and managed for a range of uses.

Other actions that could be considered are improving education and interpretation facilities for users, updating OHV area designations, and identifying facilities for future development.

2.3 SPECIAL DESIGNATIONS

2.3.1 Wilderness Areas and Wilderness Study Areas

Profile

In 1964, Congress passed the Wilderness Act, establishing a national system of lands to preserve a representative sample of ecosystems in a natural condition for the benefit of future generations. Until 1976, most land considered for and designated as wilderness was managed by the National Park Service and Forest Service. With the passage of the FLPMA in 1976, Congress directed the BLM to inventory, study, and recommend BLM-administered lands for wilderness designation.

To be designated as wilderness, an area must exhibit the following characteristics:

- **Size—**roadless areas of at least 5,000 acres of public lands or of a manageable size
- **Naturalness—**generally appears to have been impacted primarily by the forces of nature
- **Opportunities—**provides outstanding opportunities for solitude or primitive and unconfined types of recreation

In addition, wilderness areas often have special ecological, geological, educational, historical, scientific, and scenic qualities.

In accordance with the FLPMA, the BLM also inventoried and designated one WSA in the FFO, the Ah-shi-sle-pah WSA. There are no time limits on Congress to act on the recommendation, and it has sole authority to designate areas as wilderness or to release them from further study.

Lands with Wilderness Characteristics

The BLM is required under Section 201 of FLPMA to maintain information regarding wilderness characteristics. Section 201 also provides that the preparation and maintenance of the inventory shall not, of itself, change or prevent change of the management or use of the lands. BLM Manual 6310, Conducting Wilderness Characteristics Inventory on BLM Lands (BLM 2012b), guides the BLM on how to conduct and maintain an inventory of lands with wilderness characteristics.

Consistent with FLPMA Section 202 and other applicable authorities, the BLM will continue to consider the protection of wilderness characteristics on public lands as part of its multiple-use mandate in developing and revising land use plans and when making subsequent project level decisions. In accordance with NEPA, the FFO will analyze the potential effects of proposed actions and alternatives for land use plan decisions on lands with wilderness characteristics when they are present. BLM Manual

6320, Considering Lands With Wilderness Characteristics in the BLM Land Use Planning Process (BLM 2012c), provides direction for land use planning for identified lands with wilderness characteristics.

Locations of Areas

Wilderness Areas

The planning area's only Wilderness Area (WA), and the only designated WA in the San Juan Basin, is the Bisti/De-na-zin WA. It is managed by the FFO. There are 44,792 acres within the boundary of the Bisti/De-Na-Zin WA, 38,381 surface acres of which are BLM-administered land and 39,047 acres of which contain federal minerals administered by the BLM (see **Figure 2-15**). The WA contains a variety of unique geologic and scenic resource values, including the remote wind-eroded sandstone and shale badlands. This area is a grama-galleta grassland ecotype (Davis 1987), only one of two examples of this ecotype protected as wilderness in the United States. It is rich in paleontological resources and contains over 50 known archaeological sites.

The Bisti/De-na-zin WA provides substantial opportunities for solitude. Although there are few trails or surface water features in the WA, there are opportunities for primitive and unconfined recreation, such as hiking, backpacking, and horseback riding (BLM 2003a). The unique geological formations are popular with amateur and professional photographers. Its proximity to the Chaco Culture National Historic Park further promotes visitation to the WA.

Wilderness Study Areas

The FFO manages one WSA, the 6,600-acre Ah-shi-sle-pah WSA. The WSA is managed under the BLM's current WSA policy (BLM 2012e). It is in a low-intensity oil and gas development area, about two miles north of the Chaco Culture National Historic Park. The area has outstanding badland scenery, characterized by outcrops and highly rugged terrain, with spires, towers, and mushroom-shaped formations (see **Figure 2-15**).

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern WAs and WSAs:

- BLM MS-6330, Management of BLM Wilderness Study Areas
- BLM MS-6340, Management of Designated Wilderness AreasBLM-H-8550-1, Interim Management Policy and Guidelines for Lands Under Wilderness Review
- Wilderness Act of 1964, as amended

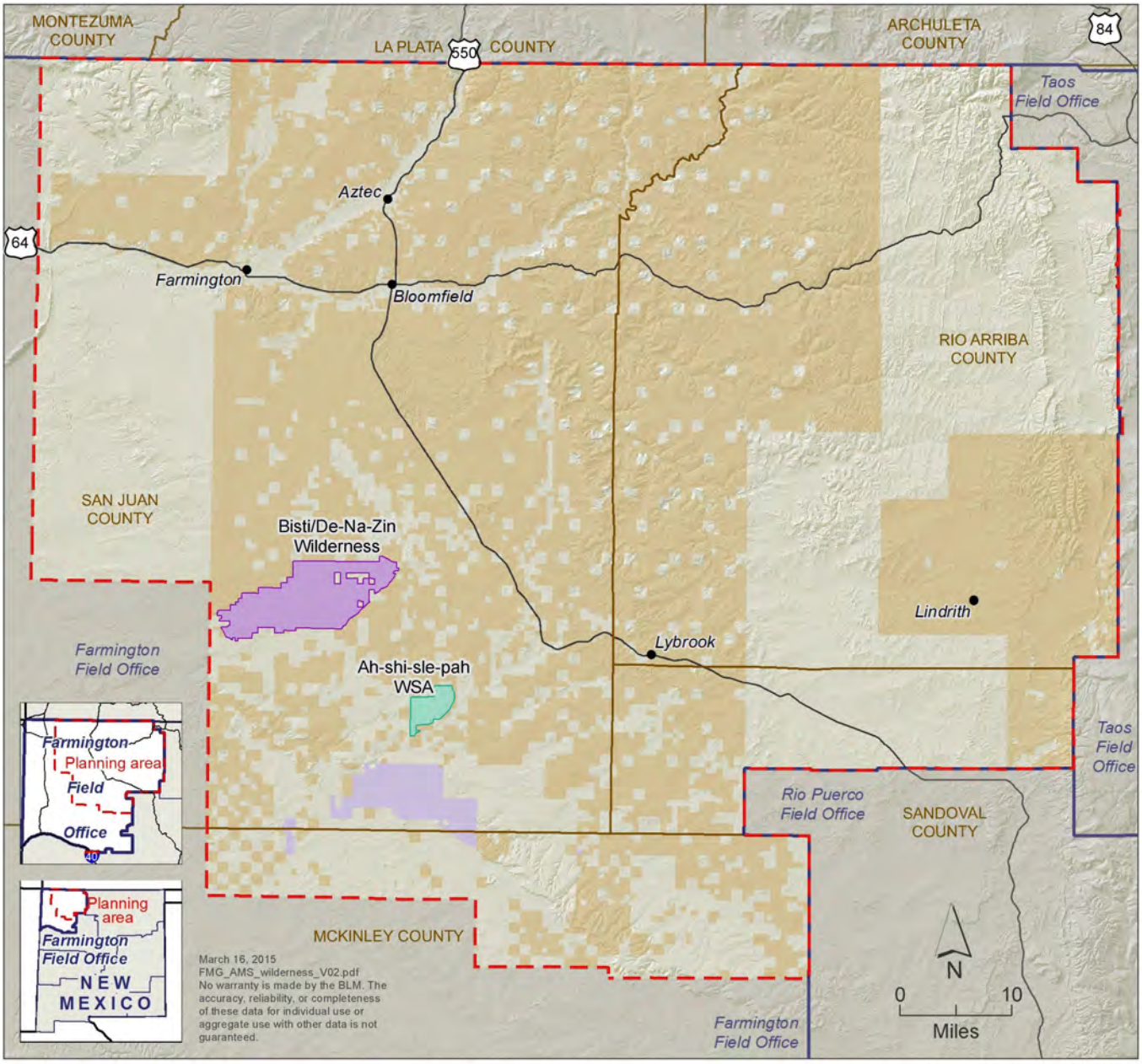
Management goals, objectives, and actions for the wilderness program are found in the **Appendix**, Current Management, and are considered adequate. The BLM is not considering changes to the WSAs in this planning effort.

WSAs are areas determined to meet wilderness eligibility requirements but for which Congress has not acted on the managing agency's recommendation. They are managed in accordance with interim management guidelines to maintain their wilderness characteristics until Congress acts. If Congress releases the Ah-shi-sle-pah WSA, management opportunities could allow for continued restrictions, such as no surface occupancy stipulations or ROW exclusions.

The Bisti/De-Na-Zin Wilderness receives frequent exposure from various word-of-mouth and media sources. It also receives use from schools, professionals, and nonprofit organizations. This exposure is expected to create more interest in and use of the area. Additional management opportunities include guided education hikes, interpretation, outdoor classrooms, and more intense ecological and wildlife assessments. There are also opportunities to encourage scientific exploration and research.

Figure 2-15 Wilderness and Wilderness Study Areas

Wilderness is a congressionally designated area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, that is protected and managed to preserve its natural conditions. Wilderness Study Area (WSA) is a designation made through the land use planning process of a roadless area found to have wilderness characteristics.



Source: BLM GIS 2014

Wilderness Area
Wilderness Study Area
Decision Area
Planning area
National Park Service
Field office boundary

2.3.2 National Historic Trails

Profile

Congress has designated as National Historic Trails (NHTs) many of the pioneer trails and other historic routes that are important in our nation's past. The National Trails System Act of 1968 (Public Law 90-543, as amended in 2009 by Public Law 111-11) provides for the development of a national system of trails in urban, rural, and wilderness settings for scenic, historic, and recreation values. NHTs along roadless segments have a generally greater potential for public use for recreation, historic interpretation, and appreciation. Today, only Congress can designate new NHTs.

On December 4, 2002, President Bush signed Public Law 107-325, designating the Old Spanish Trail as an NHT. During the eighteenth century, the Old Spanish Trail was established as a collective assortment of pack routes that connected Santa Fe and Los Angeles (Crampton and Madsen 1994). It was first traversed in its entirety in 1829 and experienced about 20 years of use by traders, slavers, trappers, and immigrants until being replaced by other trails. It likely followed older Native American trail routes in some areas and portions that had been used by earlier Spanish exploring and trading ventures.

The Old Spanish National Historic Trail in the FFO has approximately 200 miles of the Northern Route and Armijo Route segments. Out of these, 73.1 miles of the Armijo Route designated trail are on BLM-administered land. In the FFO, the Armijo Route of the designated trail from Gallina, heads west through Largo Canyon and then proceeds northwest up Largo Canyon past the Crow Canyon Petroglyph Site. At the mouth of Largo Canyon, the Armijo Route crosses the San Juan River at present day Blanco and continues northwest/west to the Animas River at present day Aztec. From the Animas River, the designated trail heads northwest across the northern portion of the Glade Run Recreation Area and into Colorado. The BLM FFO manages only portions of the trail, from Largo Canyon to the Colorado border. In the FFO, a physical trace of the Old Spanish Trail has not been identified, but efforts have been made to locate physical traces, including a complete inventory of the Largo Canyon segment.

Location of Trails

Portions of the 2,700-mile-long Old Spanish Trail (**Figure 2-16**), which begins south of the planning area in Santa Fe, extend northward through the eastern portion of the planning area. The Armijo Route, a subcomponent of the trail, splits from the main trail in the southeastern portion of the planning area and runs northwesterly through the planning area, through the cities of Blanco and Aztec, before entering Colorado.

Current Management and Management Opportunities

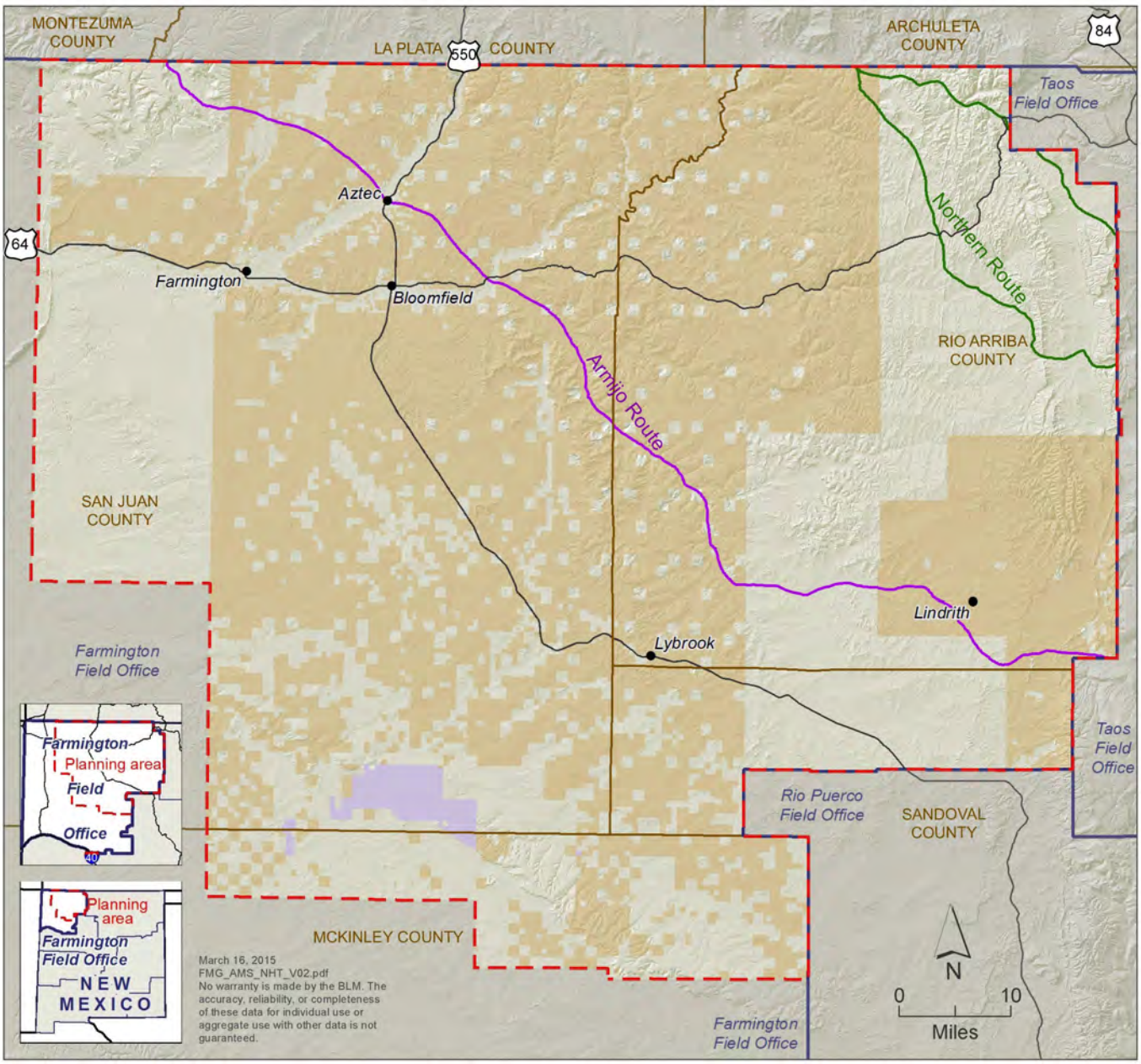
The National Trails System Act of 1968, as amended, govern NHTs.

There are no decisions for National Historic Trails in the 2003 RMP. With the exception of the 2014 Visual RMPA, NHTs are not specifically managed for in the planning area. Future management of the Old Spanish National Historic Trail will likely be covered under the pending NPS trail plan (a joint BLM-NPS action). However, for the scope of this planning effort, some management opportunities could include the following:

- Determining corridors to use for future ROW development, including oil and gas pipelines and electrical transmission lines
- Limiting the areas that the Old Spanish NHT can be crossed by linear features such as ROWs, roads, and trails
- Requiring education and interpretation as part of a permit or new lease stipulation

Figure 2-16 National Historic Trails

The National Trails System Act of 1968 (Public Law 90-543, as amended in 2009 by Public Law 111-11) provides for the development of a national system of trails in urban, rural, and wilderness settings for scenic, historic, and recreation values. The Old Spanish National Historic Trail within the planning area has two segments: Northern Route and Armijo Route segments.



Source: BLM GIS 2014, NPS GIS year unknown

Old Spanish Trail
- Armijo Route
- Northern Route

- Decision Area
- Planning area
- National Park Service
- Field office boundary

2.3.3 Special Designation Areas

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern SDAs:

- Wilderness Act of 1964, as amended
- BLM MS-6330, Management of BLM Wilderness Study Areas
- BLM MS-6340, Management of Designated Wilderness AreasBLM Handbook 8550-1, Interim Management Policy and Guidelines for Lands Under Wilderness Review
- BLM Manual 1613, Areas of Critical Environmental Concern

Management goals, objectives, and actions SDAs are found in the **Appendix**, Current Management.

Many SDAs have a management prescription that do not allow vegetation manipulation. This could limit the BLM's ability to control noxious weeds or conduct other activities to improve public land health. Current management allows for exceptions to this prescription. This would be the case when site-specific environmental analysis indicates such treatments are necessary. Vegetation treatments would be necessary to maintain or improve public land health and to control noxious weeds. Treatments also would be used when it could be demonstrated that they would not adversely impact the resources for which the SDA was created.

As noted under **Section 2.1.10**, Fish and Wildlife, Current Management and Management Opportunities, the SDA boundaries will be reviewed and may be revised as part of the amendment.

Future management opportunities could include developing goals and objectives for the resources in SDAs. These goals and objectives would apply across the planning area, not just in the SDA boundary, then the delineation would be eliminated. For example, actions could explore more effective management prescriptions for paleontological resources, such as identifying surface exposures (for example, mudstone outcrops where fossils are most commonly found) and implementing restrictions in those areas. This would be to provide better site-specific protection of paleontological resources from oil and gas development.

2.4 SOCIAL AND ECONOMIC FEATURES

2.4.1 Native American Tribal Interests and Uses

Cultural resources are not limited to archaeological sites or buildings; they include objects or locations that have a direct association with living cultural groups, and they are of religious, cultural, or traditional significance to a Native American tribe or other group. When these resources meet the criteria for listing on the NRHP, they are referred to as traditional cultural properties, TCPs. These are eligible for listing due to their "association with cultural practices or beliefs of a living community that are rooted in that community's history, and are important in maintaining the continuing cultural identity of the community."

Examples of TCPs are locations for ceremonies or gathering of medicinal plants, agricultural areas, ancestral sites and other sacred spaces, and natural features, such as springs. Such locations are often identified through government-to-government consultation with Native American tribal elders or with the public involvement processes in NEPA and Section 106 of the National Historic Preservation Act (NHPA).

Section 101(d) of the NHPA requires that federal agencies consult with Native American tribes who historically occupied the area of the undertaking or who may attach significance to resources in the region. Provisions of NEPA also require that agencies consult with Native American tribal leaders.

This consultation typically occurs during an undertaking, such as a quarterly oil and gas lease sale process or review of an application for permit to drill. It happens when the BLM requests that a tribe identify any areas of interest in the project area. Tribes are consulted for projects not related to oil and gas when proposals are received by the BLM, such as data recovery plans or changes in management

strategies. In order to consult more meaningfully with tribes, the FFO would conduct face-to-face meetings with tribes when requested.

The BLM initiated government-to-government consultation in writing with the following potentially interested tribes:

- Navajo Nation
- Hopi Tribe
- Jicarilla Apache Tribe
- Mescalero Apache Tribe
- Pueblo of Acoma
- Pueblo of Cochiti
- Pueblo of Isleta
- Pueblo of Jemez
- Pueblo of Laguna
- Pueblo of Nambe
- Ohkay Owingeh
- Pueblo of Picuris
- Pueblo of Pojoaque
- Pueblo of San Felipe
- Pueblo of San Ildefonso
- Pueblo of Sandia
- Pueblo of Santa Ana
- Pueblo of Santa Clara
- Pueblo of Santo Domingo
- Pueblo of Taos
- Pueblo of Tesuque
- Pueblo of Zia
- Pueblo of Zuni
- Ysleta del Sur Pueblo
- San Carlos Tribe
- White Mountain Apache Tribe
- Southern Ute Tribe
- Ute Mountain Ute Tribe
- Apache Tribe of Oklahoma
- Comanche Indian Tribe
- Fort Sill Apache Tribe
- Kiowa Tribe of Oklahoma
- Pawnee Tribe
- Wichita and Affiliated Tribes

In the letters, the BLM requested information on known traditional cultural properties or other locations of importance to these tribes. The BLM assured them that tribes had the opportunity to provide input on the following:

- Scope of identification
- Identification strategies for cultural resources
- Evaluation of their historical significance
- Other major issues, such as the treatment of human remains

Sacred sites are not necessarily eligible for listing on the NRHP, but the American Indian Religious Freedom Act and EO 13007 charge the BLM with protecting these localities, consistent with other rights, and ensuring tribal access.

Some tribes have indicated that there are TCPs in the planning area and requested that these areas of interest be considered during the amendment process.

Consultation

The following statutes, regulations, handbooks, and other policies govern consultation and relationships with Native American tribes:

- American Indian Religious Freedom Act of 1978
- National Historic Preservation Act of 1966
- Archaeological Resources Protection Act of 1979
- Native American Graves Protection and Repatriation Act of 1990
- EO 13007, Indian Sacred Sites
- Presidential Memorandum of April 29, 1994, Government to Government Relations with Native American Tribal Governments
- Secretarial Order No. 3215, Principles for the Discharge of the Secretary's Trust Responsibility
- BLM Manual 8120, Tribal Consultation under Cultural Resources

The BLM coordinates and consults with the Native American tribes and the Bureau of Indian Affairs. Consultation occurs before decisions are made or actions are approved that could result in changes in land use, changes to lands or resources, changes in access, or alienation of lands. Federal programs are required to be carried out in a manner sensitive to Native American concerns and tribal government planning and resource management programs.

The BLM coordinates with tribes in the following ways:

- Preparing and maintaining inventories of the lands it administers and determining their various resource and other values
- Developing and maintaining long-range plans providing for the use of the public lands
- Managing the public lands

The FFO has a long history of consultation with the Navajo Nation on projects and issues that might affect its people or interests. Consultation has, in the past, included site-specific consultation on projects, such as APDs and pipelines in areas of concern to the Navajo Nation. The BLM will cooperate with the Navajo Nation to ensure that any areas of interest are identified in advance of project decisions to provide targeted site-specific consultations.

2.4.2 Social and Economic Features

Socioeconomic Study Area

The planning area, located in northwestern New Mexico, encompasses all of San Juan County, most of McKinley County, western Rio Arriba County, and northwestern Sandoval County. In order to capture the social and economic conditions in and close to the FFO planning area, the socioeconomic study area includes data for these counties in their entirety. (Note that only portions of Rio Arriba County and Sandoval County are included in the planning area; figures presented for these counties may not be representative of the areas in the planning area.)

The FFO is in the Four Corners area and is bordered by Colorado, Utah, and Arizona. Some of the social and economic conditions presented may also apply or be impacted by other border communities or be influenced by cross-border factors, such as commuting to or from the planning area for employment in the socioeconomic study area.

Socioeconomic Regional Context

The socioeconomic study area has a complex history. Native Americans, Hispanic settlers, and non-Hispanic Euro-American settlers have all played important roles.

The study 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 study area

practiced sophisticated forms of sedentary agriculture and multiregional trade. By the 1500s, the local indigenous groups were primarily nomadic hunter gatherers living in small family groups.

Starting in the late 1500s, Spanish settlers had a presence in the area, establishing agricultural communities. The Spanish authorities awarded land grants to individuals or groups of settlers, who built villages, dug irrigation ditches, and cleared fields for planting. After the Mexican Revolution in 1821, the New Mexican government took over jurisdiction and ownership of all Spanish lands, but continued to honor Spanish land grants.

Native Americans, including Navaho, Ute, and Apache Indians, adapted some of the practices of the Spanish, such as increasing herding sheep and cattle. Wool and yarn production, blanket and rug production, and turquoise and silver jewelry making were also of importance.

Following the treaty of Guadalupe Hidalgo and annexation of New Mexico by the United States in 1848, many of the ancestral land grants became property of the individual holdings. Lands outside of 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. In contrast, much of the tribal land in the socioeconomic study area was subdivided into small parcels or allotments after the US government initially established the reservation.

The Dawes Act of 1887, allowed the federal government to grant reservation lands to Indian individuals and to auction off undeveloped parcels. The sale created “surplus” lands from former reservation lands. Granting ownership of this land to development interests resulted in a chaotic land ownership pattern in some areas of the western United States. As a result of this so-called allotment period, a portion of the planning area is referred to as the checkerboard lands, an area primarily located at the eastern boundary of the Navajo reservation. In this area, tribal lands are intermingled with fee lands (owned by both Native American and non-Native American people) and federal and state lands under various jurisdictions.

The planning area today includes approximately 4.7 million acres of tribal lands belonging to the Navajo, Jicarilla Apache, and Ute Mountain tribes, over 303,000 acres of which overlie federal minerals.

In the late 1800s, settlement by non-Hispanic Euro-American settlers increased. The economy of these settlements in Farmington and the surrounding region was based on agriculture and included apple and other fruit orchards (Crawford 2000).

Development of oil and gas resources in the region began in the early-1920s in the Four Corners Platform area to the west. Limitations of early development included a lack of a local market for resources and limited transportation opportunities to remote markets. A surge in development with increased market demand in the 1940s and 1950s and development of regional pipelines brought with it a large population increase; the population of the Farmington increased nearly 763 percent in 10 years.

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 trends in demand (University of New Mexico 2005).

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. In the early 1980s, demand was weak, resulting in no significant development. This was followed by increased production, beginning in 1989 with development of the Fruitland Formation coal play (2003a.

New Mexico’s fossil fuel energy industry, led by oil development, has made a strong recovery since the recession. In the 2010s, after years of declining production in the San Juan Basin, companies are expressing interest in the Mancos shale for both natural gas and oil potential. Advances in hydraulic

fracturing and horizontal drilling technologies have helped operators unlock shale gas and oil. Because natural gas prices are currently at a 10-year low, this represents an opportunity for increased oil production in the short term.

Mining, especially of coal and uranium, has also provided significant income on tribal lands since the1950s. In the landmark Supreme Court case Merrion v. Jicarilla (1982), the tribes won the right to impose a severance tax on oil and gas produced on their land. However, in a the subsequent Cotton Petroleum v. New Mexico (1989), the court found states retained the right to impose their own taxes on non-Indian companies operating on Indian lands. Both the Navajo Nation and Jicarilla Apache now have their own energy companies, Navajo Oil and Gas and Jicarilla Apache Energy Company.

Tribal reports indicate that in 2012 the Jicarilla Apache had approximately 2,150 active wells (Government Printing Office 2012). On the Navajo Nation as a whole, in 1991, approximately 6.1 million barrels of oil and 4.5 MCF (mllion cubic feet) of natural gas were produced. The nation's oil and gas severance is four percent of the value of the minerals extracted from reservation lands; a three percent possessory interest tax is levied on the value of natural resource leaseholds (Navajo Nation Division of Economic Development 2014).

The Navajo Nation prohibited further uranium mining as of 2005 due to public health and environmental concerns, and the volume of coal mined has declined in the early twenty-first century. However, the Navajo Transitional Energy Co. LLC, run by the tribal government, recently took control of the Navajo Mine near Farmington in the Navajo Reservation, which produced 7,619,428 tons of coal in 2012 (Energy Information Administration 2012). In addition, nearly 300 Navajo allottees in New Mexico have signed leases with oil companies to develop their nonreservation land for energy production, with much of the interest in development in the San Juan Basin checkerboard area (Navajo Times 2014).

Overall, mining's share (including oil and natural gas) of overall employment in New Mexico is relatively small, about 2.4 percent in 2010, or roughly 26,000 New Mexicans. In contrast, in the socioeconomic study area in 2011, roughly 5.12 percent of employment is in the mining sector, and in San Juan County this figure was 10.94 percent.

Much of the infrastructure and community development in the planning area has been tied to booms in energy development and the related population changes. Demand for public services, including schools, public safety, and roads, generally increases in areas experiencing development booms. County and local level development can in turn be aided by gross receipt and property tax revenue from oil and gas development. This has been particularly true for San Juan County, where oil and gas development has a long history. Here, employment in the mining sector comprises a significant portion of the total workforce.

Current land use on tribal lands follows the same patterns as elsewhere in the region. Uses include an overlapping mix of grazing, agriculture, oil, gas, and coal production, and scattered homesteads and isolated sites for commercial and industrial use. On the Jicarilla Apache and Ute Reservations, casino gaming is also an income source.

Although the mid-twentieth century brought additional economic opportunities, high unemployment and a high percentage of people living in poverty prevails for many tribal members, as further discussed in the Environmental Justice section.

In the last decade the regional economy has seen greater diversification in the economy. Farmington's role as a regional retail and service center has grown. It is the largest city within a 150-mile radius and draws on a market of 250,000 people. It is becoming a regional trade area for northwestern New Mexico and southwestern Colorado. The area also benefits greatly from recreation and tourism in the Four Corners region. At the same time, the oil and gas industry remains a primary employer and provides higher-paying jobs than many other economic sectors.

While small in terms of income and employment, agriculture remains the historic legacy of the region. It is highly valued for cultural reasons and as a strategy for a diversified economy. Agriculture remains especially important in the portions of the socioeconomic study area that do not have the historic high

level of fossil fuel development. Elements of traditional Hispanico culture are retained on small subsistence farms, or ranchos, in the valleys of northern New Mexico; in the planning area this is particularly notable in Rio Arriba County. Northern New Mexico (in the Farmington and Rio Puerco Field Offices) is also unique because it contains Navajo free permits, which support subsistence grazing.

Current Condition and Trends

Data for the counties and the state were collected from the following sources: the Headwaters Economics' Economic Profile System (Headwaters Economics 2014), the US Census Bureau, the US Bureau of Economic Analysis, and the US Bureau of Labor Statistics. Presented in the demographic data are current, historic, and forecast population statistics, age distribution, housing, and education levels. Economic characteristics discussed are employment levels and industries, major employers, income, government revenues and expenditures, and dependence on resources administered by the BLM. To the greatest extent possible, data represent the most current information available.

When possible, data for Native American tribes in the planning area are included, along with county and state data for comparison. These data are most commonly available for the ACS 2012 data but not necessarily for previous census data or other data sources. (Note that Native American participation rates tend to be lower than for other populations, potentially skewing the data collected.)

More detailed data and a discussion of current conditions and trends is provided in the FFO socioeconomic baseline report prepared in coordination with this planning effort.

Population and Migration

The population base and economic activity in Sandoval County is primarily in the city of Rio Rancho. It is near the Albuquerque metropolitan area, in the southeastern corner of the county. As such, the most the population and economic data for Sandoval County can be attributed to economic activity from the Albuquerque area. There is some economic contribution from the oil and gas industry to the Rio Rancho area; however, the portion of the San Juan Basin oil and gas development in Sandoval County is relatively small. It is expected to have a minor contribution to the economy compared to that of Albuquerque.

Where possible, additional data or discussions of the conditions outside of Rio Rancho are included in this section. Data for areas outside of Rio Rancho in Sandoval County were calculated by subtracting the data for Rio Rancho from the data for Sandoval County. These data have been included for context and are not included in the study area totals.

Measuring changes in population and migration over time can be an indicator of economic or social trends or changes in an area. These statistics are also used in federal funding allocations in a variety of sectors, including transportation, infrastructure, education, healthcare, and assistance programs.

In 2012, the socioeconomic study area total population was 549,612. For New Mexico counties it ranged from 40,201 in Rio Arriba County to 131,302 in Sandoval County; for tribal nations it ranged from 1,643 in the Ute Mountain Nation to 172,695 in the Navajo Nation.

The population density for the study area in 2012 varied from approximately 6.9 people per square mile in Rio Arriba County to 35.4 persons per square mile in Sandoval County, and from 1.9 in the Ute Mountain Nation to 6.3 in the Navajo Nation. The average population density for the four counties and three tribal nations in the study area was 11.0 persons per square mile. This is less than the average for the state of New Mexico, which was 16.9 persons per square mile. This is a slight increase from 2000, when the population density was 10.1 for the study area.

In 2000, the population densities ranged from 7.0 persons per square mile in Rio Arriba County to 24.2 persons per square mile in Sandoval County. It ranged from 2.0 persons per square mile for the Ute Mountain and Jicarilla Apache Nations to 6.6 for the Navajo Nation.

In Sandoval County, the total population outside of Rio Rancho in 2012 was 40,484, with a population density of 11.92 persons per square mile (see **Table 2-33**).

Table 2-33 Study Area Population and Density (2000-2012)

Location	Population 2000	Land Area[1] (Square Miles)	Persons per Square Mile, 2000[1]	Population 2012	Persons per Square Mile, 2012
New Mexico Counties					
McKinley County	74,798	5,450	13.7	71,888	13.2
Rio Arriba County	41,190	5,861	7.0	40,201	6.9
Sandoval County	89,908	3,711	24.2	131,302	35.4
(Excluding Rio Rancho)	(38,143)	(3,608)	(10.6)	(40,484)	(11.2)
San Juan County	113,801	5,513	20.6	128,600	23.3
New Mexico	1,819,045	121,298	15.0	2,055,287	16.9
Tribes					
Jicarilla Apache Nation	2,742	1,364	2.0	3,283	2.4
Navajo Nation	181,269	27,413	6.6	172,695	6.3
Ute Mountain Nation	1,712	864	2.0	1,643	1.9
Study Area	*505,420*	*50,175*	*10.1*	*549,612*	*11.0*

Source: US Census Bureau 2000, 2012a, 2012b
[1]2000 land area was assumed to be the same as 2012; population density for 2000 uses 2012 land areas.

In 2012, most of the population in the study area (90,818 people) resided in Sandoval County, in the city of Rio Rancho, which is close to Albuquerque. However, Rio Rancho does not lie in the planning area; it is more heavily influenced by the economic and social conditions of Albuquerque than of the planning area. The largest population center in the planning area is Farmington in San Juan County. Other population centers in the study area are Gallup, with a population of 22,088 in 2012, and Española in Rio Arriba County, with a population of 10,240 in 2012 (US Census Bureau 2012b; see **Table 2-34**).

Table 2-34 Study Area Population Centers (2012 estimate)

Location	Population (2012)	In Planning Area
McKinley County		
Gallup	22,088	Yes
Rio Arriba County		
Espanola	10,240	No
Sandoval County		
Rio Rancho	90,818	No
Bernalillo	8,413	No
San Juan County		
Aztec	6,683	Yes
Farmington	45,854	Yes
Bloomfield	7,968	Yes

Source: US Census Bureau 2012b

Table 2-35 shows that the total population increased significantly in the study area since 1980, with the highest growth rates occurring from 1990 to 2000. Between 1980 and 1990, every county and tribal nation in the study area increased in population. Population growth ranged from 7.3 percent in McKinley County to 82.0 percent in Sandoval County; it ranged from 10.9 percent in the Ute Mountain Nation to 31.1 percent in the Jicarilla Apache Nation.

Table 2-35 Study Area Population Totals (1980-2012)

Location	1980	1990	1980-1990 Percent Change	2000	1990-2000 Percent Change	2012	2000-2012 Percent Change	1980-2012 Percent Change
New Mexico Counties								
McKinley County	56,536	60,686	7.3	74,798	23.3	71,888	-3.9	27.2
Rio Arriba County	29,282	34,365	17.4	41,190	19.9	40,201	-2.4	37.3
Sandoval County	34,799	63,319	82.0	89,908	42.0	131,302	46.0	277.3
(Excluding Rio Rancho)	(24,814[**])	(30,814)	(24.2)	(38,143)	(23.8)	(40,484)	(6.2)	(63.1)
San Juan County	81,433	91,605	12.5	113,801	24.2	128,600	13.0	57.9
New Mexico	1,303,445	1,515,069	16.2	1,819,045	20.1	2,055,287	13.0	57.7
Tribes								
Jicarilla Apache Nation	1,996	2,617	31.1	2,742	4.8	3,283	19.7	64.5
Navajo Nation	110,443	144,000[*]	30.4	181,269	25.9	172,695	-4.7	56.4
Ute Mountain Nation	1,138	1,262[*]	10.9	1,712	35.7	1,643	-4.0	44.4
Study Area	*315,627*	*397,854*	*26.1*	*505,420*	*27.0*	*549,612*	*8.7*	*74.1*

Source: US Census Bureau 1980, 1990, 2000, 2012a; [*]Pritzker 2000
[**]Population data from Rio Rancho Estates, which was incorporated as the city of Rio Rancho in 1981.

Overall, there was an increase of 26.1 percent in the study area between 1980 and 1990. This shows a faster rate of growth than that of New Mexico, which increased in population by 16.2 percent during the same period. Note that due to nonparticipation or low participation rates, data points for 1990 for the Navajo Nation and the Ute Mountain Nation are not available in the nationwide census data; instead they were taken from Pritzker (2000).

All counties and tribal nations increased in population between 1990 and 2000. The greatest increase was in Sandoval County (42.0 percent) and the Ute Mountain Nation (35.7 percent); the lowest increase was in Rio Arriba County (19.9 percent) and the Jicarilla Apache Nation (4.8 percent). Between 1990 and 2000, the population of the study area grew by 27.0 percent. This was greater than New Mexico, which showed a 20.1 percent increase.

From 2000 to 2012, the population in the study area increased by 8.7 percent, showing a slower rate of growth from the two previous decades. This is also slower than New Mexico, which grew by 13.0 percent during this period. McKinley and Rio Arriba Counties showed negative growth of 3.9 percent and 2.4 percent, and the Navajo Nation and Ute Mountain Nation showed negative growth of 4.7 and 4.0 percent. Sandoval and San Juan Counties showed a positive growth of 46.0 percent and 13.0, and the Jicarilla Apache Nation also showed a positive growth of 19.7 percent.

Overall, the study area increased in population by 74.1 percent between 1980 and 2012. The fastest population growth was in Sandoval County (277.3 percent) and the Jicarilla Apache Nation (64.5 percent); the slowest growth was in McKinley County (27.2 percent) and the Ute Mountain Nation (44.4 percent). In Sandoval County, most of this growth came from the rapid expansion of the city of Rio Rancho. For areas outside of Rio Rancho, Sandoval County saw an overall steady growth between 1980 and 2012 of 63.1 percent. While much smaller than the growth experienced by Rio Rancho, this area still outpaced all other counties in the study area. The growth in the study area in the 32-year period was greater than that of New Mexico, which grew by 57.7 percent.

Population in the study area is projected to increase for all counties from 2015 to 2030, based on a University of New Mexico, Bureau of Business and Economic Research study (2012). Populations are expected to increase by 22.6 percent across the entire study area, with Sandoval County having the strongest projected growth (43.9 percent) and Rio Arriba County having the weakest (less than 1 percent). McKinley County is expected to grow by 1.5 percent and San Juan County by 16.7 percent. New Mexico is projected to grow by 18.7 percent in the next 15 years. (No population project data was available for the three tribal nations.) See **Table 2-36**.

Table 2-36 Study Area Population Projections (2015-2030)

County	2015	2020	2025	2030	% Change 2015-2030
McKinley County	72,691	73,483	73,946	73,805	1.5%
Rio Arriba County	40,780	41,026	41,058	40,872	0.2%
Sandoval County	154,048	176,276	198,950	221,644	43.9%
San Juan County	138,487	146,388	154,065	161,593	16.7%
New Mexico	2,208,450	2,351,724	2,487,227	2,613,332	18.3%
Study Area	*406,006*	*437,173*	*468,019*	*497,914*	*22.6%*

Source: University of New Mexico 2012
Data was not available for tribal nations and is not included in the study area totals for this table.

Place of Birth

Place of birth compared with current residence can have important social implications for communities, as it impacts the ties that residents have to the community and the region. Domestic in-migration plays a moderate role in the demographics of the counties and tribal nations that comprise the socioeconomic study area.

Across the study area, 26.3 percent of the US-born population was born in another state, compared with 70.1 percent who were born in their state of residence. Sandoval County has the highest domestic immigration rate (43.9 percent), while McKinley County has the lowest domestic immigration rate (19.8 percent). For the tribal nations, the Ute Mountain Nation had the highest domestic immigration rate at 40.6 percent, while the Jicarilla Apache Nation had the lowest rate at 9.7 percent.

For all counties and tribal nations, there are a higher percentage of residents living in the study area born in New Mexico than those who were born in another state and moved to the study area.

Foreign immigration plays a much smaller role in the demographics of the study area. For all counties and tribal nations, the percent of those who were not born in the United States but are living in the study area is less than 6 percent, which is less than the state average of 9.8 percent.

Table 2-37 Study Area Place of Birth (2012)[1]

Location	Born in US (Percent)	*Born in State of Residence (Percent Born in US)*	*Born in Other State (Percent Born in US)*	Foreign Born (Percent)	*Born Outside US (Percent Foreign Born, Native, or Naturalized Citizen)*	*Born Outside US (Percent Foreign Born, not US Citizen)*
New Mexico Counties						
McKinley County	97.1	*77.3*	*19.8*	2.4	*33.0*	*67.0*
Rio Arriba County	92.9	*77.0*	*15.9*	6.3	*19.6*	*80.4*
Sandoval County	92.9	*49.0*	*43.9*	5.8	*59.0*	*41.0*
San Juan County	95.8	*59.3*	*36.6*	3.8	*29.6*	*70.4*
New Mexico	89.2	*52.1*	*37.0*	9.8	*33.1*	*66.9*
Tribes						
Jicarilla Apache Nation	98.0	*88.3*	*9.7*	1.9	*79.0*	*21.0*
Navajo Nation	99.3	*82.0*	*17.3*	0.6	*39.9*	*60.1*
Ute Mountain Nation	98.1	*57.5*	*40.6*	0.9	*21.4*	*78.6*
Study Area	*96.3*	*70.1*	*26.3*	*3.1*	*40.2*	*59.8*

Source: US Census Bureau 2012a
[1]American Community Survey estimates are based on data collected over five years. The estimates represent the average characteristics of population and housing between January 2008 and December 2012 and do not represent a single point in time.

Age

Median age can be an indicator of what types of age groups and lifestyles are attracted to a region. A low median age might indicate that many young professionals are moving to the area for jobs, or a high median age could mean there are a large percentage of retirees and associated communities. As of 2012, the median age of the residents in the study area was 32.0, ranging from 39.1 in Rio Arriba County to 30.3 in McKinley County, and from 28.9 in the Navajo Nation to 26.9 in the Ute Mountain Nation. Only Sandoval and Rio Arriba Counties have a median age higher than the New Mexico average (36.6 years). **Table 2-38** shows the age structure for each county in the study area.

Table 2-38 Study Area Age of Population (2012)

Location	19 and Under	20-34	35-44	45-64	65-84	85+	Median Age
New Mexico Counties							
McKinley County	25,420	14,589	8,626	16,436	6,139	678	30.3
Rio Arriba County	11,045	7,130	4,918	11,359	5,056	693	39.1
Sandoval County	38,002	22,685	17,782	36,572	14,383	1,878	38.1
San Juan County	40,911	26,781	14,999	31,799	12,490	1,620	32.8
New Mexico	576,636	412,177	248,645	542,726	242,630	32,473	36.6
Tribes							
Jicarilla Apache Nation	1,210	780	365	725	196	7	28.5
Navajo Nation	63,570	34,363	19,864	37,630	15,567	1,701	28.9
Ute Mountain Nation	597	363	206	373	91	13	26.9
Study Area	*180,755*	*106,691*	*66,760*	*34,894*	*53,922*	*6,590*	*32.0*
Source: US Census Bureau 2012a							

Language Spoken at Home

The primary language spoken at home is one indicator of the diversity of an area. In this area, there are high percentages of English, Spanish, and native language speakers stemming from the ethnic and cultural diversity of the area, The population of the study area includes people of European descent, immigrants or first-generation Americans from neighboring Mexico or other Latin American countries, and several Native American tribes.

In McKinley County, 49.4 percent of the reporting populations speak something other than English, Spanish, other Indo-European languages, or Asian and Pacific Island language, followed closely by English (43.5 percent). Rio Arriba County has a majority of Spanish speakers (54.1 percent), followed by English speakers (38.0 percent). Sandoval and San Juan Counties have a majority of English-only speakers (70.7 and 64.0 percent), with Spanish as the second most spoken language in Sandoval County (17.7 percent) and another language as secondary in San Juan County (23.0 percent). Sandoval County most closely reflects the trends in New Mexico, with English-only speakers making up most of the language spoken (64.0 percent), followed by Spanish speakers (36.0 percent; US Census Bureau 2012a).

The tribal nations contain a mix of English and tribal languages (included under other languages), with the Jicarilla Apache Nation reporting a majority of English-only speakers (59.1 percent), followed by another language speakers (34.3 percent). The Navajo Nation has a majority of other language speakers (68.3 percent), followed by English-only speakers (30.5 percent). The Ute Mountain Nation has an almost equal number of English-only speakers (49.0 percent) and other language speakers (48.1 percent; US Census Bureau 2012a).

Overall, the study area is composed of 51.0 percent of English-only speakers, 34.2 percent of other language speakers, and 13.6 percent of Spanish speakers (US Census Bureau 2012a). Refer to **Table 2-39**.

Table 2-39 Study Area Language Spoken at Home (2008-2012)[1]

Location	English Only	Language Other Than English	Speak English Less than "Very Well"	Spanish Speaking	Speak English Less than "Very Well"	Other Indo-European Language	Speak English Less than "Very Well"	Asian and Pacific Island Languages	Speak English Less than "Very Well"	Other Languages	Speak English Less than "Very Well"
New Mexico Counties											
McKinley County	43.5%	56.5%	14.2%	6.2%	2.1%	0.4%	0.0%	0.6%	0.3%	49.4%	11.8%
Rio Arriba County	38.0%	62.0%	6.8%	54.1%	6.6%	0.5%	0.0%	0.3%	0.0%	7.2%	0.2%
Sandoval County	70.7%	29.3%	6.0%	17.7%	3.5%	1.5%	0.3%	0.8%	0.3%	9.3%	1.9%
San Juan County	66.2%	33.8%	5.7%	10.0%	2.9%	0.7%	0.1%	0.2%	0.1%	23.0%	2.7%
New Mexico	64.0%	36.0%	9.4%	28.5%	7.9%	1.3%	0.2%	0.9%	0.4%	5.3%	0.9%
Tribes											
Jicarilla Apache Nation	59.1%	40.9%	1.6%	4.8%	0.7%	1.5%	0.0%	0.3%	0.0%	34.3%	0.9%
Navajo Nation	30.5%	69.5%	18.1%	0.6%	0.1%	0.2%	0.0%	0.4%	0.1%	68.3%	17.8%
Ute Mountain Nation	49.0%	51.0%	9.5%	2.0%	0.8%	0.0%	0.0%	0.9%	0.6%	48.1%	8.1%
Study Area	51.0%	49.0%	8.8%	13.6%	2.4%	0.7%	0.1%	0.5%	0.2%	34.2%	6.2%

Source: US Census Bureau 2012a

[1]American Community Survey estimates are based on data collected over five years. The estimates represent the average characteristics of population and housing between January 2008 and December 2012 and do not represent a single point in time.

Social Indicators

Social characteristics and attitudes vary by cultural and ethnic background, belief systems, and economic trends. Changes in regional industry sectors or local population influx for example, can affect the lifestyles and attitudes of the residents. Such social indicators as education level and crime rate can provide valuable information on the impact of economic changes in a community. Examples of these changes are boom and bust cycles in employment and a regional economic downturn. These social indicators are usually only representative of the dominant sociocultural group in any given area. Social indicators as used in this context should be not be assumed to be of equal use between different ethnic or cultural communities in the socioeconomic study area.

Education

The education level of residents often correlates with other socioeconomic factors, including employment and income levels. In the study area, education levels vary greatly (see **Table 2-40**). McKinley County, Rio Arriba County, the Navajo Nation, and the study area overall have a higher percentage of adults over 25 who have attained less than a ninth grade education, as compared to New Mexico. Only Sandoval County surpassed the state average for percentage of residents who obtained a graduate, professional, or bachelor's degree. This may be in part due to the larger and more economically advantaged populations in southern Sandoval County, near Albuquerque, Rio Rancho, and Corrales. The study area as a whole surpassed the state average for percent attainment for an associate's degree, while only McKinley County, the Jicarilla Apache Nation, and the Ute Mountain Nation fell below the state average. All counties and tribal nations surpassed the state average for attaining a high school degree or equivalent.

Table 2-40 Study Area Educational Attainment for Population 25 Years and Older (2008-2012)[1]

Location	Less than 9th Grade	9th to 12th Grade, No Diploma	High School Graduate or Equivalent	Some College, No Degree	Associate Degree	Bachelor Degree	Graduate or Professional Degree
New Mexico Counties							
McKinley County	4,782	7,054	12,871	8,510	2,701	3,014	1,993
	11.7%	*17.2%*	*31.5%*	*20.8%*	*6.6%*	*7.4%*	*4.9%*
Rio Arriba County	2,605	3,197	8,168	6,548	2,027	2,448	1,799
	9.7%	*11.9%*	*30.5%*	*24.4%*	*7.6%*	*9.1%*	*6.7%*
Sandoval County	2,588	5,548	22,794	22,618	8,380	14,494	9,748
	3.0%	*6.4%*	*26.5%*	*26.2%*	*9.7%*	*16.8%*	*11.3%*
San Juan County	5,615	8,925	25,639	18,771	7,473	7,950	4,344
	7.1%	*11.3%*	*32.6%*	*23.8%*	*9.5%*	*10.1%*	*5.5%*
New Mexico	98,581	122,562	351,718	319,412	99,775	195,148	146,730
	7.4%	*9.2%*	*26.4%*	*23.9%*	*7.5%*	*14.6%*	*11.0%*
Tribes							
Jicarilla Apache Nation	62	261	669	487	133	144	46
	3.4%	*14.5%*	*37.1%*	*27.0%*	*7.4%*	*8.0%*	*2.6%*
Navajo Nation	15,804	13,735	31,463	19,518	7,493	3,939	3,086
	16.6%	*14.5%*	*33.1%*	*20.5%*	*7.9%*	*4.1%*	*3.2%*
Ute Mountain Nation	34	134	430	209	16	23	5
	4.0%	*15.7%*	*50.5%*	*24.6%*	*1.9%*	*2.7%*	*0.6%*
Study Area	31,490	38,854	102,034	76,661	28,223	32,012	21,021
	9.5%	*11.8%*	*30.9%*	*23.2%*	*8.5%*	*9.7%*	*6.4%*

Source: US Census Bureau 2012a
[1]American Community Survey estimates are based on data collected over five years. The estimates represent the average characteristics of population and housing between January 2008 and December 2012 and do not represent a single point in time.

Crime Rate

Crime rate can indicate the degree of economic and social stability in a region. In 2005, based on local law enforcement agencies reporting, the study area had a violent crime rate (murder/manslaughter, rape, robbery, and aggravated assault) and a property crime rate (burglary, larceny theft, and vehicle theft) below that of the state average. The four counties also had violent and property crime rates lower than the state average, but some cities in these counties had higher crime rates (Disaster Center 2014).

Bernalillo and Bloomfield both had violent higher crime rates (1,163.5 crimes per 100,000 residents) than that for the state (1,445.1 crimes per 100,00 residents), while Gallup had higher rates for both crime groups (1,697.1 violent crimes per 100,000 residents and 9,386.7 property crimes per 100,000 residents; Disaster Center 2014). Data was not available for the tribal nations. Refer to **Table 2-41** for a breakdown of violent and property crime by county and major city.

Table 2-41 Study Area Crime Rates (2005)

Location	Crime Index (per 100,000 residents)	
	Violent Crime	Property Crime
McKinley County	221.5	671.0
Gallup	1,697.1	9,386.7
Rio Arriba	85.2	93.7
Española	N/A	N/A
Sandoval County	196.2	765.7
Rio Rancho	329.8	2,222.4
Bernalillo	1,163.5	1,603.3

Table 2-41 Study Area Crime Rates (2005)

Location	Crime Index (per 100,000 residents)	
	Violent Crime	Property Crime
San Juan County	372.3	1,809.0
Aztec	643.1	3,544.4
Bloomfield	1,445.1	4,062.7
Farmington	788.7	3,562.1
New Mexico	646.3	4,131.7
Study Area Average	*218.8*	*834.9*

Source: Disaster Center 2014
Data was not available for tribal nations and is not included in the study area totals for this table.
N/A = Data not available

Housing

For most of the counties in the study area, the number of housing units changed considerably between 2000 and 2012. The most dramatic change was in Sandoval County, where the number of units increased by 49.9 percent. The only county to have a decrease in units was McKinley (-3.3 percent). The percent change in the remaining New Mexico counties ranged from 8.6 percent in Rio Arriba County to 13.8 percent in San Juan County. Both of these are below the state rate of change of 15.4 percent. Over the entire study area, the number of units increased by 19.6 percent (see **Table 2-42**). The increase in Sandoval County follows the change from rural to suburban development due to its proximity to Albuquerque, as seen throughout many areas in the region.

Table 2-42 Socioeconomic Study Area Household Characteristics (2000 to 2012 Comparison)

Location	Average Household Size		Total Housing Units		Housing Units Percent Change 2000-2012	Occupied Housing Units		Vacant Housing Units			
	2000	2012	2000	2012		2000	2012	2000	Percent Vacant 2000	2012	Percent Vacant 2012
New Mexico Counties											
McKinley County	3.44	4.05	26,718	25,842	-3.3%	21,476	17,518	5,242	19.6%	8,324	32.2%
Rio Arriba County	2.71	2.65	18,016	19,559	8.6%	15,044	14,959	2,972	16.5%	4,600	23.5%
Sandoval County	2.84	2.79	34,866	52,273	49.9%	31,411	46,795	3,455	9.9%	5,478	10.5%
San Juan County	2.99	3.04	43,221	49,168	13.8%	37,711	41,791	5,510	12.7%	7,377	15.0%
New Mexico	2.63	2.63	780,579	900,504	15.4%	677,971	763,844	102,608	13.1%	136,660	15.2%
Study Area	*3.00*	*3.13*	*122,821*	*146,842*	*19.6%*	*105,642*	*121,063*	*17,179*	*14.0%*	*25,779*	*17.6%*
Tribes (for reference purposes)											
Jicarilla Apache Nation	N/A	3.50	N/A	1,140	N/A	N/A	923	N/A	N/A	217	19.0
Navajo Nation	N/A	3.95	N/A	69,639	N/A	N/A	43,425	N/A	N/A	26,214	37.6
Ute Mountain Nation	N/A	2.90	N/A	688	N/A	N/A	551	N/A	N/A	137	19.9

Source: US Census Bureau 2000, 2012a
Housing data for tribal areas was not collected by the US Census in 2000. Since it cannot be compared equally to the New Mexico counties, it is not included in the study area total for this table, but the 2012 data is included for reference purposes.

In 2012, housing vacancy rates in the study area ranged from a low of 10.5 percent in Sandoval County to a high of 32.2 percent in McKinley County. Both Sandoval County and San Juan County, at 15.0 percent vacancy rate, were lower than the state value of 15 percent, but McKinley and Rio Arriba Counties were both higher at 23.5 percent. The overall vacancy rate for the study area was 17.6 percent.

While housing data was not collected for tribal nations in 2000, data from 2012 can be used to compare current vacancy rates. For all three tribal nations, the 2012 vacancy rates were higher than the state average, with the Navajo Nation having the highest rate at 37.6 percent.

Income Distribution and Poverty Level

Income Distribution

The study area population has a wide range of income levels. Overall median household income increased for all counties between 2000 and 2012 average (not adjusted for inflation). Sandoval County had the highest median household income at $58,116, and McKinley County had the lowest at $30,780. Per capita income follows similar trends from 2000 to 2012, with all counties increasing per capita income in that period. The increase in per capita income across the study area was $6,129, with the highest increase ($7,674) in Sandoval County and the lowest increase ($3,573) in McKinley County (US Census Bureau 2012a). Sandoval County was the only county to surpass the state per capita income of $23,749.

While specific data are not available for median household and per capita incomes for areas outside of Rio Rancho in Sandoval County, these income levels can be inferred by using data for Rio Rancho. The median household income for Rio Rancho in 2012 was $60,125, higher than the county and state average. This indicates that the median household income for the rest of the county is much lower than the county average. The same holds true for per capita income, which was $27,261 in Rio Rancho in 2012.

In 2000, only Sandoval County had a median household income or per capita income greater than the state average. Between 2000 and 2012, San Juan County had the greatest percent change for both median household income and per capita income, boosting its median household income to greater than the state median household income by 2012. McKinley County had the lowest percent change for both categories, leaving income values well below the state average. Overall, the study area showed a greater percent change for both median household income and per capita income than the state, showing increased growth compared to the state (see **Table 2-43**).

Table 2-43 Study Area Income Distribution (2000 to 2012 Comparison)[1]

Income	Median Household Income in Dollars			Per Capita Income in Dollars			Individuals Below Poverty Level (Percent)			Families Below Poverty Level (Percent)		
	2000	2012[1]	Percent Change	2000	2012[1]	Percent Change	2000	2012[1]	Percent Change	2000	2012[1]	Percent Change
New Mexico Counties												
McKinley County	25,005	30,780	23.1%	9,872	13,445	36.2%	36.1	33.6	-2.5%	31.9	27.8	-4.1%
Rio Arriba County	29,429	40,791	38.6%	14,263	20,253	42.0%	20.3	19.3	-1.0%	16.6	14.8	-1.8%
Sandoval County	44,949	58,116	29.3%	19,174	26,848	40.0%	12.1	13.2	1.1%	9.0	9.9	0.9%
San Juan County	33,762	48,701	44.2%	14,282	21,561	51.0%	21.5	20.4	-1.1%	18.0	16.0	-2.0%
New Mexico	34,133	44,886	31.5%	17,261	23,749	37.6%	18.4	19.5	1.1%	14.5	14.9	0.4%
Study Area	*33,286*	*44,597*	*34.0%*	*14,398*	*20,527*	*42.6%*	*22.5*	*21.6*	*-0.9%*	*18.9*	*17.1*	*-1.8%*
Tribes (for reference purposes)												
Jicarilla Apache Nation	N/A	46,771	N/A	N/A	16,536	N/A	N/A	17.8	N/A	N/A	14.5	N/A
Navajo Nation	N/A	26,963	N/A	N/A	10,874	N/A	N/A	39.2	N/A	N/A	35.2	N/A
Ute Mountain Nation	N/A	29,840	N/A	N/A	12,895	N/A	N/A	26.3	N/A	N/A	30.1	N/A

Source: US Census Bureau 2000, 2012a

[1]American Community Survey estimates are based on data collected over five years. The estimates represent the average characteristics of population and housing between January 2008 and December 2012 and do not represent a single point in time.

Income data for tribal areas was not collected by the US Census in 2000. Since it cannot be compared equally to the New Mexico counties, it was not included in the study area totals for this table, but the 2012 data is included for reference purposes.

Income data for tribal nations were not collected in 2000, so equal comparisons cannot be made between the counties and the tribal nations in the study area for income distribution. American community survey data for 2008- 2012 is available, and comparisons can be made for reference purposes. Both the Navajo Nation and the Ute Mountain Nation had median household incomes well below the New Mexico average, but the Jicarilla Apache Nation was greater than the state average. However, all of the tribal nations were below the state average for per capita income.

Income Source

Income is derived from two major sources: labor earnings or income from the workplace and nonlabor income. The latter source includes dividends, interest, and rent (collectively often referred to as money earned from investments), and transfer payments (payments from governments to individuals, including Medicare, disability, and Social Security insurance payments, and retirements). Labor income is the main source of income for all study area counties. However, nonlabor income from rent, dividends, and other sources provides a significant percentage of income in some counties.

Rio Arriba County had the highest percentage of nonlabor personal income in the study area for 2012 at 46.1 percent. McKinley County and Rio Arriba County both had higher nonlabor income percentages than the state average of 39 percent, while Sandoval and San Juan Counties had lower percentages than the state average. Overall, the study area had a slightly lower rate than the state average at 36.7 percent (BEA 2013). For more details regarding income source, refer to **Table 2-44**.

Table 2-44 Study Area Labor and Nonlabor Income (2012)

County	Personal Income Total (Thousands of Dollars)	Labor Income (Net Earnings)		Nonlabor Income (Dividends, Interest, Rent, Personal Transfer Receipts)	
		Thousands of Dollars	Percent of Personal Income Total	Thousands of Dollars	Percent of Personal Income Total
New Mexico Counties					
McKinley County	1,819,127	983,411	54.1%	835,716	45.9%
Rio Arriba County	1,217,573	656,793	53.9%	560,780	46.1%
Sandoval County	4,600,835	3,042,345	66.1%	1,558,490	33.9%
San Juan County	4,253,309	2,842,547	66.8%	1,410,762	33.2%
New Mexico	74,416,002	45,365,542	61.0%	29,050,460	39.0%
Study Area	*11,890,844*	*7,525,096*	*63.3%*	*4,365,748*	*36.7%*

Source: BEA 2013 (Table CA05N)
All state and local area dollar estimates are in current dollars (not adjusted for inflation).

Nonlabor income and labor earnings may not add to total personal income because of adjustments made by the Bureau of Economic Analysis to account for contributions for Social Security, cross-county commuting, and other factors.

Data are not available for tribal nations and are not included in the study area totals for this table.

Income Inflow and Outflow

Data collected for personal income may not accurately reflect the money available in a community if a high percentage of area workers live outside of the county. Earnings from those commuting into the study area counties were compared with earnings from those commuting out of the counties to work. Net flow, also known as net residential adjustment, is simply inflow minus outflow. If a county has positive net flow, this indicates that the commuters who live in the county are bringing more income into the county (inflow) than commuters from elsewhere are taking out (outflow).

In 2012, only San Juan County experienced a negative net residential adjustment, indicating that there is significant in-commuting to this county from other counties. McKinley, Rio Arriba, and Sandoval Counties all had positive net residential adjustments. This indicates that these counties may be bedroom

communities, with income derived from workers commuting out of the county exceeding the income of workers commuting in. For a more detailed breakdown, refer to **Table 2-45**.

The Bureau of Economic Analysis (BEA) compiles data by county, metropolitan, micropolitan, or other statistical areas, as defined by the Office of Management and Budget. Tribal areas are not included as part of these definitions, and equivalent data are not available for an accurate comparison to the counties in the study area. Consequently, tribal members' income data is not discussed in this report.

Table 2-45 Study Area Income Inflow and Outflow (2012)

Location	Outflow of Earnings ($1,000)	Inflow of Earnings ($1,000)	Net Flow ($1,000)
New Mexico Counties			
McKinley County	114,029	170,851	56,822
Rio Arriba County	85,555	287,306	201,751
Sandoval County	503,139	1,879,876	1,376,737
San Juan County	213,278	130,758	-82,520
New Mexico[1]	-	-	
Study Area	916,001	2,468,791	1,552,790

Source: BEA 2013 (Table CA91)
All dollar estimates are in current dollars and are not adjusted for inflation.
[1]Data was not available at the state level. Data also was not available for tribal nations and is not included in the study area totals for this table.

Poverty Level

The percent of individuals below the poverty level, according to 2008-2012 estimates, ranged from 13.2 percent in Sandoval County to 33.6 percent in McKinley County. Rio Arriba County (19.3 percent), San Juan County (20.4 percent), and Sandoval County all had lower rates of individuals below the poverty level than the state average (19.5 percent). The average for the study area was 21.6 percent, slightly higher than the state average. McKinley, Rio Arriba, and San Juan Counties all saw minor reductions in individual poverty levels from 2000 to 2008-2012 (around 1 percent); Sandoval County saw an increase of 1.1 percent, which equals the rate of increase for the state. Overall, the individual poverty rate for the study area decreased by 0.9 percent from 2000-2012 (US Census Bureau 2012a).

From 2008 to 2012, the proportion of families below the poverty level ranged from a low of 9.9 percent in Sandoval County to a high of 27.8 percent in McKinley County. Rio Arriba County (14.8 percent) and Sandoval County both had lower rates of families below the poverty level than the New Mexico average (14.9 percent); McKinley County, San Juan County (16.0 percent), and the study area (17.1 percent) were above the state average. McKinley, Rio Arriba, and San Juan Counties all saw minor reductions in family poverty levels from 2000 to 2008-2012 (between 4.1 percent and 1.8 percent), which are equal to or greater than the reduction seen over the study area (1.8 percent). Sandoval County saw a slight increase of 0.9 percent, which is greater than the state increase of 0.4 percent between 2000 and 2012 (US Census Bureau 2012a).

Income data for tribal nations was not collected in 2000, so equal comparisons cannot be made between the counties and the tribal nations in the study area for income distribution. Data for 2012 are available and comparisons can be made for reference purposes. Both the Navajo Nation and the Ute Mountain Nation had percentages of individual poverty greater than the state average (39.2 percent and 26.3 percent); the Jicarilla Apache Nation had a lower percentage of individuals below the poverty line (17.8 percent) than the state average. Similar trends occur for families below the poverty level; the Navajo Nation (35.2 percent) and the Ute Mountain Nation (30.1 percent) had much higher percentages of families below the poverty compared to the state average; the Jicarilla Apache Nation (14.5 percent) is about equal with the state average (US Census Bureau 2012a).

Refer to **Table 2-43**; Poverty levels are further discussed in **Section 2.4.3**, Environmental Justice.

Jobs and Employment

Employment of Residents

Employment is a key economic indicator, as patterns of growth and decline in a region's employment are largely driven by economic cycles and local economic activity. Employment patterns are discussed below for the study area counties and tribal nations.

The employment rates of the workforce population in the study area ranges from 45 percent in McKinley County to 57 percent in Sandoval County; all counties were within a few percentage points of the state rate of 55 percent. Rio Arriba, Sandoval, and San Juan Counties and the state all have similar rates of the population out of the workforce, at an average of 39 percent; McKinley County has a larger percentage of the population not in the workforce, 49 percent. This indicates that there may be many retirees in the area or unemployed persons who have dropped out the pool of active job seekers. For the tribal nations, the employment rates vary between 36 percent in the Navajo Nation to 61 percent in the Jicarilla Apache Nation. For all counties and tribal nations, the employment rate from the armed forces is between 0 and 1 percent, indicating that the armed forces have measureable impact on the economic or social conditions of the study area (see **Table 2-46**).

Table 2-46 Study Area Employment Status from 2008 to 2012[1] (Population 16 Years and Over)

Location	Total Population (16 Years and Over)	In Labor Force	Civilian		Armed Forces	Not in Labor Force
			Employed	Unemployed		
New Mexico Counties						
McKinley County	52,126	26,444	23,303	3,103	38	25,682
	100%	*51%*	*45%*	*6%*	*0%*	*49%*
Rio Arriba County	31,425	18,892	16,346	2,534	12	12,533
	100%	*60%*	*52%*	*8%*	*0%*	*40%*
Sandoval County	100,591	63,267	57,776	5,085	406	37,324
	100%	*63%*	*57%*	*5%*	*0%*	*37%*
San Juan County	95,382	56,842	52,754	4,043	45	38,540
	100%	*60%*	*55%*	*4%*	*0%*	*40%*
New Mexico	1,597,923	979,619	882,461	88,267	8,891	618,304
	100%	*61%*	*55%*	*6%*	*1%*	*39%*
Tribes						
Jicarilla Apache Nation	2,276	1,621	1,384	229	8	655
	100%	*71%*	*61%*	*10%*	*0%*	*29%*
Navajo Nation	123,841	55,741	44,465	11,250	26	68,100
	100%	*45%*	*36%*	*9%*	*0%*	*55%*
Ute Mountain Nation	1,210	728	660	68	0	482
	100%	*60%*	*55%*	*6%*	*0%*	*40%*
Study Area	406,851	223,535	196,688	26,312	535	183,316
	100%	*55%*	*48%*	*6%*	*0%*	*45%*

Source: US Census Bureau 2012a
[1]American Community Survey estimates are based on data collected over five years. The estimates represent the average characteristics of population and housing between January 2008 and December 2012 and do not represent a single point in time.

The US Bureau of Labor Statistics considers persons unemployed if they do not have a job, have actively looked for work in the prior four weeks, and are currently available for work. The unemployment rates in McKinley, Rio Arriba, and San Juan Counties, at 8.7, 8.0, and 8.0 percent, are higher than the state unemployment rate of 6.9 percent. Only Sandoval County has an unemployment rate lower than the state, at 6.8 percent. Data are not available at the sub-county scale; nevertheless, it is likely that the low unemployment rate in Sandoval County is due to the Rio Rancho area and employment from businesses

in Albuquerque. It is also likely that the unemployment rate in the areas closer to the planning area would be similar to those of the three other counties. Unemployment rates from the Bureau of Labor Statistics are not available for tribal nations. (See **Table 2-47**.)

Table 2-47 Study Area Annual Unemployment Rate by County (2002-2012)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
McKinley County	6.20%	6.90%	7.20%	6.70%	5.40%	4.30%	5.60%	7.60%	9.10%	9.20%	8.70%
Rio Arriba County	6.550%	6.70%	6.80%	6.10%	4.90%	4.40%	5.50%	6.90%	8.20%	8.30%	8.00%
Sandoval County	6.000%	6.80%	6.10%	5.40%	4.20%	3.10%	4.00%	7.20%	9.00%	7.80%	6.80%
San Juan County	6.220%	6.10%	5.80%	5.30%	4.20%	4.00%	5.30%	7.70%	8.70%	8.70%	8.00%
New Mexico	5.550%	5.90%	5.80%	5.20%	4.10%	3.50%	4.50%	6.80%	7.90%	7.50%	6.90%

Source: US Department of Labor, Bureau of Labor Statistics 2013a
Data are not seasonally adjusted to eliminate the effect of intra-year variations, which tend to occur during the same period annually.

Based on 2012 data, the retail trade industry (11.6 percent) and the arts/entertainment/recreation/ accommodation/food industry (10.1 percent) are the second and third largest employment sectors in the study area. They are surpassed only by the education/health care/social assistance industry at 27.4 percent. This indicates that tourism plays a large role in the local economies in the study area. This is particularly true in McKinley County and in the Ute Mountain Nation, where approximately 25 percent of the workforce is employed in these sectors. Public administration also plays a moderate role in the study area, accounting for 8.7 percent of employment.

The construction sector provides a sizable contribution (7.8 percent) to the employment in the study area. This industry employs between 9 and 10 percent in Rio Arriba County, the Navajo Nation, and the Ute Mountain Nation. While construction sector figures include building for residential and commercial development, they also include infrastructure for energy development, which may include development on public lands.

The agriculture, forestry, fishing and hunting, and mining industries have a relatively small impact in the study area, employing only 5 percent of the work force. For San Juan County, however, these employment sectors play a much larger role, accounting for 12.8 percent of employment, the second largest sector in that county (US Census Bureau 2012b; see **Table 2-48**).

Table 2-48 Study Area Employment Characteristics (2008-2012)[1]

	McKinley County	Rio Arriba County	Sandoval County	San Juan County	New Mexico	Jicarilla Apache Nation	Navajo Nation	Ute Mountain Nation	*Study Area*
Agriculture, forestry, fishing and hunting, mining	419	437	838	6,748	39,457	64	1,392	5	*9,903*
	1.8%	*2.7%*	*1.5%*	*12.8%*	*4.5%*	*4.6%*	*3.1%*	*0.8%*	*5.0%*
Construction	1,585	1,476	3,922	3,779	66,690	68	4,424	65	*15,319*
	6.8%	*9.0%*	*6.8%*	*7.2%*	*7.6%*	*4.9%*	*9.9%*	*9.8%*	*7.8%*
Manufacturing	1,990	308	5,739	2,395	45,358	15	1,784	30	*12,261*
	8.5%	*1.9%*	*9.9%*	*4.5%*	*5.1%*	*1.1%*	*4.0%*	*4.5%*	*6.2%*
Wholesale trade	425	135	1,348	1,722	18,913	21	302	2	*3,955*
	1.8%	*0.8%*	*2.3%*	*3.3%*	*2.1%*	*1.5%*	*0.7%*	*0.3%*	*2.0%*
Retail trade	3,470	1,325	7,213	6,353	99,583	49	4,266	89	*22,765*
	14.9%	*8.1%*	*12.5%*	*12.0%*	*11.3%*	*3.5%*	*9.6%*	*13.5%*	*11.6%*
Transportation/warehousing, utilities	699	868	2,386	4,045	39,027	18	2,604	2	*10,622*
	3.0%	*5.3%*	*4.1%*	*7.7%*	*4.4%*	*1.3%*	*5.9%*	*0.3%*	*5.4%*
Information	238	122	1,070	507	15,016	14	268	3	*2,222*
	1.0%	*0.7%*	*1.9%*	*1.0%*	*1.7%*	*1.0%*	*0.6%*	*0.5%*	*1.1%*

Table 2-48 Study Area Employment Characteristics (2008-2012)[1]

	McKinley County	Rio Arriba County	Sandoval County	San Juan County	New Mexico	Jicarilla Apache Nation	Navajo Nation	Ute Mountain Nation	*Study Area*
Finance and insurance, real estate and rental leasing	730	473	3,351	1,931	41,673	43	924	3	*7,455*
	3.1%	*2.9%*	*5.8%*	*3.7%*	*4.7%*	*3.1%*	*2.1%*	*0.5%*	*3.8%*
Professional, scientific, management, and administrative	798	2,377	6,234	3,241	95,640	40	1,217	27	*13,934*
	3.4%	*14.5%*	*10.8%*	*6.1%*	*10.8%*	*2.9%*	*2.7%*	*4.1%*	*7.1%*
Education, health care, social assistance	7,819	3,735	12,628	12,177	218,660	306	17,067	132	*53,864*
	33.6%	*22.8%*	*21.9%*	*23.1%*	*24.8%*	*22.1%*	*38.4%*	*20.0%*	*27.4%*
Arts, entertainment, recreation, accommodation, food services	2,364	2,257	5,933	4,480	93,110	137	4,581	153	*19,905*
	10.1%	*13.8%*	*10.3%*	*8.5%*	*10.6%*	*9.9%*	*10.3%*	*23.2%*	*10.1%*
Other services except public administration	732	619	2,355	2,483	41,430	21	1,235	12	*7,457*
	3.1%	*3.8%*	*4.1%*	*4.7%*	*4.7%*	*1.5%*	*2.8%*	*1.8%*	*3.8%*
Public administration	2,034	2,214	4,759	2,893	67,904	588	4,401	137	*17,026*
	8.7%	*13.5%*	*8.2%*	*5.5%*	*7.7%*	*42.5%*	*9.9%*	*20.8%*	*8.7%*
Total Employment	**23,303**	**16,346**	**57,776**	**52,754**	**882,461**	**1,384**	**44,465**	**660**	***196,688***

Source: US Census Bureau 2012a

Definitions of industries are based on the North American Industry Classification System Manual (1997). An overview is provided on the US Census Bureau website (www.census.gov/eos/www/naics/).

Note that employment estimates may vary from the official labor force data released by the Bureau of Labor Statistics because of differences in survey design and data collection.

[1]American Community Survey estimates are based on data collected over five years. The estimates represent the average characteristics of employment between January 2008 and December 2012 and do not represent a single point in time.

Annual average wages varied by industry and by county. In McKinley and San Juan Counties, the industry with the highest annual wage was natural resources and mining, with an average annual wage of $83,982 and $80,225. In Sandoval County, the industry with the highest annual wage was manufacturing, at $100,932. For Rio Arriba County, the industry with the highest average annual wage was professional and business services, at $45,553, significantly lower than the other counties. In the study area overall, the non-services industries provided higher wages than the service industries by almost $30,000 per year. This is representative of the high-paying jobs of the oil and gas extraction industry found in the study area. See **Table 2-49**.

Much of the counties and tribal nations in the study area are rural. Because of this they may be impacted to a greater extent by changes in public land management than more urban counties or counties with greater proportions of private land in other parts of the state.

Table 2-49 Average Annual Wages by Industry (2012)

	McKinley County	Rio Arriba County	Sandoval County	San Juan County	New Mexico	*Study Area*
All sectors	$32,671	$32,292	$43,682	$44,441	$41,290	*$40,915*
Private	$26,786	$30,834	$46,197	$45,681	$40,118	*$41,653*
Services	$24,520	$30,250	$31,423	$36,863	$37,625	*$32,351*
Trade, transportation, utilities	$27,591	$26,571	$30,069	$42,606	$34,191	*$35,779*
Information	$28,144	$27,319	$43,651	$39,324	$46,277	*$39,860*
Financial activities	$31,689	$34,964	$36,186	$41,278	$49,781	*$37,538*
Professional and Business	$33,886	$45,553	$44,019	$38,977	$56,415	*$41,537*
Education and Health	$26,756	$38,628	$32,561	$41,689	$38,914	*$35,981*
Leisure and Hospitality	$13,640	$15,587	$15,832	$15,279	$16,268	*$15,092*
Other services	$21,941	$28,084	$30,124	$32,420	$29,465	*$29,839*
Non-services	$48,341	$35,448	$84,979	$65,899	$51,847	*$69,831*
Natural Resources and Mining	$83,982	$41,735	$36,360	$80,225	$59,353	*$78,666*
Construction	$38,151	$28,254	$41,370	$47,268	$42,274	*$44,017*
Manufacturing	$50,980	$41,425	$100,932	$43,713	$56,327	*$83,434*
Government	$43,401	$33,784	$36,314	$40,135	$45,169	*$39,022*

Source: Headwaters Economics 2014

Definitions of industries are based on the North American Industry Classification System Manual (1997). An overview is provided on the US Census Bureau website (www.census.gov/eos/www/naics/).

Data are not available for tribal nations and are not included in the study area totals for this table.

Table 2-50 Average Annual Pay (2002, 2012)

County/State	2002	2012	% Change
McKinley County	$26,396	$32,187	21.9%
Rio Arriba County	$23,407	$31,858	36.1%
Sandoval County	$34,380	$43,011	25.1%
San Juan County	$29,472	$43,811	48.7%
New Mexico	$29,431	$40,698	38.3%
Socioeconomic Study Area	*$28,414*	*$37,717*	*32.7%*

Source: US Department of Labor, Bureau of Labor Statistics 2014

Public Services

Education

There are 13 school districts in the study area, 12 in New Mexico and one in Colorado. For the 2012-2013 school year, the three largest are Gallup School District in McKinley County (12,036 students), Rio Rancho School District in Sandoval County (16,884 students), and Farmington School District in San Juan County (11,222 students).

McKinley County also contains the Zuni School District, with an enrollment of 1,280, for a total enrollment of 13,316 students in McKinley County. Rio Arriba County contains the Chama Valley and Española School Districts, with a combined enrollment of 4,459 students.

Sandoval County also contains the Cuba and Bernalillo School Districts, for a total enrollment of 20,587 students. San Juan County contains the Aztec, Bloomfield, and Farmington School Districts, with a total enrollment of 17,604 students between pre-kindergarten and grade 12 (New Mexico Department of Education 2013).

The Jicarilla Apache Nation is primarily contained in two school districts, Dulce and Jemez Mountains, with a total enrollment of 1,014 students between pre-kindergarten and grade 12. The Navajo Nation

contains the Consolidated Central School District, with an enrollment of 6,368 students, most of whom live on the Navajo reservation (New Mexico Department of Education 2013). The Ute Mountain Nation is part of the Montezuma-Cortez RE-1 School District in Colorado. The enrollment of this school district is 2,753 students and is a mix of tribal students and students from the city of Cortez and Montezuma County (Colorado Department of Education 2013).

The total pre-kindergarten through grade 12 enrollment for the 2012-2013 school year in the study area was 66,101 students. See **Table 2-51** for a breakdown of enrollment by school district.

Table 2-51 Pre-Kindergarten through Grade 12 Enrollment for School Year 2012-2013

Location	Number of Students
New Mexico Counties	
McKinley County	
Gallup School District	12,036
Zuni School District	1,280
Rio Arriba County	
Chama Valley School District	379
Española School District	4,080
Sandoval County	
Cuba School District	554
Rio Rancho School District	16,884
Bernalillo School District	3,149
San Juan County	
Aztec School District	3,383
Bloomfield School District	2,999
Farmington School District	11,222
New Mexico	338,223
Tribes	
Jicarilla Apache Nation	
Dulce School District	711
Jemez Mountains School District	303
Navajo Nation	
Consolidated Central School District	6,368
Ute Mountain Nation	
Montezuma-Cortez RE-1 School District (Colorado)	2,753
Study Area	*66,101*
Sources: New Mexico Department of Education 2013; Colorado Department of Education 2013	

There are several higher education institutions in the study area. In the 2012-2013 school year, San Juan College had a total enrollment of 18,516 students enrolled in credit and noncredit courses. It has campuses in Farmington, Aztec, and Kirtland. Farmington hosts the main campus, as well as the College of Energy, which provides specialized courses for employment in the oil and gas industry (San Juan College 2013). New Mexico Highlands University has branch campuses in Farmington, Rio Rancho, Española, and Raton and Roswell (outside of the study area). The enrollment for these branches was 1,323 during the 2012-2013 school year. They offer undergraduate and graduate degrees and have a cooperative agreement with San Juan Community College (New Mexico Highlands University 2013).

The University of New Mexico at Gallup had an enrollment of approximately 3,000 students in the 2012-2013 school year. It specializes in vocational programs, associate degrees, and transfers to four-year colleges or universities (University of New Mexico Gallup 2014).

In addition to these three establishments, Central New Mexico Community College has a branch in Rio Rancho, Crownpoint is home to the Navajo Technical University, and New Mexico State University has an Agricultural Science Center in Farmington and an extension program in Aztec.

The Diné College system is a two-year, tribally controlled community college and is the main college system in the Navajo Nation. It contains campuses in Shiprock, Crownpoint, and Window Rock, as well as other locations in the Navajo reservation. The main focus is on preparing students for transferring to a four-year college or university or into employment opportunities, as well as the language, history, and culture of the Navajo Nation (Diné College 2014).

Medical Services

San Juan County contains the San Juan Regional Medical Center, with 254 beds. It is designated as a Level III Trauma Center, with medical, surgical, and rehabilitation services.

The San Juan Regional Rehabilitation Hospital contains 16 beds and is the only acute rehabilitation hospital in the Four Corners region (San Juan Regional Medical Center 2014; San Juan Regional Rehabilitation Hospital 2014). Both facilities are in Farmington and serve the Four Corners region.

The Northern Navajo Medical Center in Shiprock contains 55 beds. It is on the Navajo Nation Reservation and services mostly patients from the tribal community (Indian Health Service 2014). In the city of Gallup in McKinley County, the Rehoboth McKinley Christian Health Care Services have 60 acute care beds, as well as outpatient clinics, behavior health services, and addiction treatment programs (Rehoboth McKinley Christian Health Care Services 2014).

There are also health clinics in most major towns and cities.

Public Safety

The sheriff's office for San Juan County is based in Aztec and staffs 102 certified and commissioned law enforcement personnel, 16 civilian employees, 3 animal control officers, and 2 mechanics. The sheriff's office provides public safety services, such as law enforcement, civil process, prisoner extradition, and animal control. It also participates in the Region II Narcotics Task Force, along with the Farmington Police Department and assorted federal agencies. It has a special weapons and tactics team for high-risk missions (San Juan County 2013). The sheriff's offices for Rio Arriba, McKinley, and Sandoval Counties provide similar services and work closely with their town and city police departments.

San Juan County consists of 14 fire districts, 23 fire stations, and one administrative office in Aztec. It employs 246 paid and volunteer firefighters trained in basic fire suppression, emergency medical services, high angle rescue, swift water rescue, and SCUBA diving (San Juan County 2013). Sandoval County has 8 fire districts and 20 fire stations. The county employs 264 paid and volunteer firefighters (Sandoval County 2014). McKinley County contains 18 fire stations and employs 350 volunteer firefighters, and can provide emergency medical and rescue services, fire suppression, hazardous material cleanup (McKinley County 2014). Rio Arriba County contains 18 fire districts and also participates in the CodeRed emergency public awareness system (Rio Arriba 2014). These county-based fire departments work in conjunction with town and city fire response teams in their county.

Fiscal Conditions

State of New Mexico Revenues

The major components of general fund revenue in New Mexico are the gross receipts tax (GRT), income taxes (both corporate and personal), and natural resource extraction revenues, which include severance taxes, rents, and royalties.

Fiscal effects of the recession can be seen in the decreasing revenue from each of these major components in 2009 and 2010. Total general fund revenue also fell in 2013. GRT is the largest revenue source for the state and for the years shown. Severance taxes, rents, and royalties include revenue from

all natural resource extraction, but these figures are dominated by oil and gas-related contributions. The full effect of oil and gas industry operations on the general fund goes beyond these categories and includes production taxes, royalties, bonuses, and taxes on direct and indirect activities. In total, approximately 31.5 percent of New Mexico's General Fund Revenues were attributed to the oil and natural gas industry for fiscal year 2013 (New Mexico Tax Research Institute 2014).

Table 2-52 Major Components of General Fund Revenue, 2009-2013

Tax/ Revenue	2009		2010		2011		2012		2013	
	Revenue	Percent Change	Revenue	Percent Change	Revenue	Percent Change	Revenue	Percent Change	Revenue	Percent Change
Gross receipts tax	1,831,946	0%	1,634,367	-11%	1,811,400	10.8%	1,928,500	5.8%	1,917,700	-0.6%
Income tax	1,110,577	-31%	1,081,660	-3%	1,296,000	19.8%	1,431,500	10.9%	1,508,100	5.4%
Severance taxes	440,192	-29%	390,702	-11%	426,500	9.2%	456,400	7.7%	438,400	-3.9%
Rents and royalties	543,671	-17%	423,004	-22%	477,400	-0.1%	595,001	24.7%	504,200	-15.3%
Percent of general fund revenue	*70%*	–	*68%*	–	73%		76%	-	77%	-
Total general fund revenue	*5,625,923*	*-8%*	*5,207,992*	*-7%*	5,469,200	3.6%	5,817,100	*6.3%*	5,708,600	*-1.9%*

Source: New Mexico Department of Finance and Administration 2014a

Severance tax includes the oil and gas school tax, oil conservation, resource excise, and natural gas processors.

Local Government Revenues

GRT is also a major component of both state and local government revenue. A governmental gross receipts tax is imposed on the following:

- Selling property in New Mexico
- Leasing or licensing property in New Mexico
- Granting a right to use a franchise in New Mexico
- Performing services in New Mexico
- Selling research and development services performed outside New Mexico, the product of which is initially used in New Mexico

The gross receipts tax rate varies throughout the state from 5.125 to 8.6875 percent, depending on the location of the business. It varies because the total 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 their portions to the counties and municipalities. Revenue from oil and gas extraction represents from 6 to 20 percent of total GRT revenue in all counties but Sandoval. **Table 2-53** depicts annual GRT collections in study area counties.

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 2-54**. Ad valorem production taxes represent tax on the assessed value of products severed and sold in a given area. 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 collected on equipment used in production of oil, natural gas, carbon dioxide, and nonhydrocarbon gas.

Table 2-53 Gross Receipts Tax Revenue, 2009-2012

Year		McKinley County		Rio Arriba County		Sandoval County		San Juan County	
		Revenue	Percent Oil and Gas	Revenue	Percent Oil and Gas	Revenue	Percent Oil and Gas	Revenue	Percent Oil and Gas
2009	Total	86,085,261		33,726,266		182,071,552		166,647,257	
	Oil and gas	9,661,525	11%	3,418,907	10%	256,420	0%	23,209,474	14%
2010	Total	76,282,897		31,595,605		101,791,465		229,799,645	
	Oil and gas	10,096,016	13%	2,803,880	9%	91,126	0%	43,674,442	19%
2011	Total	83,727,578		32,239,596		102,790,794		245,381,294	
	Oil and gas	13,515,190	16%	2,622,554	8%	351,266	0%	45,874,426	19%
2012	Total	93,281,422		32,488,097		10,2461,596		246,559,667	
	Oil and gas	14,717,594	16%	1,978,647	6%	241,749	0%	48,699,921	20%

Source: New Mexico Department of Taxation and Revenue 2014a

Note: Tax collections are distributed the second month after the accrual (business activity) month. Annual revenue shown reflects GRT distributions during that year. Oil and gas data reflects GRT from oil and gas extraction.

Table 2-54 Property Tax Obligations, 2012

Area	2012							
	Rate	Residential	Rate	Nonresidential	Rate	Ad Valorum Production	Rate	Ad Valorum Equipment
New Mexico	.949	$874,014,104	1.025	$503,226,122	.771	$138,577,436	.775	$26,733,742
McKinley County	31.503	$8,304,819	35.162	$17,284, 522	32.389	$46,209	32.389	$9,350
Rio Arriba County	15.467	$7,319,736	25.003	$7,314,263	24.369	$68,318	24.335	$3,624,131
Sandoval County	32.491	$76,807,386	35.140	$27,583,999	29.715	$196,488	29.715	$41,315
San Juan County	22.704	$27,646,571	25.110	$41,345,267	24.056	$23,415,522	24.052	$606,890

Source: New Mexico Department of Finance and Administration 2012

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 disburses it to individual counties. PILT is determined according to a formula that includes population, the amount of federal land in 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 nearly $7 million in PILT in 2012 (**Table 2-55**).

Table 2-55 Socioeconomic Study Area PILT (Fiscal Year 2013)

Location	PILT Amount
McKinley County	$826,620
Rio Arriba County	$1,969,904
Sandoval County	$2,197,580
San Juan County	$2,062,957

Source: US Department of the Interior 2014

Local Economic Activity

Local economies realize direct and indirect benefits from expenditures and revenues generated by a variety of activities in the FFO decision area. The BLM estimates that management of activities on public lands supports more than $11.6 million in direct and $15.3 million in indirect economic impacts. These activities account for 54,000 direct and 96,700 indirect jobs in New Mexico. (See **Table 2-56** and **Table 2-57**).

Table 2-56 Direct and Indirect Economic Impacts in New Mexico Supported by the BLM's Management of Public Lands (Fiscal Year 2012; in Millions of Dollars

Economic Area	New Mexico	
	Direct	Total
Oil and gas	$10,956,000	$15,284,000
Coal	$172,000	$235,000
Nonenergy minerals	$555,000	$799,000
Geothermal and wind energy	$4000	$5000
Timber	$4.8	$13.5
Grazing	$99.9	$173.3
Total	**$11,687,103**	**$16,323,186**
Source: BLM 2012f		

Table 2-57 Direct and Indirect Jobs in New Mexico Supported by the BLM's Management of Public Lands (Fiscal Year 2012)

Economic Area	New Mexico	
	Direct	Total
Minerals	50,905	92,432
Geothermal and wind energy	12	22
Timber	17	36
Grazing	1,929	2,566
Recreation	1,174	1,638
Total	**54,038**	**96,698**
Source: BLM 2012f		

Activities that have the greatest economic influence in the study area are oil and gas development and to a lesser extent recreation and livestock grazing. BLM-administered lands cover approximately 31 percent of the planning area. Activities that BLM management decisions directly and indirectly impact are discussed in the sections below.

Market and Commodity Values

Activities Directly Impacted by BLM Management

The BLM collects revenues from recreation and commercial activities that take place on the land that it administers. A portion of these revenues are redirected back to the state and county governments. These revenues are collected from facilities, such as the following:

- Campgrounds
- Recreation permits (special, competitive, organized group activity, and event use permits)
- Mining leases and mineral revenues
- Grazing fees
- Forestry sales (wood products, seeds, and timber)

Revenue for various programs is summarized in **Table 2-58**; details are included for relevant resources in the sections below.

Table 2-58 Summary of FFO Revenue Collected 2009-2013

Source	Total Collected
Grazing fees	$458,589
Forestry/woodland product	$$2,295,450
Row receipts	$1,052,200
Special recreation permit receipts	$67,356
Source: BLM 2014h, 2014i, 2014j, 2014k	

Wood Product Harvest

Forest products harvesting remains an important source of fuel for area residents. Firewood from BLM lands is a primary heating source for much of the Native American population in the planning area (Rio Puerco Alliance and Hasbidito 2013). Small-scale commercial cutting also occurs in the planning area.

Personal permits sell for $12 a cord and commercial permits sell for $15 a cord. Individuals are limited to four cords per permit. Based on 2012 data, the FFO sold 12,109 wood permits, for an average of 2,421 permits per year. Details are included in **Table 2-59**.

Table 2-59 Wood Product Harvest in the FFO (2012)

Year		
	Permits	Cords Sold
2008	2,476	2,548
2009	2,582	2,540
2010	1,384	1,756
2011	2,773	4,188
2012	2,894	4,271
Total	**12,109**	**15,303**
Source: BLM 2013c		

Mineral and Energy Resources

New Mexico remains a leading US mineral producer, with 2011 rankings of first in potash, perlite, and zeolite; third in copper (up from fourth in 2010); and thirteenth in coal (New Mexico Energy, Minerals and Natural Resources Department 2012). More than $2.2 billion worth of minerals was extracted from New Mexico mines in 2011.

In addition to federal minerals underlying BLM-administered lands, the BLM also administers federal mineral estate underlying lands managed by other agencies and land on reserved mineral estate underlying private lands. Generally, mineral management programs include locatable minerals (e.g., metals and gypsum), leasable minerals (e.g., fluid leasables, such as oil and gas and geothermal, and solid leasables, such as coal), and salable mineral materials (e.g., common varieties of sand and gravel, clay, and rock). The economic contributions of different categories of resources in the FMG are examined in depth below. Renewable energy is discussed in a separate section immediately following.

Leasable Minerals—Oil, Gas, and Coal

Total New Mexico oil production during 2012, including condensate, was 85.2 million barrels; New Mexico natural gas production during 2012 was 1.25 BCF (billion cubic feet). Study area counties represented a significant source of the state's oil and gas production, being cumulatively responsible for approximately 35 percent of oil production and 70 percent of natural gas production in 2012.

San Juan County ranked number one in natural gas production and fifth in oil production in 2012, while Rio Arriba County was second in gas production and fourth in oil production. Sandoval and McKinley Counties were also in the top nine counties for both oil and gas production.

Production estimates and value of production by county for 2013 is provided in **Table 2-60**.

Table 2-60 Oil and Gas Production in Study Area Counties in New Mexico (2013)

County	Oil Barrels	Value of Production	Gas (MCF)	Value of Production
San Juan	1,100,000	$87,500,000	394,100,000	$1,639,000
Rio Arriba	1,100,000	$83,500,000	303,400,000	$1,329,000
Sandoval	210,000	$16,900,000	2,100,000	$890,000
McKinley	45,573	$3,590,000	175,800	$550,000
Source: New Mexico Tax Research Institute 2014				

In the San Juan Basin, there are approximately 23,500 active wells; 16,300 wells on federal lands, 2,400 fee wells, 1,800 wells on state surface, and 3,000 federal wells.

The oil and gas industry is one of the largest private sector employers in New Mexico, directly employing over 11,000 people (New Mexico Bureau of Geology and Mineral Resource 2014). Based on 2011 data, oil and gas extraction and coal mining provided 5.12 percent of total employment for the cumulative study area and 10.94 percent of total employment in San Juan County. This is compared to only .57 percent in the United States overall (Headwaters Economics 2014).

In addition to direct and indirect employment, the leasable minerals program provides tax revenue to the state and local communities.

The following are brief descriptions of taxes collected (New Mexico Department of Taxation and Revenue 2014b):

- The Oil and Gas Emergency School Tax is levied on the “privilege of doing business as a severer of oil, gas, liquid hydrocarbon or carbon dioxide.” Natural gas is generally taxed at 4 percent and all other products at 3.15 percent.
- The Oil and Gas Severance Tax is levied at the rate of 3.75 percent “taxable value” (price for the product minus federal, state, and Indian royalties and reasonable trucking expenses to the “first place” of market) for the privilege of severing oil and gas from the soils of New Mexico.
- The Oil and Gas Conservation Tax is levied on the sale of oil and gas products at the rate of 19/100 of 1 percent of taxable value.
- The Oil and Gas Ad Valorem Production Tax is in lieu of property taxes levied on the value of oil and gas natural reserves, wherein annual production is used as an approximation of the value of reserves. It is based on the property tax in the district of production.
- The Ad Valorem Production Equipment Tax is a property tax on oil and gas production equipment. Assessed value is determined at 27 percent of the sales value of the product for the previous calendar year against which the 33.3 percent “uniform assessment ratio” is applied.
- The Natural Gas Processors Tax is imposed on processing plants, at $0.0220/mmBtu tax on the volume.

In 2012, tax distributions from oil and gas taxes were $1,033,000, up from $851,400 in 2010 (New Mexico Department of Finance and Administration 2014b; see **Table 2-61**). Revenues from these taxes are paid into the general fund, severance tax bonding fund, and land grant permanent fund.

Revenues (which are based on the variable value of the product) are prone to fluctuate and represented 16 percent of general fund revenues in 2010 and 18 percent in 2001 (New Mexico Department of Finance and Administration 2014a). Considering that over 70 percent of all natural gas produced in the state comes from the San Juan Basin, and the region is also a major producer of oil, the planning area contributes significantly to state revenues.

Table 2-61 New Mexico Oil and Gas Tax Distribution (in Millions of Dollars)

Year	Oil and Gas Emergency School Tax	Conservation General Fund	Oil and Gas Severance	Ad Valorem Production	Natural Gas Pro-cessors	Production Equipment	Reclama-tion Fund	Total
2012	$399.35	$20.20	$428.71	$133.24	$23.34	$23.38	$4.86	$1,033
2011	$378.69	$18.48	$399.41	$131.06	$18.18	$19.33	$4.46	$969.6
2010	$324.54	$15.23	$327.57	$106.77	$40.43	$34.84	$1.99	$851.4
Source: New Mexico Department of Taxation and Revenue 2014c								

Over 23 million tons of coal was produced from New Mexico coal mines in 2010. Most of the production goes to electrical generation at power stations in New Mexico and Arizona. Annual production values exceed $750 Million. The mines employ over 1,500 people, with an annual payroll of over $100 million (New Mexico Energy, Minerals and Natural Resources Department 2012).

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Revenues are generated from severance, resources excise, and conservation taxes on the state's coal production. The severance tax on coal is $.57 per short ton for surface coal and $.55 per short ton for underground coal (New Mexico Department of Taxation and Revenue 2009). In addition, gross receipts taxes on coal (at an effective rate of 5.3 percent of gross sales revenues) generated an estimated $29 million and about $7.2 million in property taxes for the producing counties.

Additional revenues from oil, gas, and coal extraction come from rents and royalties paid by producers on public lands. Lease holders competitively bid, pay an initial bonus, and subsequently pay rent for the right to develop the resources on public lands. These funds are collected and distributed to the federal and state government and are known as lease revenue and, in the case of rents, lease royalties. Lease revenues and royalties to the state and county provide an additional economic benefit of mineral resource extraction.

Federal mineral lease revenues are collected by the Office of Natural Resources Revenue in the Department of the Interior (see **Table 2-62**). Approximately 49 percent of the revenues are transferred to the New Mexico State Treasurer for disbursement to counties of origin, as appropriate.

Table 2-62 Socioeconomic Study Area Royalty Disbursement

Location	2009	2010	2011	2012	2013
McKinley County	$103,890	$160,169	$549,929	$175,019	$228,553
Rio Arriba County	$82,104,990	$71,298,945	$83,158,127	$79,573,072	$66,912,106
Sandoval County	$354,736	$1,497,629	$6,155,539	$556,340	$1,499,939
San Juan County	$120,241,175	$107,409,916	$100,592,730	$102,111,549	$84,514,423
Socioeconomic Study Area	$202,804,790	$180,366,659	$190,456,324	$182,415,980	$153,155,020
Source: US Department of the Interior, US Office of Natural Resource Revenue 2014 Note: Disbursements represent 49 percent of royalties paid to the federal government.					

A summary of all payments to state and local governments from oil and gas operations is provide in **Table 2-63**.

Table 2-63 Summary of Payments to State and Local Governemtns from Oil and Gas Operations (2013)

Revenue Stream	McKinley County	Rio Arriba County	Sandoval County	San Juan County
Federal				
Royalty Payments	$314,362	$105,884,640	$1,927,729	$130,903,968
Lease Sale Bonus Payments	$109,462	$6,052,697	$981,075	$325,600
State				
Emergency School and Conservation Tax	$131,227	$39,398,681	$736,194	$53,334,693
Severance Tax	$141,171	$36,490,157	$800,598	$48,269,907
Royalties	$26,979	$9,412,537	$370,171	$17,624,139
Lease Sale Bonus Payments	$0	$6,052,697	$29,457	$336,312
Gross Receipts Tax	$349,974	$1,877,163	$210,492	$5,865,722
Local Government				
Gross Receipts Tax	$111,244	$572,869	$47,283	$3,848,233
Ad Valorum Production and Equipment Tax	$76,233	$15,601,357	$366,076	$19,379,074
Source: New Mexico Tax Research Institute 2014				

Locatable Minerals

The primary locatable mineral in the FFO is uranium. It is found in the southern portion of the area, around Ambrosia Lake and Church Rock, in the Jurassic Morrison Formation and associated rocks. Uranium mining is not active and is not a major contributor to the local or regional economy.

Salable Minerals

Salable minerals include such common materials as sand, gravel, rock, and fill material. Most of the salable materials contracted is sand and gravel. There are 27 active permitted operations listed in **Table 2-30**. In addition, there are quarries of less than the five acres associated with oil and gas well sites; these quarries supply gravel to surface access roads.

Salable minerals are sold to individuals and corporate entities through negotiated sales. Federal, state, and local governments and nonprofit organizations are permitted free use of these materials for qualified purposes, and local availability can be important for constructing and maintaining roads. Demand for materials is driven by the level of construction within 50 miles .

One driver of construction activity in the planning area is road construction for oil and gas development. As new oil and gas development in the Mancos/Gallup Formations continues, salable mineral activity is expected to continue at roughly the same level. However, the lack of roads in the vicinity of the Mancos/Gallup Formations may increase salable mineral development in that area as oil and gas development and construction of associated access roads occurs.

Land and Realty

One of the primary activities in the FFO Lands and Realty program is reviewing, issuing, and managing land use authorizations for energy-related ROWs for roads, pipelines, communication facilities, and transmission lines. There are 19,427 ROW case files covering over 1,052,200 total acres. Details are provided in **Table 2-64**. Total receipts for the period from fiscal years 2009 to 2013 were over $10,750,000.

ROW authorizations are primarily issued for oil and gas development. Commercial developers have not pursued solar energy development in this area, but there may be future development considering the area's potential.

Table 2-64 Farmington Field Office ROW Receipts (2009-2013)

Group	Cases	Acres
Acquisitions	53	16,600
Exchange	73	599,200
Withdrawals	73	29,351
Recreation and Public Purposes Act	21	1,600
Indian	2,126	342.200
Sale	53	4,900
Rights-of-way	16,990	85,200
Leases, permits, trespass	97	13,200
TOTAL	19,427	1,052,200

Source: BLM 2014g

Note: Does not include waived, exempt, or reduced rents; waived, exempt, or reduced processing or monitoring fees; special reduced fees, rents, and rates for non-profits; state and local governments, recreation, and other federal agencies.

Wind energy potential is not defined in most of the planning area and is marginal where defined. Wind energy development in the planning area does not show the potential as it does in other parts of the state. However, it may play a future role if the popularity for development continues and the technology improves to be able to optimize the use of marginal resources. Solar may play a role in the local economy, with one development currently planned on private land. The future level of development of renewable energy resources is likely to be influenced by availability of relevant government incentives, and market conditions for traditional and nontraditional energy sources.

Demand for land use authorizations in the FFO is anticipated to increase in correlation with future oil and gas development, renewable energy development, and demand from residential, commercial, and agricultural activity. Demands for future lands actions are expected to be greatest for those that support the continued development of the oil and gas industry, including on and off leases. This could spread to the supporting infrastructure for renewable energy as its popularity and development improves.

Land disposals and exchanges have the potential to impact local community finances. BLM-administered lands do not contribute tax dollars to local economies but would result in some economic contributions due to PILT. Disposal of lands to local communities may increase the level of tax dollars contributed to their economies, especially if this land were to be developed for oil and gas.

The R&PP Act authorizes the sale or lease of public lands for recreational or public purposes to state and local governments and to qualified nonprofit organizations. Approximately 340,118 acres of public land are available for disposal.

Tourism and Recreation Use

The New Mexico Department of Tourism estimated that visitor travel set a new high of 32 million visitors in 2012, a gain of 2.6 percent from 2011. Visitors to New Mexico spent $5.5 billion in 2011, which generated $7.8 billion in total business sales, including indirect and induced impacts. In addition, 85,766 jobs were sustained by visitors to New Mexico last year, with total income of $2.1 billion (Tourism Economics 2011; see **Table 2-65**). Recreation has important economic value, both in terms of the satisfaction it provides residents and the activity it generates for the regional economy.

Employment data in recreation and tourism are not collected as a separate industry category; therefore, data on jobs generated are estimates only. Jobs are generally reflected in the arts, entertainment, recreation, and accommodation services and in retail trade sectors. The socioeconomic study area supports an estimated 85,000 jobs, or 19.9 percent of total private jobs related to tourism and recreation (Headwaters Economics 2014). Not all of this employment is related to travel and recreation, and other industrial sectors may also contribute jobs. Furthermore, some of this employment is likely related to the other federal lands in the area, although the BLM contribution is expected to be significant.

Table 2-65 Economic Impacts of Tourism

Location	Visitor Spending	Tourism Employment (Direct and Indirect)	Tourism Labor Income (Direct and Indirect)	Tourism Tax Receipts	County Tourism Dependence
McKinley County	$189,600,000	4,978	$55,100,000	$35,500,000	12.9%
Rio Arriba County	$92,500,000	1,960	$23,600,000	$15,600,000	11.1%
Sandoval County	$206,000,000	5,453	$74,000,000	$42,500,000	10.4%
San Juan County	$249,400,000	6,564	$97,900,000	$53,400,000	8.0%
Socioeconomic Study Area	$736,900,000	18,955	$166,600,000	$147,000,000	N/A

Source: Tourism Economics 2011

Visitors to the planning area are often attracted to its lower elevation, sunnier climate, and distinctive recreation opportunities. Regionally distinctive recreation activities that bring people and outside dollars into the area are the motorized and nonmotorized vehicle events and dispersed recreation opportunities. These activities make direct use of BLM-administered lands, although some of this activity is individual and unrecorded.

Recreation use is the primary emphasis for eight SDAs special management areas in the FFO. Total visitor days are estimated at an average of 533,600 visits and 382,400 visitor days per year over the past 16 years (BLM 2014h). Total visitation rates by activity are not available, but details of use, as noted by BLM staff, are included below.

The BLM requires special recreation permits (SRPs) for commercial uses, competitive events, organized groups, and recreation in certain special areas. SRPs allow specified recreation uses of public lands and related waters with applicable stipulations. Over the past 15 years, approximately 100 SRPs have been issued, mostly for hunting big game. Receipts generated from SRPs over the past 10 years are displayed in **Table 2-66**.

Table 2-66 Special Recreation Permit Receipts

Year	Commercial	Competitive
2003	$20,465	$2,524
2004	$19,331	$3,781
2005	$8,563	$2,431
2006	$4,100	$2,940
2007	$13,728	$1,436
2008	$8,654	$2,315
2009	$7,104	$2,691
2010	$16,067	$2,820
2011	$7,555	$2,658
2012	$12,873	$1,915
2013	$10,511	$3,172

Source: BLM 2014c

Minor contributions came from vendor and group events in 2003, 2011, and 2012.

In the past decade planned recreation events included several biking, motorcycle, motocross, and four-wheeler events on BLM-administered lands. These events attracted over 2,000 participants annually, with an estimated economic impact of over $2,533,000 generated by visitor spending (Preister 2001). Downtown Aztec has spawned a number of stores oriented to recreation, supplying bicycling, mountaineering, and other outdoor sports. However, in the last four years, a decrease in large competitive events for rock crawling has likely decreased associated revenues.

Average visitor spending varies by activity as well as location of activity, as compared to place of residence.

Fishing on the San Juan River is popular due to low fees and year-round use. The NMDGF distributes fishing and hunting licenses. Big Game Units 2A and 2B overlap with the lands with highest hunting potential, while Unit 7 is also in the planning area. While hunting and fishing fees are collected by the state, visitors who travel to the region for these activities may contribute to the local economy. The 2011 National Survey of Hunting, Fishing, and Wildlife watching found that these activities contributed an estimated $885 million in expenditures in New Mexico (see **Table 2-67**). Economic stimulus occurs as visitors spend money in the local economy, generating jobs, income, and additional spending by residents. Indirect expenditures added economic benefits throughout the state (USFWS and US Census Bureau 2011).

Table 2-67 Hunting, Fishing, and Wildlife Watching in New Mexico (2011)

Activity	Number of Participants	Number of Days	Total Expenditures	Average Expenditures per Day
Anglers	278,000	3,899,000	$418,249,000	$60
Hunters	69,000	927,000	$139,264,000	$71
Wildlife watchers	566,000	5,962,000	$325,117,000	$25
Source: USFWS and US Census Bureau 2011				

Agriculture and Livestock Grazing

Agriculture and livestock grazing played a traditional role in the study area economy and continue to be important today. There were 6,485 farms, totaling over 6.85 million acres, in the study area in 2007 (US Department of Agriculture 2007). Agricultural data are presented in **Table 2-68**. BLM management actions have the potential to influence farming due to the purchase of farmland and through management practices influencing livestock grazing on public lands, as discussed in detail below.

Table 2-68 Summary of Socioeconomic Study Area Agriculture (2007)

County	Number of Farms	Acres in Farms	Market Value (Crop Sales)	Market Value (Livestock Sales)
McKinley	2,624	3,172,899	$1,165,000	$6,716,000
Rio Arriba	1,312	1,460,186	$3,888,000	$8,875,000
Sandoval	652	591,736	$5,615,000	$3,439,000
San Juan	1,897	1,630,556	$47,249,000	$9,951,000
Source: US Department of Agriculture, National Agricultural Statistical Service 2007				

Livestock grazing, grazing authorizations, and livestock uses are measured in animal unit months (AUMs). This is the amount of dry forage required to sustain one cow and her calf, one horse, or five sheep or goats for one month. This equates to a forage allowance of 26 pounds per day. Depending on the composition and weight of animals in the herd, actual forage use may vary.

There are approximately 119,080 AUMs of grazing authorized by the FFO, 9,228 of which are Navajo Free Use. The free-use grazing permits are authorized under 43 CFR, Part 4130.5, to individuals “whose products or work are used directly and exclusively by the applicant and his family” and are not transferrable. Navajo Free Use is unique to the FFO and Rio Puerco Field Office and is primarily for subsistence grazing.

Most allotments contain a combination of federal, state, and private land. Periods of livestock use vary, from year-round to seasonal. There are 167 grazing allotments managed by the FFO, with 351 grazing authorizations that permit cattle, sheep, and horse grazing in the planning area (BLM 2014j). Of the 167 grazing allotments, there are four authorizations issued under Section 15 of the Taylor Grazing Act to the Navajo Tribe; these authorize grazing on 35 allotments. There are an additional 30 Section 15

authorizations that permit grazing on 30 allotments in the Lindrith, New Mexico, area. The remaining authorizations are issued under Section 7 of the Taylor Grazing Act.

The BLM calculates federal grazing fees annually each March. Fees are based on a formula that is calculated using the 1966 base value of $1.23 per AUM for livestock grazing on public lands in western states. Annual adjustments are based on three factors: current private grazing land lease rates, beef cattle prices, and the cost of livestock production. The federal grazing fee for 2014 is $1.35 per AUM. The grazing fee has been at this level since 2007 (BLM 2014k).

Permit values fluctuate based on market forces but generally depend on the number of AUMs and other terms of the lease or permit and the estimated average value of replacement forage. In 2012, the average fee per AUM on private lands in New Mexico was $13.00 (US Department of Agriculture, National Agricultural Statistical Service 2012).

Based on 109,852 permitted AUMs in the planning area (excluding Navaho Free Use), the total annual grazing value of all traditional leases is approximately $1,428,076. Under the current federal rate of $1.35 per AUM, the comparative total annual grazing fee is $148,000. This is approximately $1.3 million less than the private grazing fee for all authorized grazing in the planning area.

Generally, there is some correlation between ranch land values and federal grazing permits, with ranches that hold such permits having a higher value (Winter and Whittaker 1981). This value is based on the premise that the permit's value reflects, at least to some extent, the capitalized difference between the grazing fee and the competitive market value of federal forage. It also reflects the requirement for the permittee to hold private base property to which the federal permitted use is attached. This gives the base property holder priority for renewal over other potential applicants. This value is recognized by lending institutions during a loan process and by the Internal Revenue Service when a property is transferred.

Nonmarket Values

Some of the most important socioeconomic factors associated with planning area BLM-administered lands are the nonmarket values offered by public lands management. Nonmarket values are the benefits derived by society from the uses or experiences that are not dispensed through markets and do not require payment. For example, there are unique and sensitive natural and cultural resources on public lands, including Native American traditional uses and the special spiritual contribution and foundations public lands provide to Native American cultures. 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.

Additional details on social setting and local communities and groups of interest are included in the Mancos-Gallup RMPA/EIS socioeconomic baseline report.

Social Setting and Way of Life

The planning area was historically based on a rural agricultural economy. As discussed in the regional demographics and economic context introduction, Native Americans, settlers of Hispanic descent, and those of non-Hispanic descent have all played a role in the development of the region and continue to live in the area today.

Oil and gas development has played an important role in local economy population changes, economy, and social setting since the 1950s. Community development has formed around oil and gas development booms in portions of the socioeconomic study area. Energy development in the area resulted in the building of roads and increases in housing as well as improvements to public services. However, cycles in development can result in swings in population, which may strain public services and introduce large influxes of people from outside the region, potentially straining the social setting. Large population

changes may alter perceptions of the friendliness, neighborliness, and trustworthiness of other residents; they may fear for their security, safety, and risk of victimization by crime and may question how satisfying community life is in general (Smith et al. 2001).

Additionally, should development bring an influx of workers from outside, the population would be likely to reflect traditional ethnic/racial background of the planning area, with its large proportion of Hispanic and Native American residents.

Commenters during the public scoping period asked the BLM to consider the rich and diverse socioeconomic background in the planning area. The commenters noted that current and future oil and gas development may result in impacts on communities; these include impacts from increased traffic, air and water quality degradation, noise and visual impacts, tourism and recreation, and general changes to the quality of life.

Commenters also noted the importance of economic contributions of oil and gas in the planning area and emphasized the importance of analyzing both market and non-market impacts.

Changes to the social setting are more likely to occur when development and associated population change is introduced to communities that do not have a long history of natural resource development. With changes in technology, different portions of the planning area may be impacted by development. One area of note is the portion of the FFO containing checkerboard landownership. Exploration for oil and gas has recently increased in this area.

Changes to the social setting can also impact the ability of different groups to access historic land uses. Subsistence agriculture, including sheep and cattle herding, is of historical importance for the Native American tribal groups in the area, particularly for the Navaho. In addition, approximately 26 percent of those Native Americans surveyed in the socioeconomic study area reported gathering traditional plants or hunting as a food source. Firewood from BLM lands is also important, as it represents a primary heating source for many area residents, particularly Native Americans (Rio Puerco Alliance and Hasbidito 2013).

In addition, the planning area contains TCPs, which have cultural values for Native Americans and other groups that historically used the area. These also have potential to be impacted by development.

Attracting Nonlabor Income

Open space can be an important contributor to the quality of life for communities next to public lands. These areas provide scenic views, recreation opportunities, and other benefits. In addition, nonmarket resources may provide indirect economic benefits.

Public lands in the planning area may provide enhanced value to adjacent private parcels. Additionally, open space and related ammenities may attract new residents, who in turn bring new sources of income to the area. Communities next to public lands may offer a high level of natural amenities that often attract retirees and others with nonlabor sources of income. These communities may attract 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 those goods that an ecosystem provides for human use. Examples of benefits provided from undeveloped lands include freshwater and air, waste regulation, biodiversity maintenance, soil formation, 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. A study based in the Pike San Isabel National Forest of Colorado's Front Range, for example, determined the total value of ecosystem services to be $2,208 per acre per year in 2008 (Bacigalupi 2010).

Similarly, environmental restoration, such as cleanup and restoration of abandoned mines, can have economic value to local communities. As lands and water quality improves, the value of these resources for all other land uses will increase. Conversely, if land or water quality are degraded by development, the value of these commodities decreases.

Commenters in the public scoping period noted concerns about the impacts on air and water quality in the region overall from continued and increased oil and gas development. They also were concerned about the nonmarket impacts on local communities and citizens.

Forecast

A number of trends are discernible in the planning area, related to demographics, economics, and quality of life, as follows:

- The economy of the planning area, particularly San Juan County, will continue its trend toward diversification; specifically, activity in the trades and services sectors related to medical, retirement, commercial, and tourism interests will continue to diversify.
    - If the planning area follows the trends seen for much of the western United States, the importance of agriculture, including ranching, may decline modestly in terms of economic productivity. However, livestock numbers for the planning area are difficult to determine, particularly for Section 15 leases; therefore, the trends in usage are not known. Usage and production would likely continue to vary with local climate, drought, and rangeland health. Ranching would retain its importance as a cultural value, as a means to preserve open space, and as an important component of subsistence for some residents.
    - Oil and gas production will remain the dominant force in the economy, with related primary and secondary businesses adding higher than average wages to the local economy.
    - The lifestyle amenities available in the FFO will increasingly attract urban-, retirement-, and recreation-oriented interests.
    - Quality of life considerations are becoming more important in local public policy and planning as a component of economic diversity and viability. The increasing population, the attraction of the area for recreationists, and in-migrating retired people, medical professionals, and others, coupled with the limited private land base, brings public land use and policy into the realm of local community government.
    - BLM scoping found widespread concern among residents about the impacts of oil and gas activities. Without attention to these issues, it is expected that the concerns will intensify.

Current Management and Management Opportunities

BLM-H-1601-1, Land Use Planning Handbook, governs social and economic features.

The 2003 RMP did not address any goals, objectives, or management actions for social and economic conditions in the planning area. These activities are managed according to BLM policy.

The Mancos-Gallup RMPA/EIS will evaluate the effects of each alternative on the social and economic systems surrounding the FFO. Actions and guidelines related to the social and economic sustainability of communities could be considered as well.

2.4.3 Environmental Justice

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern social and economic features:

- BLM-H-1601-1, Land Use Planning Handbook
- EO 12898, Federal Actions to address Environmental Justice in Minority Populations and Low-Income Populations

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 racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences of industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies (BLM 2005).

Guidance on environmental justice terminology developed by the President's Council on Environmental Quality (CEQ 1997) is discussed below.

- **Low-income population—**A low-income population is determined based on annual statistical poverty thresholds developed by the US Census Bureau. In 2012, poverty level is based on total income of $11,720 for an individual and $23,283 for a family of four (US Census Bureau 2012c). 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.

The 2003 RMP did not address any goals, objectives, or management actions for environmental justice in the planning area. The program is managed according to BLM policy.

The Mancos-Gallup RMPA/EIS will evaluate the effects of each alternative on the environmental justice conditions in the planning area. Actions and guidelines related to the environmental justice conditions of communities could be considered as well.

Current Conditions and Trends

Low-Income Populations

Income and poverty data estimates for study area counties indicate that the percent of the population living below the poverty level in the socioeconomic study area (21.3 percent) is slightly above that of the state (20.6 percent); however, it is higher than the national average of 12.1 percent (see **Table 2-69**). Poverty levels ranged from 37.7 percent in McKinley County to 13.7 percent in San Juan County. Only that of Sandoval County was below the state average.

Similarly, estimates from 2012 indicate that Sandoval and San Juan Counties had household median incomes ($57,376 and $45,901) that were above the state level of $42,828. McKinley County ($29,821) and Rio Arriba County ($36,900) were below that of the state in 2012.

While no key study area communities examined meet the CEQ definition of a low-income population area (50 percent or higher), the highest poverty rates were seen in Bloomfield (29 percent), Espanola (26.3 percent), and Bernalillo (24.1 percent; see **Table 2-71**). When broken down by Census Tract, 3 out of 87 tracts in the socioeconomic study area have greater than 50 percent of individuals living below the poverty line: Census Tract 9440 in eastern McKinley County had an individual poverty rate of 54.6 percent; Census Tract 9405 in southwestern McKinley County had an individual poverty rate of 59.4 percent; and Census Tract 9409 in northwestern Sandoval County had an individual poverty rate of 51.9 percent (US Census Bureau 2012b). These three census tracts are all relatively large, indicating a sparsely populated rural area.

Table 2-69 Study Area County Population in Poverty (2002-2012)

	McKinley County	Rio Arriba County	Sandoval County	San Juan County	Study Area Total	New Mexico	United States
Percent of population in poverty 2002	21,766	7,165	19,934	22,152	71,017	421,123	34,569,951
	30.2	17.7	11.1	18.2	21.3	20.6	12.1
Percent of population in poverty 2012	27,296	8,806	18,502	25,802	80,406	327,444	48,760,123
	37.7	22.0	13.7	20.3	21.5	17.7	15.9
Median household income 2002	$25,197	$30,557	$45,213	$34,329	N/A	$34,827	$45,409
Median household income 2012	$29,821	$36,900	$57,376	$45,901	N/A	$42,828	$51,371
Classified as low-income population in 2012 based on CEQ guidelines?	No	No	No	No	No	N/A	N/A

Source: US Census Bureau 2012a

Minority Populations

Based on 2012 data, minorities made up 59.5 percent of the population in New Mexico, compared to 36.3 percent in the United States as a whole (**Table 2-70**). The proportion of minorities in the socioeconomic study area (65.3 percent) substantially exceeded that of the United States and is slightly higher than the state average. At the county level, the population ranged from 89.7 percent minority in McKinley County to 52.8 percent in Sandoval County. On reservations, Native Americans represented most of the population. The largest minority groups outside of tribal reservations were Hispanics/Latinos in Rio Arriba and Sandoval Counties and Native Americans in McKinley and San Juan Counties. Based on the CEQ definition of a minority population area (minority residents exceed 50 percent of all residents), Bernalillo, Bloomfield, Espanola, and Gallup all are considered minority communities (see **Table 2-71**).

When broken down by census tract, there are 24 out of 87 tracts that have a minority population greater than 50 percent. These range from Census Tract 6.1, located just north of Aztec, with a minority population of 80.5 percent, to Census Tract 107.17, located north of Rio Rancho, with a minority population of 50.2 percent (US Census Bureau 2012b). These census tracts are relatively small and are based around the Rio Rancho and the Aztec/Farmington/Bloomfield area.

Table 2-70 Study Area County Population by Race/Ethnicity (2012)

Population	McKinley County	Rio Arriba County	Sandoval	San Juan	Study Area	New Mexico	United States	Jicarilla Apache Nation	Navaho Nation	Ute Mountain Nation
Hispanic or Latino ethnicity of any race	9,744	28,714	46,334	24,496	109,288	952,569	50,545,275	382	2,958	99
	13.6%	71.4%	35.3%	19%	29%	46.3%	16.4%	11.6%	1.7%	6.0%
White alone	7,413	5,370	61,977	54,218	128,978	831,543	196,903,968	74	3,762	47
	10.3%	28.6%	47.2%	42.2%	34.67%	40.5%	63.7%	2.3%	2.2%	2.9%
Black or African American alone	353	149	2,704	794	4000	35,586	37,786,591	0	250	5
	0.5%	0.4%	2.1%	0.6%	1.08%	1.7%	12.2%	0%	0.1%	0.3%
American Indian or Alaskan Native alone	52,358	5,629	15,964	46,676	120,627	176,766	2,050,766	2,692	162,920	1,429
	72.8%	14.0%	12.2%	36.3%	32.43%	8.6%	0.7%	82.0%	94.3%	87.0%

Table 2-70 Study Area County Population by Race/Ethnicity (2012)

Population	McKinley County	Rio Arriba County	Sandoval	San Juan	Study Area	New Mexico	United States	Jicarilla Apache Nation	Navaho Nation	Ute Mountain Nation
Asian alone	506	173	1,685	464	2828	25,411	14,692,794	73	834	14
	0.7%	0.4%	1.3%	0.4%	0.76%	1.2%	4.8%	2.2%	0.5%	0.9%
Native Hawaiian and Other Pacific Islander alone	38	7	100	72	217	989	480,063	0	209	0
	0.1%	0%	0.1%	0.1%	0.06%	<.01%	0.2%	0%	0.1%	0%
Some other race	7	22	437	84	550	3,623	616,191	0	102	0
	<.01%	0.1%	0.3%	0.1%	0.15%	0.2%	0.2%	0%	0.1%	0%
Two or more races	1,469	137	2,101	1,796	5,503	28,800	6,063,063	62	1,660	49
	2.0%	0.3%	1.6%	1.4%	1.48%	1.4%	2.0%	1.9%	1.0%	3.0%
Classified as minority population based on CEQ guidelines?	Yes	Yes	Yes	Yes		Yes	N/A	Yes	Yes	Yes
Source: US Census Bureau 2012a										

Table 2-71 Study Area Key Community Race/Ethnicity and Poverty Data

Community	Percent Population Racial or Ethnic Minority	Classified as Minority Population Based on CEQ?	Percent of Individuals Below Poverty	Classified as Low-Income Population Based on CEQ?
Aztec	36.4	N	14.4	N
Bernalillo	78.8	Y	24.1	N
Bloomfield	55.8	Y	29.0	N
Espanola	91.6	Y	26.3	N
Farmington	48.8	N	15.5	N
Gallup	76.9	Y	20.9	N
Rio Rancho	46.7	N	9.8	N
Source: US Census Bureau 2012b				

2.4.4 Public Health and Safety

Profile

The safety of visitors to public land is a concern for the FFO. When concerning public safety, the BLM is required to address abandoned mines, unexploded ordnance, and hazardous waste.

Indicators

Abandoned Mines

The AML Program is a national and state BLM safety priority. Emphasis is on ensuring public safety and protecting watersheds from hazardous materials and mine drainage. At the field office level, the purpose of the program is to identify and characterize inactive mine sites.

The BLM coordinates with the State of New Mexico Mining and Minerals Division Abandoned Mine Land Program to address abandoned mine hazards on BLM-administered lands in the state. Hazards or potential hazards to human health, safety, and the environment are inventoried, and data are stored in a national or state database. Specific sites may be closed or remediated in order to protect human health or the environment. The presence of a large number of AMLs that are not being monitored, restored, or reclaimed, would indicate a public health and safety risk.

Unexploded Ordnance

The BLM may accept lands from other federal agencies that were formerly used by the Army, Navy, Air Force, and Marine Corps and that have been returned to the public domain. As part of the management of these lands, the BLM collaborates with the Department of Defense and the US Army Corps of Engineers to address any public lands that may contain munitions or explosives of concern. The presence of unexploded ordnance or of lands in the FFO that were formally used by military services would indicate a potential public safety risk.

Petroleum Waste and Hazardous Substances

Petroleum wastes are those substances included in the meaning of the petroleum exclusion to the CERCLA (42 USC, Section 9601). This is petroleum that is not specifically listed or designated as a hazardous substance. The term “hazardous substance” is defined by CERCLA. There are thousands of hazardous substances, but they can generally be categorized as ignitable, corrosive, reactive, or toxic materials. “Release,” as defined by CERCLA, means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing (including abandonment) of a hazardous substance. The presence of oil and gas development in the FFO poses the potential for public safety and health risks if the public were to come in contact with any petroleum wastes or other hazardous substances.

Hydraulic Fracturing

New technologies in oil and gas development have led to increased concern about impacts on public health and safety. Many of the chemicals used in hydraulic fracturing are considered hazardous under 40 CFR, Part 302, Section 302.4. If the public were to come in contact with these substances, it could result in public health and safety impacts.

The public has expressed concerns about groundwater contamination related to fracturing fluid and the impacts this would have on public health. Recent studies, such as the endocrinology study, Estrogen and Androgen Receptor Activities of Hydraulic Fracturing Chemicals and Surface and Ground Water in a Drilling-Dense Region (Kassotis et al. 2013), have linked the chemicals used in hydraulic fracturing to severe negative health impacts. The endocrinology study authors reported that many of the chemicals used in hydraulic fracturing are endocrine disrupters, which have been linked to increased instances of cancer, infertility, birth defects, and reproductive deformities (Kassotis et al. 2013, p. 2).

Public health impacts could also result from soil contamination, direct exposure to hazardous fracturing chemicals, groundwater or surface water contamination by fracturing fluid or natural gas, induced seismicity, and impacts on air quality from extracting resources and the related emissions. The potential of risk to public health and safety from the processes around hydraulic fracturing would increase with the presence of oil and gas development in the FFO.

Solid Waste

The term solid waste is defined by the Resource Conservation and Recovery Act (42 USC, Section 6901). It is any solid, liquid, semisolid, or contained gaseous material that is deemed to be a waste. Solid waste is further defined as abandoned piles of household garbage, bags of yard waste, discarded appliances, old barrels, used tires, and demolition debris that can threaten the health of humans, wildlife, and the environment.

A few commonly found illegally dumped items, such as vehicles, boats, trailers, and motorhomes, can be characterized as either solid waste or hazardous waste, depending on the timeliness of the item being found, reported, and subsequently cleaned up. For example, rubber car tires or an intact fiberglass boat found in the desert does not pose much of a threat as a solid waste; however, if the rubber tires or fiberglass were set on fire and burned, they would become hazardous waste.

Current Condition

Abandoned Mines

As of January 10, 2013, the BLM's AML Program reported 4,483 known abandoned mine sites on lands it administers in New Mexico (BLM 2013b). An AML site may contain several mine openings, several waste dumps, and other mine features.

Abandoned mines pose hazards to physical safety, human health, and the environment. These include the risk of injury or death from being near or inside a collapsing mine or falling down an open mine shaft; the risk of negative health impacts from exposure to noxious gases, chemicals, toxic wastes, or explosives in or near a mine; and the risks of exposure to water and soil contaminated by mine tailings (BLM 2013a). Uranium mines pose additional risks, such as radiation exposure to contaminated sites. Exposure to uranium can lead to severe health impacts, such as increased cancer risk and liver damage (EPA 2012). There are 11 uranium mines on federal mineral estate in the decision area.

On public lands in New Mexico, remediation and reclamation have been completed on 540 AML sites. Remediation and reclamation are in progress on 12 sites, no remediation or reclamation is required on 23 sites, and actions have been planned but are not yet in progress on 386 sites (BLM 2014a).

Unexploded Ordnance

The FFO has no recent history of military installations and does not contain any known sources of unexploded ordnance. Often unexploded ordnance can be found in abandoned mine workings; in such a situation, explosives experts are required to remove or detonate the explosives. If this occurs, the BLM would follow the protocol laid out in BLM Handbook 1703-2, Military Munitions and Explosives of Concern: A Handbook for Federal Land Mangers, with Emphasis on Unexploded Ordnance.

Petroleum Waste and Hazardous Substance

Unauthorized disposal of petroleum waste and hazardous substances release continually occurs on public land throughout the FFO. Unauthorized hazardous substances and petroleum products usually are released or dumped (also known as midnight dumping) in association with active or abandoned mining or mill site claims.

The FFO follows the National Contingency Plan (40 CFR, Part 300) in dealing with releases of hazardous substances, which generally involves the timely removal of the hazardous substance. Petroleum waste is removed in accordance with state and local laws and regulations, which also generally involve the timely removal of petroleum waste. A release could require the removal for one drum of liquids, which could cost a few hundred dollars, up to a remedial action, which could involve extensive studies and cost thousands or millions of dollars.

Hydraulic Fracturing

Members of the public have expressed concern about hydraulic fracturing and the potential for groundwater contamination by chemicals used hydraulic fracturing. Studies have reported groundwater contamination, gas seeps into freshwater wells, and earthquakes linked to hydraulic fracturing (Jackson et al. 2013; USGS 2014). In the FFO, unlined earthen pits are no longer allowed, and the old ones have been remediated and closed (1993 Unlined Earthen Pit Closure and Remediation EA from FFO). People in the Aztec and Cedar Hills areas have complained about natural gas getting into their shallow freshwater wells.

Solid Waste

Unauthorized disposal of solid waste continually occurs on public land throughout the FFO, although the number of illegal solid waste dump sites has not been quantified. Most illegal solid waste dumping occurs on public land near urban areas; however, it is also common along transportation corridors and routes that are infrequently traveled and therefore more desirable for illegal dumping. Illegal solid waste dumping is also common in recreational target shooting areas and in undesignated camping areas, which are dispersed throughout the FFO.

Trends

Due to the remediation and reclamation of AMLs over the past 50 years and increased awareness of environmental hazards and ways to mitigate these hazards, some risks to public health and safety has decreased. However, in other aspects, particularly those involving the potential health and safety risks posed by hydraulic fracturing, new risks have emerged and could be a serious threat to public health.

While technology and increased regulation of oil and gas development over the past 50 years has lessened the likelihood of public exposure to danger, the increased use of new technology, such as hydraulic fracturing, that has not yet been conclusively tested, has increased the likelihood of serious health and safety impacts.

Forecast

Risks to public health from oil and gas development (petroleum waste and hazardous substances and impacts from hydraulic fracturing) are likely to increase over time. This is attributed to the use of hydraulic fracturing increases as an oil and gas extraction method to meet increasing energy demands.

Risks to public health from AMLs may decrease in the future as AMLs continue to be inventoried and remediated.

Public safety issues have the potential to increase along with increased access to the planning area.

Current Management and Management Opportunities

The following statutes, regulations, handbooks, and other policies govern public health and safety:

- 29 CFR, Part 1910.120, Hazardous Waste Operations and Emergency Response
- 40 CFR, Part 300, National Oil and Hazardous Substances Pollution Contingency Plan
- BLM Handbook 3720-1, Abandoned Mine Land Program Policy
- BLM Handbook 1703-2, Military Munitions and Explosives of Concern: A Handbook for Federal Land Managers, with Emphasis on Unexploded Ordnance
- BLM Manual 3720, Abandoned Mine Land Program Policy
- BLM National AML Strategic Plan
- BLM Rule on Oil and Gas; Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian lands (pending)
- CERCLA of 1980 and the Superfund Amendments and Reauthorization Act
- Clean Water Act of 1987, as amended
- New Mexico Occupational Health and Safety Act of 1978
- Occupational Safety and Health Act of 1970
- Resource Conservation and Recovery Act of 1976
- Surface Mining Control and Reclamation Act of 1977
- Toxic Substances Control Act of 1976
- Uranium Mill Tailings Radiation Control Act of 1978

The 2003 Farmington RMP did not contain goals, objectives, or management actions related to public safety. Public safety is managed according to BLM policy and national and state guidelines.

Illegal dumping will most likely continue. Educating the public about the dangers of this issue and increased law enforcement presence and cooperation could help to resolve this problem. In order to protect public safety and natural resources, hazardous waste disposal facilities should not be allocated or approved in the planning area.

GIS could assist the FFO in managing hazardous materials by consolidating information on illegally disposed of materials in the planning area. The use of federal and state databases containing information on hazardous materials storage, use, production, and violation could help the BLM Environmental Protection Specialist remain aware of small businesses with the potential to create or use hazardous materials in the planning area. These databases could also help identify areas where illegal dumping is ongoing and where physical closures could be used to prevent the situation and reduce cleanup costs.

As hydraulic fracturing technology continues to be heavily used, the BLM has opportunities to apply restrictions and regulations that could decrease the risk of groundwater, surface water, and soil contamination, as well as the public health impacts resulting from contamination of other resources.

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Chapter 3. Consistency/ Coordination with Other Plans

3.1 CONSISTENCY AND COORDINATION WITH OTHER PLANS

According to guidance found in FLPMA (43 CFR, Part 1610), BLM RMPs and amendments must be consistent, to the extent practical, with officially approved or adopted resource-related plans of other tribal, federal, state, and local governments. This is contingent on the guidance and RMP or amendment being compatible.

BLM RMPs and amendments must also be consistent with the purposes, policies, and programs of FLPMA and other federal laws and regulations related to public lands. This includes federal and state pollution control laws (43 CFR, Part 1610.3-2 [a]). If these other entities do not have officially approved or adopted resource-related plans, then BLM RMPs and amendments must, to the extent practical, be consistent with those entities' officially approved and adopted resource-related policies and programs. This consistency will be accomplished so long as BLM RMPs and amendments incorporate the policies, programs, and provisions of public land laws and regulations and Federal and State pollution control laws (43 CFR, Part 1610.3-2 [b]).

In the RMP amendment, the BLM will strive for consistency with plans and their revisions pertaining to lands included in and surrounding the planning area; this includes the following planning documents:

County Plans
- La Plata County Comprehensive Plan (Colorado), 2001
- McKinley County Comprehensive Plan, 2003
- Rio Arriba County Comprehensive Plan, 2008
- Sandoval County Comprehensive Plan, 2013
- San Juan County Comprehensive Plan, 1998

State Agency Plans and Comprehensive Wildlife Conservation Strategies
- New Mexico Comprehensive Wildlife Conservation Strategy, 2007
- New Mexico State Water Plan, 2003
- New Mexico 2030 Statewide Multimodal Transportation Plan
- New Mexico State Parks, Navajo Lake Management Plans, Lakeside (2012) and Riverside (2014)

Federal Agency Plans
- Aztec Ruins National Monument General Management Plan
- Chaco Culture National Historic Park General Management Plan
- Gila Cliff Dwellings National Monument General Management Plan
- Old Spanish National Historic Trail Comprehensive Management Plan/EIS

Before the BLM approves RMP or amendment decisions, the Governor has 60 days to identify inconsistencies between the proposed plan and state plans and programs and to provide written comments to the BLM State Director. The BLM and the state may mutually agree on a shorter review period. If the Governor does not respond within this period, the proposed RMP or amendment decisions are assumed to be consistent. If the Governor recommends changes in the proposed plan or amendment that were not raised during the public participation process, the State Director shall provide the public with an opportunity to comment on the recommendations (43 CFR, Part 1610.3-2 [e]). This public comment opportunity will be offered for 30 days and may coincide with the 30-day comment period for the Notice of Significant Change. If the State Director does not accept the Governor's recommendations, the Governor has 30 days to appeal in writing to the BLM Director (43 CFR, Part 1610.3-2 [e]).

The FFO will consult with tribal governments throughout the RMP amendment process. The following list includes tribes contacted for consultation and interest in the project:
- Navajo Nation
- Hopi Tribe

- Jicarilla Apache Tribe
- Mescalero Apache Tribe
- Pueblo of Acoma
- Pueblo of Cochiti
- Pueblo of Isleta
- Pueblo of Jemez
- Pueblo of Laguna
- Pueblo of Nambe
- Ohkay Owingeh
- Pueblo of Picuris
- Pueblo of Pojoaque
- Pueblo of San Felipe
- Pueblo of San Ildefonso
- Pueblo of Sandia
- Pueblo of Santa Ana
- Pueblo of Santa Clara
- Pueblo of Santo Domingo
- Pueblo of Taos
- Pueblo of Tesuque
- Pueblo of Zia
- Pueblo of Zuni
- Ysleta del Sur Pueblo
- San Carlos Tribe
- White Mountain Apache Tribe
- Southern Ute Tribe
- Ute Mountain Ute Tribe
- Apache Tribe of Oklahoma
- Comanche Indian Tribe
- Fort Sill Apache Tribe
- Kiowa Tribe of Oklahoma
- Pawnee Tribe
- Wichita and Affiliated Tribes

Consultation on the RMP amendment with the nations and tribes is conducted through the FFO's established government-to-government consultation process.

The FFO will also collaborate with other federal, state, and local agencies and governmental entities throughout the RMP amendment process. A number of agencies were invited to participate in the amendment process as cooperating agencies; to date, tnine have accepted the BLM's invitation and are working to finalize MOUs to formally establish the relationship. Invitations were sent to the following agencies and tribes:

- US Department of Agriculture, Forest Service, Santa Fe National Forest and the Carson National Forest (both accepted)
- US Department of Health and Human Services, Public Health Service
- US Department of the Interior, Bureau of Indian Affairs, Navajo Region (Accepted)
- US Department of the Interior, Bureau of Reclamation (Declined)
- US Department of the Interior, Fish and Wildlife Service
- US Department of the Interior, National Park Service (Accepted)
- US Department of the Interior, US Geological Survey, Bureau of Mines (Declined)
- US Department of Transportation, Federal Highway Administration
- New Mexico Department of Agriculture
- New Mexico Department of Cultural Affairs, Historic Preservation Division (Accepted)
- New Mexico Department of Game and Fish (Accepted)
- New Mexico Department of Health

- New Mexico Department of Transportation
- New Mexico Energy, Minerals and Natural Resources Department (Forestry Division has accepted)
- New Mexico Environment Department
- New Mexico State Land Office (Accepted)
- State of New Mexico
- La Plata County, Colorado
- McKinley County
- Rio Arriba County
- Rio Arriba County Soil and Water Conservation District
- Sandoval County
- San Juan County
- San Juan Soil and Water Conservation District
- City of Aztec
- City of Bloomfield
- City of Durango
- City of Farmington
- Village of Cuba
- All Indian Pueblo Council
- Hopi Tribe (Hopi Cultural Preservation Office has accepted)
- Jicarilla Apache Tribe
- Navajo Nation (Navajo Nation Historic Preservation Department has accepted)
- Southern Ute Indian Tribe
- Ute Mountain Ute Tribe

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Chapter 4. List of Preparers

4.1 LIST OF PREPARERS

Farmington RMPA/EIS BLM Interdisciplinary Team	
Name	**Task/Role**
Janelle Alleman*	Recreation, lands with wilderness characteristics, travel management, VRM, Special Designations (Wilderness, WSAs)
Theresa Copeland	Regional Solicitor
Brian Deaton*	Cultural resources, tribal interests, National Historic Trails
Peggy Deaton*	GIS
Ashley Dye	Contracting Officer's Representative
Stan Dykes	Invasive and noxious plants
Lindsey Eoff*	Project Manager
Tony Gallegos*	Locatable minerals, salable minerals
John Hansen*	Wildlife, big game
Geoff Haymes	Cultural resources, tribal interests, National Historic Trails
Maureen Joe	Lands and realty
Michael Johnson	Socioeconomics, environmental justice
Mark Kelly	Branch Chief for Realty and Surface Uses
John Kendall*	Threatened and endangered species, special status species, migratory birds
Sherrie Landon	Paleontological resources
Adam Madigan	GIS
Marcella Martinez	Planning and Environmental Specialist
Vera Matthews*	Lands and realty, rights-of-way, utility corridors, land tenure, land uses, withdrawals
Amanda Nisula*	Planning and Environmental Specialist
Troy Salyers*	Leasable minerals, geology
Sarah Scott*	Riparian, wetlands vegetation
Jeff Tafoya	Grazing administration, range management, wild horses and burros
Gary Torres	Farmington Field Office Manager
Mary Uhl*	Air resources, climate, greenhouse gases
Craig Willems*	Leasable Minerals Surface Permitter (access, rights-of-way);
Esther Willetto	Tribal Liaison
Michael Williams	Regional Solicitor
Sheila Williams*	Vegetation
Dale Wirth	Soils/Water, Hazardous Materials/Public Safety
Angela Yemma*	Grazing Administration, range management, wild horses and burros

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Amy Cordle	Air resources, greenhouse gases, noise
Annie Daly*	Administrative Record Specialist, public health and safety
Carol-Anne Garrison*	Project Manager, cultural resources, National Historic Trails
Zoe Ghali*	Socioeconomic and Environmental Justice Lead
Peter Gower, AICP	Lands and realty, lands with wilderness characteristics, and special designations
Derek Holmgren	Visual resources
Brandon Jensen*	Natural/Biological Resources Lead, fish and wildlife (including special status species)
Jeff Johnson	Forestry
Jenna Jonker	GIS Specialist
Kate Krebs	Lands and realty, lands with wilderness characteristics, and special designations
Laura Long	Technical Editor/Word Processor
Ralph Morris	Air quality and greenhouse gases
Nick Parker	Cultural resources, National Historic Trails
Katie Patterson*	Deputy Project Manager, Minerals Lead
William Penner	Recreation, route inventory, and travel management
Marcia Rickey*	GIS Lead
Chad Ricklefs, AICP*	Physical Resources Lead, recreation, route inventory, and travel management
Jordan Adams	Soils and geology
Drew Vankat	Recreation, route inventory, and travel management
Jennifer Whitaker	Minerals
Tom Whitehead, RG	Hydrology/hydrogeology
Liza Wozniak	Fish and wildlife (including special status species)
Meredith Zaccherio	Vegetation
Jim Zapert	Air quality and greenhouse gases
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Appendix A.
Current Management

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Appendix A
Current Management

Unique ID	Decision
	Overall
Goals	
O-G-1.	Restore and maintain the health of the land (RMP, 2-1).
O-G-2.	Provide opportunities for environmentally responsible commercial activities, including the orderly development of important energy resources (RMP, 2-1).
O-G-3.	Preserve natural and cultural heritage resources (RMP, 2-1).
Management Actions	
O-MA-1.	Issue permits for research and collection (RMP, D-1).
O-MA-2.	Develop a Cooperative Management Plan with other state and federal agencies for management of public lands around Navajo Lake (RMP, D-3).
O-MA-3.	Develop Watershed Activity Plans (RMP, D-1).
O-MA-4.	Restrict surface-disturbing activities on identified fragile watersheds and manage for watershed values (RMP, D-1).
	Air Quality
Objective	
AQ-O-1.	BLM actions and use authorizations will comply with all applicable local, state, tribal, and federal air quality laws, statutes, regulations, standards, and implementation plans (RMP, 2-22).
Management Actions	
AQ-MA-1.	All air pollutant emissions from future federally conducted or approved activities shall comply with all applicable local, state, tribal, and federal air quality laws, statutes, regulations, standards, and implementation plans (ROD, 13; RMP, 2-22).
AQ-MA-2.	Potential air quality impacts will require special mitigation (RMP, 2-22).
AQ-MA-3.	Unless ongoing monitoring and additional modeling indicate otherwise, the following mitigation measures are required (ROD, 13; RMP, 2-22): • Emissions Control (Construction): Construction shall be limited to only four wells concurrently in any give square mile, with each well no closer than one-half mile to another (ROD, 13; RMP, 2-22). • Emissions Control (Wellhead/Field Compressors): If appropriate control measures that can be applied as mitigation measures have not been recommended through the Clean Air Action Plan process by July 1, 2004, interim mitigation will be instituted. New and replacement wellhead compressors will be required to limit their NOX emissions to less than 10 grams per horsepower-hour. This requirement would apply to all new and replacement compressor engines, unless the proponent can demonstrate (using air pollutant dispersion modeling) that a specific higher emission rate would not cause or contribute to an exceedance of any ambient air quality standard (ROD, 13; RMP, 2-22). • Emission Control (Sale/Pipeline Compressors): If appropriate control measures that can be applied as mitigation measures have not been recommended through the Clean Air Action Plan process by July 4, 2004, interim mitigation will be instituted requiring that each sales (pipeline) compressor station added to the planning area shall limit its total nitrogen oxides emissions to less than 1.5 grams per horsepower-hour. This requirement applies to all new and replacement compressor engines, unless the proponent can demonstrate (using air pollutant dispersion modeling) that a specific higher emission rate would not cause or contribute to an exceedance of applicable air quality regulations (ROD, 13; RMP, 2-23). • Participation on the Four Corners Regional Ozone Task Force: The BLM will participate in the Four Corners Regional Ozone Task Force in order to continue its support of the San Juan County Early Action Compact (EAC) with location governments in San Juan County, the New Mexico Environment Department,

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	and the Environmental Protection Agency (ROD, 14). As the Ozone Task Force makes specific recommendations, the BLM will incorporate those recommendations within its legal authority as mitigation measures under 43 CFR 3162.1 (ROD, 13; RMP, 2-23). • Expanded Regional Cumulative Air Quality Impact Assessment: BLM shall perform a regional cumulative far-field analysis of potential PSD Class I increment, atmospheric deposition, and visibility impacts as part of the planned "Northern San Juan Basin Coalbed Methane Development EIS" air quality impact assessment. Based on the outcome of the regional analysis, additional mitigation may be required (RMP, 2-23).
AQ-MA-4.	Prior to implementation, all BLM-initiated or authorized activities within non-attainment areas must undergo a determination (when applicable) or conformity with the NAAQS according to the General Conformity Rule (RMP, 2-22).
AQ-MA-5.	Any emission source must comply with the NMAQB regulations (RMP, 2-22).
AQ-MA-6.	When appropriate mitigation measures are identified by the Four Corners Ozone Task Force, the BLM will establish them for existing oil and gas operations through the use of NTLs and enforce their implementation (RMP, 2-22).
AQ-MA-7.	Companies applying for APDs may be required to evaluate the use of new technology to reduce surface disturbance with its consequent impacts on air quality (RMP, 2-22).
AQ-MA-8.	For any proposed coal mining associated with the RMP, including increases in current extraction or use, the BLM will coordinate with all appropriate agencies of state, federal, and tribal governments to ensure compliance with laws and regulations. Project-specific dispersion modeling and an EA will be prepared with the opportunity for public input. Air quality will be examined in cooperation with the NMAQB, following applicable permit procedures (RMP, 2-23).
AQ-MA-9.	Monitor air quality (RMP, D-1).
Soil Resources	
Objective	
SR-O-1.	Place emphasis on preventing and/or avoiding further degradation of soil resources, as well as their conservation (RMP, 2-20).
Management Actions	
SR-MA-1.	Soil conservation practices will be used to develop site-specific BMPs at the project level to prevent or reduce the amount of pollution to a level compatible with water quality goals (RMP, 2-20).
SR-MA-2.	Monitoring will be used to determine the effectiveness of BMPs (RMP, 2-20).
SR-MA-3.	Various techniques will be employed to reduce soil erosion. Most measures focus on reducing the amount of surface disturbance, protecting disturbed soils from water or wind erosion, and restoring natural vegetation as soon as possible. Depending upon the site-specific situation, the chief mitigation measures to be employed include the following: • Operators are required to submit a plan of reclamation to the BLM. • Clearing, grading, and other disturbance of soil and vegetation is limited to the minimum area required for construction. • Any roads used exclusively for construction purposed shall be adequately closed to all vehicular travel and rehabilitated after completion of construction. • Topsoil removed during construction will be stockpiled and used in reclamation. • Sidehill cuts of more than 3 feet vertical are not permitted. Areas required cuts greater than this will be terraced so none are greater than 3 feet. • Disturbed areas shall be mulched as designated by the AO. • Disturbed areas will be reseeded following specifications using designated seed mixtures within one year of final construction. • No construction or routine maintenance activities shall be performed during periods when the soil is too wet to adequately support construction equipment. If such equipment creates ruts in excess of 6 inches deep, the soil shall be deemed too wet to work. • All roads will follow Gold Book standards (BLM and USFS 1989) (RMP, 2-21).
SR-MA-4.	Monitor soil quality (RMP, D-1).

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Water Resources	
Objective	
WR-O-1.	Place emphasis on preventing and/or avoiding further degradation of water resources, as well as their conservation (RMP, 2-20).
Management Actions	
WR-MA-1.	Water conservation practices will be used to develop site-specific BMPs at the project level to prevent or reduce the amount of pollution to a level compatible with water quality goals (RMP, 2-20).
WR-MA-2.	Monitoring will be used to determine the effectiveness of BMPs (RMP, 2-20).
WR-MA-3.	The following mitigation measures will be applied, as appropriate, to protect surface water and groundwater form the impacts of surface disturbance: • Drilling pits will be lined with an impervious material at least 8 mils thick. • Mud and blow pits will be constructed to as not to leak, break, or allow discharge of liquids or produced solids. • Washes shall be diverted around well pads. • Culverts of sufficient size (minimum of 18 inches) will be placed where drainages cross access roads. • Low water crossings shall be constructed in a manner that will prevent any blockage or restriction of the existing channel. Material removed shall be stockpiled for use in rehabilitation of the crossing. • Full compliance with all applicable laws, regulations and Onshore Orders is required (RMP, 2-21). • Prior to approval of a well location within 500 horizontal feet of the high water line of Navajo Reservoir (elevation 6, 085 feet), it must be examined by USBR and the potential impacts to water quality determined (RMP, 2-22).
WR-MA-4.	Implement Colorado River Salinity Program (RMP, D-1).
WR-MA-5.	Install water control structures where feasible (RMP, D-2).
WR-MA-6.	Maintain existing water control structures (RMP, D-2).
WR-MA-7.	Monitor the water quality of the larger ephemeral drainages with stream flow stations and peak flow gages (RMP, D-2).
WR-MA-8.	Conduct a water quality survey of all developed ground waters and potential ground water developments such as seeps and artesian flows (RMP, D-2).
WR-MA-9.	Quantify all BLM water use and secure state appropriative water rights (RMP, D-3).
WR-MA-10.	Reduce sediment and salinity in surface runoff by including BMPs in all activities in areas that contribute more than on AF/mi2/yr of sediment (RMP, D-2).
WR-MA-11.	WR-MA-11. Monitor water quality (RMP, D-1).
Riparian Areas	
Objective	
RA-O-1.	Manage riparian areas for restoration and protection to achieve and maintain Proper Functioning Condition (PFC).
Management Actions	
RA-MA-1.	Recent management guidance is provided in the Riparian and Aquatic Habitat Management Plan (BLM 2000c; BLM 2000d) (RMP, 2-32).
RA-MA-2.	HMP or activity plans will be developed for the Ephemeral Wash Riparian Area (RMP, 2-33).
RA-MA-3.	No development activity or surface occupancy shall be permitted in wetland areas (as defined in the Corps of Engineers Wetlands Delineation Manual [US Army 1987]). Exceptions may be analyzed in a site-specific environmental assessment. Any wetland acreage destroyed shall be mitigated by the acreage ratio as prescribed by the USFWS (RMP, 2-33).
RA-MA-4.	A buffer strip of vegetation, width determined on a case-by-case basis, shall be left between areas of surface disturbance and riparian vegetation (RMP, 2-33).
RA-MA-5.	When riparian vegetation cannot be avoided during permitted project, the permittee is responsible to reestablish any riparian vegetation lost during construction (RMP, 2-33).
RA-MA-6.	Cottonwoods will be replaced on a 10 to 1 ratio and willows will be replaced on a 3 to 1 ratio (RMP, 2-33).

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RA-MA-7.	Sediment barrier fences will be constructed to BLM specifications in designated riparian area active channels that may be destabilized due to construction activities, or as off-site mitigation to protect the integrity of designated riparian areas (RMP, 2-33).
Forestry	
Objective	
FO-O-1.	Manage woodlands and timber stands for the production of forest products to support multiple uses and sustained yields. Multiple uses include recreation, timber sales, and harvesting of fuelwood (RMP, 2-34).
Management Actions	
FO-MA-1.	Restoration projects focus on improving the 7,400 acres of ponderosa pine through cutting or burning the encroaching pinon and juniper (RMP, 2-34).
FO-MA-2.	Process sale of vegetative materials contracts for special forest products including fuelwood, trees, and posts (RMP, D-1).
FO-MA-3.	Conduct an intensive woodlands product inventory (RMP, D-1).
Noxious Weeds and Invasive Species	
Objective	
NW-O-1.	Detect invasive plant species populations, prevent the spread of new invasive populations, management existing populations using the tools of integrated weed management, and eradicate invasive populations, using the safest environmental methods available (RMP, 2-24).
Management Actions	
NW-MA-1.	Inventory existing infestations and plan for the prevention of noxious weed invasion, monitoring of revegetation efforts for invasive weeds, and assessment of the success of weed control efforts (RMP, 2-24).
NW-MA-2.	The plan developed for the FFO includes the following program procedures: • Prevention and Detection: Develop a prevention and early detection program. • Education and Awareness: Generate internal and external support for noxious weed control. • Inventory: ensure that adequate baseline data are available on the distribution of weeds. • Planning: Include provisions for noxious weed management in all BLM-funded or –authorized actions. • Integrated Weed Management: Determine the best methods for an integrated approach to weed management and implement on-the-ground operations. • Coordination: Ensure management for noxious weeds is carried out efficiently and consistently across jurisdictional and political boundaries. • Monitoring, Evaluation, Research, and Technology Transfer: Ensure sufficient data are available to evaluate management actions, provide a basis for making informed decisions, assess progress towards management objectives, and develop new and more effective management methods (RMP, 2-24).
NW-MA-3.	For all actions on public lands that involve surface disturbance or rehabilitation, reasonable steps would be required to prevent the introduction or spread of noxious weeds, including requirements for using wee seed-free hay, mulch, and straw (RMP, 2-24).
NW-MA-4.	The BLM will approve and use the following herbicide active ingredients: • 2,4-D • Bromacil, • Cholorsulfuron • Clopyralid • Dicamba • Diflufenzopyr (in formulation with dicamba and known as Overdrive® • Diquat • Diuron

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	• Fluridone • Glyphosate • Hexazinone • Imazapic • Imazapyr • Metsulfuron methyl • Picloram • Sulfometuron methyl • Tebuthiuron • Triclopyr (BLM, 2007, 2-1)
NW-MA-5.	BLM will use diflufenzopyr as a stand-alone active ingredient at such time the ingredient because registered for use by the USEPA under FIFRA (BLM, 2007, 2-1).
NW-MA-6.	These herbicide active ingredients and formulations shall be applied for uses, and at application rates, specified on the herbicide product label (BLM, 2007, 2-1).
NW-MA-7.	The BLM will comply with changes in label directions and will comply with all state registration requirements (BLM, 2007, 2-1).
NW-MA-8.	If state registration requirements do not allow the application of a particular herbicide active ingredient approved for use in the PEIS, the BLM will not authorize use of the herbicide active ingredient within the state where its use is prohibited (BLM, 2007, 2-1).
NW-MA-9.	The BLM will not approve the use of the following six herbicide active ingredients: • 2,4-DP • Asulam • Atrazine • Fosamine • Mefluidide • Simazine (BLM, 2007, 2-1)
NW-MA-10.	The BLM may consider the use of new herbicide active ingredients, products, and technologies in vegetation treatment projects. The BLM may also reconsider the use of herbicide active ingredients approved in previous EIS RODs, but not approved for use under this PEIS ROD. The process for identifying, evaluating, and approving herbicide active ingredients is outlined in the scientific methodology protocol attached to this ROD as Appendix A (BLM, 2007, 2-1).
NW-MA-11.	The BLM will be able to use herbicide active ingredients if: 1) they are registered by the USEPA under FIFRA for use on one or more land types (e.g., rangeland, aquatic, etc.) managed by the BLM; 2) the BLM determines that the benefits of use on public lands outweigh the risks to human health and the environment; and 3) they meet evaluation criteria to ensure that the decision to use the active ingredient is supported by scientific evaluation and NEPA documentation. The evaluation criteria are outlined in more detail in Appendix A of this ROD (BLM, 2007, 2-1).
NW-MA-12.	The BLM will follow SOPs to ensure that risks to human health and the environment from herbicide treatment actions are kept to a minimum. Standard operating procedures are the management controls and performance standards intended to protect and enhance natural resources that could be affected by vegetation treatments involving the use of herbicides. These procedures are identified in Appendix B and include, but are not limited to: • Take actions to prevent or minimize the need for vegetation control when and where feasible, considering the management objectives of the site. • Use effective nonchemical methods of vegetation control when and where feasible. • Use herbicides after considering the effectiveness of all potential methods or in combination with other methods or controls. • Develop plans to thoroughly evaluate the need for chemical treatments and their potential for impact on the environment.

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	• Reseed or plant disturbed areas with desirable vegetation when the native plant community cannot recover and occupy the site sufficiently. • Survey the project site for species listed, or proposed for listing, or special status species. If a proposed project may affect a proposed or listed species or its critical habitat, the BLM will consult with the U.S. Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Service (NMFS). The BLM will also follow protective measures identified in the NMFS Endangered Species Act Section 7 Consultation Biological Opinion Proposed Vegetation Treatment Program for 17 Western States (see Appendix C of this ROD). • Avoid using tools and equipment for vegetation management in wilderness areas unless they are necessary for the protection of the wilderness resource. • Meet responsibilities for consultation and government-to-government relationships with Native American tribes by consulting with appropriate tribal representatives prior to taking actions that affect tribal interests. • Notify potentially affected parties of treatment activities that occur on public lands. • Ensure that the public is allowed input into vegetation management actions on public lands under the NEPA process (BLM, 2007, 2-2).
NW-MA-13.	The BLM will implement additional measures to mitigate potential adverse environmental effects as a result of vegetation treatment activities using herbicides. These SOPs and mitigation measures ensure that all practicable means to avoid or minimize environmental harm have been adopted by the BLM (BLM, 2007, 2-2). • Establish appropriate (herbicide-specific) buffer zones to downstream water bodies, habitats, and species/populations of interest (see Appendix C of PEIS, Table C-16). • Areas with potential for groundwater for domestic or municipal water use shall be evaluated through the appropriate, validated USEPA model(s) to estimate vulnerability to potential groundwater contamination, and appropriate mitigation measures shall be developed if such an area requires the application of herbicides and cannot otherwise be treated with nonchemical methods. • Minimize the use of terrestrial herbicides (especially bromacil, diuron, and sulfometuron methyl) in watersheds with downgradient ponds and streams if potential impacts to aquatic plants are identified. • Establish appropriate (herbicide-specific) buffer zones (see Tables 4-12 and 4-14 in Chapter 4 of the Final PEIS) around downstream water bodies, habitats, and species/populations of interest. Consult the ecological risk assessments (ERAs) prepared for the PEIS for more specific information on appropriate buffer distances under different soil, moisture, vegetation, and application scenarios. • Limit the aerial application of chlorsulfuron and metsulfuron methyl to areas with difficult land access, where no other means of application are possible. Do not apply sulfometuron methyl aerially. • To protect special status plant species, implement all conservation measures for plants presented in the Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment. • Limit the use of diquat in water bodies that have native fish and aquatic resources. • Limit the use of terrestrial herbicides (especially diuron) in watersheds with characteristics suitable for potential surface runoff that have fish-bearing streams during periods when fish are in life stages most sensitive to the herbicide(s) used. • To protect special status fish and other aquatic organisms, implement all conservation measures for aquatic animals presented in the Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment. • Establish appropriate herbicide-specific buffer zones for water bodies, habitats, or fish or other aquatic species of interest (see Final PEIS Appendix C, Table C-16, and recommendations in individual ERAs). • Consider the proximity of application areas to salmonid habitat and the possible effects of herbicides on riparian and aquatic vegetation. Maintain appropriate buffer zones around salmonid-bearing streams (see Appendix C, Table C-16, of the Final PEIS, and recommendations in the individual ERAs). • Avoid using the adjuvant R-11® in aquatic environments, and either avoid using glyphosate formulations containing polyoxyethyleneamine (POEA), or seek to use formulations with the least amount of POEA, to reduce risks to aquatic organisms in aquatic environments.

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	• At the local level, consider effects to special status fish and other aquatic organisms when designing treatment programs. • To minimize risks to terrestrial wildlife, do not exceed the typical application rate for applications of dicamba, diuron, glyphosate, hexazinone, tebuthiuron, or triclopyr, where feasible. • Minimize the size of application areas, where practical, when applying 2,4-D, bromacil, diuron, and Overdrive® to limit impacts to wildlife, particularly through contamination of food items (BLM, 2007, 2-4). • Where practical, limit glyphosate and hexazinone to spot applications in rangeland and wildlife habitat areas to avoid contamination of wildlife food items. • Avoid using the adjuvant R-11® in aquatic environments, and either avoid using glyphosate formulations containing POEA, or seek to use formulations with the least amount of POEA, to reduce risks to amphibians. • Do not apply bromacil or diuron in rangelands, and use appropriate buffer zones (see Tables 4-12 and 4-14 in Chapter 4 of the Final PEIS) to limit contamination of off-site vegetation, which may serve as forage for wildlife. • Do not aerially apply diquat directly to wetlands or riparian areas.• To protect special status wildlife species, implement all conservation measures for terrestrial animals presented in the Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment. • Minimize potential risks to livestock by applying diuron, glyphosate, hexazinone, tebuthiuron, and triclopyr at the typical application rate, where feasible. • Do not apply 2,4-D, bromacil, dicamba, diuron, Overdrive®, picloram, or triclopyr across large application areas, where feasible, to limit impacts to livestock, particularly through the contamination of food items. • Where feasible, limit glyphosate and hexazinone to spot applications in rangeland. • Do not aerially apply diquat directly to wetlands or riparian areas used by livestock. • Do not apply bromacil or diuron in rangelands, and use appropriate buffer zones (see Tables 4-12 and 4-14 in Chapter 4 of the Final PEIS) to limit contamination of off-site rangeland vegetation. • Minimize potential risks to wild horses and burros by applying diuron, glyphosate, hexazinone, tebuthiuron, and triclopyr at the typical application rate, where feasible, in areas associated with wild horse and burro use. • Consider the size of the application area when making applications of 2,4-D, bromacil, dicamba, diuron, Overdrive®, picloram, and triclopyr in order to reduce potential impacts to wild horses and burros. • Apply herbicide label grazing restrictions for livestock to herbicide treatment areas that support populations of wild horses and burros. • Where practical, limit glyphosate and hexazinone to spot applications in rangeland. • Do not apply bromacil or diuron in grazing lands within herd management areas (HMAs), and use appropriate buffer zones identified in Tables 4-12 and 4-14 in Chapter 4 of the Final PEIS to limit contamination of vegetation in off-site foraging areas. • Do not apply 2,4-D, bromacil, or diuron in HMAs during the peak foaling season (March through June, and especially in May and June), and do not exceed the typical application rate of Overdrive® or hexazinone in HMAs during the peak foaling season in areas where foaling is known to take place. • Do not exceed the typical application rate when applying 2,4-D, bromacil, diquat, diuron, fluridone, hexazinone, tebuthiuron, and triclopyr in known traditional use areas. • Avoid applying bromacil or tebuthiuron aerially in known traditional use areas. • Limit diquat applications to areas away from high residential and traditional use areas to reduce risks to Native Americans and Alaska Natives (BLM, 2007, 2-5). • Use the typical application rate, where feasible, when applying 2,4-D, bromacil, diquat, diuron, fluridone, hexazinone, tebuthiuron, and triclopyr to reduce risk to occupational and public receptors. • Avoid applying bromacil and diuron aerially. Do not apply sulfometuron methyl aerially. • Limit application of chlorsulfuron via ground broadcast applications at the maximum application rate.

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	• Limit diquat application to ATV, truck spraying, and boat applications to reduce risks to occupational receptors; limit diquat applications to areas away from high residential and subsistence use to reduce risks to public receptors. • Evaluate diuron applications on a site-by-site basis to avoid risks to humans. There appear to be few scenarios where diuron can be applied without risk to occupational receptors. • Do not apply hexazinone with an over-the-shoulder broadcast applicator (BLM, 2007, 2-6).
NW-MA-14.	The BLM may use interactive risk assessment spreadsheets and other information contained in ecological risk assessments (ERAs) prepared in support of the PEIS to develop more site-specific mitigation and management plans based on local site-specific conditions (e.g., soil type, rainfall, vegetation type, herbicide treatment method, and herbicide application rate) (BLM, 2007, 2-6).
NW-MA-15.	The BLM may use timing restrictions or similar practices to reduce the level of risk to an acceptable level (BLM, 2007, 2-6).
NW-MA-16.	Vegetation treatments will be monitored within a variety of established monitoring programs to determine the success of the completed work, identify corrective measures (if needed), and identify actions that could be taken in the future to enhance treatment success (BLM, 2007, 2-6).
NW-MA-17.	For herbicide use, implementation monitoring is accomplished through the use of Pesticide Use Proposals and Pesticide Application Records (BLM, 2007, 2-6).
NW-MA-18.	The BLM will use the National Invasive Species Information Management System to track the success of herbicide and other invasive species treatments (BLM, 2007, 2-6).
NW-MA-19.	The BLM will use established monitoring methodologies, such as the interagency monitoring program FIREMON, for monitoring fuels treatment effectiveness (BLM, 2007, 2-6).
NW-MA-20.	The BLM will use the Forest Vegetation Information System (FORVIS) (BLM, 2007, 2-6).
NW-MA-21.	Additional monitoring methods and guidance are found in Appendix D (BLM, 2007, 2-7).
Fire Management	
Objective	
FM-O-1.	Manage and use fire consistent with its natural role in the functioning ecosystem and the protection of life and property (RMP, 2-34).
Management Actions	
FM-MA-1.	All fire management activities must comply with other federal regulations on wilderness management, T&E species protection, cultural and historic preservation, and air and water quality standards and guidance.
FM-MA-2.	During reclamation after a fire, a weed management plan is required.
Wildlife	
Objective	
WI-O-1.	Ensure optimum populations and a natural abundance and diversity of fish and wildlife values by restoring, maintaining, and enhancing habitat conditions for consumptive and non-consumptive uses.
Management Actions	
WI-MA-1.	Priority management activities include big game management and surveys to determine game population size and health. The FFO also determines the numbers, habitat needs, and distribution of non-T&E bird species including migratory songbirds (RMP, 2-24).
WI-MA-2.	The protection and enhancement of wildlife habitat is accomplished through an aggressive program of habitat improvement projects, designated of SDAs with wildlife-friendly management prescriptions, and the application of mitigation measures on key wildlife lands where oil and gas reserves are being developed (RMP, 2-24).

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WI-MA-3.	Continue the monitoring program to assess the status of avian species utilizing the key habitat types common to the FFO area. This monitoring effort consists of conducting point count surveys during the spring breeding period and during the winter in the following habitat types: • Pinon-juniper • Ponderosa pine/pinon pine/Gambel's oak • Riparian (cottonwood, willow, saltcedar) • Wyoming big sagebrush/grass (untreated) • Wyoming big sagebrush/grass (treated) (RMP, 2-25).
WI-MA-4.	HMPs or activity plans will be developed for wildlife management areas, especially the six Wildlife SDAs without plans (RMP, 2-25).
WI-MA-5.	HMPs developed for Rattlesnake Canyon and Crow Mesa SDAs will be implemented (RMP, 2-25).
WI-MA-6.	Mitigation measures to protect or restore wildlife habitat include the following: • No hardwood tree with a diameter of 10 inches or more at the base or any ponderosa pine, Douglas fire, or aspen tree is to be removed or damaged without approval from the AO. • Use of pesticides and herbicides shall comply with applicable federal and state laws. • Permit holder shall be responsible for weed control and selective control of invasive weeds on disturbed land and reclaimed areas within the limits of the well pad, associated road, and pipeline ROW (RMP, 2-25). • Permit holder is responsible for consultation with the AO and/or local authorities for acceptable weed control methods within limits imposed in the COAs. • In order to protect important antelope fawning habitat, exploration, drilling and other development activity will be allowed only during the period from May 1 through July 15. Limitation does not apply to maintenance and operation of producing wells. Exception to this limitation may be, specifically authorized in writing by the AO of the Federal surface management agency. • In order to protect important season wildlife habitat (elk calving range), exploration, drilling, and other development activity will be allowed only during the period from July 15 through November 30. This limitation does not apply to maintenance and operation of producing wells. Exception to this limitation may be specifically authorized in writing by the AO of the Federal surface management agency. • Seasonal restrictions are applied to prohibit surface disturbance in key habitats for deer. • Permanent or temporary pipelines for water disposal will be installed as early as possible to eliminate excessive truck traffic in sensitive wildlife areas. Exceptions may be considered on a case-by-case basis. • Unguarded pits containing liquids will be fenced with woven wire. All fencing must be in accordance with New Mexico State Law. • Unless otherwise agreed to by the AO in writing, powerlines shall be constructed in accordance to standards outlined in "Suggested Practices for Raptor Protection on Powerlines" (Olendorff et al. 1981). • No construction, drilling, or completion activities shall be conducted between March 1 and June 30 in buffer zones surrounding active raptor nests. • In key area, where practical, well data may be required to be transmitted electronically to reduce vehicle traffic and wildlife disturbance (RMP, 2-26).
WI-MA-7.	Implement Habitat Management Plans (RMP, D-1).
WI-MA-8.	Continue to do mechanical treatments of sagebrush and pinyon-juniper woodlands for wildlife habitat improvement (RMP, D-3).
Special Status Species	
Objective	
SS-O-1.	Comply with federal and state requirements for protection of threatened and endangered species and their habitat.
SS-O-2.	Protect the habitat of sensitive, non-listed species to prevent the need for listing them as threatened or endangered.
Management Actions	
SS-MA-1.	Habitat management plans (HMPs) or activity plans will be developed for the five Threatened and Endangered Species ACECs (RMP, 2-32).

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SS-MA-2.	No surface disturbance shall be permitted in bald eagle core areas (RMP, 2-32).
SS-MA-3.	No construction activities shall be conducted between November 1 and March 31 in bald eagle buffer zones, unless approved on a case-by-case basis (RMP, 2-32).
SS-MA-4.	Golden eagle (Aquila chrysaetos), ferruginous hawk (Buteo regalis), and prairie falcon (Falso mexicanus) nest sites: No construction, drilling, or completion activities shall be conducted between March 1 to June 30 in a radius of 1/3 mile around active and historic nest sites (RMP, 2-32).
SS-MA-5.	Mitigation for peregrine falcon nest sites will be determined on a site-specific basis using the principle of designating sensitive zones in which disturbance is seasonally restricted as delineated in Johnson (1994) (RMP, 2-32).
SS-MA-6.	All oil and gas producers will receive a list of sections by legal location that contain established raptor nests. If a producer wishes to install or operate a new compressor between March 1 and June 30 in a designated raptor section, the compressor must not emit more than 48.6 dbA at 30 feet from the compressor or the producer may submit a sundry prior to installing a compressor so the FFO T&E biologist can evaluate the situation and recommend a mitigation solution. The coordinated mitigation solution will not be more stringent than 48.6 dbA at 300 feet (RMP, 2-32).
SS-MA-7.	All proposed actions within unsurveyed suitable habitat for any current or proposed T&E (state or federally listed) species will require surveys according to the responsible agency's protocol. Restrictions will be placed on surface disturbing activities in suitable habitat until these inventories are complete. The absence of any T&E species must be confirmed prior to approval of any surface disturbing action that may affect the habitat. If a T&E species is found, appropriate restrictions on new development will be imposed to avoid or mitigate adverse impacts. USFWS and affected agency shall be involved in Section 7 consultation, if necessary (RMP, 2-32).
SS-MA-8.	When individual plants or suitable habitat for Brack's cactus are found during a biological survey for a ground-disturbing project, the company proposing the project will be required to transplant plants from the project area if well relocation or directional drilling are not feasible (RMP, 2-32).
SS-MA-9.	Aztec gilia mitigation measures will be implemented on a case-by-case basis (RMP, 2-32).
Wild Horses	
Allocation	
WH-A-1.	Provide forage for 23 wild and free roaming horses on the Rosa Community Allotment (RMP, D-2).
Cultural Resources	
Objective	
CR-O-1.	Respond in a legally and professionally adequate manner to (1) the statutory authorities concerning historic preservation and cultural resource protection, and (2) the principles of multiple use (RMP, 2-36).
CR-O-2.	Recognize the potential public and scientific uses of, and the values attributed to, cultural resources on the public lands, and manage the lands and cultural resources so that these uses and values are not diminished, but rather are maintained and enhanced (RMP, 2-36).
CR-O-3.	Contribute to land use planning and the multiple use management of the public lands in ways that make optimum use of the thousands of years of land use history inherent in cultural resource information, and that safeguard opportunities for attaining appropriate uses of cultural resources (RMP, 2-36).
CR-O-4.	Protect and preserve in place representative examples of the full array of cultural resources on public lands for the benefit of scientific and public use by present and future generations (RMP, 2-36).
CR-O-5.	Ensure that proposed land uses, initiated or authorized by BLM, avoid inadvertent damage to federal and no-federal cultural resources (RMP, 2-37).
Allocations	
CR-A-1.	No sites are specifically allocated for experimental use or for discharge from management (RMP, 2-37).
Management Actions	
CR-MA-1.	Maintain copies of the investigative records prepared for cultural resources associated with federal undertakings (RMP, 2-37).
CR-MA-2.	Work cooperatively with the Navajo Nation to ensure that any areas of interest are identified in advance of project decisions so site-specific consultations can be targeted (RMP, 2-38).

Unique ID	Decision
CR-MA-3.	The following mitigation measures apply to situations that may occur during surface-disturbing activities. Others may be developed to apply to site-specific activities and permits, as appropriate to the location. • Discovery of Cultural Resources in the Absence of Monitoring: If, in its operation, an operator/holder discovers any previously unidentified historic or prehistoric cultural resources then work in the vicinity of the discovery will be suspended and the discovery promptly reported to the BLM Field Office Manager. The BLM will then specify what action is to be taken. If there is an approved "discovery plan" in place for the project, then the plan will be executed. In the absence of an approved plan, BLM will evaluate the significance of the discovery and consult with the State Historic Preservation Officer in accordance with 36 CFR Section 800.11. • Discovery of Cultural Resources During Monitoring: If monitoring confirms the presence of previously unidentified cultural resources, then work in the vicinity of the discovery will be suspended and the discovery promptly reported to the BLM Field Office Manager. BLM will then specify what action is to be taken. If there is an approved "discovery plan" in place for the project, then the plan will be executed. In the absence of an approved plan, BLM will evaluate the significance of the discovery and consult with the State Historic Preservation Officer in accordance with 36 CFR Section 800.11 (RMP, 2-38). • Damage to Sites: If, in its operations, operator/holder damages, or is found to have damaged, any previously documented or undocumented historic or prehistoric cultural resources, excluding "discoveries" as noted above, the operator/holder agrees at his/her expense to have a permitted cultural resources consultant prepare and have executed a BLM approved data recovery plan. Damage to cultural resources may result in civil or criminal penalties in accordance with the Archeological Resource Protection Act of 1979 (as amended) (RMP, 2-39).
Paleontological Resources	
Objective	
PR-O-1.	Facilitate research and collection on public lands and use for education and recreation (RMP, 2-39).
PR-O-2.	Protect scientifically valuable resources that may be in conflict with other land and resource uses (RMP, 2-39).
PR-O-3.	Protect scientifically valuable fossils, as required by law (RMP, 2-39).
Management Actions	
PR-MA-1.	Identify and evaluate paleontological resources so they may be adequately addressed in planning and environmental analysis documents (RMP, 2-39).
PR-MA-2.	Maintain and conduct an effective and continuing protection program (RMP, 2-39).
PR-MA-3.	Increase the awareness of federal land managers and the public regarding the significance of paleontological resources and management requirements, and encourage the public to participate in resource management (RMP, 2-39).
PR-MA-4.	Develop volunteer or cooperative management agreements and associations with individuals, professional paleontologists, local organizations and governments, and the scientific community (RMP, 2-39).
PR-MA-5.	Avoid or mitigate impacts to valuable paleontological resources (RMP, 2-39).
PR-MA-6.	Avoid publicizing the exact locations of scientifically significant paleontological resources if such attention would conflict with management objectives (RMP, 2-39).
PR-MA-7.	Manage and issue collection permits when appropriate (RMP, 2-39).
PR-MA-8.	If in the conduct of any surface disturbing operations, paleontological material is observed, the lessee or operator shall cease operations that would result in the destruction of such objects and immediately contact the BLM. Further investigation will dictate site-specific stipulations for avoidance or salvage of any significant paleontological resources (RMP, 2-39).
Visual Resources	
Objective	
VR-O-1.	Systematically identify and evaluate these resources to determine an appropriate level of management, then manage all activities to meet that level (RMP, 2-20).

Unique ID	Decision
Allocations	
VR-A-1.	Until the VRI is complete, the list below summarizes the acreage of VRM classes within the FFO area: • Class I: 83,433 acres • Class II: 560,143 acres • Class III: 1,104,717 acres • Class IV: 2,323,810 acres (RMP, 2-20). – Change when VRM ROD IS signed (next couple weeks0
Management Actions	
VR-MA-1.	Mitigation measures for visual resources listed below apply primarily to mineral extraction activities and are not all-inclusive. Additional mitigation measures for mineral extraction or other program activities may be developed and implemented as necessary. • Operators may be required, on a case-by-case basis, to leave a tree screen on one or more sides of a location. • Above-ground structures are required to be painted in one of five colors designated to blend with the natural color of the landscape. • Permit holders are required to coordinate with the Authorized Officer on the design and color of power poles and transmission lines to achieve minimal practicable visual impacts. • Permit holders may be required to reconstruct rock rims as near as possible to the original (RMP, 2-20)
Minerals	
Objective	
MIN-O-1.	Make mineral resources available for disposal and encourage development of mineral resources to meet national, regional, and local needs, consistent with national objectives of an adequate supply of minerals at reasonable market prices (RMP, 2-2).
MIN-O-2.	Ensure that mineral development is carried out in a manner that minimizes the environmental damage and provides for the rehabilitation of affected lands (RMP, 2-3).
Management Actions	
MIN-MA-1.	Some mitigation measures directly related to mineral extraction are described below: • Standardized drilling window offsets will be employed to reduce the number of drill sites needed. Dual completion, re-completion, and commingling (both downhole and at the surface) will be encouraged and permitted in order to reduce the number of new well pads and consequent surface disturbance. • A compliance plan for new well pads and ROWs will be developed to integrate existing initiatives and prioritize areas with outstanding problems. A timeline for correcting problem areas will be included as will a strategy for assigning adequate personnel to address the issue of compliance and reclamation. • Pipelines will follow existing roads where possible in order to minimize surface disturbance and consequent potential impacts to soils, vegetation, and habitats. This will also serve to reduce potential for spread of noxious weeds. • Oil and gas development will be restricted in areas that have special topographic (steep or broken terrain and/or on benches) and soil concerns in order to reduce impacts caused by soil erosion and habitat disturbance. Development in these areas will be considered on a case-by-case basis and will contain site-specific mitigation designed to prevent increased sediment from being transported into drainages and to prevent fragmentation of areas determined to provide important wildlife habitat. • Operators are encouraged to unitize in areas of dense development to increase management efficiency and facilitate operations in sensitive areas. • Drilling within 1,000 horizontal feet of Navajo Dam and appurtenant structures will be restricted. This includes the foundation of the dam, which extends 1,320 feet upstream and 1,260 feet downstream from the dam axis (RMP, 2-7). • Electronic transmission of well data and piping of produced water will be required, where feasible, to reduce the number of vehicle visits to wells in order to reduce disturbance to wildlife and direct mortality as a result of road kills. It will also reduce the amount of dust, potential increased sedimentation, disruption of livestock operations, and recreational uses.

Unique ID	Decision
	Oil and Gas
Allocations	
OG-A-1.	A total of 2,597,193 acres of BLM-managed land will be open for oil and gas leasing and development under Standard Terms and Conditions (ROD, 3; RMP, 2-3).
OG-A-2.	Lands subject to oil and gas leasing restrictions are listed in Appendix A (ROD, 3).
OG-A-3.	Approximately 286,910 acres are subject to Controlled Surface Use stipulations for new leasing, in all or part of the SDAs listed below: • Alien Run Mountain Bike Trail • Bald Eagle ACEC • Betonnie Tsosie Fossil Area • Bohannon Canyon Fossil Complex • Carson Fossil Pocket • Cedar Hill ACEC • Cereza Canyon Wildlife Area • Crow Mesa Wildlife Area • Dzil'na'oodlii ACEC • Ensenada Mesa Wildlife Area • Ephemeral Wash Riparian Area • Glade Run Recreation Area • Gobernador and Cereza Canyon Fossil Area • Gonzales Mesa Wildlife Area • Kutz Canyon Fossil Area • La Jara ACEC • Laguna Seca Mesa Wildlife Area • Lybrook Fossil Area • Mexican Spotted Owl ACEC • Middle Mesa Wildlife Area • Munoz Canyon ACEC • Navajo Lake Horse Trail • Pinon Mesa Fossil Area • Pinon Mesa Recreation Area • Rattlesnake Canyon Wildlife Area • River Tracts Riparian Area • Rock Garden Recreation Area • Rosa Mesa Wildlife Area • San Rafael Canyon ACEC • 1870s Wagon Trail SMA (AFO) • Canon Jarido SMA (AFO)

Unique ID	Decision
	• Elk Springs ACEC (AFO) • Headcut Prehistoric Community SMA (AFO) • Historic Homesteads SMA (AFO) • San Luis Cliffs Window SMA (AFO) • San Luis Mesa Raptor ACEC (AFO) • Torrejon Fossil Fauna ACEC (AFO) (RMP, 2-3).
OG-A-4.	Approximately 25,442 acres will be under No Surface Occupancy stipulations for new leases, in all or part of the SDAs listed below: • Adams Canyon ACEC • Ah-shi-sle-pah Road ACEC • Albert Mesa ACEC • Angel Peak ACEC • Angel Peak Scenic Area • Ashii Na'a'a' ACEC • Bi Yaazh ACEC • Blanco Mesa ACEC • Blanco Star Panel ACEC • Cagle's Site ACEC • Canyon View ACEC • Cho'li'l ACEC • Christmas Tree Ruin ACEC • Church Rock Outlier ACEC • Cottonwood Divide ACEC • Crow Canyon ACEC • Deer House ACEC • Delgadita-Pueblo Canyons ACEC • Devil's Spring Mesa ACEC • Dogie Canyon School ACEC • Dunes Vehicle Recreation Area • East Side Rincon Site ACEC • Encierro Canyon ACEC • Encinada Mesa-Carrizo Canyon ACEC • Farmer's Arroyo ACEC • Four Ye'I ACEC • Frances Mesa ACEC • Gonzalez Canyon-Senon S. Vigil Homestead ACEC • Gould Pass Camp ACEC • Haynes Trading Post ACEC

Unique ID	Decision
	• Head Canyon motocross Track • Hummingbird ACEC • Hummingbird Canyon ACEC • Jacques Chacoan Community ACEC • Kachina Mask ACEC • Kin Yazhi ACEC • Kiva ACEC • Largo Canyon Star Ceiling ACEC • Margarita Martinez Homestead ACEC • Martin Apodaca Homestead ACEC • Martinez Canyon ACEC • Moss Trail ACEC • Negro Canyon SDA • Pointed Butte ACEC • Pork Chop Pass ACEC • Pregnant Basketmaker ACEC • Pretty Woman ACEC • Prieta Mesa ACEC • Rincon Largo District ACEC • Rincon Rockshelter ACEC • Rock House-Nestor Martin Homestead ACEC • Santos Peak ACEC • Shield Bearer ACEC • Simon Ruin ACEC • Star Rock ACEC • Star Spring-Jesus Canyon ACEC • String House ACEC • Superior Mesa ACEC • Tapacito and Split Rock ACEC • Truby's Tower ACEC • Azabache Station SMA (AFO) • Continental Divide Trail SMA (AFO) • Cuba Airport SM (AFO) (RMP, 2-4)

Unique ID	Decision
OG-A-5.	Nondiscretionary closures will occur on 111,148 acres. These areas are contained in designated Wilderness, Wilderness Study Areas (WSAs), and Specially Designated Areas (SDAs) (ROD, 3) as listed below: • Ah-shi-sle-pah WSA • Bisti/De-Na-Zin Wilderness Area • Fossil Forest Research Natural Area • Lake Valley Chaco Cultural Archaeological Protection Site • Cabezon WSA (AFO) • Chamisa WSA (AFO) • Empedrado WSA (AFO) • Ignacio Chavez SMA (AFO) • Ignacio Chavez WSA (AFO) • La Lena WSA (AFO) (RMP, 2-5)
OG-A-6.	Approximately 79,000 acres, primarily contained within SDAs, will be closed to new leasing (ROD, 3): • Andrews Ranch ACEC • Bee Burrow ACEC • Beechatuda Tongue Geological Formation • Bis sa'ani ACEC • Carracas Mesa Recreation/Wildlife Area • Casa del Rio Chaco Culture Archaeological Protection Site • Casamero Community ACEC • Chacra Mesa Complex ACEC • Crownpoint Steps and Herradura ACEC • East La Plata Wildlife Area • Greenlee Ruin Chaco Cultural Archaeological Protection Site • Halfway House ACEC • The Hogback ACEC • Holmes Group ACEC • Indian Creek ACEC • Kin Nizhoni ACEC • Morris 41 ACEC • North Road ACEC • Pierre's Site ACEC • Reese Canyon Research Natural Area • Simon Canyon ACEC • Thomas Canyon Natural/Wildlife Area • Toh-la-kai ACEC • Twin Angles ACEC

<table>
<tr><th>Unique ID</th><th>Decision</th></tr>
<tr><td></td><td>

Upper Kin Klizhin ACEC (RMP, 2-5)
Cabezon Peak ACEC (AFO)
Jones Canyon SMA (AFO)
Juana Lopez Research Natural Area (AFO)
Pelon Watershed SMA (AFO) (RMP, 2-6)

</td></tr>
<tr><td>OG-A-7.</td><td>Seasonal Timing Limitations will be employed on 483,807 acres (Map 2-11; ROD, 5), in the areas listed in Table 1 (RMP, 2-6 to 2-7).

Table 1. Areas with Timing Limitations
<table>
<tr><th>Area</th><th>Administrative Office</th><th>Time Period</th><th>Purpose</th></tr>
<tr><td>Bald Eagle ACEC</td><td>FFO</td><td>November 1 through March 31</td><td>Protection of important seasonal wildlife habitat (buffer zones around bald eagle use areas)</td></tr>
<tr><td>Cereza Canyon Wildlife Area</td><td>FFO</td><td>December 1 through March 31</td><td>Protection of important seasonal wildlife habitat (big game winter range)</td></tr>
<tr><td>Crow Mesa Wildlife Area</td><td>FFO</td><td>December 1 through March 31</td><td>Protection of important seasonal wildlife habitat (big game winter range)</td></tr>
<tr><td>East La Plata Wildlife Area</td><td>FFO</td><td>December 1 through March 31</td><td>Protection of important seasonal wildlife habitat (big game winter range)</td></tr>
<tr><td>Ensenada Mesa Wildlife Area</td><td>FFO</td><td>May 1 through July 15</td><td>Protection of important seasonal wildlife habitat (antelope fawning range)</td></tr>
<tr><td>Gonzales Mesa Wildlife Area</td><td>FFO</td><td>December 1 through March 31</td><td>Protection of important seasonal wildlife habitat (big game winter range)</td></tr>
<tr><td>Middle Mesa Wildlife Area</td><td>FFO</td><td>December 1 through March 31</td><td>Protection of important seasonal wildlife habitat (big game winter range)</td></tr>
<tr><td>Raptor nest sites</td><td>FFO</td><td>March 1 through June 30</td><td>Protection of important seasonal wildlife habitat (bird of prey nests)</td></tr>
<tr><td>Rattlesnake Canyon Wildlife Area</td><td>FFO</td><td>December 1 through March 31</td><td>Protection of important seasonal wildlife habitat (big game winter range)</td></tr>
<tr><td>Rosa Mesa Wildlife Area</td><td>FFO</td><td>December 1 through March 31</td><td>Protection of important seasonal wildlife habitat (big game winter range)</td></tr>
<tr><td>Rosa Mesa Wildlife Area: Designated habitat</td><td>FFO</td><td>December 1 through July 15</td><td>Protection of important seasonal wildlife habitat (elk calving)</td></tr>
<tr><td>Canon Jarido SMA</td><td>AFO</td><td>February 1 to July 1</td><td>Protection of recreational, wildlife, and cultural values</td></tr>
<tr><td>Elk Springs ACEC</td><td>AFO</td><td>May 15 to November 15</td><td>Protection of elk and deer winter range and recreational and scenic values</td></tr>
<tr><td>Ignacio Chaves SMA</td><td>AFO</td><td>May 15 to November 15</td><td>Protection of elk and deer winter range and recreational and scenic values</td></tr>
<tr><td>San Luis Mesa Raptor Area ACEC</td><td>AFO</td><td>July 2 to January 31</td><td>Protection of raptor nesting habitat</td></tr>
</table>
</td></tr>
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Unique ID	Decision
Management Actions	
	Note: The specific stipulation and lease notice wording to apply to leases is contained in Appendix B of the 2003 ROD. OG-MA-1 and OG-MA-2 summarize the stipulations and lease notices.
OG-MA-1.	The following stipulations are attached to new leases issued in specific areas. Stipulations with the prefix of F are applied to the FFO, those with the prefix of RP are applied to the RPFO, and those with the prefix of NM apply across both field office boundaries (ROD, B-1). • F1 Timing Limitation Stipulation – Important Seasonal Wildlife Habitat – Raptor: No surface use is allowed March 1 through June 30 on raptor nest sites for the protection of important seasonal wildlife habitat (bird of prey nests). This stipulation does not apply to operation and maintenance of production facilities. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period (ROD, B-1). • F-3 Timing Limitation Stipulation – Critical Bald Eagle Areas: No surface use is allowed November 1 through March 31 in the Bald Eagle ACEC (37 units totaling 4,141 acres) for the protection of important seasonal wildlife habitat (buffer zones around bald eagle use areas). Within buffer zones are areas of intensive bald eagle use such as roost sites where any surface disturbing activity is prohibited yearlong. This stipulation does not apply to operation and maintenance of production facilities. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period ROD, B-2). • F-4 Timing Limitation Stipulation – Important Seasonal Wildlife Habitat: No surface use is allowed December 1 through March 31 in the Cereza Canyon Wildlife Area (27,868 acres), Crow Mesa Wildlife Area (34,264 acres), East La Plata Wildlife Area (5,814 acres), Gonzales Mesa Wildlife Area (6,103 acres), Middle Mesa Wildlife Area (40,317 acres), Rattlesnake Canyon (98,276 acres), Rosa Mesa Wildlife Area (61,406 acres) for the protection of important seasonal wildlife habitat (big game winter range). This stipulation does not apply to operation and maintenance of production facilities. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period (ROD, B-2). • F-19 No Surface Occupancy Stipulation – Special Cultural Values: No surface occupancy or use is allowed on specific cultural resource ACECs to protect cultural resource values. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period (ROD, B-4). • F-21 Timing Limitation Stipulation – Antelope Habitat: No surface use is allowed May 1 through July 15 in Ensenada Mesa Wildlife Area (45,767 acres) to protect important seasonal wildlife habitat (antelope fawning range). This stipulation does not apply to operation and maintenance of production facilities.

Unique ID	Decision
	o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period (ROD, B-4). • F-22 Timing Limitation Stipulations – Elk Calving Habitat: No surface use is allowed December 1 through July 15 on designated elk calving habitat in Rosa Mesa Wildlife Area (2,500 acres) to protect important seasonal wildlife habitat (elk calving). This stipulation does not apply to operation and maintenance of production facilities. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period (ROD, B-5). • F-23 No Surface Occupancy Stipulation – Beechatuda Tongue: No surface occupancy or use is allowed on portions of T. 30 N., R. 15 W., Section 5: NW1/4 (100 acres) to preserve the unit to be studies for stratigraphic nomenclature. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period (ROD, B-5). • F-25 No Surface Occupancy Stipulation – River Tracts Special Management Area: No surface occupancy or use is allowed on the River Tract ACEC (30 tracts; 2,699 acres) within the active floodplain and designated Threatened or Endangered Species habitat including: o Animas River tracts: 1, 2, and 9- La Plata River tracts: 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10 o San Juan River tracts: Archuleta, Blanc, Bloomfield, Bradshaw, Bull Calf, Desert Hills, Gallegos, Jewett valley, Kutz, La Plata, Santa Rosa, Schneider, Simon Canyon, South Bloomfield, Subdivision, Valdez, and Wheeler. o As river properties are acquired through land exchanges, other tracts may be added to protect riparian habitat, Southwest willow flycatcher potential habitat, bald eagle use areas, and other important values. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period. o Exception: No exceptions are allowed within the active floodplain. Exceptions within threatened or endangered species habitat would only be allowed if the U.S. Fish and Wildlife concurs that there would be no adverse effect on listed species or their habitat (ROD, B-6). • F- No Surface Occupancy/Controlled Surface Use Stipulation – Ephemeral Wash Riparian Area: No surface occupancy is allowed on active floodplains in the Ephemeral Wash Riparian Area SDA for the protection of riparian systems and facilitation of attainment and maintenance of proper functioning condition. Controlled surface use requiring special mitigation measures to stabilize channels in order to prevent migration of channel on to well sites may be required within the 100-year floodplain.

Unique ID	Decision
	o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period (ROD, B-8). • RP-1 Stipulation Important Seasonal Wildlife Habitat: In order to protect important seasonal wildlife habitat, exploration, drilling and other development activities will be allowed only during the period from July 2 to January 31 in the San Luis Mesa Raptor Area ACEC (5,271 acres) to protect raptor nesting habitat. This limitation does not apply to maintenance and operation of producing wells. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period (ROD, B-8). • RP-2 Stipulation Important Seasonal Wildlife Habitat: In order to protect important seasonal wildlife habitat, exploration, drilling, and other development activity will be allowed only during the period from May 15 to November 15 in the Elk Springs ACEC (9,445 acres) and Ignacio Chaves SDA (4,085 acres) to protect elk and deer winter range and recreational and scenic values. This limitation does not apply to maintenance and operation of producing wells. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period. o Exception: Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of the Bureau of Land Management (ROD, B-9). • RP-8 Timing Limitation Stipulation: In order to protect important seasonal wildlife habitat, exploration, drilling, and other development activity will be allowed only during the period from February 1 to July 1 in the Canon Jarido SDA (1,803 acres) for the protection of recreational, wildlife, and cultural values. This limitation does not apply to maintenance and operation of producing wells. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period. o Exception: Exceptions to this limitation in any year may be specifically authorized in writing by the authorized officer of the Bureau of Land Management (ROD, B-9). • RP-10 Stipulation – No Surface Occupancy: No surface occupancy will be allowed when a lease area contains a Church or Cemetery. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period (ROD, B-10).

Unique ID	Decision
	• NM-4 Stipulation for Leases Subject to a Highway Material Site ROW: The lessee/operator shall conduct operations in conformity with the following requirements: o The New Mexico Department of Transportation (NMDOT) will have unrestricted rights of ingress and egress to the ROW. o The lessee/operator will not conflict with the right of the NMDOT to remove any road-building materials from the ROW. o NMDOT reserves the right to set up, operate, and maintain such facilities as are reasonable to expedite the removal, production, and use of the materials; and the lessee shall not interfere with NMDOT's use of the property for such purposes. o The lessee/operator will make no excavations and erect no structures on the ROW that might be adverse to the use and interest of the land by NMDOT (ROD, B-10). • NM-6 Continental Divide Trail: No occupancy or other surface disturbance will be allowed within 1,000 feet of the Continental Divide National Scenic Trail Treadway. o Modification: This distance may be modified when specifically approved in writing by the BLM (ROD, B-11). • NM-10 Drainage Stipulation for Federal Lands: All, or part, of the lands contained in this lease are subject to drainage by well(s) located adjacent to this lease. The lessee shall be required within six months of lease issuance to submit to the AO plans for protecting the lease from drainage. Compensatory royalty will be assessed effective the expiration of this six-month period if no plan is submitted. The plan must include either an APD for a protective well, or an application to communitize the lease so that it is allocated production from a protective well off the lease. Either of these options may include obtaining a variance to State-spacing for the area. In lieu of this plan, the lessee shall be required to demonstrate that a protective well would have little or no chance of encountering oil and gas in quantities sufficient to pay in excess the costs of protecting the lease from drainage or an acceptable justification why a protective well would be uneconomical, the lessee shall be obligated to pay compensatory royalty to the Mineral management Service at a rate to be determined by the AO (ROD, B-11).
OG-MA-2.	The following stipulations are rewritten as lease notices for new leases issued in specific areas. Stipulations with the prefix of F are applied to the FFO, those with the prefix of RP are applied to the RPFO, and those with the prefix of NM apply across both field office boundaries (ROD, B-1). • F-9 Controlled Surface Use Stipulation – Paleontology: Surface occupancy or use is subject to the following special operating constraints: restrict vehicles to existing roads and trails, and require a paleontological clearance on surface disturbing activities. This applies to the Betonnie Tsosie Fossil Area (7,267 acres), Bohanon Canyon Fossil Complex (12,468 acres), Carson Fossil Pocket (968 acres), Gobernador and Cereza Canyon (25,643 acres), Kutz Canyon Fossil Area (47,661 acres), Lybrook Fossil Area (19,840 acres), Pinon Mesa Fossil Area (19,033 acres) to protect the areas for scientific study. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period (ROD, B-3). • F-28 Controlled Surface Use Stipulation – Navajo Indian Irrigation Project: Surface occupancy or use is subject to the following special operating constraints on the lands contained within the Navajo Indian Irrigation Project. No oil or gas facilities will be installed that will unduly interfere with the construction or development of the area for agriculture purposes in connection with the Navajo Indian Irrigation Project. The lessee must clear with the Navajo Indian Irrigation Project Manager prior to the installation of any oil and gas equipment so that modification or relocation at a later date may be avoided. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period (ROD, B-6).

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	• F-30 Controlled Surface Use Stipulation – Huerfano Mesa: Surface occupancy or use is subject to the following special operating constrains of the Dzil'na'oodlii ACEC to protect cultural values. Any portion of the lease area that contains these special values will receive special attention to prevent damage to surface resources. Any surface use or occupancy within such areas will be strictly controlled. Use or occupancy will be authorized only when the lessee/operator demonstrates that the area is essential for operations and when the lessee/operator submits a surface use plan of operations, which is satisfactory to the Federal surface management agency, for the protection of these special values and existing or planned uses. After the Federal surface Management Agency has been advised of the proposed surface use or occupancy of these lands and on request of the lessee/operator, the Federal surface management agency will furnish further data on such areas. o Waiver, Exception, and Modification: If circumstances or relative resource values change or if it can be demonstrated that oil and gas operations can be conducted without causing unacceptable impact, this stipulation may be waived, excepted, or modified by the BLM Authorized Officer, if such action is consistent with the provisions of the Farmington RMP, or if not consistent, through a land use plan amendment and associated NEPA analysis document. If the BLM Authorized Officer determines that the waiver, exception, or modification involves an issue of major public concern, the waiver, exception, or modification shall be subject to a 30-day public review period (ROD, B-7).
OG-MA-3.	Minerals under ACECs along the San Juan River and under or close to Navajo Lake shall be developed using NSO and directional drilling. Exceptions may be granted on a case-by-case basis in consultation with appropriate agencies. Any exception to surface occupancy shall have strict additional mitigating measures attached (RMP, 2-33).
OG-MA-4.	Seasonal closure(s) for waterfowl and bald eagle wintering may also apply (RMP, 2-33).
OG-MA-5.	The FFO will work in collaboration with industry, the New Mexico Department of Game and Fish, and other interested parties to develop structured exception criteria to the Seasonal Timing Limitations. Any exceptions will be based on this criteria (ROD, 5).
OG-MA-6.	Development must be conducted in a manner that minimizes adverse impacts to other resources and other land uses and complies with existing laws and regulations (ROD, 4).
OG-MA-7.	Companies applying for permits to drill may be required to evaluate the use of new technology such as directional drilling from existing pads and other techniques in order to reduce surface disturbance with its consequent impacts on soil, water, vegetation, and air resources (ROD, 4).
OG-MA-8.	Standardized drilling window offsets will be employed to reduce the number of drill sites needed (ROD, 4).
OG-MA-9.	Dual completion, re-completion, and commingling (both downhole and at the surface) will be encouraged and permitted in order to reduce the number of new well pads and consequent surface disturbance (ROD, 4).
OG-MA-10.	A compliance plan for new well pads and rights-of-way (ROWs) will be developed by December 1, 2003. This plan will integrate existing initiatives and prioritize areas with outstanding problems. A timeline for correcting problem areas will be included, as will a strategy for assigning adequate personnel to address the issue of compliance and reclamation (ROD, 4).
OG-MA-11.	Pipelines will follow existing roads where possible in order to minimize surface disturbance and consequent potential impacts to soils, vegetation, and habitats. This will also serve to reduce potential for spread of noxious weeds (ROD, 4).
OG-MA-12.	Oil and gas development will be restricted in areas that have special topographic (steep or broken terrain and/or benches) and soil concerns in order to reduce impacts caused by soil erosion and habitat disturbance. Development in these areas will be considered on a case-by-case basis and will contain site-specific mitigation designed to prevent increased sediment from being transported into drainages and to prevent fragmentation of areas determined to provide important wildlife habitat (ROD, 4).
OG-MA-13.	Operators are encouraged to unitize in areas of dense development to increase management efficiency and facilitate operations in sensitive areas (ROD, 4).
OG-MA-14.	Electronic transmission of well data and piping of produced water will be required, where feasible, to reduce the number of vehicle visits to wells in order to reduce disturbance to wildlife and direct mortality as a result of road kills. It will also reduce the amount of dust, potential increased sedimentation, and disruption of livestock operations and recreational uses (ROD, 5).

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OG-MA-15.	The FFO will assist operators in designing plans of development to minimize impacts to oil and gas operations while still meeting wildlife goals (ROD, 5).
OG-MA-16.	Review all lists of parcels submitted for simultaneous drawing, regular competitive, and non-competitive offer to lease filings (RMP, D-2).
OG-MA-17.	Continue to study rehabilitation measures for oil and gas drilling where past efforts have not been successful (RMP, D-2).
OG-MA-18.	Ensure that proper disposal of toxic waste from oil and gas wells are accomplished (RMP, D-2).
Off-Site Mitigation	
OG-MA-19.	Voluntary off-site mitigation funds will be used to development adaptive management strategies, implement management prescriptions in SDAs, fund research related to mitigation and reclamation, and to enhance other resource conditions off site (ROD, 4).
OG-MA-20.	Voluntary contributions made at the discretion of oil and gas operators for land which cannot be reclaimed for the life of the well, will be deposited in an account maintained by San Juan County and San Juan County Farm and Ranch Improvement Board in cooperation with the Farmington District Office per the Memorandum of Understanding dated March 7, 2007 (ROD, 4; PM #15).
OG-MA-22.	A working group consisting of the Farm and Ranch Improvement Board, affected grazing permittees and oil and gas industry representatives, and BLM will evaluate proposals for the distribution of funds (ROD, 4; PM #15).
OG-MA-23.	Seventy percent of the funds will be used for projects to improve public land health (ROD, 4; PM #15).
OG-MA-24.	BLMBLM will be responsible for project development, clearances and implementation. San Juan County will be responsible for the expenditure and payment of funds for work completed (ROD, 4; PM #15).
Mitigation Measures	
OG-MA-25.	Additional mitigation measures may be developed during permitting to address site-specific resource concerns (ROD, 13).
OG-MA-26.	All COAs will be consistent with valid existing rights (ROD, 13).
OG-MA-27.	Noise from oil and gas equipment that operates more than 8 hours/day for more than one week in duration will be kept at or below 48.6 dBA at specific locations to minimize disturbances to people as well as to raptor nest sites for golden eagles, ferruginous hawks, and prairie falcons. The Draft Noise NTL (Appendix B) will be issued as a Final NTL and attached as a COA to APDs and as a stipulation to ROW grants and Sundry Notices in order to reduce impacts from noise generated form oil and gas sites on visitor and residential use areas. (ROD 5; RMP, 2-8).
Coal	
Allocations	
CO-A-1.	Fourteen Preference Right Leasing Applications (PRLAs) containing 28,708 acres of Federal coal are brought forward (Table 2; ROD, 8). The 14 PRLAs designated in the 1988 RMP will be available and the unsuitability criteria previously applied will be in effect (RMP, 2-8).

Table 2. PRLAs

PRLA Serial No.	Federal Coal Acreage	BLM Surface Acreage	Indian Surface Acreage	State Surface Acreage	Criterion Removed Acreage
NM-003752	3,760	2,876	844	0	980
NM-003753	2,951	825	2,126	0	825
NM-003754	2,875	1,875	1,000	0	280
NM-003755	2,588	973	1,615	0	669
NM-003835	375	650	0	85	325
NM-003837	560	560	0	0	0
NM-003918	3,357	2,998	359	0	884
NM-003919	3,598	3,598	0	0	3,124

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NM-006802	213	213	0	0	170
NM-007235	160	160	0	0	0
NM-008128	4,499	1,007	2,811	681	0
NM-008130	2,133	608	1,525	0	0
NM-008745	520	320	200	0	0
NM-011670	1,119	639	0	480	0
Total	**28,708**	**17,302**	**10,480**	**1,246**	**7,257**

Source: BLM (2003a), Table 2-7, page 2-215.

CO-A-2.

Seventeen competitive coal leasing tracts, covering 48,661 acres of Federal coal, will be available for leasing (Table 3; ROD, 8).

Table 3. Competitive Coal Lease Tracts

Tract Name	Federal Surface (acres)	Federal Coal (acres)	Mineable Coal Reserves (millions of tons)	Recoverable Coal Reserves (millions of tons)
Bisti #1	2,933	3,713	150	127
Bisti #4	1,040	2,600	35	30
Bisti #6/8	240	520	1	1
Sundance	0	720	4	1
Catalpa Canyon	0	120	0.4	0.3
Chico Wash South	10,070	11,670	74	63
Crownpoint East	160	9,880	149	124
Divide	400	3,031	16	14
Gallo Wash #1	120	320	11	10
Kimbeto #2	640	640	20	18
La Plata #1	200	200	9	8
La Plata #3	160	200	2	2
Lee Ranch East	0	969	16	14
Lee Ranch Middle	0	5,068	86	73
Lee Ranch West	160	6,410	101	86
Star Lake East #1	1,364	1,840	61	52
Star Lake West #2	440	760	28	24
Total	**17,927**	**48,661**	**763**	**647**

Source: BLM (2003a), Table 2-8, page 2-216.

CO-A-3.

378,285 acres will be considered for future leasing and development (Map 2-9) (ROD, 8). The remainder of the FFO boundary can be considered if there are:

- Commercial quantities,
- Areas with a coal transportation system, and
- When there is a viable market for coal (RMP, 2-8).

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CO-A-4.	One coal tract identified as Lee Ranch by Peabody Natural Resources, Inc., and two coal tracts identified as Twin Peaks and East Pinon by Broken Hill Proprietary Company, Limited, are designated as available for leasing. • Portions of the Twin Peak coal tract that underlie the Pinon Mesa Fossil Area and Pinon Mesa Recreation Area would not be available for leasing and coal development. These lands are identified as Sections 10, 14, and 15 in T. 30 N., R. 14 W. • The lands in NE¼NE¼ of Section 22; E½, N ½NW ¼ of Section 23; and the NE¼, N½SE ¼ of Section 26 would be available for underground coal mining with stipulations that ensure the trail corridors would remain open to public access and paleontological resources are protected. Paleontological surveys prior to underground mining and periodic monitoring of subsidence during mining may be required (ROD, 8 December 2003 Errata Sheet).
Management Actions	
CO-MA-1.	PRLAs affected by Congressional designation of the Bisti/De-Na-Zin Wilderness Area and the Fossil Forest RNA may be exchanged for coal leases in New Mexico if it is in the public interest. Unsuitability criteria will be reapplied, if necessary, when the PRLAs are processed (ROD, 8; RMP 2-8).
CO-MA-2.	Companies interesting in mining coal in the competitive coal leasing tracts are required to submit a lease application and the 20 unsuitability criteria would be reapplied during the leasing process (ROD, 8).
CO-MA-3.	BLM management of existing domestic coal licenses of public lands will continue (ROD, 8).
CO-MA-4.	New domestic coal license applications will be considered on a case-by-case basis (ROD, 8).
CO-MA-5.	Protect the physical and legal availability of all existing water sources on federal coal leases by appropriate lease stipulation (RMP, D-3).
Salable Minerals	
Management Actions	
SA-MA-1.	Valuable sources of salable minerals within the proposed disposal areas near the tri-cities will be identified to enable the FFO to maintain access to these sources in the event that nearby parcels are transferred out of federal ownership (RMP, 2-8).
Land Use Authorizations	
Allocations	
LUA-A-1.	ROW corridors identified by the 2002 Western Utility Group revision of the 1992 Western Regional Corridor Study are designated for powerline and pipeline use (ROD, 6; RMP, 2-11).
Management Actions	
LUA-MA-1.	Activities that would generally be excluded from ROW corridors include mineral material sales, range and wildlife habitat improvements involving surface disturbance and facility construction, campgrounds and public recreational facilities, and other facilities that would attract public use (ROD, 6; RMP, 2-11).
LUA-MA-2.	New oil and gas wells would be sited outside ROW corridors (ROD, 6; RMP 2-11).
LUA-MA-3.	To the extent possible, new ROWs will be located within or parallel to existing ROWs or ROW corridors to minimize resource impacts (RMP, 2-11).
Land Tenure	
Objective	
LT-O-1.	Facilitate the acquisition, exchange, or disposal of public lands in order to provide the most efficient management of public resources (RMP, 2-8).
Allocations	
LT-A-1.	Approximately 340,118 acres of public land will be available for disposal (ROD, 5; Maps 2-2 and 2-5; RMP 2-9).
LT-A-2.	178,237 acres are identified for acquisition within and surrounding SDAs (ROD, 5; RMP 2-9).
LT-A-3.	Parcels identified in the previous RMP and amendments are incorporated into the lands available for disposal or acquisition (ROD, 5).
Management Actions	
LT-MA-1.	Lands on Crouch Mesa and lands along and less than 1 mile east of U.S. Highway 550 between Aztec and Bloomfield will receive priority for disposal to assist the cities in meeting their long-term planning goals for urban development (ROD, 5; RMP 2-9).

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LT-MA-2.	Disposal of parcels within SDAs may be considered, in rare instances, if the Authorized Officer determines, after site-specific environmental analysis, appropriate consultation, and public review, that such a disposal would not have an adverse effect on the management goal of the SDA and would be overall benefit to the public (ROD, 5, 6; RMP 2-9).
LT-MA-3.	Inholdings within SDAs will receive priority for acquisition (ROD, 5; RMP 2-9).
LT-MA-4.	Additional riparian areas will receive priority for acquisition (ROD, 5).
LT-MA-5.	Other lands that consolidate public ownership or benefit a resource program could be acquired if the acquisition were determined to be in the public interest (RMP, 2-9).
LT-MA-6.	Any lands acquired would be managed in the same manner as the adjacent or surrounding public lands (RMP, 2-9).
LT-MA-7.	Acquire all non-federal minerals, surface rights, and easements on 177 acres in Albert Mesa (C-58).
LT-MA-8.	Acquire all non-federal surface/minerals and easements on 60 acres on Blanco Mesa (C-35).
LT-MA-9.	Acquire 60 to be managed as the Cottonwood Divide ACEC (RMP, C-35).
LT-MA-10.	Acquire 42 acres to be managed as the Casa Del Rio Chaco Culture Archaeological Protection Site (RMP, C-14).
LT-MA-11.	Acquire 60 acres to be managed as the Greenlee Ruin Chaco Culture Archaeological Protection Site (RMP, C-16).
LT-MA-12.	Acquire all non-federal minerals, surface, and easements on 44 acres on Pork Chop Pass (C-46).
LT-MA-13.	Acquire all non-federal minerals, surface, and easements on 60 acres at String House (C-51, C-52).
LT-MA-14.	Resolve Navajo trespass occupancies within the planning area by exchange (RMP, D-1).
LT-MA-15.	Exchange, sale, disposal under the R&PP Act, or other legal disposal will be considered if the proposed parcels meet the following criteria established in Section 203 of FLPMA • Such tract because of its location or other characteristics is difficult and uneconomical to manage as part of the public lands and is not suitable for management by another federal department or agency; or • Such tract was acquired for a specific purpose and the tract is no longer required for that or any other federal purpose; or • Disposal of such tract will serve important public objectives, including but not limited to, expansion of communities and economic development, which cannot be achieved prudently or feasibly on land other than public land and which outweigh other public objectives and values, including, but not limited to, recreation and scenic values, which would be served by maintaining such tract in federal ownership (RMP, 2-9).
LT-MA-16.	Review existing land withdrawals on a periodic basis to ensure that the reasons for the withdrawal are still valid and only the acreage needed is retained in withdrawn status (RMP, 2-11).
LT-MA-17.	Upon revocation or modification of a withdrawal, all or part of the withdrawn land could be restored to multiple use (RMP, 2-11).
LT-MA-18.	Additional land may be identified for withdrawal if criteria are met and will be processed on a case-by-case basis (RMP, 2-11).
LT-MA-19.	BLM will protect valid existing rights (RMP, 2-8).
LT-MA-20.	Continue a prevention program developed by BLM, the Navajo Nation, and BIA to prevent unauthorized occupation (RMP, 2-9).
Transportation and Travel	
Allocations	
TR-A-1.	A total of 4,616 acres of public land are designated as Open for OHV use (ROD, 6; RMP, 2-15). Open areas are areas on public land where OHVs may be operated, subject to the conditions set forth in 43 CFR 8341 through 8344. Open designations generally include areas where there are no compelling resource protection needs, use conflicts, or public safety issues that would warrant limiting OHV use (RMP, 2-16).
TR-A-2.	The 4,600 acres under open designation within the GRTS will continue to apply (RMP, 2-15).
TR-A-3.	The dispersed recreation areas that could be designated as open to cross-country travel would be further refined as OHV Management Unit plans are developed by FFO staff. Other site-specific screening criteria that could further restrict the potentially open areas will be applied during plan development, including avoidance

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	of cultural resources, sensitive species habitats, riparian areas, and proximity to residences. To be suitable for cross-country travel, the land must meet the following criteria: • BLM surface • Outside an SDA • Outside a designated disposal area (RMP, 2-16). In the Proposed RMP/Final EIS, approximately 65,800 acres that met the above criteria were determined to be the least susceptible to damage from cross-country travel by applying the additional criteria below: • Slopes greater than 30 percent • South-facing slopes steeper than 15 percent • Seasonal high water table • Depth to bedrock less than 20 inches • Highly erodible by wind or water (RMP, 2-16).
TR-A-4.	1,353,301 acres are designated a Limited to Maintained Roads, Designated Trails, Routes and Areas except where conditions are determined to be suitable for cross-country travel (ROD, 6; RMP, 2-15). Limited areas are areas on public land where OHVs may be restricted at certain times, in certain areas, and/or to certain vehicular use. These restrictions may be of any type, including the following categories: number of vehicles, types of vehicles; time or season of vehicle use; permitted or licensed use only; use on maintained roads and trails; use on designated road and trails; and other restrictions. Limitations may be used to meet specific resource management objectives, protect resources, or public safety (RMP, 2-16).
TR-A-5.	The 22,800 acres of OHV use limited to designated routes within the GRTS will continue to apply (RMP, 2-15).
TR-A-6.	A plan completed for Rosa Mesa that limits OHV use to designated maintained roads and seasonal closures on 40,960 acres of public land will continue in effect (RMP, 2-15).
TR-A-7.	57,369 acres are designated as Closed to OHV travel (ROD, 6; RMP, 2-15). Closed areas are areas on public land where OHV use is prohibited. Closures may be necessary to protect resources, ensure visitor safety, or reduce use conflicts (RMP, 2-16).
TR-A-8.	Unit planning may change the size or location of areas subject to closure (ROD, 6; RMP, 2-15).
Management Actions	
TR-MA-1.	Motorized travel is considered cross-country when: • The passage of motorized vehicles depresses undisturbed ground and crushes vegetation. • The motorized vehicle maximum width (the distance from the outside of the left tire to the outside of the right tier or maximum tire width for motorcycles) does not easily fit the road or trail profile. However, an all-terrain vehicle traveling within a two-track route established by a pickup truck is not considered cross-country travel. • Motorized vehicles use livestock and game trails, unless the trails are clearly evident, or continuous single-track routes used by motorcycles over a period of years (RMP, 2-17).
TR-MA-2.	Motorized use is not considered cross-country when: • Motorized vehicles use constructed roads that are maintained by the oil and gas industry and/or the BLM, unless specifically closed to use through signing and/or gates. Constructed roads are often characterized by a road prism with cut and fill slopes. • Motorized vehicles use trails specifically designated for the vehicle being used. For example, this would include the single-track trails within SDAs that are designated for motorcycles. • Motorized vehicles use clearly evident two-track and single-track routes with regular use and continuous passage of motorized vehicles over a period of years. A route is a track where perennial vegetation is devoid or scarce, or where wheel tracks are continuous depressions in the ground, evident to the casual

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	observer, but are vegetated (RMP, 2-17). • Travel is within a dry wash or arroyo that is as wide as the motorized vehicle's maximum width and there are no other resource concerns such as riparian areas or springs (RMP, 2-18).
TR-MA-3.	Cross-country travel is defined as wheeled, motorized travel by any vehicle, recreational or other, off of roads and trails. This definition only applies to cross-country travel in the dispersed area and not to cross-country travel within the SDAs and ACECs (RMP, 2-17).
TR-MA-4.	Cross-country travel for camping is allowed within 300 feet of roads by the most direct route, after site selection by non-motorized means (ROD, 7).
TR-MA-5.	BLM authorized access to inholdings in the northern portion of the De-Na-Zin Wilderness Area may be permitted using the route to the former life estate located in T. 24 N., R. 11 W., Section 7 (ROD, 6). Authorization would require the inholder to secure all necessary permits and leases, and would require appropriate environmental analysis and all mitigation measures necessary to minimize impacts to the wilderness area (RMP, 2-18).
TR-MA-6.	To address issues of unnecessary roads and road maintenance as well as problems with reclamation of abandoned roads, the Albuquerque Field Office will establish a road management unit in the Lindrith/Cuba area similar to those established in the FFO (ROD, 6).
TR-MA-7.	Support the San Juan Basin Public Roads Committee that includes members from the oil and gas industry and the FFO (RMP, 2-11).
TR-MA-8.	Construction and design of roads shall meet the standards specific in BLM Manual 9113 and the Gold Book (BLM and USFS, 1989) (RMP, 2-13).
TR-MA-9.	Cattleguards may be required when new roads cross existing fence lines (RMP, 2-36).
TR-MA-10.	Detailed OHV management direction is provided through RAMPs for Simon Canyon ACEC, the Dunes Vehicle Recreation Area, and the Glade Run Recreation Area (RMP, 2-15).
Transportation and Travel Planning	
TR-MA-11.	Complete the inventory of the existing road system to identify the major collector roads that could serve as the backbone for the long-term road network (RMP, 2-11).
TR-MA-12.	After the inventory is complete, classify and designate all levels of roads within the system based on traffic levels, type of use, condition, and other criteria (RMP, 2-11).
TR-MA-13.	Through site-specific planning, roads, routes, trails, and areas would be inventoried, mapped and designated as open, limited by season or type of vehicle, or closed (RMP, E-2).
TR-MA-14.	Thirteen OHV Management Units will be created (Map 2-6) (ROD, 6; RMP, 2-11; RMP 2-15). The goal of the OHV management units is to provide a range of recreational opportunities for the different recreational user groups, while ensuring resource protection and reducing conflicts between other public land users and permit holders (ROD, 6; RMP, 2-15). Specific management objectives for each unit will likely vary depending upon site-specific resource conditions and public needs and concerns (ROD, 6; RMP, 2-15).
TR-MA-15.	Within six month of the signing of the ROD, the FFO will complete a prioritized list of areas for site-specific planning in close coordination with the public (RMP, 2-15; RMP E-2). Plans will be written based on the priority of resource protection needs and the amount of public use, and will include environmental review and public involvement (RMP, 2-18).
TR-MA-16.	When determining the priorities for site-specific planning, the FFO will consider the effects of the Final EIS; Executive Orders 11644 and 11989; the National Management Strategy for Motorized Off-Highway Vehicle Use on Public Lands; coordination with the public; other partners, agencies, and tribal governments, and the factors listed below: • Opportunity to provide a variety of OHV recreational experiences, while minimizing resource damage and conflicts. • Risk of, or current damage to, soil watersheds, vegetation, or other natural, cultural, or historic resources on public land. • Potential to spread noxious weeds. • Avoidance of riparian/wetland areas. • Need to minimize harassment of wildlife or significant degradation of wildlife habitats.

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	• Concern for safety of all users. • Resolution of conflicts between various user groups. • Current or potential impacts to federally listed threatened or endangered, and sensitive species. • Amount of public land within the disposal zone.
TR-MA-17.	OHV management units and applicable SMAs will be included in one of the following categories: • High Priority Areas: Areas that currently have a high level of OHV use, which has resulted in resource damage and/or user conflicts. There is the need to address all or most of the factors listed above. Site-specific planning would be initiated within two years of the resolution of any protests to the Final EIS or administrative appeals to the ROD. • Moderate Priority Areas: These areas may address some of the factors listed above, as well as identifying areas that provide OHV opportunities, and at the same time minimize user conflicts and resource damage. Site-specific planning would be started within five years (same guidelines as above). • Low Priority Areas: Areas where the majority of the public land is in the disposal zone and/or there is low OHV use due to remoteness and distance from the major population centers. Any resource problems can be solved with emergency closures until they are resolved. There are no specific requirements for initiation of site-specific planning (RMP, E-2).
TR-MA-18.	Access needs will be determined and incorporated into a transportation plan (RMP, D-2).
TR-MA-19.	Site-specific planning would identify appropriate locations and types of allowable use based on resource management plan desired conditions and management conditions (RMP, E-2). Integration of other resource objectives and other types of recreational use would be incorporated (RMP, E-2).
TR-MA-20.	Site-specific planning would identify issues needing resolution at the site-specific level. The following procedure would be followed: • Define the scope of the analysis. The boundaries of the area to be analyzed would be the prioritized OHV Management Unit and/or the SMA. • Identify and describe vehicle travel needs for individual roads, routes, trails and areas. Consider the reasons for needing access to the area, what travel mode is needed or desired, and why people choose to participate in a specific activity in a particular place. Is access needed for: o Meeting recreation opportunity and demand? o Commodity production? o Water production? o Special use permits? o ROWs, legal access, easement, cost-share, or prescriptive rights? o Private inholdings? o Hazardous waste remediation or watershed restoration? o Fire protection or law enforcement? o Barrier-free recreation opportunities or special access accommodations as needed by individuals? o Other access needs? • Identify and describe needs and/or reasons to limit travel in the OHV Management Unit. Consider the potential effects of different uses on: o Wildlife habitat o Grazing allotments o Soils o Water quality o Riparian areas o Threatened and endangered species habitat o Cultural resources

<table>
<tr><th>Unique ID</th><th>Decision</th></tr>
<tr><td></td><td>
o Native vegetation
o Conflicting uses
o Public safety
o Special management areas
o Lessees and permittees
o Other access restriction needs (RMP, E-3).
• Alternatives should reflect a range of distribution strategies for agency and public land users. The distribution strategies must balance requirements for restrictions with the needs for vehicle travel (RMP, E-3). The must also address objectives for the area (RMP, E-4).
• Planning prescriptions should be developed for roads, routes, trails, and areas within the analysis area (RMP, E-4).
</td></tr>
<tr><td>TR-MA-21.</td><td>Routes, trails, and areas may be identified within the OHV Management Units when OHV Activity Plans are completed for each unit. Management actions and exceptions within dispersed recreation areas are listed in Table 4 (ROD, 6; RMP, 2-16; RMP, 2-17).

Table 4. Summary of Dispersed Area OHV Cross-Country Issues and Exceptions
<table>
<tr><th>OHV Issue</th><th>Management Action</th></tr>
<tr><td>Cross-Country Travel</td><td>Permitted in certain designated SDAs. Emergency Use Allowed.</td></tr>
<tr><td>Administrative Use</td><td>Allowed unless specifically prohibited.</td></tr>
<tr><td>Lease and Permit Holders</td><td>Not allowed unless specifically authorized.</td></tr>
<tr><td>In Proximity to Residences</td><td>Not allowed within ½ mile of any residence unless on a maintained road or a designated trail or route.</td></tr>
<tr><td>Wetlands and Riparian Areas</td><td>Prohibited. Travel limited to maintained roads.</td></tr>
<tr><td colspan="2">Exceptions for OHV Cross-Country Travel</td></tr>
<tr><td>OHV Issue</td><td>Management Action</td></tr>
<tr><td>Camping</td><td>Cross-country travel for camping is allowed within 300 feet of roads by the most direct route, after site-selection by non-motorized means.</td></tr>
<tr><td>Dry Washes</td><td>Allowed unless specifically prohibited for protection of other resources.</td></tr>
<tr><td>Game Retrieval</td><td>Allowed by the most direct route unless specifically prohibited.</td></tr>
<tr><td>Disabled Access</td><td>Allowed per provisions of Rehabilitation Act.</td></tr>
<tr><td>Firewood and Christmas Tree Collection</td><td>Not allowed unless specifically authorized by permit.</td></tr>
</table>
</td></tr>
<tr><td>TR-MA-22.</td><td>Roads identified in the Transportation Plan to remain open for public access when oil and gas development in the area ceases will be included in the individual OHV Activity Plans (RMP, 2-18).</td></tr>
<tr><td>TR-MA-23.</td><td>Site-specific planning may identify areas for trail construction and/or improvement or specific areas where intensive OHV use may be appropriate (RMP, E-2).</td></tr>
<tr><td>TR-MA-24.</td><td>Unnecessary roads will be identified and rehabilitated (RMP, D-2).</td></tr>
<tr><td>TR-MA-25.</td><td>All OHV Activity Plans will be completed within 15 years (ROD, 6; RMP 2-15; RMP 2-18).</td></tr>
<tr><th colspan="2">Recreation</th></tr>
<tr><td colspan="2">Goal</td></tr>
<tr><td>REC-G-1.</td><td>Provide opportunities for environmentally responsible recreation (RMP, 2-1).</td></tr>
<tr><td colspan="2">Objective</td></tr>
<tr><td>REC-O-1.</td><td>Ensure the continued availability of public land for a diverse array of quality resource-dependent outdoor recreation opportunities.</td></tr>
</table>

<table>
<tr><th>Unique ID</th><th>Decision</th></tr>
<tr><td>REC-O-2.</td><td>Recreation use is managed to protect the health and safety of visitors; to protect natural, cultural, and other resource values; to stimulate enjoyment of public lands; and to resolve user conflicts (RMP, 2-14).</td></tr>
<tr><td colspan="2">Allocations</td></tr>
<tr><td>REC-A-1.</td><td>The acreage under each ROS class is shown in Table 5 (RMP, 2-14).

Table 5. Recreation Opportunity Spectrum Classifications
<table>
<tr><th>ROS Class</th><th>Acres[1]</th></tr>
<tr><td>Rural</td><td>19,388</td></tr>
<tr><td>Roaded Natural</td><td>39,431</td></tr>
<tr><td>Semi-primitive non-motorized/motorized[2]</td><td>5,275</td></tr>
<tr><td>Semi-primitive non-motorized</td><td>55,978</td></tr>
<tr><td>Primitive</td><td>0</td></tr>
<tr><td>Total</td><td>120,072</td></tr>
</table>
[1] Applies to BLM land only.
[2] Motorized use generally applies to mesa top areas. Canyon sides and bottoms are non-motorized.</td></tr>
<tr><td colspan="2">Management Actions</td></tr>
<tr><td>REC-MA-1.</td><td>Most public lands are managed to maintain a freedom of recreational choice with a minimum of regulatory constraints (RMP, 2-14).</td></tr>
<tr><td>REC-MA-2.</td><td>Detailed direction for primitive and unconfined types of recreation can be found in management plans for the Bisti and De-na-zin WAs (RMP, 2-14).</td></tr>
<tr><td>REC-MA-3.</td><td>Replace the Bisti and De-na-zin management plans with one updated management plan (RMP, 2-14).</td></tr>
<tr><td>REC-MA-4.</td><td>A broad range of outdoor recreation opportunities such as backpacking, camping, sightseeing, fishing, boating, picnicking, horseback riding, wildlife viewing, OHV use, mountain biking, and motorcycling is provided for, in an attempt to meet varying public needs (RMP, 2-15).</td></tr>
<tr><td>REC-MA-5.</td><td>Develop a River Management Activity Plan for the San Juan and recreation opportunities (RMP, D-3).</td></tr>
<tr><td colspan="2">Alien Run Mountain Bike Trails SRMA</td></tr>
<tr><td colspan="2">Goal</td></tr>
<tr><td>SRMA-G- 1.</td><td>Manage area to facilitate mountain biking as a high quality recreational experience (RMP, C-105).</td></tr>
<tr><td colspan="2">Allocations</td></tr>
<tr><td>SRMA-A- 1.</td><td>Manage 3,334 surface and 3,137 subsurface acres as the Alien Run Mountain Bike Trails Special Recreation Management Area (SRMA) (RMP, C-105).</td></tr>
<tr><td colspan="2">Carracas Mesa ERMA/Wildlife Area</td></tr>
<tr><td colspan="2">Goal</td></tr>
<tr><td>ERMA-G- 1.</td><td>Protect and enhance wildlife habitat (RMP, C-109).</td></tr>
<tr><td>ERMA-G- 2.</td><td>Provide for semi-primitive, non-motorized, and motorized outdoor recreation opportunities (RMP, C-109).</td></tr>
<tr><td colspan="2">Allocations</td></tr>
<tr><td>ERMA-A- 1.</td><td>Manage 7,943 surface and 7,309 subsurface acres as the Carracas Mesa Extensive Recreation Management Area /Wildlife Area (RMP, C-109).</td></tr>
<tr><td colspan="2">Dunes Vehicle SRMA</td></tr>
<tr><td colspan="2">Goal</td></tr>
<tr><td>SRMA-G- 2.</td><td>Manage the Dunes Vehicle SRMA as an Off Road Vehicle recreation area, minimizing user conflicts, promoting user safety, and protecting resources (RMP, C-111).</td></tr>
</table>

Unique ID	Decision
Allocations	
SRMA-A- 2.	Manage 825 acres as the Dunes Vehicle SRMA (RMP, C-111).
Glade Run SRMA	
Goal	
SRMA-G- 3.	Manage the recreation area to accommodate a large variety of recreational uses and outdoor recreational experiences (RMP, C-113).
SRMA-G- 4.	Coordinate management efforts with multiple users and regulatory groups (RMP, C-113).
Allocations	
SRMA-A- 3.	Manage 17,935 surface and 18,796 subsurface acres as the Glade Run SRMA (RMP, C-113).
Head Canyon Motocross Track SRMA	
Goal	
SRMA-G- 5.	Minimize user conflicts, protect public safety, and protect natural resources (RMP, C-116).
Allocations	
SRMA-A- 4.	Manage 140 acres as the Head Canyon Motocross Track SRMA (RMP, C-116).
Navajo Lake Horse Trails SRMA	
Goal	
SRMA-G- 6.	Manage for equestrian recreational use on designated trails, routes, and areas (RMP, C-118).
Allocations	
SRMA-A- 5.	Manage 5,657 surface and 5,952 subsurface acres as the Navajo Lake Horse Trails SRMA (RMP, C-118).
Pinon Mesa SRMA	
Goal	
SRMA-G- 7.	Manage to provide and protect recreational, paleontological, ad visual values (RMP, C-122).
Allocations	
SRMA-A- 6.	Manage 8,340 surface and 8,489 subsurface acres as the Pinon Mesa SRMA (RMP, C-122).
Rock Garden SRMA	
Goal	
SRMA-G- 8.	Manage for OHV, equestrian, and other recreational use on designated trails, routes, and areas (RMP, C-125).
Allocations	
SRMA-A- 7.	Manage 9,632 surface and 8,560 subsurface acres as the Rock Garden SRMA (RMP, C-125).
Thomas Canyon ERMA/Wildlife Area	
Goal	
ERMA-G- 3.	Manage the area for the optimal combination of primitive recreational opportunities and wildlife protection (RMP, C-130).
Allocations	
ERMA-A- 2.	Manage 8,156 surface and 12,775 subsurface acres as the Thomas Canyon ERMA /Wildlife Area (RMP, C-130).
Livestock Grazing	
Objectives	
LG-O-1.	Meet the New Mexico Standards for Public Land Health that were accepted by the Secretary of the Interior as part of the Record of Decision for the Statewide RMP Amendment/EIS for Standards for Public Land Health and Guidelines for Livestock Grazing Management (2000) (RMP, 2-1).
LG-O-2.	Promote healthy sustainable rangeland ecosystems (RMP, 2-35).

Unique ID	Decision
LG-O-3.	Accelerate restoration and improvement of public rangeland to properly functioning condition (RMP, 2-35).
LG-O-4.	Promote the orderly use, improvement, and development of public lands (RMP, 2-35).
LG-O-5.	Efficiently and effectively administer domestic livestock grazing (RMP, 2-35).
LG-O-6.	Provide for the sustainability of the western livestock industry and communities that are dependent upon productive, healthy public rangelands (RMP, 2-35).
Management Actions	
LG-MA-1.	Public rangeland will be managed to meet the Standards for Public Land Health (BLM 2000b) (RMP, 2-35).
Wilderness Study Areas	
Goal	
WSA-G-1.	Preserve the natural, solitude, and primitive recreation values in the interim until Congressional determination of wilderness status is made (RMP, C-150).
Objective	
WSA-O-1.	Protect and manage the Wilderness Study Area (WSA) in accordance with the non-impairment standards of the Wilderness Act of 1962 (RMP, 2-33).
Allocation	
WSA-A-1.	Manage 6,516 surface and 6,552 subsurface acres as the Ah-shi-sle-pah WSA (RMP, C-150).
Management Actions	
WSA-MA-1.	The Ah-shi-sle-pah WSA will be managed under the Interim Management Policy and Guidelines for Lands Under Wilderness Review until the area is either added to the National Wilderness Preservation System by Congress or removed from further consideration (BLM, 1995b) (RMP, 2-33).
WSA-MA-2.	If the Ah-shi-sle-pah WSA is designated wilderness, the area will be managed under the Wilderness Act of 1964, the enabling legislation, and BLM Wilderness Management Regulations (43 CFO 6300, formerly 8560) (RMP, 2-34).
WSA-MA-3.	If released from further wilderness consideration, the Ah-shi-sle-pah WSA would continue to be managed as an ACEC to protect important paleontological, scenic, and recreational values (RMP, 2-34).
WSA-MA-4.	Continue management for existing oil and gas leases under BLM guidelines for WSAs until Congressional determination on wilderness status (RMP, C-150).
WSA-MA-5.	Nondiscretionary closure on new oil and gas leasing (RMP, C-150).
WSA-MA-6	Manage leasables and salables under BLM guidelines for WSAs until Congressional determination on wilderness status (RMP, C-150).
WSA-MA-7.	Manage locatables under BLM guidelines for WSAs until Congressional determination on wilderness status (RMP, C-150).
WSA-MA-8.	Land ownership is subject to Navajo and Hopi Indian Relocation Act (RMP, C-151).
WSA-MA-9.	Manage as a ROW exclusion area (RMP, C-151).
WSA-MA-10.	Close to motorized and mechanized equipment (RMP, C-151).
WSA-MA-11.	Manage as VRM Class I (RMP, C-151).
WSA-MA-12.	Prohibit forest product removal (RMP, C-151).
WSA-MA-13.	Prohibit the sale of vegetative materials (RMP, C-151).
WSA-MA-14.	Vegetative treatments for the control of noxious weeds may occur in accordance with existing laws, using non-impairment concept (RMP, C-151).
WSA-MA-15.	Continue current permitting for livestock grazing (RMP, C-151).

Unique ID	Decision
WSA-MA-16.	Apply semi-primitive non-motorized ROS objectives (RMP, C-151).
WSA-MA-17.	No shooting in developed areas (RMP, C-151).
WSA-MA-18.	Collection of paleontological resources prohibited except by permit. Permits granted only for scientific endeavors (RMP, C-151).
WSA-MA-19.	Collection of all other resources is prohibited except where otherwise authorized by law or policy (RMP, C-151).
WSA-MA-20.	Identify as Noise Sensitive Area. Stricter standards may apply (RMP, C-151).
Research Natural Areas	
Fossil Forest RNA	
Goal	
RNA-G- 1.	Fulfill the requirement of the enabling legislation (RMP, C-93).
RNA-G- 2.	Take measures when necessary to ensure that no activities disturb the land surface or impair the area's existing natural, educational, and scientific research values, including paleontological study, excavation, and interpretation (RMP, C-93).
Allocation	
RNA-A- 1.	Manage 2,796 acres as the Fossil Forest RNA (RMP, C-93).
Management Actions	
RNA-MA- 1.	Identify as Noise Sensitive Area (RMP, C-93).
RNA-MA- 2.	Prohibit forest product removal (RMP, C-93).
RNA-MA- 3	Prohibit the sale of vegetative materials contracts (RMP, C-93).
RNA-MA- 4.	Vegetation treatments must benefit cultural, scientific, and educational values (RMP, C-93).
RNA-MA- 5.	Paleontological clearance is required for vegetation treatments (RMP, C-93).
RNA-MA- 6.	Manage as VRM Class I (RMP, C-93).
RNA-MA- 7.	Develop baseline inventory of fossil resources in the area (RMP, C-93).
RNA-MA- 8.	Nondiscretionary closure on new oil and gas leasing (RMP, C-93).
RNA-MA- 9.	Close to all other forms of mineral entry (RMP, C-93).
RNA-MA-10.	Manage as a ROW exclusion area: (RMP, C-93).
RNA-MA-11.	Land ownership not available for disposal (RMP, C-93).
RNA-MA-12.	Acquire easement (RMP, C-93).
RNA-MA-13.	Closed to OHV use except for administrative or permitted use (RMP, C-93).
RNA-MA-14.	Closed to livestock grazing (RMP, C-93).

Unique ID	Decision
RNA-MA-15.	Sign and fence portions of the boundary (RMP, C-93).
RNA-MA-16.	Prepare Management Plan (RMP, C-93).
Reese Canyon RNA	
Goal	
RNA-G- 3.	Provide opportunities for the reintroduction of sensitive plants and the protection of wintering bald eagles (RMP, C-144).
Allocation	
RNA-A- 2.	Manage 2,299 surface and 2,338 subsurface acres as Mexican Spotted Owl ACEC (RMP, C-144).
Management Actions	
RNA-MA-17.	Designate noise receptor points at identified cliff habitat for the protection of wintering bald eagles (RMP, C-144).
RNA-MA-18.	Prohibit forest product removal except for administrative purposes with approval of wildlife staff (RMP, C-144).
RNA-MA-19.	Any vegetative management must benefit the purpose of the RNA (RMP, C-144).
RNA-MA-20.	Apply limited fire suppression (RMP, C-144).
RNA-MA-21.	Manage as VRM Class II (RMP, C-144).
RNA-MA-22.	Manage existing oil and gas leases under CSU constraint (RMP, C-144).
RNA-MA-23.	Discretionary closure on new oil and gas leasing (RMP, C-144).
RNA-MA-24.	Close to all other forms of mineral entry (RMP, C-144).
RNA-MA-25.	Manage as a ROW avoidance area: • ROWs granted with special management constraints and mitigation (RMP, C-144).
RNA-MA-26.	Land ownership not available for disposal (RMP, C-144).
RNA-MA-27.	OHV limited to maintained roads for the entire area (RMP, C-144).
RNA-MA-28.	Open to livestock grazing (RMP, C-144).
RNA-MA-29.	Complete Reese Canyon RNA plan (RMP, D-1).

Unique ID	Decision
Specially Designated Areas	
Objective	
SDA-O- 1.	Protect, maintain, and enhance the special resource values on public lands.
Allocations	
SDA-A- 1.	There are 649,901 acres of areas with special designations and management prescriptions designed to protect specific resource values (RMP, 2-13).
Management Actions	
SDA-MA- 1.	Where two SDAs overlap, the specific management prescriptions for each SDA remain in effect and the more restrictive prescriptions will apply (ROD, 7; RMP 2-13).
SDA-MA- 2.	Exceptions to restrictions on vegetation manipulations will be allowed when site-specific environmental analysis indicates such treatments are necessary to maintain or improve public land health or control noxious weeds and when it can be demonstrated such treatments will not adversely impact the resources for which the SDA was created (ROD, 7; RMP 2-13).
SDA-MA- 3.	New oil and gas leasing can be allowed in the Negro Canyon SDA with the lease stipulation of No Surface Occupancy (ROD, 7).
SDA-MA- 4.	Implement River Tracts SDA prescriptions (RMP, D-1).
Angel Peak Scenic Area	
Goal	
SDA-G- 1.	Protect and preserve the natural, scenic, and outdoor recreation values (RMP, C-107).
SDA-G- 2.	Provide visitors with the opportunity to engage in a wide variety of activities including camping, hiking, rockhounding, sightseeing, and horseback riding (RMP, C-107).
Allocations	
SDA-A- 2.	Manage 8,946 surface and 9,952 subsurface acres as the Angel Peak Scenic Area (RMP, C-107).
Beechatuda Tongue Geological Formation	
Goal	
SDA-G- 3.	Manage to protect scientific study values (RMP, C-83).
Allocations	
SDA-A- 3.	Manage 100 acres as the Beechatuda Tongue Geological Formation (RMP, C-83).
Betonnie Tsosie Fossil Area	
Goal	
SDA-G- 4.	Facilitate scientific study and protection of the paleontological resources (RMP, C-87).
Allocations	
SDA-A- 4.	Manage 7,267 acres as the Betonnie Tsosie Fossil Area (RMP, C-87).
Bohanon Canyon Fossil Complex	
Goal	
SDA-G- 5.	Facilitate scientific study and protection of the paleontological resources (RMP, C-89).
Allocations	
SDA-A- 5.	Manage 12,380 surface and 12,468 subsurface acres as the Bohanon Canyon Fossil Complex (RMP, C-89).
Carson Fossil Pocket	
Goal	
SDA-G- 6.	Facilitate scientific study and protection of the fossils (RMP, C-91).

Unique ID	Decision
Allocations	
SDA-A- 6.	Manage 968 acres as the Carson Fossil Pocket (RMP, C-91).
Cereza Canyon Wildlife Area	
Goal	
SDA-G- 7.	Manage to protect wildlife habitat (RMP, C-157).
Allocations	
SDA-A- 7.	Manage 17,912 surface and 27,868 subsurface acres as the Cereza Canyon Wildlife Area (RMP, C-157).
Crow Mesa Wildlife Area	
Goal	
SDA-G- 8.	Manage the Crow Mesa Wildlife Area with a focus on protecting big game and their habitat (RMP, C-159).
Allocations	
SDA-A- 8.	Manage 34,189 surface and 34,264 subsurface acres as the Crow Mesa Wildlife Area (RMP, C-159).
East La Plata Wildlife Area	
Goal	
SDA-G- 9.	Manage the area to protect and preserve big game habitat (RMP, C-161).
Allocations	
SDA-A- 9.	Manage 5,895 surface and 5,814 subsurface acres as the East La Plata Wildlife Area (RMP, C-161).
Ensenada Wildlife Area	
Goal	
SDA-G- 10.	Manage the Ensenada Wildlife Area to protect and preserve wildlife and their habitat (RMP, C-163).
Objective	
SDA-O- 2.	The primary focus in this SDA will be to increase the resident antelope population to where it is self-sustaining. The forage needs of resident and migratory deer and elk are also of concern (RMP, C-163).
Allocations	
SDA-A- 10.	Manage 43,179 surface and 45,767 subsurface acres as the Ensenada Wildlife Area (RMP, C-163).
Ephemeral Wash Riparian Area	
Goal	
SDA-G- 11.	Manage to protect these riparian systems and facilitate the attainment and maintenance of proper functioning condition as outlined in the Riparian and Aquatic Habitat Management Plan (HMP; 2000; RMP, C-134).
Allocations	
SDA-A- 11.	Manage 7,331 surface and 7,363 subsurface acres as the Ephemeral Wash Riparian Area (RMP, C-134).
Gobernador and Cereza Canyon Fossil Area	
Goal	
SDA-G- 12.	Facilitate scientific study and protection of paleontological resources (RMP, C-95).
Allocations	
SDA-A- 12.	Manage 13,333 surface and 25,643 subsurface acres as the Gobernador and Cereza Canyon Fossil Area (RMP, C-95).

Unique ID	Decision
Gonzales Mesa Wildlife Area	
Goal	
SDA-G- 13.	Manage to preserve and protect big game species, especially in wintertime (RMP, C-165).
Allocations	
SDA-A- 13.	Manage 6,076 surface and 6,103 subsurface acres as the Gonzales Mesa Wildlife Area (RMP, C-165).
Kutz Canyon Fossil Area	
Goal	
SDA-G- 14.	Manage for the protection of paleontological resources for scientific study (RMP, C-97).
Allocations	
SDA-A- 14.	Manage 47,098 surface and 47,661 subsurface acres as the Kutz Canyon Fossil Area (RMP, C-97).
Laguna Seca Mesa Wildlife Area	
Goal	
SDA-G- 15.	Manage the Laguna Seca Mesa Wildlife Area to preserve and protect local wildlife and their habitat (RMP, C-167).
Allocations	
SDA-A- 15.	Manage 7,460 surface and 8,124 subsurface acres as the Laguna Seca Mesa Wildlife Area (RMP, C-167).
Lake Valley Chaco Cultural Archaeological Protection Site	
Goal	
SDA-G- 16.	Manage the Lake Valley Chaco Cultural Archaeological Protection Site to protect and preserve its cultural resource values (RMP, C-20).
Allocations	
SDA-A- 16.	Manage 28 acres of subsurface as the Lake Valley Chaco Cultural Archaeological Protection Site (RMP, C-20).
Lybrook Fossil Area	
Goal	
SDA-G- 17.	Facilitate scientific study and protection of the paleontological resources (RMP, C-99).
Allocations	
SDA-A- 17.	Manage 18,268 surface and 19,840 subsurface acres as the Lybrook Fossil Area (RMP, C-99).
Middle Mesa Wildlife Area	
Goal	
SDA-G- 18.	Manage the Middle Mesa Wildlife Area to preserve and protect wildlife and their habitat (RMP, C-169).
Allocations	
SDA-A- 18.	Manage 31,390 surface and 40,317 subsurface acres as the Middle Mesa Wildlife Area (RMP, C-169).
Negro Canyon SDA	
Goal	
SDA-G- 19.	Manage the area for semi-primitive, non-motorized types of outdoor recreation (RMP, C-120).
Allocations	
SDA-A- 19.	Manage 1,361 surface and 1,992 subsurface acres as the Negro Canyon SDA (RMP, C-120).

Unique ID	Decision
Pinon Mesa Fossil Area	
Goal	
SDA-G- 20.	Facilitate scientific study and protection of the paleontological resources (RMP, C-101).
Allocations	
SDA-A- 20.	Manage 18,197 surface and 19,033 subsurface acres as the Pinon Mesa Fossil Area (RMP, C-101).
Rattlesnake Canyon Wildlife Area	
Goal	
SDA-G- 21.	Manage Rattlesnake Canyon to support increases in potential wildlife (RMP, C-171).
Allocations	
SDA-A- 21.	Manage 89,173 surface and 98,276 subsurface acres as the Rattlesnake Canyon Wildlife Area (RMP, C-171).
Rosa Mesa Wildlife Area	
Goal	
SDA-G- 22.	Manage the site to protect and preserve wildlife habitat (RMP, C-173).
Allocations	
SDA-A- 22.	Manage 47,375 surface and 61,406 subsurface acres as the Rosa Mesa Wildlife Area (RMP, C-173).
Law Enforcement	
Management Actions	
LE-MA-1.	The FFO Field Office Ranger will work closely with the Field Manager to prioritize actions in support of resource management objectives (RMP, 2-39).
LE-MA-2.	The seven areas of emphasis for the Law Enforcement Program in the planning area are: • Oil and Gas: Support the Petroleum Engineering Technicians on the theft of product, vandalism to facilities and equipment, and compliance checks. • Cultural Resources: Provide patrol, surveillance, and cooperative information sharing on suspected criminal activity. • Paleontological Resources: Focus on extended patrols of risk areas and recruiting volunteers to assist in providing coverage. • Controlled Substances: Focus on maintaining visibility to deter illegal substance activity on public lands, while continuing close coordination with other law enforcement organizations within the planning area. • Vegetation Theft: Focus on prevention through education and permitting, patrols, and public support in reporting illegal activity. • Employee Safety: Support safe operations in isolated areas through direct support, overflight safety checks, and provision of safety information and equipment. With awareness of any potential threat of interference, the Law Enforcement Ranger will accompany resource specialists to the field. • Recreation: Assist the recreating public with information on special areas, permitting, opportunities, access, and land status. Focus on patrol of developed sites, visitor information and education, and coordination with other agencies during special events (RMP, 2-40).

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