CHAPTER 3
AFFECTED ENVIRONMENT

INTRODUCTION

This section describes the physical, biological, and social environment on BLM-administered public land in New Mexico and Texas that could be affected by each alternative. Information on the affected environment is summarized from the "Final Environmental Impact Statement on Vegetation Treatments on BLM Lands in 13 Western States"(BLM 1991). The information on fire effects on land and vegetation is compiled from current literature, existing Fire Management Plans and Resource Management Plans (RMPs) at Field Offices in New Mexico and Texas, and the Fire Effects Information System found at www.fs.fed.us/database/feis.

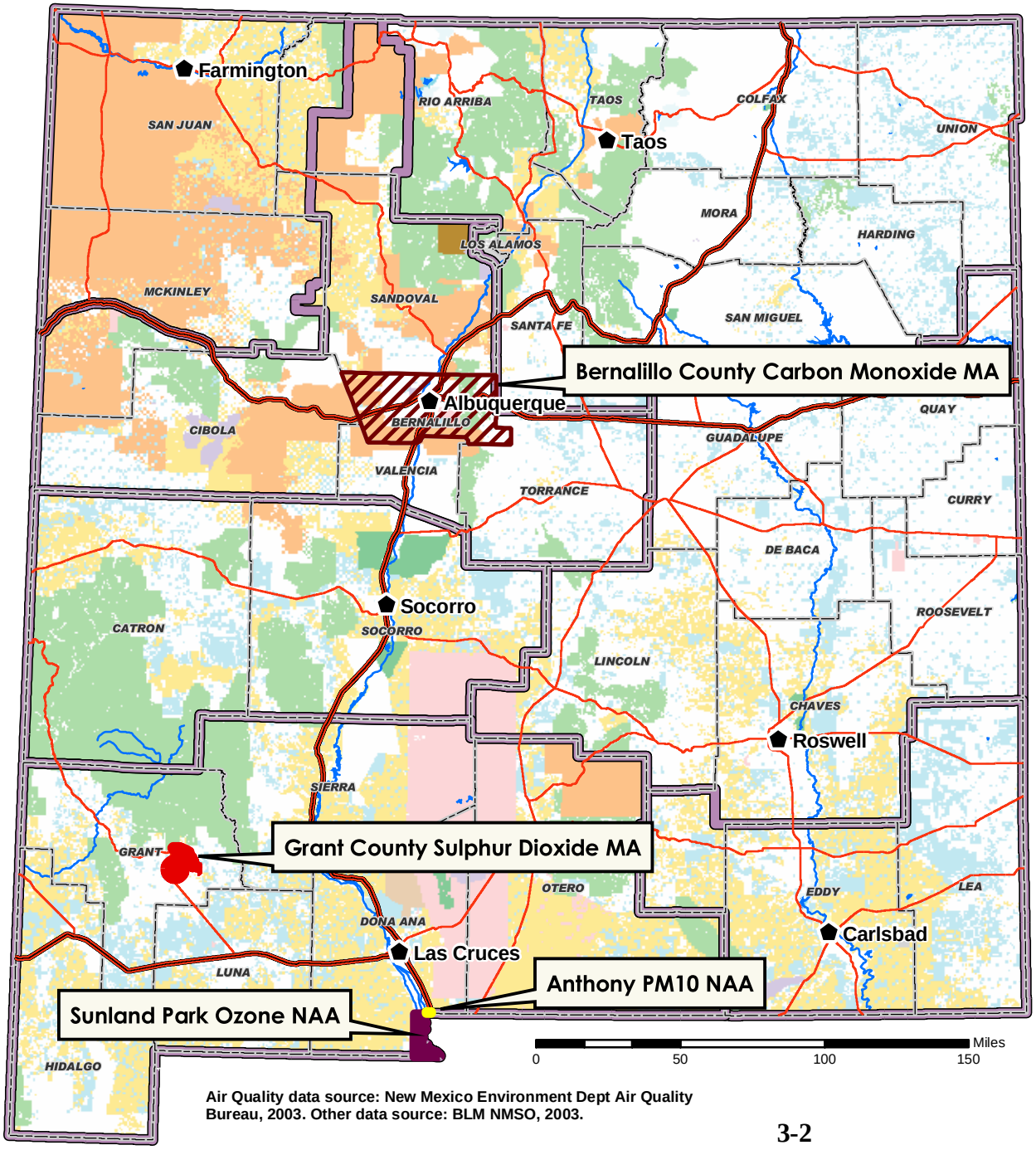
AIR RESOURCES AND AIR QUALITY

The purity of the air we breathe is an important public health issue. Particles of dust, smoke, and soot in the air from many sources, including wildland fire, can cause acute health effects. The purity of the air also affects regional haze and visibility. This haze is caused by many sources of both natural and manmade air pollution, including wildland fire. The primary purpose of the Clean Air Act (CAA) is to protect humans against negative health or welfare effects from air pollution. The Clean Air Act defined National Ambient Air Quality Standards (NAAQS) as the amount of pollutant above which detrimental effects to public health or welfare may result.

An area that is found to be in violation of a primary NAAQS is labeled a nonattainment area; an area once in nonattainment but recently meeting NAAQS, and with appropriate planning documents approved by EPA, is a maintenance area; all other areas are attainment areas or unclassified. There are currently two non-attainment areas and two maintenance areas in New Mexico (Figure 3.1). Non-attainment Areas (NAA) in the state of New Mexico includes the Sunland Park Ozone NAA and the Anthony PM_{10} NAA, both of which are located in Dona Ana County. The Maintenance Areas (MA) are the Bernalillo County Carbon Monoxide MA and the Grant County Sulfur Dioxide MA. Texas has four nonattainment areas for ozone: Dallas/Fort Worth, El Paso, Beaumont/Port Arthur, and Houston/Galveston. Also, parts of El Paso County are nonattainment areas for particulates and carbon monoxide.

The Clean Air Act also requires the Prevention of Significant Deterioration (PSD). The goal of PSD is to prevent areas that are currently cleaner than is allowed by the NAAQS from being polluted up to the maximum level established by the NAAQS. From this, three air quality classes were established: Class I, Class II, and III. Class I areas are subject to the tightest restrictions on how much additional pollution can be added to the air. These areas include wilderness areas and National memorial parks over 5,000 acres, National parks over 6,000 acres, and International parks in existence as of August 7, 1977. Since no areas have been designated as Class III, everything else is a Class II; this includes everything from non-Class I wildlands to urban areas. In New Mexico and Texas all public land is Class II.

Figure 3.1 New Mexico Air Quality Nonattainment Areas (NAA) and Maintenance Areas (MA)



Air Quality data source: New Mexico Environment Dept Air Quality Bureau, 2003. Other data source: BLM NMSO, 2003.

Air Quality Nonattainment/Maintenance Areas

- Ozone NAA
- Sulphur Dioxide MA
- PM10 NAA
- Carbon Monoxide MA

Land Status

- Bureau of Land Management
- Bureau of Reclamation
- Dept. of Agriculture
- Dept. of Defense
- Dept. of Energy
- US Forest Service
- Fish & Wildlife Service
- Tribal Lands
- National Park Service
- Private
- State
- State Game & Fish
- State Park
- Valles Caldera Nat'l Preserve

Other Features

- BLM Field Office
- County Line
- Interstate Highway
- US Highway
- Major Rivers/Lakes
- BLM Field Office Boundary

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There are nine Class I areas in New Mexico and two in Texas. They are:

- Bandelier National Monument, New Mexico (National Park Service)
- Big Bend National Park, Texas (National Park Service)
- Bosque del Apache National Wildlife Refuge, New Mexico (U.S. Fish and Wildlife Service)
- Carlsbad Caverns National Park, New Mexico (National Park Service)
- Guadalupe Mountains National Park, Texas (National Park Service)
- Gila Wilderness, New Mexico (U.S.D.A. Forest Service)
- Pecos Wilderness, New Mexico (U.S.D.A. Forest Service)
- Salt Creek Wilderness, New Mexico (U.S. Fish and Wildlife Service)
- San Pedro Parks Wilderness, New Mexico (U.S.D.A. Forest Service)
- Wheeler Peak Wilderness, New Mexico (U.S.D.A. Forest Service)
- White Mountain Wilderness, New Mexico (U.S.D.A. Forest Service)

New Mexico is within 100 km of nine other Class I areas located in Colorado and Arizona. Texas is within 100 km of six other Class I areas located in New Mexico, Colorado, Oklahoma and Arkansas.

In 1999, the U.S. Environmental Protection Agency (EPA) promulgated the Regional Haze Rule. The regional haze regulations call for States to establish goals for improving visibility in Class I areas and to develop long-term strategies for reducing emissions of air pollutants that cause visibility impairment. Wildland fire is one of the sources of regional haze covered by the new rules. Visibility rules require States to make "reasonable progress" toward the Clean Air Act goal of "prevention of any future, and the remedying of any existing, impairment of visibility". The regional haze regulations did not define visibility targets but instead gave States flexibility in determining reasonable progress goals for Class I areas. States are required to conduct analyses to ensure that they consider the possibility of setting an ambitious reasonable progress goal, one that is aimed at reaching natural background conditions in 60 years. The rule requires States to establish goals for each affected Class I area to: (1) improve visibility on the haziest 20 percent of the days, and (2) ensure no degradation occurs on the clearest 20 percent of days over the period of each implementation plan.

The State of New Mexico is a member of the Western Regional Air Partnership. Because regional haze is a multi-State issue, regional haze regulations encourage all stakeholders to work together and participate in regional cooperation and coordination efforts to eliminate barriers and boundaries to developing planning guidelines that address regional haze issues. In 2003, the State of New Mexico developed a smoke management program through a diverse stakeholder process that is part of the State Implementation Plan. Texas participates in the Central States Regional Air Partnership.

SOILS

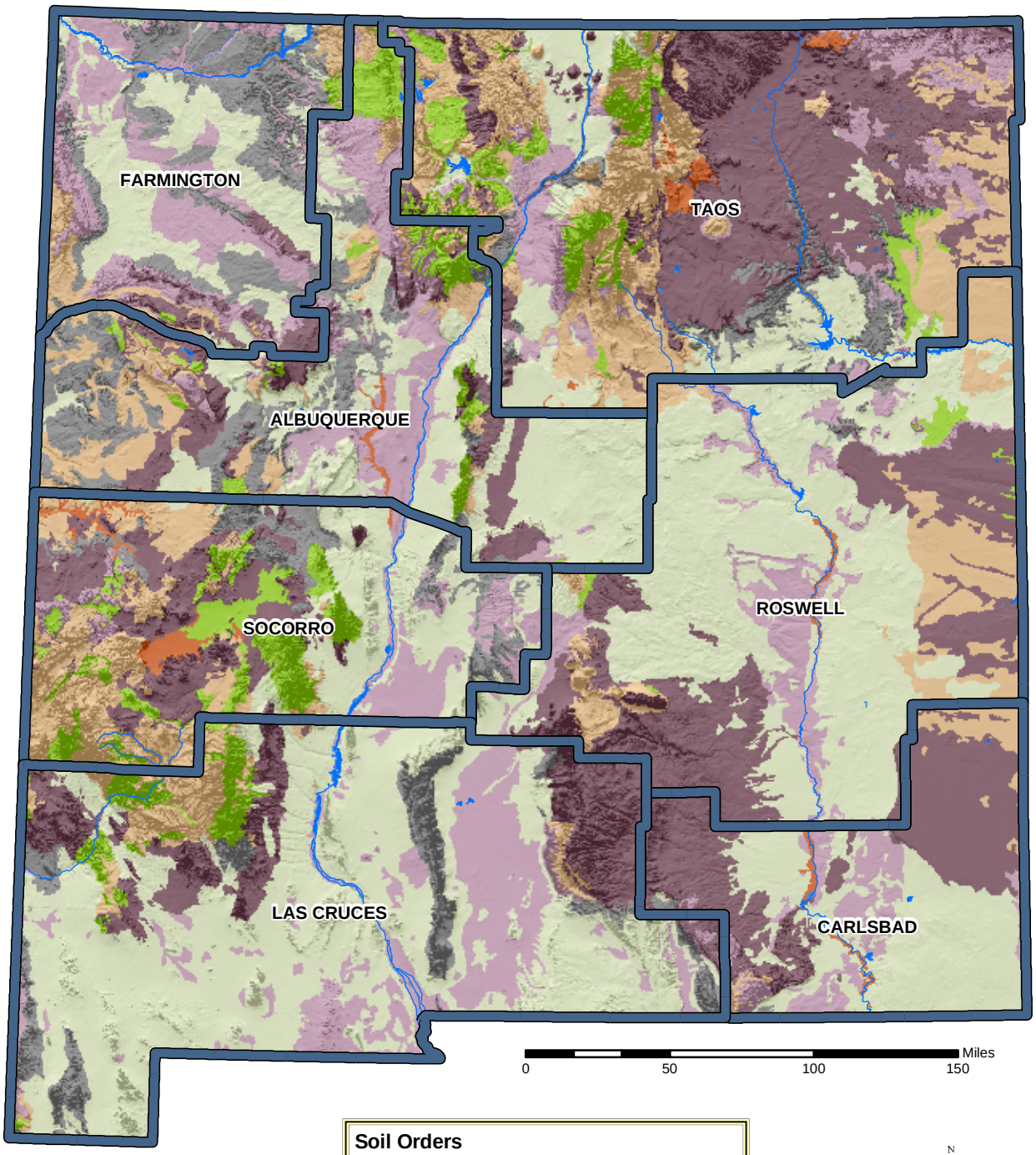
Soils are important as physical, biological and chemical filters. They are essential for plant establishment, water movement and storage, and erosion resistance. The soils on BLM-administered public land in New Mexico are diverse and are associated with a variety of climates, vegetative cover, topography, and geology. Thirteen soil suborders are found on BLM-administered public land in New Mexico (Table 3.1, Figure 3.2); 53 percent of these soils are associated with the soil order Aridisol.

TABLE 3.1 SOIL ORDERS AND SUBORDERS ON PUBLIC LAND IN NEW MEXICO AND TEXAS			
SOIL TYPE		**NEW MEXICO ACRES**	**TEXAS ACRES**
ORDER	**SUBORDER**		
Alfisols	Udalfs	28,993	
	Ustalfs	309,947	
Aridisols	Argids	3,224,299	
	Orthids	3,899,704	1,662
Entisols	Fluvents	166,743	1,562
	Orthents	1,392,726	
	Psamments	772,232	
Inceptisols	Ochrepts	144,233	
Mollisols	Aquolls	544	8,578
	Udolls	195,564	
	Ustolls	1,517,620	
Vertisols	Torrerts	15,816	
	Usterts	23,669	
NON-SOIL TYPE			
Badland		389,034	
Lava Flow		9,666	
Rock Outcrop		1,346,386	
Water		18,330	
TOTAL BLM ACRES		**13,455,506**	**11,802**
SOURCE: Natural Resources Conservation Service State Soil Geographic Database (STATSGO), 1994			

Alfisols (2 percent of public land in New Mexico) are mineral soils that develop in cool moist regions, often under grassland, woodland and forest cover, and have a significant accumulation of clay in the subsurface. They are capable of storing and providing more moisture and nutrients for plants than less developed soils at lower elevations.

Aridisols (53 percent of public land in New Mexico) are mineral soils that have developed in dry regions. They are light colored; low in organic matter; and may have accumulations of sodium, soluble salts, and lime. Aridisols are common in the desert shrub, sagebrush, and lower pinyon-juniper vegetation communities. Without irrigation, Aridisols are not as productive as soils that receive more precipitation and as such, they are slower to respond to changes in management. The Orthid soil suborder is a major component of Chihuahuan Desert Shrub (6 percent of public land in New Mexico).

Figure 3.2 Soil Orders in New Mexico



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Soils data source: Natural Resources Conservation Service (NRCS) State Soil Geographic Database (STATSGO), published 1994. Other data source: BLM NMSO, 2003.

Entisols (16 percent of public land in New Mexico) are mineral soils that lack profile development (soil horizons) and are often called young soils. Entisols are formed in recently deposited material that typically is coarse textured and low in nutrients. They are often found in lower elevations, and arid and semiarid environments supporting desert shrub and sagebrush communities. However, they do occur in most of the vegetation cover types in New Mexico, especially sandy washes.

Inceptisols (1 percent of public land in New Mexico) are relatively young soils that exhibit minimal horizon development. They are more developed than Entisols. These soils, primarily the Ochrepts suborder, are associated with grasslands and woodlands.

Mollisols (11percent of public land in New Mexico) are mineral soils that have thick, dark-colored surface horizons rich in organic matter. They are fertile and extend from mountainous terrain to grasslands where they are most abundant. The suborder Ustolls is the most abundant and they support primarily grassland, chaparral, woodland, and forest vegetation types.

Vertisols only account for 39,486 acres of public land in New Mexico. These soils are high in clay content and shrink and swell with changes in moisture. During dry periods, the soil volume shrinks, and deep, wide cracks form.

Non-soil types account for 14 percent of public land in New Mexico and are primarily rock outcrops, water, lava flows, and badlands.

The majority of soils on public land in Texas (Table 3.1, Figure 3.3) are **Mollisols** (73 percent), with approximately equal amounts of **Aridisols** (14 percent) and **Entisols** (13 percent).

At the project level, Field Offices utilize the Natural Resources Conservation Service (NRCS) soil standards or county level soil surveys for range site and soil series information specific for their projects.

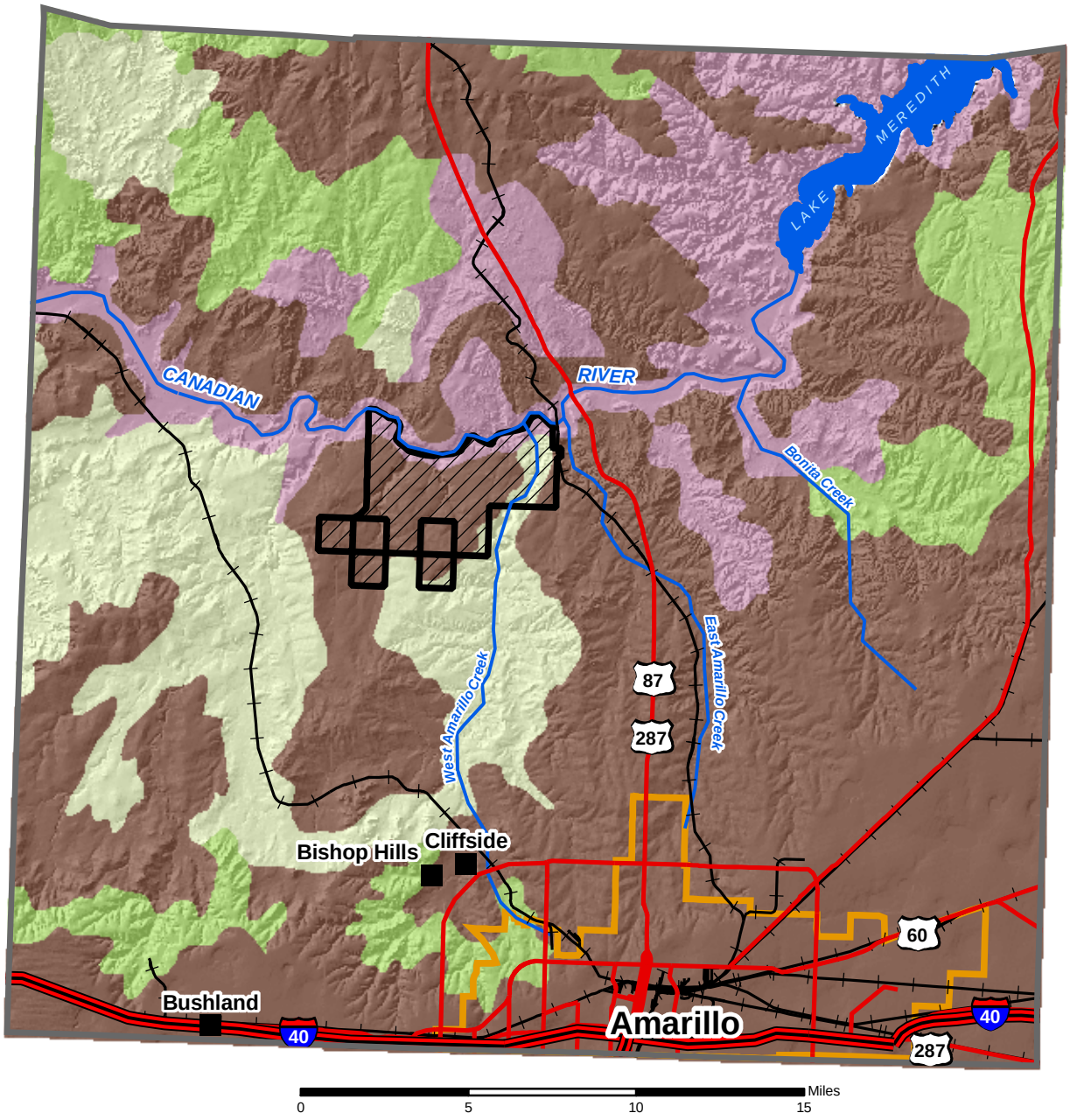
WATER RESOURCES

Statewide Waters

The State of New Mexico estimates that New Mexico has approximately 109,000 miles of watercourses, of which 6,600 miles are perennial (New Mexico Water Quality Control Commission, [NMWQCC] 2002). Major New Mexico surface water features are shown on Figure 3.4.

The following water discussion is summarized from NMWQCC 2002. Surface waters in New Mexico include headwaters of three principal drainages of the United States: the San Juan and Colorado River Basins contribute to the Colorado River; the Arkansas-White-Red River Basins contribute to the Mississippi River; and the Rio Grande and Pecos River Basins contribute to the Gulf of Mexico. Some streams are within closed basins and drain internally. Total annual stream flow in New Mexico is over 5.7 million acre-feet. Precipitation provides 3.3 million acre-feet, and the remainder of the flow is primarily inflow from Colorado. Quality of surface water varies within the State. Water from the high mountains is generally excellent quality. As the water flows downstream, many factors contribute to degradation of the water quality. These factors include evapo-transpiration, evaporation, pollution loading from man's activities, and changes due to beneficial uses. Some basins are well known for their water quality problems,

Figure 3.3 Soil Orders in Potter County, Texas



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Soil Orders

- Aridisols
- Inceptisols
- Entisols
- Mollisols

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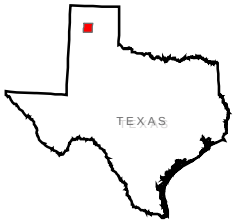


- Public Land
- Potter County Line
- Amarillo City Limits
- Lake
- River/Creek
- Interstate Highway
- Other Roads
- Railroad

Soils data source: Natural Resources Conservation Service (NRCS) State Soil Geographic Database (STATSGO), published 1994.
Other data source: BLM NMSO, 2003.

such as the San Juan with the high salt content in the rocks and soils, and the Rio Puerco Basin with its fine textured valley fills that are high sediment producers.

According to NMWQCC 2002, the hydrogeology of New Mexico is variable and complex, thus quality and quantity of groundwater varies by location. Valley or basin fill aquifers are the most important aquifers in the State, especially for drinking water, and usually occur along drainage ways. Many aquifers are highly vulnerable to contamination from surface discharges because they are shallow. Maintenance of surface water quality is necessary to protect the groundwater.

Approximately 3,080 assessed river miles within the State are threatened or impaired. Use impairment is frequently due to several causal agents from several sources. Overall, 7 of the State's 15 designated uses have been impaired by point or nonpoint sources of pollutants. All subcategories of cold water and warm water fishery uses, as well as irrigation and irrigation storage, secondary contact recreation, and livestock watering uses have been impaired (NMWQCC 2002).

Nonpoint source pollution is directly related to land use practices on a broad geographical scale. In New Mexico, the principal sources of nonpoint source pollution include agriculture, silviculture, resource extraction, hydromodification, recreation, and rangeland use. These and other nonpoint sources are responsible for approximately 92 percent of the impairments to the State's surface water.

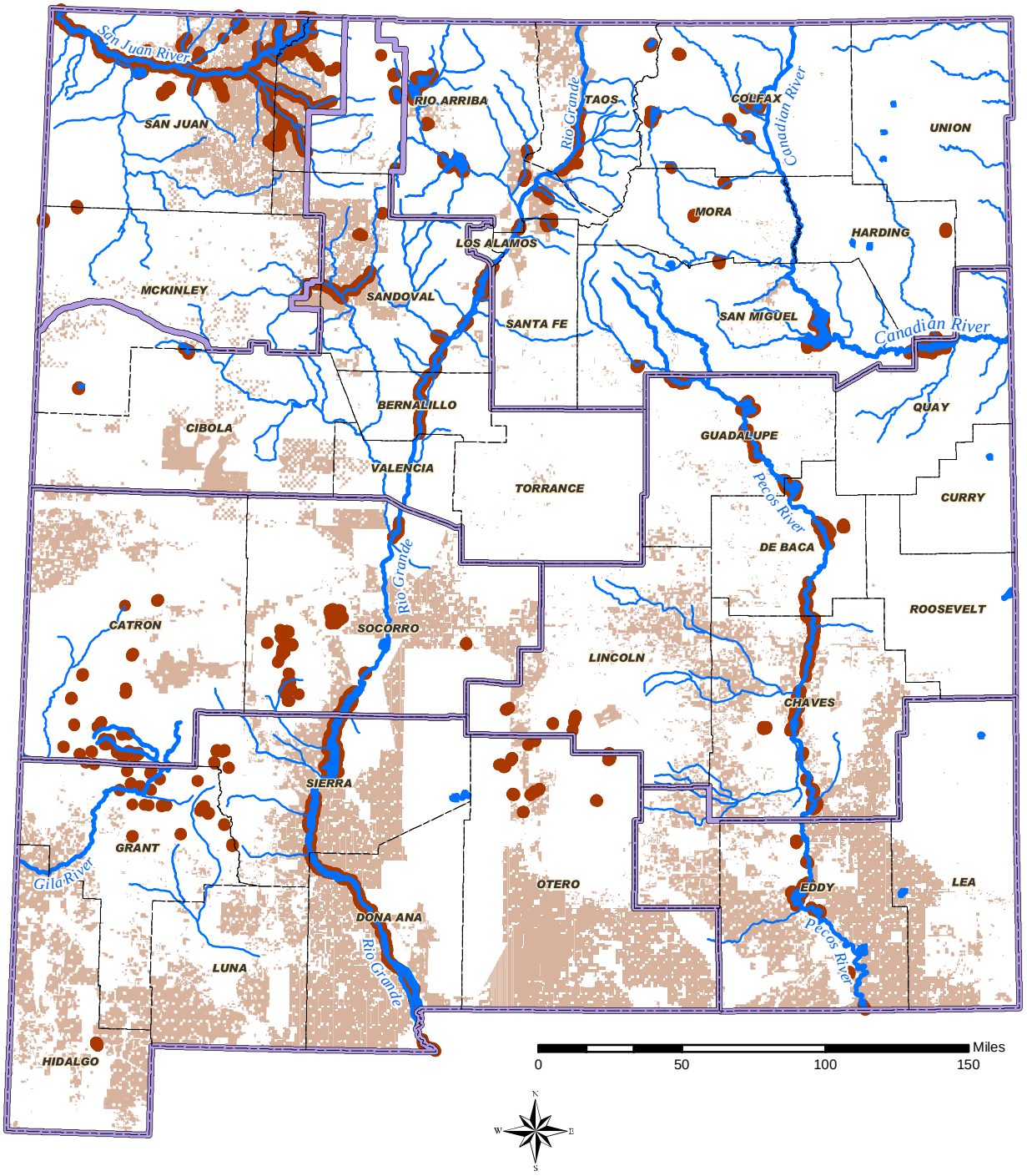
Waters on Public Land

Of the nonpoint sources, rangelands account for 21 percent of the total nonpoint source contribution to surface water quality impairments of the State. Grazing is a probable major source of pollutants that may contribute to water quality impairments on approximately 2,000 stream miles (NMWQCC 2002).

NMWQCC 2002 makes the following points regarding rangelands and water quality:

> In New Mexico, rangeland nonpoint source pollution in the form of turbidity and siltation is often the product of natural conditions associated with arid land climates. Most of New Mexico receives 15 inches or less of annual precipitation on highly erodible soils. This precipitation typically arrives in July and August in the form of torrential downpours following 2 to 3 months of little to no rainfall. Scarce vegetation in the form of grasses and forbs allows overland flows to strip soils from the surface.
>
> Progress continues to be made in the area of grazing management as ranchers and State/Federal allotment permittees become increasingly aware of the ecological importance of riparian areas. . . Another issue facing the ranching community is the ever-shrinking size of suitable grazing land due to an accelerated encroachment by woody species (pinon and juniper). This phenomenon is generally thought to be a direct result of the interrupted natural fire cycle, which used to occur in the southwest United States. Some progressive ranchers have begun to reverse this trend by removing woody species and reintroducing fire into the ecosystem, the results of which have proven to be positive to both water quality and quantity . . .
>
> Fire suppression allowing woody plant species invasion is the primary cause of surface erosion in the woodland and lower elevation grasslands. In the ponderosa pine forests, fire suppression has fostered an increase in tree densities resulting in an average of 30

Figure 3.4 New Mexico Major Surface Water Features



Riparian/Wetland data sources: NM GAP Analysis, 1996; BLM NMSO, 1998. Other data source: BLM NMSO, 2003.

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> percent reduction of surface flows and restriction of infiltration to ground waters. . . The Soil and Water Conservation Commission and Districts have identified watershed restoration as the number one priority for New Mexico. The reductions of water delivery from the watersheds due to increased tree densities has also contributed to exceeded water quality standards in the lower reaches of New Mexico's rivers. As the flows of higher quality water are reduced, numeric concentrations of point and nonpoint source pollutants increase.
>
> In many instances, changes in water quality from management practices will not be immediately evident, due to slow vegetative growth rates and other ecological factors. Actual improvements within the water column may not be noticeable for years, and possibly even decades.

Under the Clean Water Act and a Memorandum of Understanding with the New Mexico Environment Department, BLM is the designated agency for water quality management on public land and is responsible for the control and reduction of nonpoint source pollution on this land. Nonpoint source pollution can be directly related to land use practices, and sediment related pollutants are likely the most significant contribution from public land activities (NMWQCC 2002). One of the key tools in reducing nonpoint source pollution is the identification and application of best management practices (BMPs) to every activity with the potential to impact water quality. BMPs should be the best combination of structural and nonstructural measures working together to reduce or prevent water quality impairment.

It is BLM policy that project planning and implementation include site-specific BMPs to address nonpoint source pollution concerns. This effort is coordinated with the State of New Mexico Nonpoint Source Management Program (New Mexico Environment Department 1999). BMPs, which could be applied to fuel treatments, would include, but not be limited to: deferring grazing after treatments, managing the intensity of the vegetation treatments, minimizing ground disturbing activities, revegetation of treatment areas, and installation of erosion control structures.

The public land in Potter County, Texas, also known as the Cross Bar property, is located entirely within the Lake Meredith sub-basin (Hydrologic Unit #11090105). This area contains nine rivers and streams in total. The Cross Bar property is bordered on the north by the Canadian River, and dissected by three streams: West Amarillo, Ranch, and Horse creeks. Other surface water resources consist of 27 constructed lakes and ponds (most shallow and dry during normal summers) as well as 6 water wells/windmills, a variety of springs and a plunge pool that is spring fed and contains water on a constant basis. West Amarillo Creek also contains water on a constant basis as it is also spring fed from a spring on private property to the south.

The Canadian river upstream from Lake Meredith (river segment TX-0103) is listed on the Texas list of impaired waters for the parameter of “pathogens”, because bacteria levels sometimes exceed criterion established to ensure the safety of contact recreation. This segment of the Canadian River forms the northern border of the Cross Bar property. To address water quality concerns related to any project proposals, BMPs similar to those described above for New Mexico public land would also be utilized in Texas.

VEGETATION RESOURCES

BLM-administered public land in New Mexico and Texas falls within 6 ecoregion provinces of the 52 ecoregions nationwide as defined by Bailey (1995) and shown in Figure 3.5. These ecoregion provinces are:

- Arizona - New Mexico Mountains
- Chihuahuan Semi-Desert
- Colorado Plateau Semi-Desert
- Southern Rocky Mountains Steppe
- Great Plains-Palouse Dry Steppe
- Southwest Plateau and Plains Dry Steppe

BLM-administered public land in New Mexico and Texas supports 17 main biotic vegetation communities. These communities were derived from numerous vegetation descriptions, databases, or layers established from the following sources: New Mexico GAP Analysis 1996, Dick-Peddie 1993, and Brown 1994. The vegetation of New Mexico and of Potter County, Texas is detailed in Figures 3.6 and 3.7 and Table 3.2. Note that some vegetation groups from the tables have been combined in Figure 3.6 for clarity of presentation. BLM in New Mexico and Texas also use vegetation classifications derived from the NRCS soil surveys by county. The soil series includes descriptions of not only soil texture and productivity, but also describes plant communities and ecological sites on the majority of public land. The ecological sites may be the only tools to adequately describe the current and potential ecological succession pathways that relate to Fire Regime Condition Class. The assessment documents and software for Fire Regime Condition Class also utilize the NRCS plant database for plant names. The NRCS database of plants and plant names can be accessed at http://plants.usda.gov. For the purpose of classification on a Statewide basis, the New Mexico GAP analysis will provide the data for the following descriptions of plant communities.

The main vegetation communities are divided into five classes: grasslands, shrublands, riparian or wetlands, woodlands, and forests.

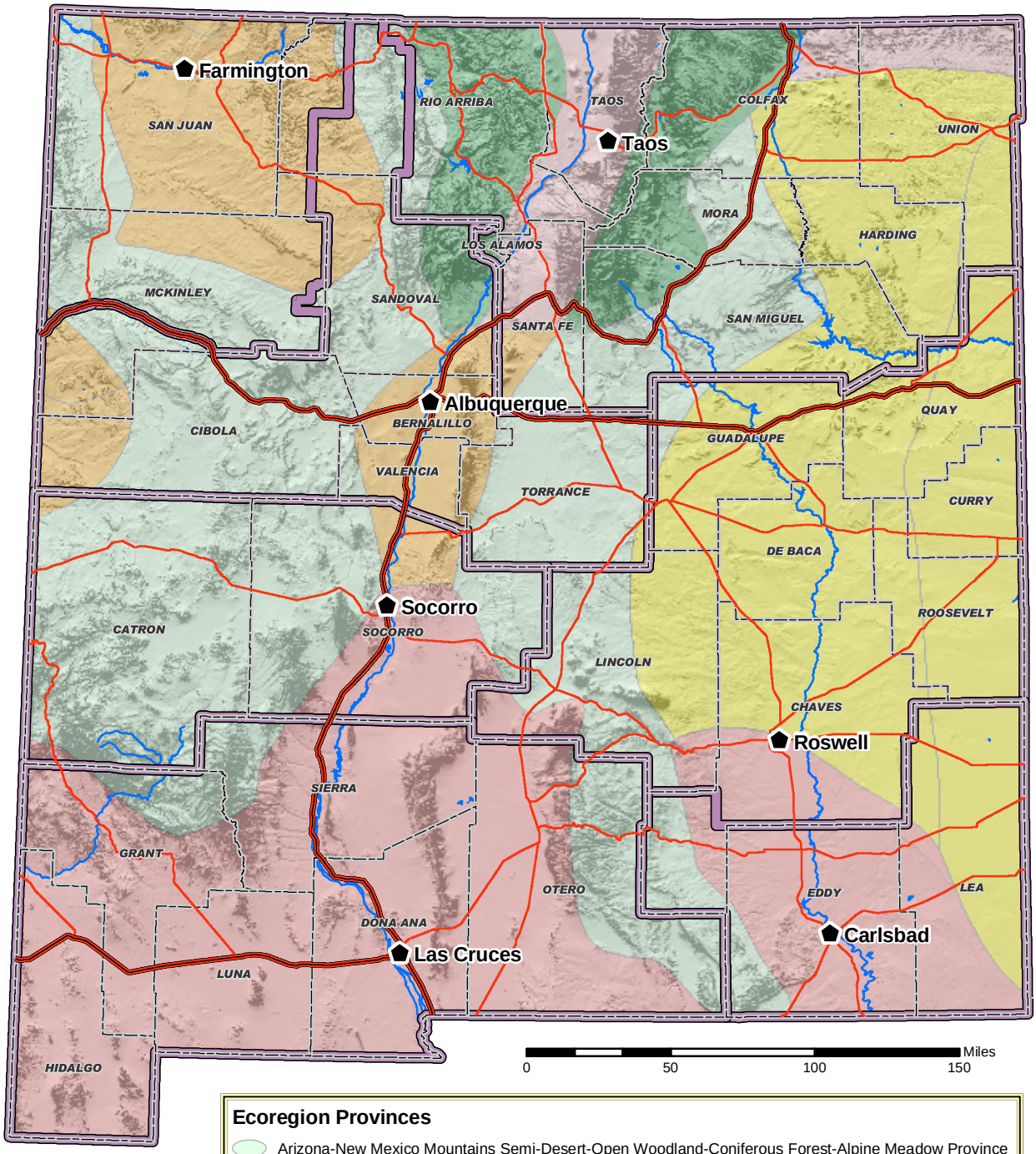
Grasslands

1. Rocky Mountain Montane Grassland
2. Plains-Mesa Grassland
3. Great Basin Desert Grassland
4. Chihuahuan Desert Grassland

Shrublands

5. Rocky Mountain Montane Scrub-Interior Chaparral
6. Plains-Mesa Sand Scrub
7. Great Basin Desert Scrub
8. Chihuahuan Desert Scrub

Figure 3.5 Ecoregion Provinces in New Mexico



Ecoregion Provinces

- Arizona-New Mexico Mountains Semi-Desert-Open Woodland-Coniferous Forest-Alpine Meadow Province
- Chihuahuan Semi-Desert Province
- Colorado Plateau Semi-Desert Province
- Great Plains-Palouse Dry Steppe Province
- Southern Rocky Mountain Steppe-Open Woodland-Coniferous Forest-Alpine Meadow Province
- Southwest Plateau and Plains Dry Steppe and Shrub Province

N
W
E
S

- BLM Field Office
- County Line
- Interstate Highway
- US Highway
- Major Rivers/Lakes
- BLM Field Office Boundary

Ecoregion Provinces data source: USDA Forest Service, published 1994.
Other data source: BLM NMSO, 2003.

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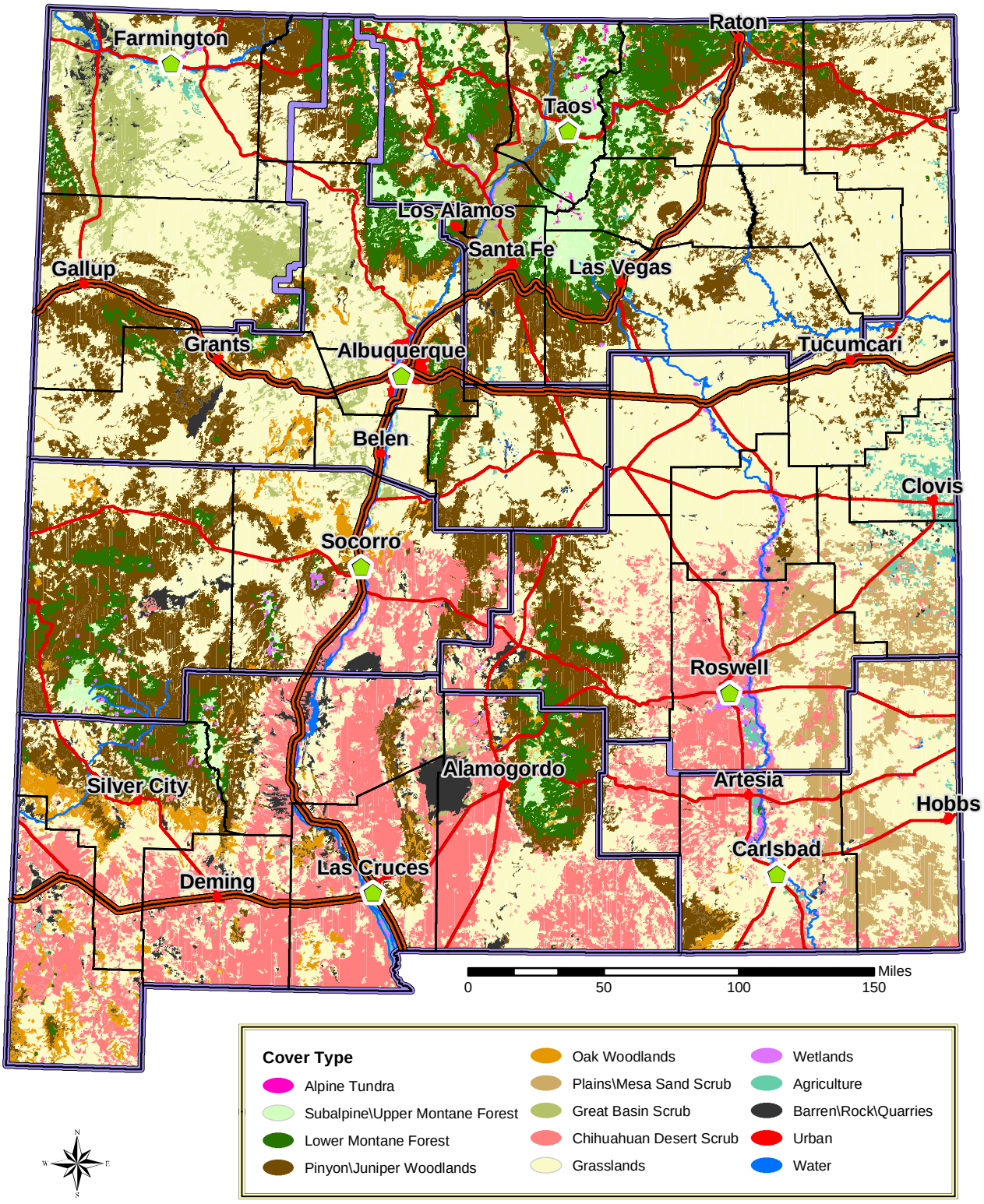
Figure 3.6 New Mexico Vegetation Communities



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Vegetation data source: New Mexico GAP Analysis Project, published 1996. Some categories have been grouped on this map for better readability at a statewide scale. Other data source: BLM NMSO, 2003.

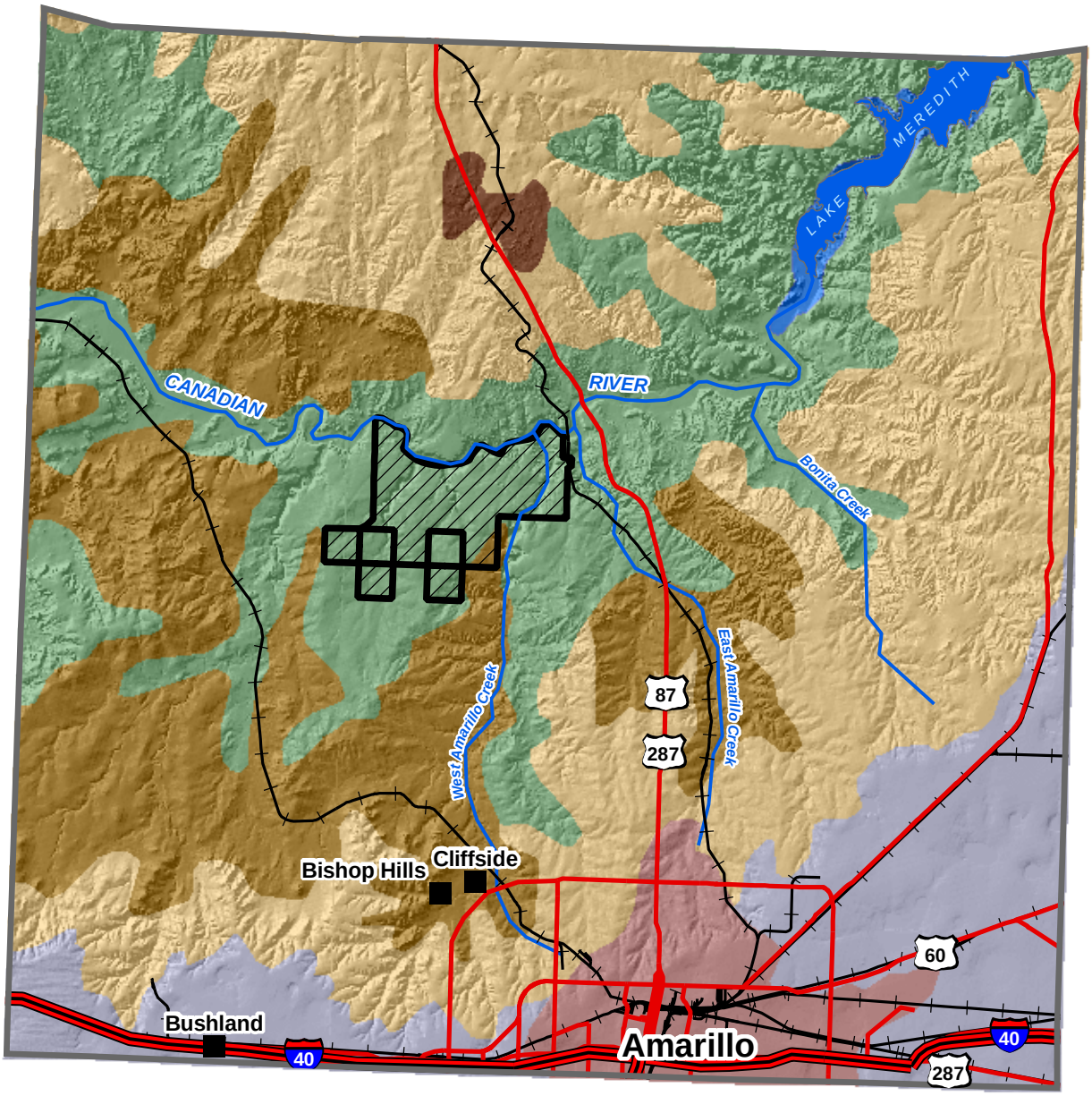
TABLE 3.2 GENERAL CHARACTERISTICS OF THE VEGETATION COMMUNITIES ON PUBLIC LAND IN NEW MEXICO AND TEXAS						
Vegetation Community	**Public Land (%)**	**Plant Growth Form**	**Dominant Species**	**Elevation Range (feet)**	**Climate**	**Precipitation (inches)**
Rocky Mountain Montane Grassland	< .1	Grass Mesophytic	Arizona fescue (*Festuca arizonica*), Mountain muhly (*Muhlenbergia Montana*), Junegrass (*Koeleria cristata*), Tufted hairgrass (*Deschampsia caespitosa*)	> 9,000	Cold-Temperate	20-30
Plains-Mesa Grassland	9.9	Grass Mesophytic	Blue grama (*Bouteloua gracilis*), Hairy grama (*Bouteloua hirsuta*), Sideoats grama (*Bouteloua curtipendula*), Little bluestem *Schizachyrium scoparium*), Western wheatgrass (*Pascopyrum smithii*), and Sand dropseeds (*Sporobolus cryptandrus*)	4,000-7,000	Cold-Temperate	10-18
Great Basin Desert Grassland	10.9	Grass Xerophytic	Galleta (*Hilaria jamesii*), Indian ricegrass (*Oryzopsis hymenoides*), and Alkali sacaton (*Sporobolus flexuosus*)	4,500-7,200	Cold-Temperate	8-10
Chihuahuan Desert Grassland	21.7	Grass Xerophytic	Dropseeds (*Sporobolus flexuosus*) Tobosa (*Hilaria mutica*), Sacatons (*Sporobolus wrightii*), Saltgrass (*Distichlis spicata*), and Vine-mesquite (*Panicum obtusum*)	3,000-5,500	Warm-Temperate	8-12
Rocky Mountain Montane Scrub-Interior Chaparral	3.0	Mesophytic Shrubs	Mountain mohagany (*Cercocarpus montanus*), Gambel oak (*Quercus gambelii*), and Wavyleaf oak (*Quercus undulata*), Shrub live oak (*Quercus turbinella*), Toumey Oak (*Quercus toumeyi*) and Point-leaf Manzanita (*Arctostaphylos pungens*).	5,500-9,000	Cold to Warm Temperate	10-20
Plain-Mesa Sand Scrub	5.3	Mesophytic Shrubs	Shinoak (*Quercus havardii*), Sandsage (*Artemesia filifolia*) White ratany (*Krameria grayii*), Sand bluestem (*Andropogon halii*), Little bluestem (*Schizachyrium scoparium*).	3,900-4,200	Warm-Temperate	10-14
Great Basin Desert Scrub	3.4	Xerophytic Shrubs	Big sagebrush (*Artemisia tridentate*), Shadscale (*Atriplex confertifolia*), Fourwing saltbush (*Atriplex canescens*), Greasewood (*Sarcobatus vermiculatus*) ,Winterfat (*Krascheninnikovia lanata*) and Rubber rabbitbrush(*Chrysothamnus nauseosus*).	5,250-7,200	Cold-Temperate	<10
Chihuahuan Desert Scrub	30.9	Xerophytic Shrub	Creosotebush (*Larrea tridentata*) Tarbush (*Flourensia cernua*), Honey mesquite (*Prosopis glandulosa*), Whitethorn (*Acacia constricta*), Ocotillo (*Fouquieria splendens*).	3,000-5,000	Warm-Temperate	<4 to 12
Southwest and Plains Forested/ Shrub Wetland	.1	Deciduous Broadleaf Trees and Shrubs	Fremont cottonwood (*Populus fremontii*), Plains cottowood (*Populus sargentii*), Arizona walnut (*Juglans major*), Netleaf hackberry (*Celtis reticulata*) Willows (*Salix spp.*) and Seepwillow (*Baccharis spp.*). Russian olive (*Elaeagnus angustifolia*) and Saltcedar (*Tamarix spp.)*	3,000-7,000	Cold to Warm Temperate	Various
Graminoid	< .1	Herbaceous	*Juncus spp* and *Carex spp.*	3,000-	Cold-	>12

TABLE 3.2
GENERAL CHARACTERISTICS OF THE VEGETATION COMMUNITIES ON PUBLIC LAND IN NEW MEXICO AND TEXAS

Vegetation Community	Public Land (%)	Plant Growth Form	Dominant Species	Elevation Range (feet)	Climate	Precipitation (inches)
Wetlands	(266 acres in Roswell Field Office)	Grass-like		5,000	Temperate	
Closed Conifer Woodland	2.0	Trees less than 33 feet	Pinyon (*Pinus edulis)*, Junipers, primarily *Juniperus monosperma*	6,500-8,000	Cold-Temperate	16-25
Open Conifer Woodlands (Savanna)	9.3	Trees less than 33 feet	Oneseed juniper (Juniperus monosperma) and Utah juniper (*Juniperus osteosperma*)	5,000-7,000	Cold	12-16
Madrean Closed Conifer Woodlands	.1	Trees less than 33 feet	Border pinyon (*Pinus discolor*), Mexican pinyon (*Pinus cembroides*) and Alligator juniper (*Juniperus deppeana)*	5,800-7,500	Warm-Temperate	12-16
Madrean Open Conifer Woodlands	.7	Trees less than 33 feet	Gray oak (*Quercus grisea*), Arizona white oak (*Quercus arizonica*), Emory oak (*Quercus emoryi*), Alligator juniper and shrub liveoak (*Quercus turbinella*).	4,200-6,800		10-12
Subalpine Conifer Forests	< .1 (Less than 500 acres)	Trees > 33 feet	Engelmann spruce (*Picea engelmanni*), Subalpine fir (*Abies bifolia*), Douglas-fir (*Pseudotsuga menziesi*i), and White fir (*Abies concolor*)	9,500-12,000	Cold-Temperate	>20
Upper Montane Conifer Forest	< .1	Trees > 33 feet	Douglas-fir, White fir, and Blue spruce (*Picea pungens*)	8,000-10,000	Cold-Temperate	16-25
Lower Montane Conifer Forests	< .1	Trees > 33 feet	Ponderosa pine (*Pinus ponderosa*), Pinyon, Junipers, Gambel oak (*Quercus gambellii*), Silverleaf oak (*Quercus hypoleucoides*), Arizona white oak (*Quercus arizonica*), and Alligator juniper (*Juniperus deppeana*)	6,500-9,000	Cold-Temperate	12-25
BLM-Texas Southwest Plateau and Plains Dry Steppe	100 (11,802 acres in Potter County, Texas)	Grass and Xerophytic shrubs	Sideoats grama (*Bouteloua curtipendula*), Buffalograss (*Buchloe dactyoides*), Big bluestem (*Andropogon gerardii*), Little bluestem (*Scizachyium scoparian*), Tobosa (*Pleuraphis mutica*) Mesquite, Yucca	3,200-3,500	Semiarid	19 inch mean

NOTE: Unvegetated areas account for 2.6 percent of public land in New Mexico
SOURCE: New Mexico GAP Analysis Project, 1996

Figure 3.7 Potter County, Texas Vegetation Communities



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Vegetation/Land Cover

- Agriculture/Pasture
- Intermittent Lake Area
- Mesquite-Juniper-Brush
- Mesquite-Brush
- Mesquite-Shrub
- Sage-Oak-Brush
- Urban

N W E S

Produced by the BLM New Mexico Geographic Sciences Team.

- Public Land
- Potter County Line
- Lake
- River/Creek
- Interstate Highway
- Other Roads
- Railroad

Vegetation/Land Cover data source: Texas Parks & Wildlife Department, published 1984. Other data source: BLM NMSO, 2003.

U.S. DEPARTMENT OF THE INTERIOR BUREAU OF LAND MANAGEMENT

Riparian

9. Southwest and Plains Forested/shrub Wetland
10. Graminoid Wetlands

Woodlands

11. Closed Conifer Woodlands
12. Open Conifer Woodlands (Savanna)
13. Madrean Closed Conifer Woodlands
14. Madrean Open Oak Woodlands

Forests

15. Subalpine Conifer Forest
16. Upper Montane Conifer Forest
17. Lower Montane Conifer Forest

These 17 main vegetation communities provide abundant diversity in plant and wildlife species. The nature of plant communities is distinguished by climatic, geological, elevation and aspect gradients which in turn influence soil type and soil water holding capacity. New Mexico spans approximately 6 degrees of longitude and 6 degrees of latitude. This considerable geographic spread gives the State many different microclimates. The various vegetation types result from this variability.

At the lower elevations, the Chihuahuan Desert supports a mixture of different vegetation communities because of variance in precipitation and temperature patterns. These desert environments are dominated by cold-intolerant and drought-tolerant species. The Great Basin Desert on the other hand, is dominated by cold-tolerant and drought-tolerant species.

The present-day composition and distribution of plant communities in New Mexico have been influenced by many factors, including climate, drought, insects, diseases, wind, domestic livestock grazing, cultivation, browsing by wildlife, and fire (Gruell 1983). In addition, competition with other species, especially invasive plant species, has also had a profound effect on native vegetation. Before European settlement, naturally occurring fire was an important influence on the landscape of most of New Mexico.

Grassland reduction during the last 150 years has resulted primarily in an increase of Desert Shrubland. In addition, the transition Desert Grassland type now occupies areas previously covered by Plains-Mesa Grasslands. There has been an extensive advance of Juniper Savanna, also at the expense of Grasslands. In northern New Mexico, the juniper advance downslope has been accompanied by the sagebrush (*Artemisia tridentata*) advance upslope, resulting in open Juniper-Sagebrush Woodland rather than Juniper-Grass Savanna found in most of the State (Dick-Peddie 1993). This is also true farther south in the State. The desert shrubs mixed with juniper are usually snakeweed (*Gutierrezia spp*.) and rabbitbrush (*Chrysothamnus spp.)*.

In New Mexico, much of the forest, woodland, and grassland areas are currently in some stage of succession. This correctly suggests that much of the State's vegetation has been subjected to some kind of disturbance during the past century. Changes in vegetation patterns due to changes in climate result from combinations of evolution, extinctions, and migration. However,

most plant succession may be initiated by natural disturbances, such as fire, flood, volcanism, avalanche, and human disturbances, such as fire, flood, logging, grazing, and fire suppression (Barbour et al, 1980).

The relationship between fire and vegetation can be very complicated. Broad generalizations, such as fire favoring grasses over shrubs, are often invalid (Kozlowski and Ahlgren, 1974). Kittams (1972) and Ahlstrand (1981) found that most desert shrubs are marginally affected by fire, and many of the shrubs sprout back after fire. Cable (1967 and 1972) found that Black grama (*Bouteloua eriopoda*) is more negatively affected by fire than most shrub species. Buffington and Herbel (1965) found that fire frequency in southern New Mexico was very low or absent. However, Thornber (1907,1910), Griffiths (1910), Wooton (1916), Leopold (1924), and Humphrey (1958) were convinced that fire controlled shrubs in those portions of the semidesert grass-shrub type that had sufficient fine fuel (grasses).

Grasslands (Generally shrubs make up less than 25 percent canopy cover)

Most of the grasslands on public land in New Mexico are Chihuahuan Desert grasslands, which cover much of the southern portion of the State. The most dominant perennial grass is black grama, and other grass species include dropseeds (*Sporobolus flexuosus*), tobosa (*Hilaria mutica*), sacatons (*Sporobolus wrightii*), saltgrass (*Distichlis spicata*), and vine-mesquite (*Panicum obtusum*). These grasslands also border desert shrublands.

The Great Basin Desert Grassland is mapped primarily in the northwest portion of the State and in some places blends with the Chihuahaun Desert in the central portion of the State. The most dominant species are galleta (*Hilaria jamesii*), Indian ricegrass (*Oryzopsis hymenoides*), and alkali sacaton (*Sporobolus flexuosus*).

The Plains-Mesa Grasslands occur on mid to lower elevations of foothills and mesas or regional plains and cover about 1 percent of public land in New Mexico. Most of this vegetation type is short grass steppe and mid-grass prairie. The dominant species are mainly blue grama (*Bouteloua gracilis*), hairy grama (*Bouteloua hirsuta*), sideoats grama (*Bouteloua curtipendula*), little bluestem (*Schizachyrium scoparium*), western wheatgrass (*Pascopyrum smithii*), and sand dropseeds (*Sporobolus cryptandrus*). The shrub, broom snakeweed (*Gutierrezia sarothe*), increases under heavy grazing pressure in this grassland. Improved range-management practices from range research has provided results in succession trends as documented by Donart (1984) and BLM (2000, 2003). Table 3.3 shows range condition through time. A very small portion of public land in New Mexico contains a mid to high elevation Montane grassland that contains primarily grasslands such as Arizona fescue (*Festuca arizonica*), mountain muhly (*Muhlenbergia Montana*), Junegrass (*Koeleria cristata*), tufted hairgrass (*Deschampsia caespitosa*), and may contain sedges or rushes. Shrubs and trees are absent or rare, mainly because soil properties do not allow them.

The vegetation communities of Potter County, Texas are within the Southwest Plains Dry Steppe ecoregion. These vegetation communities are primarily desert grasslands similar to the Plains-Mesa Grasslands of New Mexico that are heavily encroached by mesquite and cholla shrubs. This vegetation community is described in Table 3.2 and depicted in Figure 3.7 (Texas Parks and Wildlife Department 1984), showing the departure of historic conditions versus current conditions.

TABLE 3.3 BLM RANGELAND CONDITIONS BY YEAR REPORTED				
Condition	**1936**	**1975**	**1996 (BLM 2000)**	**2002 (BLM 2003)**
Excellent			1 %	3%
Good	1.5 %	17 %	35%	31%
Fair	14.3 %	50 %	46%	42%
Poor	84.2 %	33 %	14%	19%
SOURCE: BLM New Mexico State Office Data 2003				

Shrublands (Generally shrubs form canopies greater than 25 percent cover)

The Chihuahuan Desert Scrub is primarily in the southern portion of the state and contains an evergreen component consisting primarily of creosotebush (*Larrea tridentata*); and a deciduous component consisting of tarbush (*Flourensia cernua*), honey mesquite (*Prosopis glandulosa*), whitethorn (*Acacia constricta*), and ocotillo (*Fouquieria splendens*). The majority of BLM shrublands in New Mexico are Chihuahuan deciduous desert scrubland containing mesquite. According to Shreve (1942), these lands supported plains-mesa or desert grasslands prior to 1850. The possible causes of this change are domestic livestock grazing, climate change, fire suppression, and rodent competition. According to Dick-Peddie (1993), if there are scattered soaptree yuccas (*Yucca elata*) in a relatively pure stand of creosotebush, it is likely that the desert scrub has occupied the site no longer than 100-120 years.

The primary carrier of wildfire is the grass fine fuel, and the patchy nature of this vegetation makes it difficult to carry an extensive fire, except during summers following wet winters. The abundant moisture causes the development of annual forbs and grasses that cure during very warm and dry springs. The ignition of these fuels, which provide a carrier between shrublands, is usually the only time when a larger fire can develop.

The Great Basin Desert Scrub is limited to primarily the northwest corner and a tongue in the north-central part of New Mexico. The plant communities in this region receive most of the precipitation during the winter months with annual precipitation totaling less than 9 inches per year. Small-leaved shrubs that are cold- and drought- tolerant dominate most of this desert scrub. The major shrubs of these communities are big sagebrush (*Artemisia tridentate*), shad scale (*Atriplex confertifolia*), fourwing saltbush (*Atriplex canescens*), greasewood (*Sarcobatus vermiculatus*), winterfat (*Krascheninnikovia lanata*), and rubber rabbitbrush (*Chrysothamnus nauseosus*). Big sagebrush components have increased during the last 125 years, as a result of heavy grazing by domestic livestock on land that was grassland or savanna in the middle of the last century (Gross and Dick-Peddie 1979).

Most of the Plains-Mesa Sand Scrub is located in the east-central and southeastern portion of the State. The cover type consists predominately of shinnery oak (*Quercus havardii*), sandsage (*Artemesia filifolia*) and white ratany (*Krameria grayii*), with an understory of grasses such as sand bluestem (*Andropogon halii*), and little bluestem (*Schizachyrium scoparium*). This habitat is valuable for Lesser Prairie Chicken where stands are unfragmented.

The Montane Scrub and Interior Chaparral vegetative communities contain a deciduous component of shrubs that are scattered at mid elevations among most mountain ranges. The major species are mountain mahogany (*Cercocarpus montanus*), Gambel oak (*Quercus gambelii*), and wavy leaf oak (*Quercus undulata*). The other component of this vegetative community is evergreen shrubs such as shrub live oak (*Quercus turbinella*), toumey oak

(*Quercus toumeyi*) and point-leaf manzanita (*Arctostaphylos pungens*). Most of these species are very fire-adapted and re-sprout following fire.

Riparian (Southwest and Plains Forested/Shrub Wetlands)

The GAP vegetation analysis does not adequately map at a Statewide scale the acres of riparian on public land in New Mexico, and as result only a fraction of the total land base is riparian. However, these habitats provide tremendous small-scale biodiversity and valuable wildlife habitat, since they are associated with water.

Most of the riparian vegetation in New Mexico is along reaches of the larger rivers and streams, including the Canadian, Pecos, Rio Grande, San Juan, and Gila and their perennial tributaries. On BLM lands in Potter County, Texas, the Cross Bar Ranch has less than 400 acres of riparian vegetation along Amarillo Creek and other intermittent streams within the property. The major deciduous cover types are Fremont cottonwood (*Populus fremontii*), Plains cottonwood (*Populus sargentii*), Arizona walnut (*Juglans major*), and netleaf hackberry (*Celtis reticulata*). These are not fire adapted communities. Exotic cover types now often dominate Southwest riparian areas, including Russian olive (*Elaeagnus angustifolia*) and saltcedar (*Tamarix spp.)*. The major cover types should be willows (*Salix spp*.) and seepwillow (*Baccharis spp*.). An additional component in the uplands is vegetation found along intermittent and ephemeral washes and dominated by deciduous shrubs. Graminoid wetlands are only found in small localities on public land and contain species such as *Juncus* spp. and *Carex* spp.

Woodlands (Trees are less than 33 feet tall forming canopies of less than 60 percent to closed woodland canopies of greater than 60 percent)

The woodland communities on public land are very diverse and are dependent on soil, moisture availability, aspect, elevation, and soil texture. The woodlands are classified as closed conifer woodland, open conifer woodland, madrean closed conifer woodland, and madrean open woodland associated with live oaks.

The Closed Conifer Woodlands (greater than 60 percent canopy cover) are dominated by the State tree, pinyon (*Pinus edulis)*. Junipers, primarily *Juniperus monosperma* are common canopy associates. The undergrowth is variable and dependent on canopy closure, soil texture, elevation and aspect. Elevation varies from 5,000 to 9,000 feet.

The Open Conifer Woodlands comprise a wide landscape on public land that form moderately open to very open canopies (25 to 50 percent canopy cover). This type can include very open stands in the broad ecotone to grassland commonly referred to as savanna. Major cover types are one-seed juniper (*Juniperus monosperma*) and Utah juniper (*Juniperus osteosperma*) found in the northwestern part of the State. Undergrowth is again dependent on soil texture, aspect, elevation, and canopy closure. The major grass species are warm season grasses such as blue grama, hairy grama, sideoats grama, and galletta. Shrub species such as snakeweed, winterfat, and rabbitbrush can be well represented. Elevation varies from 4,000 to 7,000 feet.

The Madrean Closed Conifer Woodlands are found in the southwestern portion of the State, primarily the Las Cruces and Socorro Field Offices. The major cover types are border pinyon (*Pinus discolor*), Mexican pinyon (*Pinus cembroides*), and alligator juniper (*Juniperus deppeana).* Evergreen oaks can occasionally occur in the canopy, but they are not dominant.

These communities are found in the foothills of the mountain ranges in the southwest corner of the State at 5,800 to 7,500 feet in elevation.

The Madrean Open Oak Woodland is dominated by rounded crown, broadleaf evergreen oaks that form moderately open to very open canopies. The major cover types are gray oak (*Quercus grisea*), Arizona white oak (*Quercus arizonica*), Emory oak (*Quercus emoryi*), and alligator juniper. Common shrub associates are Wright's silktassel (*Garrya wrightii*), manzanita (*Arctostaphylos pungens*), sotol (*Dasyliron wheeleri*), and shrub liveoak (*Quecus turbinella*). Characteristic grasses and forbs are sideoats grama, pinyon ricegrass (*Piptochaetium fimbariatum*), threeawns (*Aristida* spp.), blue grama, and bullgrass (*Muhlenbergia emersleyi*).

Human-induced disturbance is varied and widespread in woodland vegetation in the state (Dick-Peddie 1993). Typical disturbances are changes in fire frequency, grazing by domestic livestock, clearing (chaining) for increased forage production and watershed health, and woodland product harvesting. An apparent increase in juniper trees and shrubs in grasslands may be due to the following: Human impacts may cause scrubland to advance from the lower, dry side into grassland; and savanna to advance from the higher (mesic) side. Erosion may be occurring within woodland zones due to less infiltration, which has been caused by land management practices or drought. Prior to erosion, with a high degree of infiltration under grass cover, the soil moisture is suitable for grass but not for junipers. With run-off instead of infiltration, erosion creates miniature drain ways, leaving much of the soil surface drier. The newly created catchments hold sufficient water for junipers. As erosion continues, more and more of the previously grass-covered landscape becomes dissected with gullies; and juniper density increases (Dick-Peddie 1993).

The most visible disturbance which has occurred within the last 2 years has been landscape-scale bark beetle activity in pinyon forests, caused primarily by the Ips pine engraver (*Ips confusus*). These pinyon stands have been predisposed to beetles by drought conditions for at least 3 years. A dramatic decrease in precipitation combined with a high tree density, higher than normal temperatures, and the natural presence of bark beetles has resulted in a bark beetle population explosion. This beetle outbreak is not the first, but has been exacerbated by these particular conditions. There is nothing that the BLM can do tactically, other than accelerating fuels treatments as proposed, to fight the outbreak or save the trees in the short-term. The bark beetle infestation and drought-related die-offs are nature's way of reestablishing balance in our ecosystems. There will still be woodlands in New Mexico, but their appearance and vegetative mix will change for many years, providing an opportunity to reestablish a healthy mix of woodlands and native grasslands.

Forests (Trees are greater than 33 feet tall [10 meters], usually with canopy exceeding 60 percent, but may include some open canopied 25-60 percent cover)

The forested acres on public land in New Mexico account for less than 1 percent of all ownership but do provide an astonishing diversity of habitat types or plant associations. Because forest land occurs at higher elevations and receives higher amounts of precipitation, forests provide the essential ecological function of sustaining healthy watersheds.

The forests in New Mexico are generally in early and middle successional stages (Dick-Peddie, 1993). The most extensive cause of disturbance has been logging activities since settlement by Europeans. Prior to 1900, wildfires were also important and widespread in all elevations (Swetnam, 1990). In the pine and lower mixed conifer regions, naturally occurring fires were very frequent; mostly low intensity ground fires that helped maintain stands of open, park-like

structure (Moir and Dietrich, 1988). At higher elevations, naturally occurring wildfires were less frequent and more disposed to high intensities. The intensity of a mixed stand to high stand replacement fire is dependent on climatic conditions, fuel moisture, and topography. The other major disturbance factors of forests are insects and disease. These disturbances include bark beetles, defoliators, and parasites such as dwarf-mistletoe.

The order in which the coniferous forests are discussed below follows a generalized climatic gradient from colder-wetter environments to warm, dry environments at lower elevations.

Subalpine Coniferous Forests occur on less than 500 acres of public land in New Mexico, primarily in the northern portion of the State. These forests occur at elevations of 9,500 to 12,000 feet. The major cover types are Engelmann spruce (*Picea engelmanni*), subalpine fir (*Abies bifolia*), Douglas-fir (*Pseudotsuga menziesi*i), and white fir (*Abies concolor*).

The Upper Montane Conifer Forest occurs on most of the mountain ranges of the State at elevations ranging from 8,000 to 10,000 feet. The major cover types include Douglas-fir, white fir, and blue spruce (*Picea pungens*). Undergrowth is variable, ranging from sparse and moss dominated to shrubby and forb-rich. Common species are Rocky Mountain maple (*Acer glabrum*), snowberry (*Symphoricarpos oreophila*), Gambel oak (*Quercus gambellii*) and fringed brome (*Bromus cilatrus*).

The Lower Montane Forest contains most of the forested land administered by the BLM. These forests are generally warm and dry and occur at elevations of 6,500 to 8,500 feet on most mountain ranges of the State and at the higher elevations on the State's northwest plateau. The major cover type is Ponderosa pine (*Pinus ponderosa*). There is an abundant variety of habitat types associated with Ponderosa pine. These include a Ponderosa Pine-Gambel Oak Series which often has grassy understories. Succession in the grassy pine forest habitat types has been thoroughly documented. Recurring low-intensity fires occurred at 2-10 year intervals prior to about 1900. These fires helped maintain open, park-like vistas (Cooper,1960,1961). Since 1900, most fires have been suppressed. As a consequence, there is increased density in pine regeneration, often in dense thickets, abundance of dwarf mistletoe, and suppressed herbaceous understory (Moir and Dietrich, 1988). The BLM in New Mexico has been conducting prescribed burns in several ponderosa pine habitats within the four northern field offices since 1981 (BLM 1994).

The next Ponderosa pine series includes the Ponderosa Pine-Live Oak Series where winter temperatures are mild. These forests are located in southwestern New Mexico, in areas where Ponderosa pine is associated with silverleaf oak (*Quercus hypoleucoides*), Arizona white oak (*Quercus arizonica*), and alligator juniper (*Juniperus deppeana*). The next pine series is the Ponderosa Pine-Pinyon Pine-Gray Oak series. This series extends from southwestern New Mexico up to southwest of Socorro. Fires were frequent in this dry forest type, as documented for 167 years between 1700 and 1870 (Dietrich and Hibbert 1990).

FIRE ECOLOGY: FIRE ON THE LANDSCAPE

The historic management practice of suppressing all wildfires has significantly altered the role of fire in the ecosystem of the FMUs of New Mexico, with predictable results. Fire played a major role in shaping the composition, structure, and function of the vegetation types throughout the Southwest, including New Mexico--particularly those of Ponderosa pine, pinyon-juniper woodlands, and grasslands (Covington et al, 1994, Dietrich, 1980, Swetnam, 1990, Weaver,

1951). However, the ecological changes brought about by traditional fire management practices, along with others resulting from timber harvest and livestock grazing, have greatly altered conditions in many of the plant communities and greatly affected many species occurring in New Mexico.

These changes have moved vegetation conditions away from their pre-European settlement range of natural variation for community structure, fire frequency, and fire size (Covington et al, 1994). These changes include:

- Reduced tree growth
- Stagnated nutrient cycles
- Increased incidence of disease
- Insect and parasite infestations
- Decreased forage quality and quantity
- Increased fuel loading
- Increased vertical fuel continuity
- Increased canopy cover
- Increased severity of wildfires
- Decreased water availability and stream flow
- Fewer and smaller openings
- Shifts in habitat quality
- Lower aesthetic value

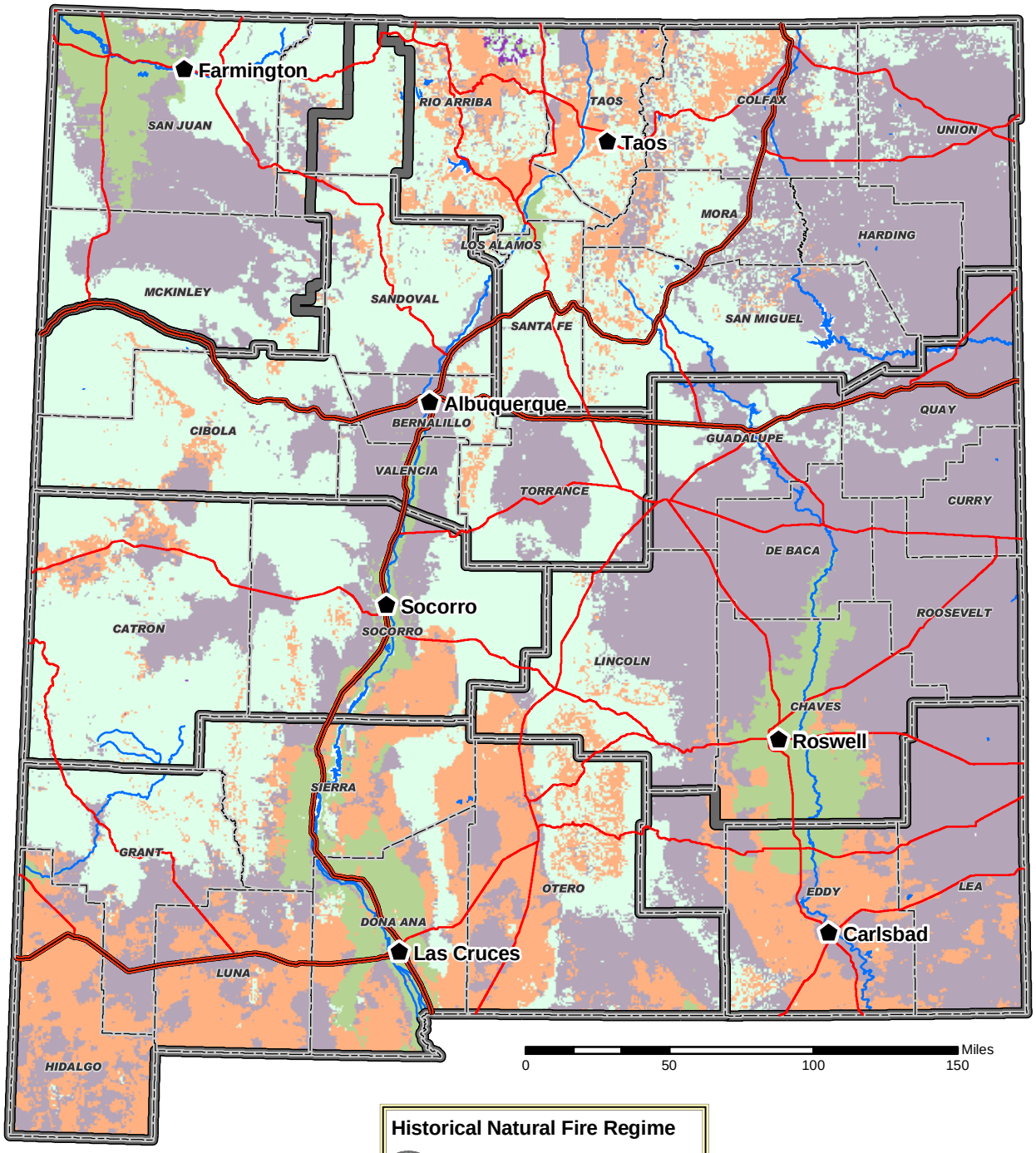
Prior to European settlement, fire was a common and widespread influence on many landscapes in the Southwest (Paysen et al. 2000). Many of these fires were caused naturally from lightning but some were also started purposefully by Native American for a variety of reasons (Swetnam and Baisan 1996; Brown 2000). The historic fire regime of New Mexico varied in frequency and severity depending on many factors such as vegetation type, climate, and topography (Figure 3.8). The historic fire regime of land in Potter County, Texas, was frequent stand replacement grass fires, in which fire removes more than 75 percent of the upper layer. These grasslands were maintained by frequent fires that in most cases rejuvenate the grass stand growth. The current Fire Regime Condition Class is 2, which is moderately altered due to shrub encroachment and past cattle grazing. The current Fire Regime Condition Class for New Mexico is displayed in Figure 3.9. Wildfire in the different vegetation communities found on public land was a normal occurrence and helped define their species composition, structure and standing biomass (Brown 2000). Additional information on fire effects can be found in BLM NMSO 2004d.

Table 3.4 summarizes the fire regime and basic fire ecology of the major vegetation communities in New Mexico and Texas on public land. Table 2.8 summarizes fire history on public land in New Mexico since 1980; additional fire history information can be found in Appendix A.4.

INVASIVE AND NOXIOUS WEEDS

Like other Western states, New Mexico is the land of wide open spaces--spaces which provide comfortable homes for invasive alien weeds such as Russian knapweed, Canada thistle, African rue and leafy spurge. As their names indicate, weeds have arrived from well outside New Mexico's borders. Invasive species and the problems they create are far from new; the first ones arrived along with the first colonists to set foot in America. Introductions can be the result

Figure 3.8 New Mexico Historical Natural Fire Regime



Historical Natural Fire Regime

- 0-35 yrs; Low Severity
- 0-35 yrs; Stand Replacement
- 35-100+ yrs; Mixed Severity
- 35-100+ yrs; Stand Replacement
- 200+ yrs; Stand Replacement

(See Table A.3 for fire regime definitions.)

- BLM Field Office
- County Line
- Interstate Highway
- US Highway
- Major Rivers/Lakes
- BLM Field Office Boundary

Historical Natural Fire Regime data source: USDA Forest Service, published 2002.
Other data source: BLM NMSO, 2003.

Produced by the BLM New Mexico Geographic Sciences Team.

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of deliberate or unintentional transport by humans or natural invasion of human-modified landscapes. New Mexico, with a vascular plant flora of about 3,542 species, has about 390 alien plant species (Cox 2001). New species are appearing annually. About 77.2 percent of alien species are of Eurasian origin, with 11.3 percent being from other parts of the Americas. Since publication of the first state flora, the number of alien plants has increased from 136 in 1915 to 390 in 2000. The pattern of increase has been exponential, with about 6.75 new aliens appearing per year since 1980, up from an average annual increase of 1.81 species from 1915-1980.

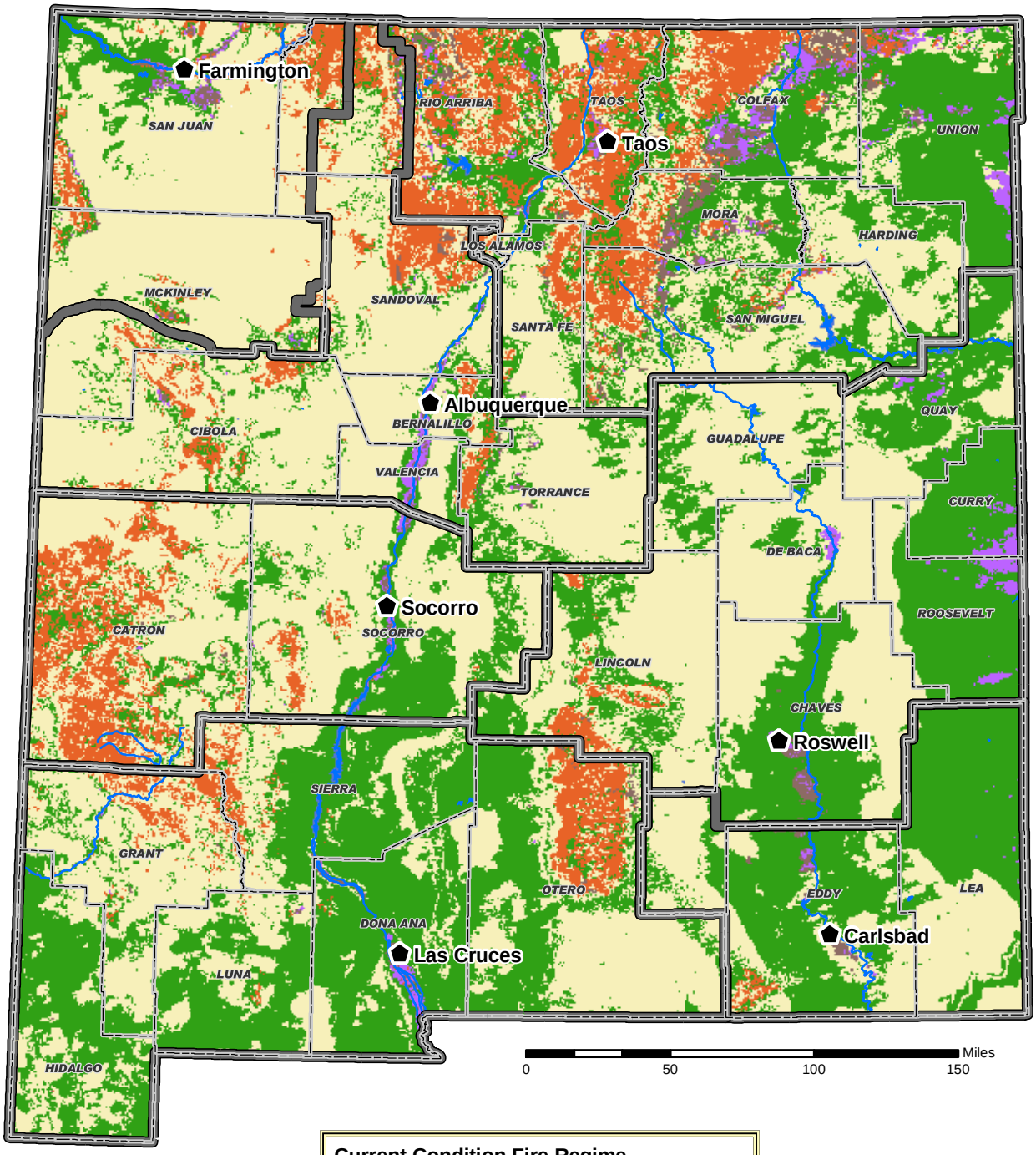
Many other alien plants are present in neighboring states, and the potential for additional invasions is great. Many species do not emerge as serious problems until decades--sometimes even more than a century--after becoming established, due to time lags related to demographic buildup, habitat change, or evolutionary adjustment. New Mexico is experiencing invasions of alien plant species from several phytogeographic regions: the Chihuahuan and Sonoran desert regions to the south and west, the Colorado Plateau and Great Basin to the northwest, the Rocky Mountain region to the north, and the Great Plains to the east. Although New Mexico is somewhat remote from the points of introduction of alien plants from outside North America, many such species are now appearing. Currently, 33 alien plant species are listed as noxious weeds in New Mexico (Table 3.5). The BLM National List of Invasive Weed Species of Concern is much more extensive than the New Mexico list (BLM NMSO 2004b).

Native plant communities can be transformed by keystone invasives, species that can cause the nearly complete reorganization of a community by their direct or indirect influence. Cheatgrass is an example of a keystone invasive; it promotes fire and can transform sagebrush to monospecific cheatgrass stands. Facilitation of subsequent invasions may occur. As the number of alien species increases, the plant community becomes more and more disrupted, and more and more vulnerable to further alien invasions. Along the Rio Grande water course, saltcedars and Russian olives are being joined by Siberian elm, white mulberry, black locust, and Ailanthus, forming a new type of riparian forest community, usually with an understory of alien grasses and forbs.

Threatened and endangered native plants may be harmed by invasive aliens, as in the case of musk thistle (*Carduus nutans*) and teasel (*Dipsacus fullonum*) which are overrunning the habitat of the endangered Mescalero thistle (*Cirsium vinaceum*) in the Sacramento Mountains. Alien plants also affect wildlife. Many sagebrush-dependent birds, mammals, and reptiles decline after the sagebrush-to-cheatgrass transformation. Replacement of native riparian woodland by alien woodland leads to decline of many native birds and invertebrates. Ecosystem-level processes, including water and salinity relationships, erosion vulnerability, soil microbiota and nutrient relationships, fire frequency, and geomorphology are modified by alien plants. Some ecosystem-level impact is probably exerted by every alien species. Disruption of ecosystem function by invasive aliens may push dynamics across a threshold from which recovery is almost impossible, leading to a new, altered stable state.

New Mexico's current weed infestations are generally small isolated populations whose spread is controllable. There are a few notable exceptions. Saltcedar infests nearly all of New Mexico's riverine systems below 7,500 feet as well as other water collection points such as dirt tanks and barrow ditches. African rue has spread over the majority of the southern desert areas along Interstate10 from Arizona to Texas. Cheatgrass infests nearly all of New Mexico's ecosystems, although it has not caused the fire regime problems experienced in the Great Basin.

Figure 3.9 New Mexico Current Condition Fire Regime (FRCC)



(See Table A.3 for condition class definitions.)

Current Condition Fire Regime data source: USDA Forest Service, published 2002.
Other data source: BLM NMSO, 2003.

BLM Field Office
County Line
Major Rivers/Lakes
BLM Field Office Boundary

Produced by the BLM New Mexico Geographic Sciences Team.

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data, or for purposes not intended by BLM. Spatial information may not meet National Map Accuracy Standards.

TABLE 3.4 FIRE REGIMES FOR BLM NEW MEXICO AND TEXAS PLANT COMMUNITIES					
Community or Plant Association	**Dominant Species**	**Fire Return Interval (Range)**	**Fire Effects**	**Fire Regime**	**Comments**
Rocky Mountain. Montane Grassland	Arizona fescue, Mountain muhly, Fringed brome, Tufted hairgrass	Less than 20 years depending on moisture during any fire season	Tolerant	I, II (I is frequent, low severity; (II is frequent stand replacement)	Fringed brome has low tolerance to moderate and high intensity fires
Plains-Mesa Grasslands	Blue grama, Hairy grama, Purple threeawn, Western wheatgrass, Buffalograss, Little bluestem, Sideoats grama	10-35 years	Generally tolerant. Fire top kills blue grama but species is benefited unless burned during drought.	II	Drought and grazing management influence fire behavior and frequency
Great Basin Desert Grasslands	Galleta, Indian ricegrass, Four-wing saltbush	< 35 to <100 years	Four-wing saltbush sprouts	III (III is 35-100 year frequency and mixed severity)	High variation of fire frequency due to drought and lack of fine fuels
Chihuahuan Desert Grasslands	Black grama, Soaptree yucca	Historically 7-10 years	Black grama is sensitive to fire	II	Yucca is well adapted to fire
Rocky Mountain Montane Scub-Interior Chaparral	Shrub live oaks, Ceanothus, Mountain mohagany, Gambel oak, Manzanita	40-60 years	Adapted to fire because most species resprout; manazanita does not resprout but does seed profusely	IV (35-100 year frequency and high severity)	90 percent stand replacement fires in dense shrub
Plains-Mesa Sand Scrub	Shinoak, Sand bluestem	15-30 years	Oak resprouts, sand bluestem generally tolerant	II	Many sand dunes are fire proof
Great Basin Desert Scrub	Big sagebrush, Greasewood, Winterfat, Atriplexes	20-70 years	Most shrubs resprout	III, infrequent mixed	Fire frequency depends on winter moisture, drought, and grazing of fine fuels
Chihuahuan Desert Scrub	Creosotebush, Mesquite, Tarbush	<35 to 75 years, depending on winter moisture. Prior to 1850 may have been 8-10 year interval	Generally not tolerant	II to III	Fire frequency depends on amount of fine fuels to carry fire between shrubs
Open Conifer Woodlands	One-seed juniper, Utah juniper in NW New Mexico, Snakeweed, Rabbitbrush, Winterfat	< 30 years depends on fine fuel continuity	Juniper is susceptible to fire damage	I and II	A mixture of surface fires and mixed severity dependent on understory fuel loading

TABLE 3.4 FIRE REGIMES FOR BLM NEW MEXICO AND TEXAS PLANT COMMUNITIES					
Community or Plant Association	**Dominant Species**	**Fire Return Interval (Range)**	**Fire Effects**	**Fire Regime**	**Comments**
Madrean Closed Conifer Woodlands	Border or Mexican pinyon, Alligator juniper, Evergreen oaks, some Arizona cypress	10-35 years, depends on understory composition	Tolerant, most species resprout	II and III, mixed severity depending on shrub density	Fuel loading is now higher than historical, thus higher severity fires lead to stand replacement
Madrean Open Oak Woodlands	Arizona white oak, Gray oak, Emory oak, Alligator juniper, mixed with chaparral shrubs and grassy understory	10-20 years, depends on specific plant association	Tolerant, most species will resprout	I and II	Fuel loading affects fire behavior and fire effects
Subalpine Forest	Engelmann spruce	50-200 years	Low frequency and high intensity, generally not tolerant	III and IV	Less than 400 acres of this type in Taos Field Office
Upper Montane Forest	Douglas-fir, White-fir, and mixed with other conifers	6 to 31 years	Mixed severity depending on stand structure and fuel loading	I and II	Less than 1,000 acres on BLM
Lower Montane Forest	Ponderosa pine, Pinyon, One-seed juniper, Gambel oak, usually grassy understory	1 to 10 years	High frequency and usually low intensity surface fires. Stand replacement fires have occurred recently due to increased density in saplings and poles	I	Very frequent fire regime has been altered by fire suppression, grazing, logging, and climate conditions
Riparian (Southwest and Plains Forested/Shrub Wetland)	*Tamarisk* spp. is an exotic fire adapted species. The common native riparian species are not fire adapted.	Usually <35 years	Saltcedar (*Tamarix* spp.) can form new plants by sprouting from the root crown, which leads to impenetrable thickets.	IV	Increases in fire size and frequency have been occurring in the Southwest
Texas-Southwest Plateau and Plains Dry Steppe	Short and mid grasses with Mesquite shrubs and scattered juniper	Usually 10 years on 83% of land, 118 years on 17%	Most grasses have rejuvenated from prescribed burning. Mesquite resprouts	II on grasslands, III in some shrub and juniper types	Prescribed fire is being used to restore native grasslands. The current FRCC is 2

NOTE: Data from table was summarized from current literature review, FEIS, Draft Interagency Handbook on Reference Conditions and Potential Natural Vegetation Groups, and USDA Forest Service Region 3 Forest and Woodland Plant Association –Habitat Guide 1997.

TABLE 3.5 NEW MEXICO NOXIOUS WEED LIST		
CLASS A	**LATIN NAME**	**ORIGIN**
Alfombrilla	*Drymaria arenarioides*	Mexico
Black henbane	*Hyoscyamus niger*	Europe
Camelthorn	*Alhagi pseudalhagi*	Asia
Canada thistle	*Cirsium arvense*	Eurasia
Dalmatian toadflax	*Linaria genisitifolia* ssp. *Dalmatica*	Europe
Diffuse knapweed	*Centaurea diffusa*	Mediterranean
Dyer's woad	*Isatis tinctoria*	Europe
Eurasian watermilfoil	*Myriophyllum spicatum*	Eurasia
Hoary cress	*Cardaria draba*	Europe
Hydrilla	*Hydrilla verticillata*	South Africa
Leafy spurge	*Euphorbia esula*	Eurasia
Onionweed	*Asphodelus fistulosus*	Mediterranean
Perennial pepperweed	*Lepidium latifolium*	South Europe
Purple loosestrife	*Lythrum salicaria*	Europe
Purple starthistle	*Centaurea calcitrapa*	Europe
Scotch thistle	*Onopordum acanthium*	Europe
Spotted knapweed	*Centaurea maculosa*	Eurasia
Yellow starthistle	*Centaurea solstitialis*	Europe
Yellow toadflex	*Linaria vulgaris*	Euasia
CLASS B	**LATIN NAME**	**ORIGIN**
African rue	*Peganum harmala*	North Africa
Bull thistle	*Cirsium vulgare*	Eurasia
Halogeton	*Halogeton glomeratus*	Asia
Malta starthistle	*Centaurea melitensis*	Europe
Musk thistle	*Carduus nutans*	South Europe
Russian knapweed	*Acroptilon repens*	Eurasia
Poison hemlock	*Conium maculatum* L.	Europe
Teasel	*Dipsacus fullonum*	Europe
CLASS C	**LATIN NAME**	**ORIGIN**
Field bindweed	*Convolvulus arvensis* L.	Europe
Jointed goatgrass	*Aegilops cylindrical*	South Europe
Russian olive	*Elaeagnus angustifolia* L.	Europe
Saltcedar	*Tamarix* sp.	Europe
Siberian elm	*Ulmus pumila*	Europe

NOTE: Pursuant to the New Mexico Noxious Weed Management Act of 1998 (data source), the noxious weed list is classified into three divisions: Class A, Class B, and Class C weeds, all of which are non-native to New Mexico.

Class A weeds are species that currently are not present in New Mexico or have limited distribution; preventing new infestations of these species and eradicating existing infestations is the highest priority.

Class B weeds are species that are limited to portions of the State. In areas that are not infested, these species should be treated as class A weeds. In areas with severe infestations, management plans should be designed to contain the infestation and stop any further spread.

Class C weeds are species that are wide-spread in the State. Management decisions for these species should be determined at the local level based on feasibility of control and level of infestation.

FISH AND WILDLIFE RESOURCES

General Wildlife Habitat

New Mexico sits at the junction of several physiographic provinces, including two American deserts in the Basin and Range physiographic province (Chihuahuan and Great Basin), the Colorado Plateau, the Rocky Mountains, and the Great Plains. This diversity in habitat types creates tremendous wildlife diversity on public land within the State. BLM manages 13.4 million acres of both big and small game habitat. In New Mexico and Potter County, Texas, a conservative estimate of 21,000 acres consists of riparian habitat (New Mexico Annual Riparian-Wetland Report 2002). These various habitats provide a wide range of variability in vegetation species composition, structural components, and food quality and availability, thereby hosting abundant wildlife. More than 800 species of fish, amphibians, birds, reptiles and mammals occur in New Mexico and Potter County, Texas as year-round residents, seasonal residents, or migrants. This diversity has strong ecological value and attraction for the public.

Within these broad habitats are relatively small amounts of wetland/riparian habitat. Although riparian areas make up less than 1 percent of the public land in New Mexico and Texas, they are one of the most productive and important habitats, providing for an even greater diversity of wildlife species. Many riparian-obligate wildlife species, as well as many native fish species, are either Federally-listed or are considered special status species by the Federal Government (US Fish and Wildlife Service [USFWS] and BLM) or State wildlife agencies in New Mexico and Texas.

The structure, composition, and condition of the various habitat types directly influence the fish and wildlife species assemblages that inhabit them. Fire-adapted vegetation communities comprise more than 99 percent of wildlife habitats on BLM-administered public land in New Mexico and Texas and include all vegetation communities except riparian vegetation communities. Non-fire adapted communities comprise less than 1 percent of habitats on BLM-administered public land. However, because of the proliferation of non-native plants, many of the non-fire adapted riparian habitats are threatened by wildfires. The altered conditions of both the fire-adapted and non-fire adapted vegetation communities have left these communities, and their fish and wildlife inhabitants, at high risk of unnatural, high-intensity wildfire events.

The New Mexico Department of Game and Fish (NMDGF) is responsible for managing wildlife populations throughout New Mexico. The Texas Parks and Wildlife Department (TPWD) is responsible for managing wildlife populations throughout Texas, including Potter County. The BLM coordinates closely with both State agencies to manage the diverse habitats that sustain these wildlife populations (Memorandum of Understanding [MOU] Between the State of New Mexico, New Mexico Game and Fish Commission and the Department of the Interior, Bureau of Land Management, 1990). Many of the New Mexico BLM Field Offices have developed Habitat Management Plans (HMPs), or other interdisciplinary activity plans, in cooperation with the NMDGF, that outline the goals and actions for managing wildlife habitats and populations on public land in the State. Wildlife habitats and priority wildlife species within the management areas of the BLM Field Offices in New Mexico are discussed in these HMPs and in the RMPs listed in Chapter 2, and are incorporated here by reference.

Game Species, Predators, and Furbearers

Big game species are an important aesthetic and economic resource in New Mexico (NMDGF 2003). Eleven big game species inhabit New Mexico, all of which occur on BLM-administered public land. Habitat management is achieved cooperatively between the BLM and the NMDGF. Numerous small game species occur throughout the different vegetation types within New Mexico and Potter County, Texas. Small game species commonly found in many habitats include upland game birds (e.g., pigeons, doves, quail, etc.), cottontail rabbits, and squirrels, as well as a wide variety of waterfowl species. Waterfowl species, including ducks, geese, coots, and gallinules, nest in New Mexico and are found primarily in the natural and modified marshes along the middle Rio Grande, from Sevilleta Wildlife Refuge north of Socorro south to the upper reaches of Elephant Butte Reservoir. Many waterfowl species also migrate through or winter in wetland habitats on public land in New Mexico. There are an additional 14 mammals which are classified as predators or furbearers. These game species, predators, and furbearers inhabit the variety of both fire-adapted and fire-threatened habitats on public land in New Mexico and Potter County, Texas. Habitat information for these species is summarized in Appendix B.

Non-Game Wildlife

New Mexico has a diverse, abundant mammalian fauna, including 140 species of non-game mammals (NMDGF 2003). While the distribution, ecology, and habitat needs of many of the non-game mammals are poorly understood, these species occupy a variety of habitats on public land in New Mexico and in Potter County, Texas. Many of these species have small, local populations.

Over 360 bird species occupy the diverse habitats of New Mexico and Potter County, Texas, of which approximately 320 are non-game species (NMDGF 2003). At least 329 bird species have been documented breeding at least once within New Mexico (Breeding Bird Survey 1996, in Checklist of New Mexico Birds, url: http://www.interaktv.com/NM/NMBirds.html, viewed 12/30/03). New Mexico provides habitats for roughly 140 species of neotropical migratory birds, which breed in the United States or Canada and winter from Mexico to South America. Thirty-nine raptor and owl species have been documented in New Mexico, 27 of which occur year-round or breed in the State. Two vulture species also occur in the State. The greatest variety of species, and often numbers, of birds in New Mexico and Potter County, Texas occur in the riparian and wetland habitats, which often provide oases within the upland habitats.

The Migratory Bird Treaty Act (MBTA) of 1918 and its amendments of 1936, 1974, and 1989 provide domestic law that fulfills the United States' commitment to four international conventions with Japan, Russia, Canada and Mexico. A considerable number of migratory avian species are protected by these regulatory measures, covering a broad range of habitats. Executive Order (EO) 13186 (2001) directs Federal agencies to enforce the MBTA and thereby minimize the loss of birds and their habitat. A Draft Memorandum of Understanding (MOU) dated December 9, 2002 defines the specific roles and responsibilities of the BLM, U.S. Fish & Wildlife Service, and the Forest Service in implementing EO 13186. In the absence of an approved MOU, BLM New Mexico will continue to observe the provisions of the MBTA and strive to minimize the take, either intentional or unintentional, of migratory birds or their habitat. More rigid, proactive interpretations of EO 13186 will be at the discretion of individual Field Offices. For example, current policy in the Farmington Field Office precludes the application of prescribed fire or mechanical thinning (excluding chainsaws) in the implementation of vegetation treatments during the critical nesting period of May 1 through July 15. Exceptions to this policy may be considered where unusual long-term climatic conditions prevent the completion of the

project. Natural fire starts where plan guidance allows for the use of wildland fire for resource benefit is also exempt from this policy.

Many New Mexico and Texas amphibians and reptiles are abundant and seasonally conspicuous, especially the desert-dwelling species. The distribution and status of many of New Mexico's 26 species of amphibians and 104 species of reptiles is not well known (NMGFD 2003).

Fish

New Mexico encompasses the unique geologic boundary of the Continental Divide, which results in distinct fish communities between east and west draining watersheds. Public land occurs adjacent to six of eight major drainages within the State including four east (Rio Grande, Tularosa, Pecos, and Canadian) and two west (San Juan and Gila) of the Continental Divide. Fish communities on the eastern side of the Divide are primarily derived from the Mississippi icthyofauna and predominated by generalists that are able to inhabit a wide variety of habitats (Sublette et al. 1990). In contrast, the western fish species evolved in more confined areas and tend to be more intolerant of habitat changes.

In addition to the east-west difference, the State's fish communities on public land tend to vary north to south between cold and warm water fisheries; the warm water fisheries associated with desert regions. Among BLM-managed areas, warm water fisheries predominate even in the northern part of the State due to the fact that BLM often manages lower elevation valleys with higher average annual temperature than found in mountain areas managed by the Forest Service. The most important cold water fisheries managed by the BLM in New Mexico include the Rio Grande and tributaries within the Taos Field Office and the San Juan River below Navajo Dam within the Farmington Field Office. Some of the southern Field Offices contain cold water reaches in mountain areas, but most have not been developed as trout fisheries of importance to the State. Important warm water fisheries managed by the BLM include the Pecos River (Roswell and Carlsbad Field Offices) and the Gila River (Las Cruces Field Office).

New Mexico BLM has not collected fish community data for many of its water bodies and has not previously maintained a separate fishery program to collate Statewide data. However, based on the occurrence of public land within given drainages, a rough estimate of native and non-native fish species potentially influenced by BLM activity can be determined.

Western side of the Divide:

1. San Juan drainage (Farmington Field Office) contains 9 native and 20 non-native species
2. Gila drainage (Las Cruces Field Office) contains 5 native and 7 non-native species

Eastern side of the Divide:

1. Rio Grande drainage (Taos, Albuquerque, Socorro and Las Cruces Field Offices) contains 27 native species and 33 non-native species
2. Tularosa drainage (Las Cruces Field Office) contains 1 native and 5 non-native species
3. Pecos drainage (Taos, Roswell, Carlsbad Field Offices) contains 39 native and 28 non-native species
4. Canadian drainage (Taos, Roswell and Amarillo Field Offices) contains 24 native and 21 non-native species

The total number of fish species actually occurring on BLM-administered public land is smaller than the list above. However, there are other drainages not adjacent to public land, but subject to effects from activities on public land. BLM activities in upstream and upland areas can have a large impact on fish communities and populations in downstream habitats (Vannote et al. 1980).

SPECIAL STATUS PLANT AND WILDLIFE SPECIES

An estimated 60 Federally-listed threatened and endangered, proposed threatened and endangered and candidate species are known or potentially could occur on public land within New Mexico and Potter County, Texas. In addition, approximately 175 other special status species (U.S. Fish and Wildlife species of concern, BLM sensitive, and State-listed) could also occur on public land in New Mexico and Potter County, Texas. However, because of the land ownership patterns and the specific habitats used by these species, they may occur within the broad borders of New Mexico and Potter County, Texas, but not occur on BLM-administered public land.

A variety of habitats occur throughout the public land in New Mexico and Potter County, Texas that provide important environments (foraging, cover, reproduction, and rearing) for a number of special status species. Of the habitat types, grasslands, woodland/forest, and riparian/wetland habitats are the most limited and important to special status species. Some of the species associated with each of the important habitat types are summarized briefly below.

Grasslands

A number of special status species are dependent on grassland habitats, including peregrine falcon, swift fox, aplomado falcon, mountain plover, black-footed ferret, Guadalupe southern pocket gopher, Arizona black-tailed prairie dog, Baird's sparrow, ferruginous hawk and western burrowing owl.

Woodland/Forest

Special status species dependent on woodland/forest habitats include Kuenzler hedgehog cactus, Knowlton's cactus, Todsen's pennyroyal, Mexican spotted owl, northern goshawk, Sacramento Mountain and Jemez Mountain salamanders, and numerous bat species.

Riparian/Wetland

Species dependent on riparian/wetland habitats include Sacramento prickly poppy, Sacramento Mountain thistle, interior least tern, southwestern willow flycatcher, bald eagle, Chiricahua leopard frog, Arizona southwestern toad, black tern, New Mexico jumping mouse, northern goshawk, common black-hawk, white-faced ibis, yellow-billed cuckoo, and numerous bat, fish, and invertebrate species.

Appendix C provides a list of the Federally-listed threatened and endangered, proposed threatened and endangered, and candidate species, and a list of other special status species that are most likely to occur on BLM-administered public land in New Mexico and Potter County, Texas.

CULTURAL RESOURCES

Cultural resources are the fragile and non-renewable products of modern, historic, and prehistoric human activity. Historic properties may be in the form of historic districts, sites, buildings, structures, or objects and are important to our understanding of prehistory and history. Traditional Cultural Properties (TCPs) hold significance because of their association with cultural practices or beliefs of a living community, and are important in maintaining the cultural identity of that community. Specific legal requirements under which the BLM and other Federal agency cultural resource management programs operate to meet program objectives can be found in BLM NMSO 2004a.

Cultural resource inventories in New Mexico have been conducted on between 2 and 15 percent of BLM-administered public land, documenting 26,028 sites. Approximately 12 percent of the 11,833 acres of BLM surface public land in Texas has been inventoried, resulting in documentation of 57 sites. Many sites exhibit multiple occupations by historic and prehistoric groups. These separate manifestations of past use are referred to as components, identified by their unique artifact assemblages and features.

Humans have occupied New Mexico for at least 12,000 years. Adaptations have ranged from hunting and gathering to horticulture to herding. The earliest period of human occupation in New Mexico is referred to as the Paleoindian Period, dating to at least 10,000 years B.C. and is characterized by the hunting of extinct megafauna. More than 131 archaeological sites have been recorded on BLM-administered public land in New Mexico that exhibit components from this period. The second broad time period is referred to as the Archaic Period, from about 6,000 B.C. to A.D. 1, characterized by the hunting and gathering of a wide variety of food resources. More than 1,745 Archaic components have been recorded on public land in New Mexico to date.

Population expansion, settled communities, increased dependence on cultivated crops, above ground architecture, pottery, and the bow and arrow are all characteristic of the ensuing Pueblo Period. Many dramatic changes in settlement and subsistence patterns occurred throughout this period, lasting from about A.D. 1 to Spanish contact in the late sixteenth century. In the eastern part of the State, a lifestyle more similar to that of the Archaic Period persisted well into the nineteenth century. To date, more than 10,284 components from the Pueblo Period have been recorded on sites on public land in New Mexico.

After about 1200 A.D., Pueblo groups shifted drastically in different regions but persisted. Athabaskan groups (ancestors of modern Navajos and Apaches) moved into the area, and the Spanish arrived in the late sixteenth century, bringing domestic animals such as horses, cattle and sheep, the use of which was soon adopted by resident Native American populations. Anglo/Euro-American homesteaders settled in the nineteenth and early twentieth centuries. The entire time from European (Spanish) contact until 50 years ago is referred to broadly as the Historic Period and includes sites from Spanish colonial settlements, post-contact Native American sites, trails such as the Santa Fe and Camino Real, Civil War forts and battlefields, early farming and ranching sites, early industrial sites, and even Cold War practice areas and targets. A total of 7,087 historic components have been documented on BLM-administered public land sites in New Mexico. For additional information on the prehistory and history of New Mexico, see Stuart and Gauthier (1981) or Swadesh (1973) and for information on prehistory pertaining to the Cross Bar Ranch in Potter County, Texas, see Wood (1998).

In addition to their recognition by the BLM as Areas of Critical Environmental Concern (ACECs) or Special Management Areas (SMAs), many of the archaeological and historic sites on public land in New Mexico have been listed on the National Register of Historic Places, and several Chacoan sites in the Farmington Field Office are on the World Heritage List. One ACEC, Big Bead Mesa, located in the Albuquerque Field Office, is designated a National Historical Landmark. One SMA, San Lazaro Pueblo located in the Taos Field Office, also is designated a National Historic Landmark.

Under New Mexico's existing Protocol Agreement through the National Historic Preservation Act, the BLM identifies and evaluates historic properties within a project's area of effect and consults with the State Historic Preservation Officer (SHPO) and Advisory Council on Historic Preservation (ACHP) where potential adverse effects may result. If it has been determined that the proposed undertaking will have no effect on historic properties that are included in or eligible for inclusion in the National Register of Historic Places, then the project may proceed without further consultation with SHPO. If a historic property cannot be avoided, SHPO is given an opportunity to consult with the BLM regarding measures to mitigate adverse effects to the site. The BLM does not have a Protocol Agreement in Texas.

New Mexico Cultural Resource Components and Component Types

The prehistoric and historic sites found in New Mexico can be categorized by time period and culture, as well as by structures and facilities found at the site (referred to by archaeologists as features). The following classification broadly describes the diversity of cultural resource sites located on public land in New Mexico. These data are available from the New Mexico Cultural Resources Information System (NMCRIS) database for the majority of properties known; however many sites are poorly recorded, and most areas in the State have received little or no inventory. It is likely that several million sites have yet to be recorded in New Mexico.

The known archaeological and historic sites on public land are classified in Table 3.6 by component, representing the major time periods and cultures, and by component type. The component types used here consist of Habitation components, Limited Activity components, Special Use components, and Components Without Features. Habitation components have the remains of single and multiple residential structures, ranging from simple to complex. These sites may exhibit a single structure, or be the remains of larger villages or aggregations of multiple structures. Limited Activity components are comprised of feature types generally associated with resource procurement activities, resource processing activities, and resource storage features. Examples include hearths; roasting pits and other thermal features such as fire-cracked rock scatters; features associated with short-term prehistoric and historic camps; stone and clay quarry sites; and a variety of other features representing non-habitation kinds of uses. Special Activity components exhibit features such as burials and graves, cemeteries, ceremonial features and rock art, trails and roads, road related features, and other non-habitation and non-resource use features. Many of these feature types are ascribed cultural values that may render them important as TCP. Components Without Features are properties generally consisting of artifact scatters, often with limited information other than culture or time sensitive artifacts.

Potter County, Texas Cultural Resource Components and Component Types

The majority of the known properties on the public land in Potter County, Texas (also known as the Cross Bar Ranch) are prehistoric sites ranging from the Late Archaic period to the Proto-

historic period. Twelve historic sites are known including water control features, a water trough, a rock wall and two historic trash dumps related to the Cross Bar Ranch complex. The Cross Bar Ranch complex has also been recorded, consisting of the remains of a historic homestead and cattle ranch operated by the Bivens Family in the early 20th century. These components and component types are outlined in Table 3.7, following the same classification method used for New Mexico, modified to reflect components known from the Cross Bar Ranch land.

PALEONTOLOGICAL RESOURCES

New Mexico has a fossil record that includes almost all of the geologic periods from the Cambrian Period (500+ million years ago) to the Holocene (the last 10,000 years), and nearly every imaginable ancient environment. Many New Mexico fossil deposits are of National and International importance, and close to 1,000 different kinds of fossils were originally made known to the scientific world from specimens first found in New Mexico rocks. Many of these have never been found anywhere outside of the State. These fossils play an important role in the study of specialized subdivisions of the discipline such as paleobotany, paleoecology, paleobiogeography, micropaleontology, biostratigraphy, palynology, and taphonomy. For more information on New Mexico paleontology, see Kues (1982) and Lucas (1997).

TABLE 3.6
NEW MEXICO CULTURAL RESOURCE SITES BY COMPONENT AND COMPONENT TYPE

Component	Total	Habitation	Limited Activity	Special Use	No Features
Paleo-Indian	131	1	25	0	105
Archaic	1,745	32	651	48	836
Ancestral Puebloan	10,284	3,142	2,677	392	3,299
Unknown Prehistoric	2,159	27	991	24	1,048
Historic Puebloan	86	13	16	13	26
Plains	12	2	5	0	5
Navajo	4,317	1,531	1,612	607	619
Apache	62	12	21	8	16
Hispanic	358	99	158	80	21
Anglo/Euro-American	1,629	438	688	169	298
Unknown Historic	622	118	296	106	99
Unknown Components	5,489	269	2,271	224	2,603
TOTAL COMPONENTS	**26,894**	**5,684**	**9,411**	**1,671**	**8,975**

SOURCE: New Mexico Cultural Resources Information System 2004.

TABLE 3.7 CROSS BAR RANCH CULTURAL RESOURCE SITES BY COMPONENT AND COMPONENT TYPE					
Component	**Total**	**Habitation**	**Limited Activity**	**Special Use**	**No Features**
Paleo-Indian	1		1		
Archaic	3	1	2		
Antelope Creek/Protohistoric	8	5	1		2
Unknown Prehistoric	30		21	2	7
Plains	2	2			
Anglo/Euro-American	12	1	11		
Unknown Components	1			1	
TOTAL COMPONENTS	**57**	**9**	**37**	**3**	**9**
SOURCE: BLM New Mexico State Office data 2004.					

Public land in New Mexico contains fossils representing this outstanding diversity of paleontological resources on important type localities. Approximately 4,600 paleontological localities are known within New Mexico, with over 2,000 localities on public land. Of particular importance are vertebrate and uncommon non-vertebrate fossils. A brief outline of the more important fossil resource locations by geological period is outlined below. This synopsis begins with the last period of the Paleozoic Era, the Permian, where notable fossils have been found on public land. Rocks of the Pennsylvanian and older periods have produced important fossils, but not to date on public land.

Paleozoic Era (250 million years ago and older)

Permian Period (251 million to 286 million years ago)

The Paleozoic Trackways of Permian Age in the Robledo Mountains north of Las Cruces is a unique fossil resource. These tracks dwarf all other known sites in quantity, quality, and diversity of ichnotaxa (animal trace forms), and undoubtedly represent the most important Early Permian track sites known to date. They preserve a unique record of the lives and behavior of reptiles, amphibians, insects, and other invertebrates that lived 280 million years ago.

Mesozoic Era (64 million to 250 million years ago)

Triassic Period (208-251 million years ago)

The most complete series of fossil remains from the Triassic period in New Mexico have been recovered from the Chinle formation in the lower Chama River Valley near the Ghost Ranch, which yielded the remains of hundreds of Coelophysis theropod dinosaurs. The Chinle formation has also yielded remains of other Triassic fauna, including phytosaurs, aetosaurs, theropod dinosaurs, reptiles, fish, bivalves, conchostracans, and decapods. Although much Triassic outcrop occurs on private land, there are areas of public land where outcrops occur and

have the potential to produce important material. A single paleontological find has been recovered from the Cross Bar Ranch land in Potter County, Texas, consisting of a bone fragment of a possible phytosaur.

Jurassic Period (146 million to 208 million years ago)

Exposures of the Morrison Formation have produced scientifically significant dinosaur remains. Over a dozen sites have been located in the Morrison Formation south of the San Juan Basin, some of which have a high probability of containing articulated skeletons of Jurassic age dinosaurs. In addition, a Morrison Formation dinosaur quarry west of Albuquerque, New Mexico has produced a sauropod skull and remains of large carnivorous dinosaurs.

Cretaceous Period (64 million to 146 million years ago)

BLM administers much of the San Juan Basin, a large depositional basin in the Colorado Plateau, in which great thicknesses of Late Cretaceous and early Tertiary sediments were deposited. These sediments probably contain the most abundant and diverse fossil vertebrate assemblages in the State. The basin is one of a small number of places on the earth's surface where continental sediments containing Late Cretaceous dinosaurs are immediately overlain by rocks bearing some of the earliest Tertiary Era mammals.

Cenozoic Era (1.6 million to 64 million years ago):

Paleocene Period (55 million to 64 million years ago)

The Nacimiento Formation is exposed over a wide area in the northwest part of the State. This formation contains one of the best records of Paleocene vertebrates in the world. The lower strata of the Nacimiento Formation contain the "Puercan Fauna." The Puercan fauna of the San Juan Basin is the most diverse and best represented in existence. Of equal importance is the fauna found in slightly higher strata in the Nacimiento Formation. This formation contains mammal fossils considered to be the standard for the North American Middle Paleocene land mammals of the period.

Eocene Period (38 million to 55 million years ago)

Exposures of the San Jose Formation have yielded two classic North American Early Eocene vertebrate faunas and still produce important fossil vertebrate specimens, including those of primitive primates. Important paleobotanical and vertebrate fossil remains are found in the San Jose Formation outcrops across much of the northwestern part of the State.

Miocene and Pliocene Periods (1.6 million to 38 million years ago)

Significant fossil locations associated with the Miocene and Pliocene periods are found largely in the Santa Fe Group along the Rio Grande corridor in north central New Mexico. Sediments along the Rio Grande corridor and associated basins in the southern part of the State have produced vertebrate fossils, including elephants, camels, horses, dogs, rhinoceros and antelope. In the southeastern part of the State, BLM-administered public land has excellent potential for fossil discoveries although they have not yet been adequately surveyed.

Pleistocene Period (10,000 to 1.6 million years ago)

Formations along the Rio Grande south to Albuquerque, in the sand and gravel river terraces, yield fossils that represent Pleistocene animals of more recent times. These fossils and their associated data provide important information for the overall analysis of paleoclimate, past plant and animal assemblages, and Pleistocene dispersal routes. The southeastern part of the State also contains Pleistocene deposits that exhibit megafaunal remains of mammoth, bison, horse, camel, and other recently extinct mammals, some having potential for association with early man in North America. Some 600 caves are known to exist, some of which contain paleontological resources of considerable significance.

BLM New Mexico manages a series of specially designated paleontological areas as Areas of Critical Environmental Concern (ACECs) or Special Management Areas (SMAs), as well as Wilderness Areas and Wilderness Study Areas (WSAs) which have significant paleontological resources.

Land administered by BLM on the Cross Bar Ranch in Potter County, Texas has only produced one known fossil locality, where a possible phytosaur bone fragment was recovered. Triassic rocks exposed along the Canadian River Breaks in Texas have produced phytosaurs, freshwater sharks and invertebrates, indicating potential for further discoveries on the Cross Bar Ranch properties.

VISUAL RESOURCES

Visual resources on BLM-administered public land are identified, evaluated, and classified following guidelines in BLM Manual Section 8700, Information Bulletin No. 98-135, and Instruction Memorandum No. 98-164. Systematic inventory procedures are described in BLM Handbook H-8410-01, Visual Resource Inventory. Accordingly, Visual Resource Management (VRM) land classifications have been established in the RMPs referenced in Chapter 1. The four VRM classes (I-IV) are based on determinations of scenic quality or visual appeal of the area, distance zones from which the landscape of interest is viewed, and public sensitivities to change in the existing landscape character. Overall, VRM quality is managed on the basis of the objectives for Classes I through IV described below:

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

Class II – The objective of this class is to retain the character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. 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 – The objective of this class is to partially retain the existing character of the landscape. The level of 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 – The objective of this class 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. Every attempt should be made, however, to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Class I areas, the most scenic and most sensitive of the four VRM classes, are typically special designation management areas such as wilderness or ACECs. Management in these areas is generally consistent with VRM objectives. Class II areas may include special designation areas not managed as Class I areas and, in addition, include canyon and mountain vistas of particular interest. Class III VRM management areas are established along some major highway corridors or may have been established adjacent to higher level VRM classes to buffer management impacts near more sensitive areas or broad vistas. Class IV areas are those lands not included in Classes I-III. Management activities in all of these areas are assessed on a project-by-project basis through a process described in BLM Handbook H-8431-1, Visual Resource Contrast Rating, to ensure that impacts to visual quality are minimized or mitigated. Potential impacts, analyzed for the basic elements of form, line, texture, and color, can be managed through the application of various design techniques.

SPECIAL DESIGNATION AREAS

Special designation or special management areas contain natural and cultural resource features that have been recognized by law, Presidential Proclamation or through the BLM planning process as being unique, important and deserving of some form of special management. There are six types of special designation areas on BLM-administered public land in New Mexico: National monuments, National Conservation Areas (NCA), Wild and Scenic Rivers (WSR), Wilderness Areas, WSAs, and ACECs. Specific special designation areas are discussed in more detail in the RMPs referenced at the beginning of Chapter 1, and are incorporated herein by reference. The following sections are brief descriptions of the special designation areas in New Mexico.

Wilderness Areas and Wilderness Study Areas

There are three wilderness areas in New Mexico totaling 139,537 acres as shown in Table 3.8. The Cibola and West Malpais wilderness areas are administered by the Albuquerque Field Office and the Bisti-De-na-zin is administered by the Farmington Field Office.

There are 52 WSAs in New Mexico totaling 962,343 acres. Table 3.9 shows WSAs and acreage by Field Office. Most of these were designated through the Statewide wilderness study process initiated in 1979 and completed in 1991 as prescribed by Section 603 of the Federal Land Policy and Management Act (FLPMA). Five WSAs have been designated through legislation or through the land use planning process.

Fire management for WSAs is prescribed in Handbook 8850-1 – Interim Management Policy for Lands Under Wilderness Review (IMP). Chapter III, Section C.2 of the IMP addresses vegetation manipulation in WSAs. Chapter III, Section J of the IMP addresses fire management, for both prescribed fire and fire suppression. In general, all prescribed fire and fire suppression activities will be conducted according to Fire Management Plans and subsequent operational plans using caution to avoid damage to an area's wilderness characteristics. "Light-Hand-on-the-Land" fire suppression tactics, mop-up, and rehabilitation

will be used to the extent possible. This section of the IMP should be thoroughly reviewed prior to any fire management activity in a WSA.

National Monuments and National Conservation Areas

The Kasha Katuwe Tent Rocks National Monument was designated by Presidential Proclamation in January 2001. The monument is located on the southern edge of the Jemez Mountains and is adjacent to the Pueblo of Cochiti. It consists of 4,114 acres of Federal land, receives approximately 50,000 visitors per year, and is jointly managed with the Pueblo of Cochiti.

El Malpais NCA is located south of Grants, New Mexico and covers 277,100 acres of diverse topography, landform, and vegetation. It was designated through Congressional legislation in 1988 and receives approximately 90,000 visitors annually. Even though some areas are sparsely vegetated, i.e. the lava flow, a number of fires have occurred in the NCA in the past. In 2002, the Cherry Fire burned 4,069 acres of public land and another 13,000 acres of National Park Service land in the Hole-in-the-Wall area, which is in the central part of the NCA.

TABLE 3.8
CONGRESSIONALLY DESIGNATED UNITS

Name	Size
El Malpais National Conservation Area	227,100 acres
Kasha Katuwe Tent Rocks National Monument	4,148 acres
Bisti-De-na-zin Wilderness Area	38,381 acres
Cebolla Wilderness Area	61,500 acres
West Malpais Wilderness Area	39,400 acres
Rio Chama Wild and Scenic River	5 mi.
Rio Grande Wild and Scenic River	48 mi.
Continental Divide National Scenic Trail	175 mi.*
El Camino Real de Tierra Adentro	60 mi.*
Old Spanish Trail	96 mi.*

NOTE: *Approximate miles of trail on BLM-administered public land.
SOURCE: BLM New Mexico State Office data, 2004.

Wild and Scenic Rivers

Two WSRs have been designated on BLM-administered public land in New Mexico: the Rio Grande Wild and Scenic River and the Rio Chama WSR. The Rio Grande WSR includes 48 miles of the Rio Grande from the Colorado border south to just below the Taos-Rio Arriba County line, along with 4 miles of Red River to its confluence with the Rio Grande. These sections were designated by Congress in 1964. An additional 12 miles along the Rio Grande, continuing south from the earlier designated area, to Velarde, New Mexico, were added to the wild and scenic designation by Congress in 1992.

TABLE 3-9
WILDERNESS STUDY AREAS AND ACREAGE BY FIELD OFFICE

Field Office	WSA	Acreage
Albuquerque	Cabezon	8,159
	Chain of Craters	18,300
	Chamisa	13,692
	Canyons	4,000
	Empedrado	9,007
	Ignacio Chavez	33,609
	La Lena	10,438
	Manzano	881
	Ojito	10,903
	Petaca Pinta	11,668
FIELD OFFICE TOTAL		**120,657**
Taos	Rio Chama	11,985
	Sabinoso	15,760
	San Antonio	7,050
FIELD OFFICE TOTAL		**34,795**
Las Cruces	Aden Lava Flow	25,972
	Alamo Hueco Mountains	17,244
	Apache Box	6,229
	Big Hatchet Mountains	67,697
	Blue Creek	14,620
	Brokeoff Mountains	30,848
	Cedar Mountains	14,908
	Cooke's Range	19,872
	Cowboy Spring	6,661
	Culp Canyon	11,265
	Florida Mountains	22,066
	Gila Lower Box	8,178
	Gray Peak	14,471
	Guadalupe Canyon	4,145
	Guadalupe Escarpment	6,957
	Hoverrocker	22
	Organ Mountains	7,211
	Organ Needles	5,598
	Peloncillo Mountains	3,993
	Pena Blanca	4,780
	Robledo Mountains	13,379
	Las Uvas Mountains	11,067
	Sacramento Escarpment	3,010
	West Potrillo Mountains	151,049
FIELD OFFICE TOTAL		**471,242**

Field Office	WSA	Acreage
Socorro	Antelope	20,710
	Continental Divide	68,761
	Devil's Backbone	9,764
	Eagle Peak	43,960
	Horse Mountain	5,032
	Jornada del Muerto	31,147
	Mesita Blanca	19,414
	Presilla	8,680
	Sierra de las Canas	12,798
	Sierra Ladrones	45,308
	Stallion	24,238
	Veranito	7,206
FIELD OFFICE TOTAL		**297,018**
Roswell	Carrizozo Lava Flow/Little Black Peak	25,312
FIELD OFFICE TOTAL		**25,312**
Farmington	Ah-shi-sle-pah	6,353
FIELD OFFICE TOTAL		**6,353**
Carlsbad	Devil's Den Canyon	320
	Lonesome Ridge	3,505
	McKittrick Canyon	200
	Mudgetts	2,941
FIELD OFFICE TOTAL		**6,966**
Grand Total		**962,343**

SOURCE: BLM New Mexico State Office data 2004

Only about 5 miles of the Rio Chama WSR is on public land, with the remainder on Santa Fe and Carson National Forests. However, BLM manages commercial and private boating on more than 30 miles of the River.

WSR designations typically extend a quarter mile on each side of the high water mark of the river in question. However, this may vary depending on topography, land ownership or other factors. WSRs are administered to protect and enhance the values that caused them to be included in the system without limiting other uses. Management emphasis is placed on protecting the aesthetic, scenic, historic, archaeological, and scientific features found in each component of the designated wild or scenic river (BLM Manual Section 8351 - Wild and Scenic Rivers – Policy and Program Direction for Identification, Evaluation, and Management).

Areas of Critical Environmental Concern (ACECs)

There are 151 ACECs totaling 595,002 acres on BLM-administered public land in New Mexico. These range in size from 10-acre archaeological sites in the Farmington Field Office to the 62,460-acre Ladrone Mountain ACEC in the Socorro Field Office. ACEC designations highlight areas where special management attention is needed to protect and prevent irreparable damage to important historic, cultural, or scenic values; fish or wildlife habitat or populations; or other natural systems or processes. ACECs may also be designated to protect human life and safety from natural hazards. Information about ACECs is summarized in BLM NMSO 2004c.

National Trails

Three Congressionally designated trails occur, in part, in New Mexico: the Continental Divide National Scenic Trail (CDNST), El Camino Real de Tierra Adentro (The Royal Road to the Interior Lands), and the Old Spanish Trail. The CDNST runs more or less along the Continental Divide from Mexico to Canada. Although the trail corridor has been defined across BLM-administered public land in New Mexico, the actual on-the-ground trail route is still being determined. Management of the trail is described in the Mimbres, Socorro, Rio Puerco and El Malpais National Conservation Area RMPs.

In the United States, El Camino Real runs from El Paso, Texas to north of Santa Fe, New Mexico. Approximately 60 miles of the trail occurs on public land. An Environmental Impact Statement (EIS) addressing the management of El Camino Real National Historic Trail is being finalized. The Old Spanish Trail runs from Santa Fe through the northwest portion of the State and eventually to southern California. The management plan for this trail will be initiated in the near future.

LAND USES

The four-state area (New Mexico, Oklahoma, Kansas, and Texas) administered by BLM Field Offices in Albuquerque, Taos, Las Cruces, Socorro, Roswell, Carlsbad, and Farmington, New Mexico; Tulsa and Moore, Oklahoma; and Amarillo, Texas, as well as by the New Mexico State Office in Santa Fe, contains some 13.4 million acres of surface land plus over 44 million acres of Federal mineral estate and over 8 million acres of American Indian mineral estate. Public land uses are diverse and include livestock grazing, recreation, forestry, and mining. The New Mexico BLM also issues leases, rights-of-way and a wide variety of use permits, including parks, power transmission lines, and roads. BLM offices in New Mexico are currently processing right-of-way applications for fiber optic projects that cross public land in New Mexico.

Additionally, BLM administers both mining claim records and mineral leases (including leases for oil and gas development), which are on lands managed by other Federal agencies.

Grazing Management

Currently, the BLM administers livestock grazing on Federal land primarily under the authority of Section 3 and 15 of the Taylor Grazing Act of 1934. Livestock grazing is authorized through grazing permits and leases that are typically issued for a 10-year term. No livestock grazing is permitted on the 12,000 acres of BLM-administered public land in Texas. In New Mexico, more than 2,000 operators are authorized to graze livestock on 2,193 allotments (BLM 2000). Grazing is authorized by leases on 872 grazing allotments. Allotments vary in size with regard to the number of active Animal Unit Months (AUMs). The smallest allotment contains one AUM, while the largest has 37,940. As of 2002, 1,872,958 active AUMs were authorized for New Mexico; 96,646 AUMs were suspended, not authorized (BLM Public Statistics FY 2002). The types of livestock authorized to graze on public land include cattle, horses, burros, bison, sheep and goats. Livestock grazing is managed through allotment management plans referenced in existing RMPs. Over 290 allotment management plans have been prepared in conjunction with the permittees and with other agencies to successfully resolve conflict and establish goals by prescribing stewardship objectives. Grazing management practices adhere to the *New Mexico Standards for Public Health and Guidelines for Livestock Grazing Management* (BLM 2000).

Recreation

Public land in New Mexico offers a wide variety of outdoor recreation opportunities including hunting, hiking, camping, off-highway vehicle (OHV) travel, wildlife viewing and photography, rock collecting, mountain biking and others. There are thousands of miles of roads and trails open to both motorized and non-motorized vehicles, as well as trails designated for specific uses such as hiking, horseback riding or mountain biking. Many people like to use the public land simply because of the wide open spaces and undeveloped character. They give visitors a sense of freedom and an escape from the restrictions of urban areas. Over 2 million visitors use public land annually.

Forestry

Forested land in New Mexico include mixed-conifer and ponderosa pine forests, pinyon and juniper woodlands, and oak woodlands as displayed in Table 3.10. The acreage for forested land in New Mexico on BLM-administered public land was developed from a US Forest Service (FS) Intermountain Research Station Forest Inventory Analysis conducted for the entire nation in 1999. The BLM has developed a Forest and Woodland Plan that addresses Forest Health and the opportunity to manage forests while providing wood products from hazardous fuel treatments, forest health projects, and restoration treatments that can support local community-based commercial activity (Miller 2002). Forest products include mainly firewood, fence posts, and poles. Other forest products include Christmas trees, pinyon nuts, and wood products for tribal uses. In Fiscal Year 2002, wood product values from public land in New Mexico totaled $25,991 for fuelwood, posts and poles; permits for other wood products yielded $3,406 (Public Land Statistics 2002).

TABLE 3.10 FOREST AND WOODLANDS ON PUBLIC LAND IN NEW MEXICO							
Field Office	**County**	**Woodland Acres**				**Forest Acres**	**TOTAL**
		Juniper	**Pinyon-Juniper**	**Oak Woodland**	**Total Woodland**	**Ponderosa Pine**	**Forest and Woodland**
Socorro	Catron	11,560	78,550		90,110	5,543	
	Socorro	35,904	37,080		72,984		
					163,094	5,543	168,637
Albuquerque	Cibola		159,686		159,686	27,143	
	McKinley		36,876		36,876	5,268	
	Sandoval	11,864	51,323		63,187		
					259,749	32,411	292,160
Taos	Mora		12,966		12,966		
	Rio Arriba	19,953	226,289		246,242		
	San Miquel		25,932		25,932		
	Santa Fe		25,017		25,017		
	Taos		38,408	9,259	47,667	4,801	
					357,824	4,801	362,625
Farmington	San Juan	12,688	183,944		196,632		
					196,632		
Las Cruces	Grant		4,766		4,766	4,766	
	Hidalgo		6,106		6,106		
	Otero		6,246		6,246		
	Sierra		12,514		12,514		
					29,632	4,766	34,398
Roswell	Lincoln		21,999		21,999		
					21,999		21,999
TOTALS		**91,969**	**927,702**	**104,912**	**1,034,473**	**47,521**	**1,081,994**
SOURCE: Forest Inventory 1999, FIA-USFS, All stocking)							

Minerals

The BLM minerals program includes locatable, leasable, and salable minerals. Locatable minerals are subject to location under the mining laws. Leasable minerals are subject to leasing pursuant to the Mineral Leasing Act. Salable minerals are common varieties of mineral materials subject to use authorization through sale or permit. Some uncommon varieties of mineral materials (such as high quality or unique quarry rock or building stone) may be considered "locatable" minerals.

Locatable minerals include the base and precious metals, or so-called "hardrock minerals." The principal locatable minerals mined in New Mexico are gold, silver, copper, and molybdenum. Most locatable mineral operations on BLM-administered public land require either a notice or plan of operations. There are approximately 45 active plans and notices on public land in New Mexico. At the end of Fiscal Year 2002, there were 168,982 total mining claims in New Mexico, of which 6,314 were active.

The BLM administers 13 coal leases in New Mexico for a total of 31,716 acres and 12 in Oklahoma for a total of 17,113 acres. BLM New Mexico has one of the largest oil and gas programs in the BLM, including one of the largest reserves of natural gas in the world in the San Juan Basin in northwestern New Mexico. There are over 6,500 producing oil and gas leases in New Mexico and 500 in Texas.

BLM permits the extraction of common varieties of mineral materials from public land, including sand and gravel, quarry rock, building stone, fill dirt, caliche, scoria, pumice, humate and brick clay. Materials are sold at fair market value. Mineral materials are used in highway construction and maintenance, residential and commercial construction, oil and gas well drilling, landscaping, and flood control and irrigation projects.

One of the largest potash reserves in the country is located in southeastern New Mexico. Potash is a vital fertilizer component. BLM's Amarillo Field Office in Amarillo, Texas, manages helium gas reserves, helium gas leasing, and transportation and storage of helium. Helium plays a prominent role in the Government's space, defense, and energy programs.

SOCIO-ECONOMIC CONDITIONS

Census figures from 2000 are used in the following analyses, available from the U.S. Census Bureau web site (mainly http//factfinder.census.gov); from the U.S. Department of Agriculture Economic Research Service (www.ers.usda.gov/statefacts), and the University of New Mexico Economy web site (www.unm.edu/~bber/economy.htm).

New Mexico is home to a diverse population. During the 2000 census, residents of New Mexico reported their ethnic heritage to be: 44.7 percent white (not of Hispanic or Latino origin), 42.1 percent white of Hispanic or Latino origin, 9.5 percent American Indian and Alaska native, 1.9 percent Black or African American, 1.1 percent Asian, .1 percent Native Hawaiian and Other Pacific Islander, with 17.0 percent reporting some other race and 3.6 percent reporting two or more races, in a population of 1,819,046. During the 2000 census, residents of Potter County, Texas reported their ethnic heritage to be: 57.7 percent white (not of Hispanic or Latino origin), 28.1 percent white of Hispanic or Latino origin, .9 percent American Indian and Alaska native, 10 percent Black or African American, .9 percent Asian, 0 percent Native Hawaiian and Other

Pacific Islander, with 15.4 percent reporting some other race and 2.6 percent reporting two or more races, in a population of 113,546.

Between 1970 and 2000, New Mexico's population grew by 44 percent, compared to the U.S. growth of 28 percent over the same time period. Between 1990 and 2000, the State of New Mexico experienced a 20.1 percent increase in population compared to the National increase of 13.2 percent. Peach (2000:2) notes that between 1950 and 2000, two-thirds of the growth occurred in only four counties in New Mexico (Bernalillo, Dona Ana, Santa Fe, and San Juan). However, the fastest growing counties from 1990 to 2000 were Torrance, Lincoln, Valencia, and Sandoval, which experienced population increases of 64 percent, 59 percent, 46 percent and 42 percent, respectively. Potter County experienced a 16.1 percent growth from 1990 to 2000. In 2000, 57 percent of New Mexico residents lived within urban areas, while 43 percent lived in rural areas. The most urban counties in New Mexico are Bernalillo, Dona Ana, Los Alamos, Sandoval, Santa Fe, and Valencia. The most rural counties are Catron, DeBaca, Guadalupe, Harding, and Union. The number of residents living in urban areas has steadily increased, from 52 percent of the State's population in 1980 to 57 percent in 2000.

In 2002, Luna County had the highest unemployment rate at 19.4 percent, followed by Mora, Grant, and Taos Counties at 13.2 percent, 12.2 percent, and 9.1 percent, respectively. Los Alamos County had the lowest unemployment rate at 1.0 percent, followed by Union and Santa Fe Counties at 2.7 percent and 2.9 percent, respectively. In 2000, the unemployment rate in Potter County was 4.2 percent. Between 1990 and 2000, employment in all industries grew by 151,685 workers in New Mexico. The percentage of total employment has increased in the service industries (finance, insurance, real estate, entertainment, recreation, education, and other services) from about 24.7 percent of all workers to about 28.5 percent of all workers. Industries that have decreased as a percentage of total employment include mining; manufacturing; and finance, insurance and real estate. The importance of Federal rangelands to livestock production can be measured by ranchers' dependency on Federal forage. In 1997, the Federal land's share of the total cattle/sheep feed produced in New Mexico was lower only than in Nevada and Arizona compared to other western states with BLM-administered public land (Power 2004:2, Table 1).

Since 1980, an average of 112 wildland fires have occurred annually on BLM-administered public land in New Mexico, for an average of 25,316 acres burned per year. During the past 24 years of records, the greatest number of fires occurred in 2000, with a total of 305 wildland fires reported. The greatest number of BLM acres burned in 1993, with 129,199 acres reported. Since 1989, there have been 12 firefighter deaths in New Mexico while suppressing wildland fires, including three deaths in 2000 (NIFC Wildland Fire Statistics 2004). In May 2000, the 47,650-acre Cerro Grande fire destroyed 235 structures and damaged Los Alamos National Laboratory. In March 2002, the 1,000-acre Kokopelli fire destroyed 29 structures in a subdivision near Ruidoso. During the large fire years of 2000 and 2002, wildfires threatened the watersheds of Los Alamos, Santa Fe, and Ruidoso. Even during the relatively normal year of 2003, wildfires threatened communities and tribal watersheds near Taos and Nambe.

The economic cost of suppressing wildfires varies widely. The vast majority of wildfires are suppressed during initial attack operations at only a few acres in size. Initial attack fires generally require a relatively small amount of resources to control. Conversely, fires that escape initial attack efforts and grow to a large size may require hundreds of firefighters to suppress them, and suppression operations may take several weeks to complete. Large fires of this nature often cost millions of dollars to suppress.

The costs of fuels treatment can also vary widely. A June 2000 survey from the U.S. Forest Service, Southern Research Station, found few sources of data on the per-acre costs of prescribed burns. The total cost of prescribed burning includes components incurred during planning and layout, fire-line construction and burn preparation, ignition, and mop-up. Fixed costs include burn plan preparation, NEPA analysis and public involvement, compliance with other laws, smoke management precautions, post-fire evaluation, and general overhead. Per-acre planning costs can vary depending on operational efficiency and unit size. Project costs include firebreak construction, igniting and conducting the burn, mopping up, post-fire monitoring, and contractor costs. Costs may differ from unit to unit because of differences in topography, weather conditions, and other factors. Different burning objectives also cause variations in planning, personnel and equipment needs, and the precautions that are necessary. Overall cost will reflect differences in timber types and fuels treated, safety precautions, the objectives of the burn program, overall efficiency, and cost-collection methods.

Unit size is one of the most important factors in per-acre costs: larger burns have smaller per acre costs. Costs also vary with the shape and configuration of the treatment area, especially in slash reduction/fire preparation burns. Irregularly shaped units are more difficult to burn and monitor than more geometric units of the same size. Small and irregularly shaped units usually cost more to treat, although they may be more environmentally and aesthetically desirable. The survey reported a USDA Forest Service-wide mean cost of $78.13 per acre, but ranged from $22.80 per acre in one region to $223.38 per acre in another. BLM New Mexico reports the mean cost of prescribed fire to be approximately $50 per acre; the mean cost of mechanical treatments to be approximately $500 per acre for all Field Offices except the Taos Field Office, which has a mean cost for mechanical treatments of approximately $1,600 per acre because of denser woodland conditions in that Field Office; and the mean cost of chemical treatments to be approximately $25 per acre.

The social and economic impacts from wildland fires in New Mexico can be measured by estimated property losses from wildland fires, fire suppression costs, and watershed restoration costs. Economic impacts arise both directly from fire damage and indirectly from changes in local economic activity, such as a drop in tourism. Both direct and indirect effects of wildfires have exacted a heavy economic toll on many communities. In addition to these types of direct, out-of-pocket impacts on communities and government agencies, it is likely that losses in resource values will total many millions of dollars.

The consequences of recent wildfires on New Mexico's natural resources are as vast as they are varied. Wildland fires burned both public and private lands over a broad spectrum of rangeland and forested ecosystems, often encompassing entire watersheds critical to community water supplies. Compared to historic fire events, recent fires have burned with such intensity that the ecosystems of many of these extensively burned areas have been drastically changed. Without intervention, these burned lands will recover slowly and be susceptible to undesirable changes in vegetation composition. The cost to eradicate unwanted invasive species such as cheatgrass, although unquantified, is very large. It is also difficult to quantity the costs or benefits of wildland fires in terms of lands, lives, and other values lost or saved from the fire. Resource benefits can include restoring the health of natural ecosystems, enabling native species to thrive, and preserving the many natural and cultural resources located on Federal lands. Additional information on socio-economic analysis at the Field Office level can be found in BLM NMSO 2004e.

ENVIRONMENTAL JUSTICE

Title VI of the Civil Rights Act and Executive Order 12898 ("Environmental Justice") require Federal agencies to identify and address "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." "Environmental justice" means ensuring that low-income populations and minority populations are not exposed to disproportionately high or adverse environmental impact. In December 1997, the Council on Environmental Quality (CEQ) issued guidance on environmental justice. In addition, Executive Order 13045 ("Protection of Children from Environmental Health Risks") requires that actions be evaluated to identify and assess environmental health risks and safety risks that may disproportionately affect children.

As discussed previously in this section, New Mexico is home to a culturally diverse population, including many minority populations. In accordance with CEQ Environmental Justice Guidelines, minority populations should be identified when 1) the minority population of the affected area exceeds 50 percent; or 2) the minority population of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate use of geographic analysis. Although the population of Hispanics, Latinos, or American Indians does not exceed 50 percent, their population in portions of the analysis area is "meaningfully greater" than the minority population in the general population (State of New Mexico). Therefore, for the purposes of screening for environmental justice concerns, a minority population exists within the planning area. This does not appear to be the case in Potter County, Texas.

The portion of New Mexico residents living below the poverty level was 18.4 percent in 1999 (latest data available), compared to the U.S. average of 12.4 percent. Eighteen of 34 counties in New Mexico had more than 20 percent of their residents living below the poverty level in 1999. Of these, those counties with over 25 percent of their residents living below the poverty level were McKinley County (36.1 percent), Luna County (32.9 percent), Socorro County (31.7 percent), Hidalgo County (27.3 percent), Dona Ana County (25.4 percent), and Mora County (25.4 percent) (U.S. Census Bureau). The proportion of Potter County, Texas residents living below the poverty level was 19.2 percent in 1999, compared to the U.S. average of 12.4 percent.