C h a p t e r 3

CHAPTER 3
AFFECTED ENVIRONMENT

INTRODUCTION

This chapter describes the physical, biological, social, and economic environment that would be affected by implementation of the proposed action or other alternatives. Not all aspects of the environment are addressed; generally only those aspects affected and those that influence effects on public land resources and resource uses are discussed.

The public lands of New Mexico are diverse, due to the intersection of at least five major ecosystems, including the Great Plains, Great Basin, Chihuahuan Desert, the Rocky Mountain, and Sierra Madre. Implicit in the presence of these ecosystems is a diversity of climate, geology, landform, elevation, and other physical attributes contributing to their uniqueness.

MAJOR LAND RESOURCE AREAS (MLRAs)

For the purposes of this EIS, the affected environment descriptions of vegetation and soils are analyzed based on the Major Land Resource Areas (MLRAs) described by the U.S. Department of Agriculture, NRCS (1981). Descriptions of the MLRAs used in this section are nearly verbatim from the NRCS publication. These descriptions include BLM acreage estimates and a brief analysis of the existing vegetation types (biomes) in each MLRA. Each MLRA is given a code number. These data were derived from geographic information system (GIS) analysis of vegetation types on a small scale map produced by the New Mexico Gap Analysis Project (Thompson et al. 1996). The Gap Project vegetation types were grouped into biome types (biological communities characterized by similar plant life forms) which provide a coarse, regional scale description of biological communities. Biome types used included the following:

- **Conifer forest** - all conifer forest types including ponderosa pine.
- **Woodland** - all pinon-juniper types. mountain scrub, and interior chaparral
- **Grassland** - all grasslands including Great Plains grasslands, Chihuahuan Desert grasslands, and Great Basin desert grasslands.
- **Desert** - all desert types including, Chihuahuan Desert and Great Basin Desert.

Descriptions of the biomes within each MLRA are contained within the "BLM Estimate of Existing Vegetation" section in each MLRA description acreages and percentages of MLRA's and Biomes on public land are presented in Tables 3-1 and 3-2. Following the MLRA descriptions are two sections that include an overall summary of ecological status of vegetation statewide and the current status of riparian systems in New Mexico. Riparian systems are treated separately, due to the small percentage of land they occupy and the disproportionately high importance they have to our natural systems.

The following MLRA descriptions were taken directly from *Land Resource Regions and Major Land Resource Areas of The United States* (United States Department of Agriculture, Soil Conservation Service 1981) A*griculture Handbook 296*. New Mexico MLRA's are also shown on Map 3-1. Photos in this section were taken in the MLRA being described to provide the reader a perspective of the MLRA described.

36-New Mexico and Arizona Plateaus and Mesas

Photo 3-1

TABLE 3-1
ACRES AND PERCENT MLRA AND BIOMES ON PUBLIC LAND IN NEW MEXICO

MLRA Name	MLRA Code	MLRA Total Acres	Biomes				
			Conifer Forest	Woodland	Grassland	Desert	Other
New Mexico and Arizona Plateaus and Mesas	**36**	2,619,000	10,000	1,262,800	1,191,800	116,800	37,900
	%	19	0.4	48	46	5	1
San Juan River Valley Mesas and Plateaus	**37**	786,000	0	72,700	586,000	110,600	16,500
	%	6	0	9	75	14	2
Arizona and New Mexico Mountains	**39**	325,000	1,400	228,900	89,500	3,200	1,700
	%	2	0.2	71	11	<1	<1
Southeastern Arizona Basin and Range	**41**	153,000	0	40,300	40,100	63,200	8,900
	%	1	0	26	26	41	6
Southern Desert Basins, Plains, and Mountains	**42**	6,677,000	100	836,000	2,571,600	2,998,500	270,600
	%	49	<1	13	43	50	5
Southern Rocky Mountains	**48A**	41,000	2,000	30,300	8,200	300	100
	%	<1	5	74	20	1	<1
High Intermountain Valleys	**51**	209,000	2,900	86,100	5,400	114,200	300
	%	2	1	41	3	55	<1
Pecos-Canadian Plains and Valleys	**70**	2,675,000	100	527,500	1,122,400	997,600	27,000
	%	20	<1	20	42	37	1
Southern High Plains	**77**	10,000	0	3,400	6,000	100	200
	%	<1	0	35	62	1	3
Total		**13,495,000**	**16,500**	**3,088,100**	**5,621,000**	**4,404,400**	**363,200**
Total %		**100**	**0.1**	**23**	**42**	**33**	**3**

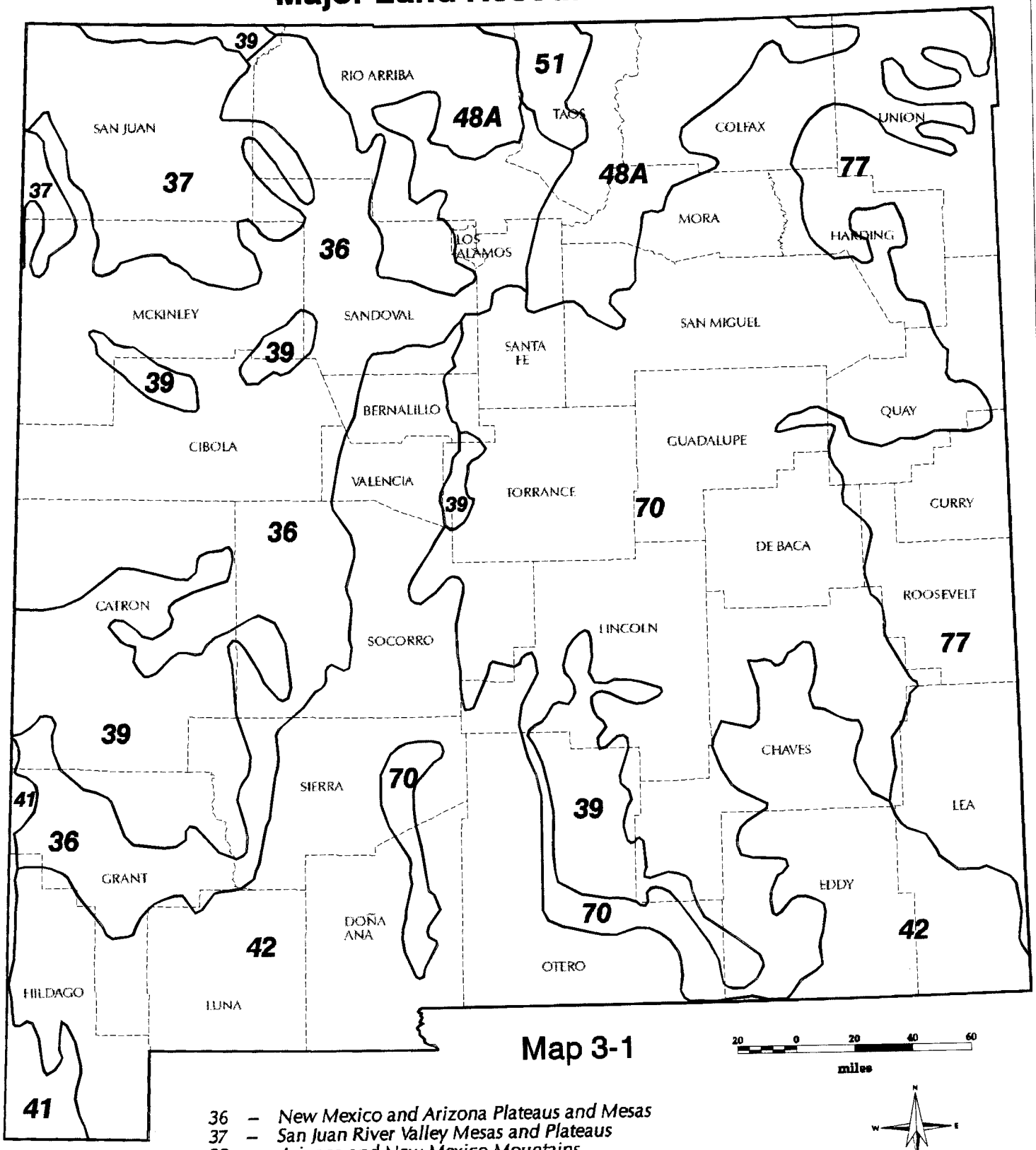
Source: BLM GIS analysis of USDA NRCS MLRA boundaries and vegetation data derived from the U.S. Geological Survey BRD New Mexico Gap Analysis Project

TABLE 3-2
MAJOR LAND RESOURCE AREAS - LAND ACREAGE IN NEW MEXICO

MLRA - Number and Name	Total for New Mexico	Public Land Acres	Percent of MLRA in New Mexico that is Public Land
36 - New Mexico and Arizona Plateaus and Mesas	14,621,000	2,619,000	18
37 - San Juan River Valley Mesas and Plateaus	3,966,000	786,000	20
39 - Arizona and New Mexico Mountains	6,299,000	325,000	5
41 - Southeastern Arizona Basin and Range	778,000	153,000	20
42 - Southern Desertic Basins, Plains, and Mountains	17,654,000	6,677,000	38
48A - Southern Rocky Mountains	5,366,000	41,000	1
51 - High Intermountain Valleys	544,000	209,000	38
70 - Pecos-Canadian Plains and Valleys	20,998,000	2,675,000	13
77 - Southern High Plains	7,544,000	10,000	<1
MLRA Total (rounded)	**77,770,000**	**13,500,000**	**17**

Source: BLM GIS analysis of USDA NRCS MLRA boundaries and public land status records

New Mexico
Major Land Resource Areas



Map 3-1

20 0 20 40 60
miles

36 – *New Mexico and Arizona Plateaus and Mesas*
37 – *San Juan River Valley Mesas and Plateaus*
39 – *Arizona and New Mexico Mountains*
41 – *Southeastern Arizona Basin and Range*
42 – *Southern Desertic Basins, Plains, and Mountains*
48A – *Southern Rocky Mountains*
51 – *High Intermountain Valleys*
70 – *Pecos-Canadian Plains and Valleys*
77 – *Southern High Plains*

Produced by the New Mexico State Office Geographic Sciences Team, Bureau of Land Management, September 02, 1998

Land Use: This MLRA occurs on approximately 2,619,000 acres of public land in New Mexico.

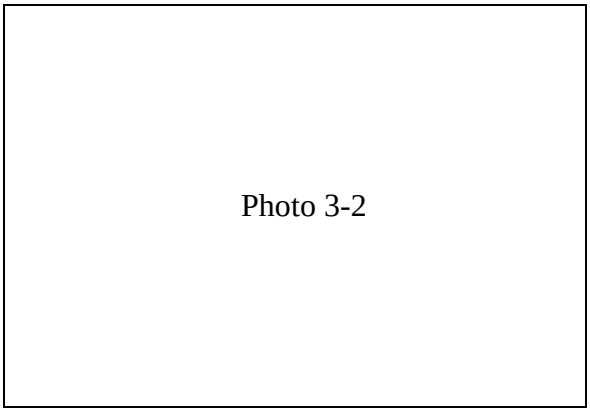
Elevation and topography: Elevation ranges from 1,500 to 2,300 meters, but a few isolated mountains are higher than 2,600 meters. These plateaus and mesas have gentle slopes, but precipitous slopes are along valley walls and edges of the mesas.

Climate: The average annual precipitation is between 250 and 325 millimeters (mm) in most of the area but higher elevations receive an average of 375 mm. About two-thirds of the precipitation falls from midsummer to early autumn. The average annual temperature ranges from 9 to 12 degrees celsius (^{0}C), and the average freeze-free period is between 120 to 180 days.

Water: Water is scarce because of the low precipitation and sparse streamflow. A small amount of water is available for irrigation along the major streams that flow into the area from surrounding mountains. Navajo Lake is near the northern border.

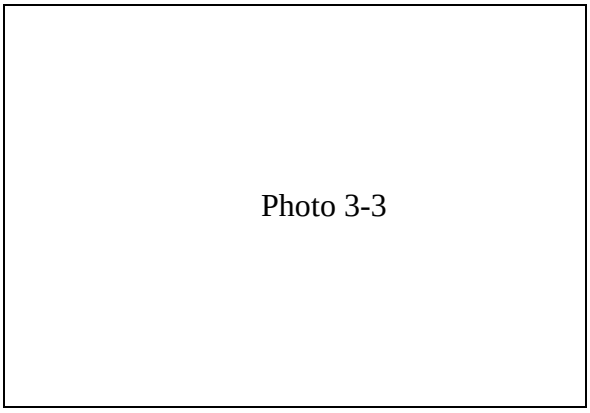
Soils: Most of the soils are Argids and Orthents. They are well drained and fine textured to medium textured and have a mesic temperature regime, an aridic moisture regime, and mixed mineralogy.

Potential natural vegetation: Most of this area supports grassland vegetation. Indian ricegrass, blue grama, dropseed, and galleta are the major species. Alkali sacaton, fourwing saltbush, winterfat, and rabbitbrush grow in the valleys between mesas. Pinon-juniper woodland occur at the higher elevations and also on shallow soils and escarpments. The understory includes western wheatgrass, galleta, sideoats grama and, in some places, big sagebrush.



BLM Estimate of existing vegetation: Existing vegetation within this MLRA currently comprises of less than 1 percent conifer forest, 48 percent woodland, 46 percent grassland (primarily Great Basin grassland types), and 5 percent desert (dominated by Great Basin desert types). It is believed that desert has replaced some of the area formerly occupied by grassland due to past land use practices (Dick-Peddie 1993, McClaran and VanDevender 1995).

37-San Juan River Valley Mesas and Plateaus



Land use: This MLRA occurs on approximately 786,000 acres of public land in New Mexico.

Elevation and topography: Elevation ranges from 1,500 to 2,000 meters. Gently sloping broad valleys and plains are bordered by deeply dissected bands of steep slopes and sharp local relief. Margins of mesas and a few isolated low mountain ranges are also steeply sloping.

Climate: The average annual precipitation ranges from 175 to 250 mm. About one-half of the precipitation falls from midsummer to early autumn. Average annual temperature 10 and 12^{0}C, and the average freeze-free period is between 140 and 165 days.

Water: The low precipitation and intermittent streamflow provide a small amount of water for agriculture. A few major streams supply water for irrigation. Water from Navajo Lake is to be used for an irrigation project planned for the area. Ground water is scarce, of poor quality, and mostly untapped.

Soils: Most of the soils are Orthents. They are well drained and medium textured and have a mesic temperature regime, aridic moisture regime, and mixed mineralogy.

Potential natural vegetation: This area supports desert shrub vegetation. Indian ricegrass, big sagebrush, fourwing saltbush, and galleta are major species. Shadscale, greasewood, alkali sacaton, and fourwing saltbush occur on the bottom lands. Pinon-juniper woodland, along with mountain mahogany, western wheatgrass, and galleta occur at higher elevations. Most of the western part of the area is grassland on which Indian ricegrass, alkali sacaton, and sand dropseed are dominant.

Photo 3-4

BLM Estimate of existing vegetation: Existing vegetation within this MLRA is approximately 9 percent woodland, 75 percent grassland and 14 percent desert. The grassland and desert types are those of the Great Basin flora. It is believed that desert has replaced some of the area formerly occupied by grassland due to past land use practices (Dick-Peddie 1993, McClaran and VanDevender 1995).

39-Arizona and New Mexico Mountains

Land use: This MLRA occurs on approximately 325,000 acres of public land in New Mexico.

Elevation and topography: In most places, elevation ranges from 1,400 to 2,400 meters, with a maximum height of 3800 meters. This area is mostly very hilly and mountainous, but an upland plateau is dissected by many deep canyons.

Climate: The average annual precipitation ranges 275 to 900 mm, increasing with elevation. The average annual temperature is between 5 and 15^0C. In timbered areas at higher elevations the average is 7^0C, and at lower elevations it is 10^0C. The average freeze-free period ranges from less than 70 days at higher elevations to 170 days at lower elevations, averaging about 115 days.

Photo 3-5

Water: This MLRA supplies water for much of the adjoining irrigated areas. Because more than one-half of the annual precipitation occurs in winter, there is a general deficiency of moisture during the growing season. Several of the larger streams and a few of their larger tributaries maintain a yearlong flow. Much of this water is stored in reservoirs near or below the southern edge of the area and is used for irrigation and municipal water supplies. Small natural and artificial lakes at higher elevations are used for fishing and other recreation. Annual runoff into all reservoirs is highly variable, and most of the smaller lakes and reservoirs are dry in some years. Ground water is limited and usually occurs at great depth.

Soils: The dominant soils are Borolls, Boralfs, Ustolls, Ustalfs, Orthents, and Orthids. They have a cryic, frigid, or mesic temperature regime, depending mainly on elevation.

Potential natural vegetation: This area supports alpine vegetation, conifer forests, chaparral, and grasses because of the broad elevation range. Such cushion plants as moss campion, kobresia, alpine timothy, and many low-growing forbs grow above timberline. Spruce-fir woodland characterizes the area below timberline. Aspen grows on sites that have not been

disturbed by past fires. The under-story includes Thurber fescue, brome, bluegrasses, mountain muhly, Arizona fescue, lupine, aspen peavine, penstemons, and daisies. The major part of the area is a vast ponderosa pine forest. Common understory plants include bromes, Junegrass, pine dropseed, wheatgrasses, mountain muhly, blue grama, sedges, and snowberry. Pinon-juniper woodland is at an elevation below 2,100 meters. The understory includes blue grama, tobosa, sideoats grama, and western wheatgrass. Below an elevation of about 1,800 meters, turbinella oak, mountain mahogany, hollyleaf buckthorn, ceanothus, and manzanita grow along with sideoats grama, blue grama, Junegrass, longtongue muttongrass, squirreltail, and bluegrasses.

Photo 3-6

BLM Estimate of existing vegetation: Existing vegetation within this MLRA comprises less than 1 percent conifer forest, 71 percent woodland, and 11 percent grassland (primarily Plains and Great Basin grassland types) and less than 1 percent desert. The conifer type is composed mainly of lower elevation ponderosa pine forest. It is expected that the woodland biome has replaced portions of the grassland biome due to past land use practices (Dick-Peddie 1993, McClaran and VanDevender 1995).

41-Southeastern Arizona Basin and Range

Land use: This MLRA occurs on approximately 153,000 acres of public land in New Mexico. Most of this area is used for grazing.

Elevation and topography: Elevation ranges from 800 to 1,400 meters in most places and from 1,500 meters to 1,800 meters in the mountains. On some peaks, however, elevation is 2,700 meters. This area consists of southeast-northwest-trending mountain ranges with relatively smooth valleys separating the mountains.

Photo 3-7

Climate: The average annual precipitation ranges from 275 to 375 mm, but as much as 900 mm at the higher elevations. More than half of the precipitation falls during July, August, and September. Snow falls occasionally in winter. The average annual temperature ranges from 13 to 17^0C, and the average freeze-free period lasts between 150 and 250 days.

Water: None of the streams flow continuously, although they may have water in them for several months each year. There are no lakes or reservoirs of consequence. Water for irrigation generally is obtained by pumping ground water, and there has been a noticeable decrease in the ground water level in the last several years. Water quality is generally satisfactory.

Soils: The dominant soils are Orthents, Ustolls, Argids, and Fluvents. They have a thermic temperature regime and mostly aridic moisture regime.

Potential natural vegetation: This area supports forest, savanna, and desert shrub vegetation. Pine-oak woodlands are at higher elevations. Ponderosa pine, Douglas-fir, live oak, New Mexico locust, Mexican piñon, buckbrush, and manzanita grow with an understory of muhlys, bluegrasses, sedges, pine dropseed, and squirreltail. Evergreen woodland savannas occur at intermediate elevations. Mexican blue oak, Emory oak, and turbinella oak are dominant species. Cone beardgrass, sideoats grama, blue grama, Texas bluestem, plains lovegrass, sprucetop grama, threeawns, and needlegrass characterize the

under-story. Whitethorn, soaptree yucca, fourwing saltbush, mesquite, and ocotillo grow on drier soils at lower elevations. The understory consists of Rothrock grama, black grama, alkali sacaton, curly mesquite, plains bristlegrass, bush muhly, and lemongrass.

Photo 3-8

BLM Estimate of existing vegetation: Existing vegetation within this MLRA is approximately 26

Photo 3-9

percent woodland, 26 percent grassland, and 41 percent desert. This area is primarily representative of the Madrean vegetation that just enters the United States from Mexico, in southern Hidalgo County. This area has a high number of vegetation types and plant species found nowhere else in New Mexico.

42-Southern Desertic Basins, Plains, and Mountains

Land use: This MLRA occurs on approximately 6,677,000 acres of public land in New Mexico.

Elevation and topography: Elevation ranges from 800 to 1,500 meters in basins and valleys, but reaches more than 2,600 meters in the mountains. Broad desert basins and valleys are bordered by gently sloping to strongly sloping fans and terraces. Steep north-south-trending mountain ranges and many small mesas occur in the western portion of the MLRA.

Climate: The average annual precipitation ranges from 200 to 325 mm. Maximum precipitation is from midspring to midautumn. The average annual temperature is between l3 and 18^0C. An average freeze-free period of 200 to 240 days occurs in most of the area but only 180 days are freeze-free in the northern ends of the Pecos and Rio Grande valleys.

Water: The Rio Grande and Pecos Rivers and a few of their larger tributaries are the only perennial streams. Water for irrigation generally is obtained from these rivers or from wells. Ground water in deep valley fill provides water for domestic use and livestock, and in places for some irrigation.

Soils: Most of the soils are Argids and Orthids. They are well drained and medium textured and have a thermic temperature regime, aridic moisture regime, and mixed or carbonatic mineralogy.

Potential natural vegetation: This area supports desert grass-shrub vegetation. Giant dropseed and mesa dropseed, along with scattered shrubs such as sand sagebrush and yuccas, grow on the sandier soils. Creosotebush, tarbush, catclaw, and javalinabush are on gravelly, calcareous foot slopes. Giant sacaton, vine-mesquite, desert willow, brickellbush, and mesquite grow in drainageways and depressions. Juniper, piñon, scattered ponderosa pine, and Douglas-fir occur on upper mountain slopes.

Photo 3-10

BLM Estimate of existing vegetation: Existing vegetation within this MLRA comprised less than 1 percent conifer forest, 13 percent woodland, 43 percent grassland (dominated by Chihuahuan Desert grassland), and 50 percent desert (dominated by Chihuahuan Desert types). It is projected that desert has replaced some of the area formerly occupied by grassland due to past land use practices (Dick-Peddie 1993, McClaran and VanDevender 1995).

48A-Southern Rocky Mountains

Photo 3-11

Land use: This MLRA occurs on approximately 41,000 acres of public land in New Mexico.

Elevation and topography: Elevation ranges from 2,300 to 4,300 meters. These strongly sloping to precipitous mountains are dissected by many narrow stream valleys with steep gradients. In places, the upper mountain slopes and crests are covered by snowfields and glaciers. High plateaus and steep-walled canyons are fairly common, especially in the west.

Climate: The average annual precipitation is generally between 375 and 750 mm, but as much as 1,025 mm or more can fall on some of the higher mountains. Most of the precipitation falls in winter as snow. The average annual temperature ranges from 0 to 7^0C, and the average freeze-free period is generally less than 70 days.

Water: Water from the streams and lakes is abundant, and ground water is plentiful. The lower valleys depend on streamflow from this area for irrigation water.

Soils: Most of the soils are Boralfs. They are moderately deep, stony and very stony, and medium textured.

Potential natural vegetation: This area supports forests on upper slopes, alpine tundra above timber-line, and shrub-grass vegetation at lower elevations. Grasses, sagebrush, and other shrubs grow on the lower slopes and in valleys. Lodgepole pine, aspen, Douglas fir, and ponderosa pine are major trees of the lower forest. Engelmann spruce, subalpine fir, white fir, and limber pine intermingled with stands of aspen are typical on the mountain slopes. Willow, alder, and birch trees grow along streams. The timberline zone is characterized by stunted and wind-twisted limber pine, bristlecone pine, Engelmann spruce, and subalpine fir. Alpine grasses, herbaceous plants, and shrubs constitute the treeless alpine tundra.

Photo 3-12

BLM Estimate of existing vegetation: Existing vegetation within this MLRA is approximately 5 percent conifer forest, 74 percent woodland, 20 percent grassland, and 1 percent desert. The BLM portions of this MLRA occur on the lower slopes of the mountains. The vegetation in these areas is woodland.

51-High Intermountain Valleys

Land use: This MLRA occurs on approximately 209,000 acres of public land in New Mexico.

Elevation and topography: Elevation ranges from 2,100 to 2,700 meters. Much of the area consists of nearly level to gently sloping old valley fill. Gently sloping to steep hills underlain by basalt are extensive in the south. Local relief is slight except in the south, where it is as much as 100 meters.

Climate: The average annual precipitation ranges from 150 to 500 mm, increasing from north to south. Most of the precipitation falls during the growing season. The average annual temperature is between 4 to 10^0C, and the average freeze-free period ranges from 100 to 140 days.

Water: The low precipitation in the north supports

Photo 3-13

only a sparse cover of range plants, but rainfall in the south is adequate for a good cover of grass and

Photo 3-14

sagebrush. Irrigation water is provided by the Rio Grande and small reservoirs on intermittent streams flowing into the area from surrounding mountains. The Chama River is an important water source in the south. Wells that tap ground water in the deep valley fill are also an important source of water for irrigation and domestic use. Salinity is a problem in much of the area.

Soils: Most of the soils are Argids, which are deep and moderately deep and coarse textured to medium textured. They have an aridic moisture regime, frigid temperature regime, and mixed mineralogy.

Potential natural vegetation: This area supports desert shrub-grassland vegetation. Greasewood, rabbitbrush, fourwing saltbush, saltgrass, alkali sacaton, wheatgrasses, sedges, and rushes are common at the lower elevations. Piñon-juniper, Indian ricegrass, blue grama, needle and thread, wheatgrasses, and bluegrasses grow at higher elevations. Narrowleaf cottonwood grows along the major streams.

BLM Estimate of existing vegetation: Existing vegetation within this MLRA is approximately 1 percent conifer forest, 41 percent woodland, 3 percent grassland, and 55 percent desert (primarily Great Basin desert types). It is likely that both woodland and desert have encroached into grassland areas due to past land use practices.

70-Pecos-Canadian Plains and Valleys

Photo 3-15

Land use: This MLRA occurs on approximately 2,675,000 acres of public land in New Mexico. Cattle and sheep grazing is the principal enterprise. Eastern slopes of the high mesas in the north are covered by forest vegetation, but the total forested area is small.

Elevation and topography: Elevation ranges from 1,200 to 2,100 meters, increasing gradually from southeast to northwest, but reaches 2,400 meters on a few mesas and mountains. Most of these dissected high plains are gently sloping to rolling, but bands of steep slopes and rough broken land border the stream valleys. A few isolated mountains, mesas, and canyon walls have steep to very steep slopes. Valley floors are mostly narrow and cut by stream channels.

Climate: The average annual precipitation is between 300 and 400 mm, but it fluctuates widely from year to year. Maximum precipitation is from late spring to early autumn. The average annual temperature ranges from 10 to 16^{0}C, and the average freeze-free period is between 135 to 200 days, decreasing from southeast to northwest.

Water: Water is scarce throughout the area because of the low and erratic precipitation and the few perennial streams. Ground water in deep sand and gravel in the north and from limestone in the southern two-thirds of the area provides water for domestic use and for livestock, and locally it provides water for irrigation. Ground water is scarce in areas where shale and sandstone are near the surface.

Soils: Most of the soils are Orthids, Argids, and Ustolls. They are well drained and moderately fine textured to moderately coarse textured and have mixed mineralogy. In the north and west, these soils have a mesic temperature regime and in the south and east a thermic temperature regime. They have an ustic or aridic moisture regime.

Potential natural vegetation: This area supports plains grassland vegetation that is dominated by short and mid-grasses. Blue grama is the dominant species. Western wheatgrass is the associated species in the northern part of the area, while lesser amounts of blue grama in association with black grama, galleta, New Mexico feathergrass, and a variety of shrubs, halt shrubs, and forbs characterize the southern part. Scattered juniper and piñon with an understory of sideoats grama, bottlebrush squirreltail, and western wheatgrass grow on shallow soils and in escarpments. Ponderosa pine grows on north and east slopes of the high mesas.

Photo 3-16

BLM Estimate of existing vegetation: Existing vegetation within this MLRA is made up of less than 1 percent conifer forest, 20 percent woodland, 42 percent grassland (Great Plains grassland types), and 37 percent desert. It is likely that both woodland and desert have encroached into grassland areas due to past land use practices. In addition, a large percentage of the woodland biome in this MLRA is dominated by shinnery oak which has dominated Great Plains mid- and tall grass types due to past land use practices.

77-Southern High Plains

Land use: This MLRA occurs on approximately 10,000 acres of public land in New Mexico.

Photo 3-17

Elevation and topography: Elevation ranges from 800 to 2,000 meters, increasing gradually from southeast to northwest. These smooth high plains are gently sloping, but along the major rivers, breaks are very steep. The deep sand in the southwest has an irregular dune topography.

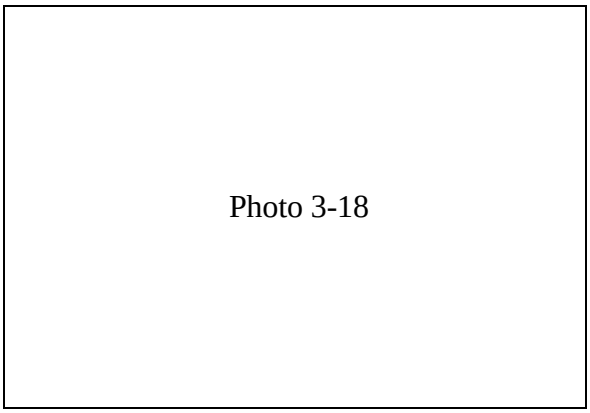
Climate: The average annual precipitation is between 375 and 550 mm, but it fluctuates widely from year to year. Maximum precipitation is from late spring through autumn. The low precipitation in winter is mainly snow. The average annual temperature ranges from 13 to 17^{0}C, and the average freeze-free period ranges from 130 to 220 days, increasing from north to south and from west to east.

Water: The moderately low and erratic precipitation serves as the source of water for dry-farmed crops and range. Perennial streams are few; they fluctuate widely in flow from year to year and are minimally used for irrigation. Sand and gravel throughout the central and northern parts of the area yield an abundance of ground water. Irrigation water is obtained from wells, but in the central and southern parts withdrawals

exceed recharge, and the water table is gradually declining. Some areas formerly irrigated are now dry-farmed.

Soils: Most of the soils are Ustolls and Ustalfs. They are deep, fine, and medium textured and coarse textured. These soils have a mesic or thermic temperature regime, ustic moisture regime, and mixed or carbonatic mineralogy.

Potential natural vegetation: This area supports a short grass community characterized by blue grama and buffalograss. Mid-grasses such as sideoats grama grow on the more open soils and breaks. Tall grasses such as sand bluestem, little bluestem, and Indiangrass grow mixed with shinnery oak and sand sagebrush on



the sandy soils. A wide range of perennial forbs grow on the sandier soils and are characterized by dotted gayfeather, pitchersage, sagewort, bush sunflower, and daleas.

BLM Estimate of existing vegetation: Existing vegetation within this MLRA is approximately 35 percent woodland, 62 grassland, and about 1 percent desert. A large portion of the woodland biome in this MLRA is dominated by shinnery oak which has dominated Great Plains mid- and tall grass types due to past land use practices.

VEGETATION

BLM Management and Ecological Status of the Uplands

Ecological status of vegetative communities on public lands in New Mexico has been classified as 1 percent potential natural community (PNC), 35 percent late seral, 46 percent mid seral, 14 percent early seral, and 3 percent unclassified (USDI, BLM, 1996 - *Public Land Statistics*.) Trend on public lands was classified as 41 percent in an upward trend, 55 percent in a static trend, and 4 percent in a downward trend. (USDI, BLM 1995 - *National Range Inventory Report*). These conditions are reflected in the MLRA descriptions above. In addition, these conditions are indicative of, at least in part, ongoing BLM livestock and vegetation management efforts. McCormick and Galt (1993) found, in analysis of vegetation condition and trend studies conducted within the BLM's Las Cruces Field Office and repeated every 10 years since the 1950s, that both ecological condition and trend have steadily increased since then. Their data showed that perennial plant cover increased from 14 percent to 35 percent, bare ground decreased from 72 percent to 24 percent, and litter increased from 15 percent to 28 percent. In addition, 58 percent of the study sites improved one or more range condition classes. Thirty-nine percent of the study sites showed no change in range condition, and of these, half were in fair and half were in good condition. During the same time period total livestock numbers increased by 22 percent within the six counties encompassed by the Field Office. The improvement to can be attributed to management activities and increased precipitation in recent years.

BLM range management activities are primarily directed at manipulation of cattle stocking rates and construction of range improvements such as fencing and water developments to better distribute grazing pressure. In addition, BLM undertakes direct vegetation manipulation projects (primarily using herbicides) to restore grasslands that have been dominated by shrub species. For example, the average annual management activities of the BLM New Mexico Rangeland Management Program in a four year period from fiscal year 1989 to fiscal year 1992 included: 20,500 acres of brush control, 100 acres of seedings, 300 acres of soil stabilization, 6 water detention/diversion structures containing a total of 3,200 cubic yards, 45 pipelines totaling 52 miles in length, 15 reservoirs totalling 18,556 cubic yards of storage, 3 spring developments, 1 water catchment storing 20,000 gallons of rain water, 8 wells, 45,135 gallons of water storage and drinking facilities, and 71 miles of fence (USDI, BLM 1989, 1990, 1991, 1992 - *Public Land Statistics*) Table 3-3 depicts the existing distribution of vegetation management effort by MLRA. It shows that most of the management effort on public lands is directed at MLRAs 36, 42, and 70. These MLRAs encompass 78 percent of the public land acreage in New Mexico, but also contain the bulk of the desert areas of New Mexico where a large amount of the early- and mid-seral vegetation occurs.

Riparian Vegetation

Riparian areas on public land in New Mexico are generally characterized by low- and mid- elevation riparian broad-leaf deciduous forest types. Various cottonwood and willow species characterize the overstory in areas where the riparian vegetative community is in relatively good condition. Various grasses, and grass-like plants (sedges, bullrush, scouring rush) compose the understory. Manageability of these areas is high, and successful, fast results can be expected from riparian management activities. BLM estimates that 19,600 acres of public land are occupied by saltcedar (BLM, Western Weed Team Memorandum, 1997). In areas where saltcedar dominates, manageability is low. Saltcedar is difficult and expensive to remove, due to the need for removal by hand or by use of heavy equipment, followed by the use of herbicides and then planting of native tree species.

Most running water (lotic) riparian systems occurring on public land within New Mexico have been inventoried consistent with BLM procedures for rating riparian functional condition (USDI, BLM 1995). However, lakes, ponds, and playas (lentic wetland systems) have not all been inventoried. Riparian condition is rated as one of four categories: proper functioning condition, functioning at risk, nonfunctional, or not determined (see the Glossary for full definitions of these terms). Under this rating system it should be noted that a stream reach can reach proper functioning condition at a mid-seral ecologic state, long before reaching late seral or climax condition.

When inventoried, each spring or stream is divided into segments or reaches that have similar physical and biologic characteristics. For example a steep, narrow boulder strewn reach with New Mexico alders is separated from a wide, meandering gravelly reach with Goodding willows and cottonwoods. Functional condition of each segment is rated (based upon physical and biologic factors existing in that particular segment) against the management capability of that segment on a standardized score card. Condition is not rated totally against biotic potential or climax vegetation. In many cases, management problems occurring upstream or on uplands on other than public land limit the manageability of a particular segment. These factors are taken into account when a segment is rated. With regard to this situation, BLM commonly manages only a very small percentage of a given stream and its upland watershed.

Based on existing inventory data, lotic riparian areas on public land in New Mexico total 427 miles, containing 13,285 acres of riparian habitat located in 244 stream segments (Table 3-4). Statewide there are 38 stream segments in proper functioning condition, 116 segments are functional at risk, 38 segments are not functional, and 52 have not been inventoried. Of the total areas, 160 segments are grazed and 84 segments are excluded from grazing. Of the grazed areas, 14 are in proper functioning condition, 85 are functional at risk, 31 are not functional, and 30 have not been inventoried. Of the excluded areas, 24 are in proper functioning condition, 31 are functional at risk, 7 are not functional, and 22 have not been inventoried. Table 3-5 depicts the current functional condition rating of riparian segments currently not meeting the standards for each alternative. The following assumptions were made to determine which riparian segments currently don't meet the proposed and alternative standards:

> RAC and County Alternatives - Segments in Not Functional condition and Functional At Risk condition with a Not Apparent or Downward trend that do not meet the proposed Standards.
>
> No Action and Fallback Alternatives - Segments in Not Functional condition and Functional At Risk condition that do not meet the proposed Standards.

As with upland vegetation management activities, BLM has been steadily working on improving riparian conditions. While much work is yet to be done, BLM is implementing 62 Activity Plans (on-the-ground management plans) with specific riparian management objectives. Projects implemented through these plans include projects such as construction of livestock exclusion fences (107 miles of stream on public land have been excluded from grazing to date),

TABLE 3-3
STANDARDS AND GUIDELINES - NUMBERS OF ALLOTMENT MANAGEMENT PLANS (AMPS) AND OTHER APPLICABLE LIVESTOCK ACTIVITY PLANS (LAPS) AND OF BRUSH CONTROL PROJECTS SINCE 1987 BY MLRA.

MLRA NAME	MLRA CODE	FARMINGTON		ALBUQUERQUE		TAOS		ROSWELL		CARLSBAD		SOCORRO		LAS CRUCES		TOTALS	
		AMPS LAPS	BRUSH CNTL	AMPS LAPS	BRUSH CNTL	AMPS LAPS	BRUSH CNTL	AMPS LAPS	BRUSH CNTL	AMPS LAPS	BRUSH CNTL	AMPS LAPS	BRUSH CNTL	**AMPS LAPS**	**BRUSH CNTL**	**AMPS LAPS**	**BRUSH CNTL**
NEW MEXICO AND ARIZONA PLATEAUS AND MESAS	**36**	**7**	**22**	**7**	**27**	**8**	**3**					**36**	**2**	**6**	**0**	**64**	**54**
SAN JUAN RIVER VALLEY MESAS AND PLATEAUS	**37**	**9**	**33**													**9**	**33**
ARIZONA AND NEW MEXICO MTNS	**39**													**1**	**0**	**1**	**0**
SOUTHEASTERN ARIZONA BASIN AND RANGE	**41**													**1**	**1**	**1**	**1**
SOUTHERN DESERT BASINS, PLAINS, AND MTNS	**42**							**42**	**17**	**15**	**36**	**23**	**17**	**52**	**41**	**135**	**111**
SOUTHERN ROCKY MTNS	**48A**					**3**	**0**									**3**	**0**
HIGH INTERMOUNTAIN VALLEYS	**51**					**19**	**7**									**19**	**7**
PECOS-CANADIAN PLAINS AND VALLEYS	**70**							**38**	**14**	**8**	**6**	**3**	**1**	**9**	**5**	**58**	**26**
SOUTHERN HIGH PLAINS	**77**															**0**	**0**
TOTAL		**16**	**55**	**7**	**27**	**30**	**10**	**80**	**31**	**27**	**42**	**62**	**20**	**69**	**47**	**290**	**232**

SOURCE: UNPUBLISHED BLM FIELD OFFICE RECORDS [NOTE: NUMBERS OF PLANS INCLUDE ANY NRCS THAT ARE IN EFFECT ON PUBLIC LAND.]

Table 3-4
Riparian Conditions by Grazing Status

CONDITION RATING	GRAZING STATUS	MILES	ACRES	NUMBER OF RIPARIAN SEGMENTS
PROPER FUNCTIONING CONDITION	EXCLUDED	106	2750	24
FUNCTIONAL AT RISK	EXCLUDED	47	949	31
NOT FUNCTIONAL	EXCLUDED	21	513	7
NOT DETERMINED	EXCLUDED	9	330	22
TOTAL EXCLUDED		**183**	**4542**	**84**
PROPER FUNCTIONING CONDITION	GRAZED	9	151	14
FUNCTIONAL AT RISK	GRAZED	156	6661	85
NOT FUNCTIONAL	GRAZED	71	1743	31
NOT DETERMINED	GRAZED	8	188	30
TOTAL GRAZED		**244**	**8743**	**160**
GRAND TOTAL		**427**	**13285**	**244**

Source: New Mexico BLM Riparian Database. Data obtained from BLM Functional Condition Inventories.

TABLE 3-5
EXISTING RIPARIAN CONDITION FOR SEGMENTS NOT MEETING THE STANDARDS FOR EACH ALTERNATIVE.

ALTERNATIVE	CONDITION	NUMBER OF AREAS
NO ACTION	AREAS IN NOT FUNCTIONAL CONDITION AND FUNCTIONAL AT RISK CONDITION THAT DO NOT MEET THE STANDARDS FOR THIS ALTERNATIVE.	154
RAC	AREAS IN NOT FUNCTIONAL CONDITION AND FUNCTIONAL AT RISK CONDITION WITH A NOT APPARENT OR DOWNWARD TREND THAT DO NOT MEET THE STANDARDS FOR THIS ALTERNATIVE.	112
COUNTY	AREAS IN NOT FUNCTIONAL CONDITION AND FUNCTIONAL AT RISK CONDITION WITH A NOT APPARENT OR DOWNWARD TREND THAT DO NOT MEET THE STANDARDS FOR THIS ALTERNATIVE.	112
FALLBACK	AREAS IN NOT FUNCTIONAL CONDITION AND FUNCTIONAL AT RISK CONDITION THAT DO NOT MEET THE STANDARDS FOR THIS ALTERNATIVE.	154

Source: Analysis of data derived from New Mexico BLM Riparian Database

grazing management adjustments (in most FOs), riparian tree plantings in many FOs, fisheries work (particularly in the Taos FO portions of the Rio Grande), and saltcedar removal by hand and approved chemical treatments. A few multi-land owner efforts to improve watersheds and riparian areas are currently underway, such as the current efforts on the Rio Puerco in the Albuquerque FO and Laborcita Canyon in the Las Cruces FO.

Grazing systems have been devised that maintain or improve riparian health. For example, conservative grazing during the winter can provide some livestock use without damaging growing plants and avoiding heavy concentrations of livestock in the riparian area. However, riparian areas that are adversely affected, at least in part, by ongoing grazing are of continuing concern in managing public lands. BLM grazing is not the only problem affecting public land riparian areas. Because of the scattered pattern of public land riparian parcels, a great many other non-livestock grazing related factors affect them, including mineral developments, non-BLM grazing, wildlife, recreation activities, watershed problems on other lands, urban areas, channelization, and water diversions. Saltcedar infestations both on and off public lands also are major impediments to achieving proper functioning condition. Regardless of the problem or solution in a particular area, past experience has shown that improvement of public land riparian areas best occurs through multi-land owner cooperative efforts on entire watersheds.

SOILS

Most of the public lands in New Mexico are in a semi-arid environment with a range in parent material and vegetation that allows a wide variety of soils to develop. This variety affects the use and management of the public lands. Soil types on the public lands vary in depth, texture, color, structure, rock content, pH, nutrient
status, water holding capacity, and other characteristics. Soil properties influence and, in some instances, control the amount and kinds of vegetation or land use. Soil variation is often dramatic, changing over short distances, whether on forest, woodland, grassland, or riparian soil types. Upland soils are generally less resilient to impacts and slower to respond to management than are soils within riparian and wetland areas.

The NRCS has divided New Mexico into nine geographic areas (MLRAs) based on patterns of soil, climate, water resources, and land uses. Soil descriptions for each MLRA utilize the soil taxonomy to identify broad groups of soils. At the broadest or highest taxonomic grouping are soil orders. Four of the 11 soil orders, Alfisols, Aridisols, Entisols, and Mollisols, compose the majority of soils in New Mexico.

Alfisols are mineral soils that develop in cool moist regions, often under 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 or soils at lower elevations. Alfisols are generally productive soils that respond well to changes in management. Alfisols are major components in MLRAs 39, 48A, and 77. Subdivisions of Alfisols in these MLRAs include Eutroboralfs, Cryoboralfs, Haplustalfs, and Paleustalfs.

Aridisols 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 piñon juniper vegetation communities. Without irrigation, Aridisols are not as productive as those that receive more precipitation and as such, they are slower to respond to changes in management. Aridisols are major components in MLRAs 36, 37, 39 (low elevation), 41, 42, 51, and 70. Subdivisions of Aridisols in these MLRAs include Haplargids, Calciorthids, Camborthids, Paleargids, Paliorthids, Gypsiorthids, and Natrargids.

Entisols 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 all MLRAs, especially along existing stream channels and floodplains. They generally respond slowly to changes in management. Entisols are major components in MLRAs 36, 37, 39, 41, 42, and 48A. Subdivisions of Entisols in these MLRAs include Torriorthents, Torrifluvents, Ustifluvents, Torrispamments, Ustorthents, and Cryorthents.

Mollisols are mineral soils that have thick, dark-colored surface horizons rich in organic matter. They are fertile and extend from the higher mountains to the prairie grasslands where they are most abundant. Mollisol soils support the plains grasslands, chapparral-mountain shrub, mountain and plateau grasslands, and coniferous-deciduous forest community types. Mollisols are the most productive soils and respond well to management changes. Mollisols are major components in MLRAs 39, 41, 48A, 70, and 77. Subdivisions of Mollisols in these MLRAs include Argiborolls, Cryborolls, Haplustolls, Argiustolls, Calciustolls, and Paleustalls.

Soil Erosion

Soil erosion is influenced by climate, topography, soil properties, soil condition, cover, and land use. Of all the factors, soil cover is most important (*USDI, BLM 1994 Rangeland Reform Draft EIS*). Cover and land use are the two factors that BLM can influence to control erosion. Cover intercepts precipitation, reducing raindrop impact, restricting overland flow, and allowing more infiltration and less runoff and erosion. Research indicates that cover values of 30 to 40 percent are the lowest needed to control sheet and rill erosion and that 20 percent is needed to prevent wind erosion *(USDI, BLM 1994 Rangeland Reform Draft EIS)*. The 30 to 40 percent minimum cover values are more pertinent to arid areas where cover is naturally sparse. Cover values of 85 percent are not uncommon in the plains grasslands (*USDI, BLM 1994 Rangeland Reform Draft EIS)*. Sufficient cover requires adequate vegetation (basal cover and foliar cover) and natural litter.

Natural litter is the uppermost sightly decayed layer of organic matter on the soil surface. It not only adds soil cover but it also adds to the overall soil health by improving soil structure, thus improving the ability of the soil to absorb water. Litter also supplies nutrients to the soil.

Rangelands are affected by all three types of water erosion - sheet-rill, gully, and streambank. Sheet-rill erosion is insidious because it generally goes unnoticed as it removes very small amounts of soil over broad areas. Conversely, gully and streambank erosion are far more noticeable. Many uplands, especially in the arid areas, have an arroyo (gully) network inscribed throughout, replacing what were once grass-covered swales. As a result, water flow patterns in arid areas have been altered, causing an increase in size and frequency of runoff events and sediment yield to local water sources. Arroyos lower water tables and alter soil moisture regimes over large areas. Some researchers have concluded that 75 percent of the erosion in desert systems is the result of arroyo and streambank erosion *(USDI, BLM, 1994 Rangeland Reform EIS).*

Arroyo evolution begins with initial headcutting, then passes into a down-cutting phase, followed by channel widening and then infilling and rebuilding the floodplain. "Data from several streams in New Mexico and the southwest show decreasing sediment yields without changing flows. The lower reaches of these streams show evidence of renewed floodplain building within the arroyo walls." (Gellis 1991.)

WATER

Statewide

The State of New Mexico estimates that New Mexico has approximately 111,000 miles of watercourses, of which 6,000 miles are perennial (New Mexico Water Quality Control Commission, [NMWQCC] 1998).

The following water discussion is summarized from NMWQCC 1998. Surface waters in NM include headwaters of three principal drainages of the U.S.: the San Juan and Colorado River Basins contribute to the Colorado River; the Arkansas-White-Red River Basins contributes to the Mississippi River; and the Rio Grande and Pecos River Basins contribute to the Gulf of Mexico. There are also streams which are within closed basins and drain internally. Total annual streamflow in new NM is over 5.7 million acre-feet, with precipitation within NM providing 3.3 million acre-feet. 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 evapotranspiration, evaporation, pollution loading from man's activities, and changes due to beneficial uses. Some basins are well known for their water quality problems, such as the San Juan with the high salt content in the rocks and soils, or the Rio

Puerco Basin with its fine textured valley fills that are high sediment producers.

The following hydrogeology discussion is summarized from NMWQCC 1998. The hydrogeology of NM is also variable and complex, thus quality and quantity of ground water varies by location. Sandstone, limestone, and unconsolidated sand and gravel (sedimentary deposits) are the most productive aquifers. Valley or basin fill are the most important aquifers in the State, especially for drinking water, and usually occur along drainageways. These aquifers are highly vulnerable to contamination from surface discharges because they are shallow. Maintenance of surface water quality is necessary to protect the ground water.

Water quality management in New Mexico has both State and Federal aspects. The State, through the NMWQCC and New Mexico Environment Department (NMED), establishes standards for ground water, lakes, and streams or segments of streams, assesses the quality of these water bodies, adopts regulations, and takes actions to protect and maintain water quality. The State also coordinates with the U.S. Environmental Protection Agency in implementing the Federal Water Pollution Control Act (33 U.S.C. 1288), popularly known as the Clean Water Act and other Federal acts which contain water quality protection provisions.

Programs and measures to control pollution in New Mexico include the following:

- Federal National Pollutant Discharge Elimination Program for point source discharges and the State certification process for permits issued under this program,
- State certification of Federal dredge-and-fill permits,
- Discharge plans required under the State ground water regulations,
- State review of Federal actions under the consistency provisions of the Federal Clean Water Act, and
- Agreements between NMED and Federal and other agencies to implement nonpoint source (NPS) pollution control measures.

Approximately 2,936 assessed river miles [in the State] are impaired for designated or attainable uses. Many of the identified stream reaches have more than a single threatened or impaired use. Use impairment is frequently due to several causal agents from several sources. Overall, twelve of the State's fifteen designated uses have been impaired by point or nonpoint sources of pollutants. All subcategories of both the coldwater and warmwater fishery uses, as well as the irrigation and irrigation storage, primary and secondary contact recreation, domestic water supply, fish culture, and livestock watering and wildlife habitat uses have been impaired. (NMWQCC 1998).

Nonpoint source pollution is directly related to land use practices on a broad geographical scale. In New Mexico, the principal sources of NPS pollution include agriculture, including, silviculture, resource extraction, hydromodification, recreation, road construction and maintenance, and on-site liquid waste disposal. These sources are responsible for more than 91 percent of the impairment to the State's surface water. Reduction in pollution delivery from these sources is controlled or prevented through the implementation of BMPs by the responsible party. New Mexico encourages the use of BMPs for the control of NPS pollutants through a combination of efforts including incentive programs, education and outreach activities. Statewide efforts to control or reduce the degree of water quality impairments utilize a combination of BMP techniques. (NMWQCC 1998).

Rangeland Agriculture

Of the NPS sources, grazing on rangelands accounts for 21.3 percent of the total NPS contribution to surface water quality impairments of the State. Grazing is a probable major source of pollutants which may contribute to water quality impairments on approximately 812 stream miles, and a minor source of pollutants which may contribute to water quality impairments on approximately 1,792 stream miles. (NMWQCC 1998).

The following discussion is taken from page 100 and 101 NMWQCC 1998.

> In New Mexico rangeland NPS 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 two to three 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. Although many operators continue to feel threatened by the plethora of regulation surrounding water quality and riparian related species, many now recognize that what is good for riparian areas is also good for production. Grazing management trends point to multiple-pasture rest rotation grazing systems which often include special protection for riparian areas. This type of active management, whereby cattle are frequently moved from pasture to pasture, has proven to be a reliable path to success. Riparian and upland watershed conditions often exhibit rapid improvements under this type of system.

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. Most within the ranching community recognize that the long-term sustainability of the ranching in New Mexico depends on an environmentally sensitive and active management approach. In fact, many bear witness to the fact that their ranches are thriving under these types of systems. In the words of one such rancher, "...this environmentalism is making me money."

Efforts to reduce rangeland NPS pollution have focused on grazing practices instead of vegetation management. Years of livestock numbers reductions and implementation of grazing BMPs have had little to no effect on grazing lands NPS pollution. The recognition that a 90% reduction in livestock numbers has brought little to no improvement has prompted a reevaluation of the source of NPS pollution on grazing lands.

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 from 19 to 50 trees per acre to highs of 3000 trees per acre resulting in an average of 30% reduction of surface flows and restriction of infiltration to ground waters.

In the early 1980's, the Soil and Water Conservation Division promulgated BMPs designed to address the issues of woody invasion, diminishing grasses and forbs, reduction of surface flows and groundwater recharge. Federal and State land management agencies have not successfully implemented many of these BMPs.

The Soil and Water Conservation Commission and Districts have identified watershed restoration as the number one priority for New Mexico.

The following silviculture discussion was taken from page 101 of the NMWQCC 1998 Report:

> Areas on Forest Service Lands identified by the USFS as suitable for timber harvesting occupy roughly 10 per cent of the forested lands. Pre-1990 harvesting activities were disturbing about one half of one percent of those lands. BMPs were modified at that time to reduce impacts to water quality. Fire suppression on all Forest Service lands over the last 100 years has created conditions that favor large scale catastrophic wildfires and an average 30 per cent reduction of high quality water delivery.
>
> These reductions of water delivery from the watersheds has also contributed to exceedence of water quality standards in the lower reaches of New Mexico's rivers. As the flows of higher quality water is reduced, numeric concentrations of point and non point source pollutants increase.

The following is taken from pages 109 and 110 of the NMWQCC 1998 Report:

> New Mexico is fortunate in being able to demonstrate water quality improvements in specific watersheds. Since many of the State's high quality waters exist in areas managed by USFS, management changes and BMP implementation in many of these ares results in a rapid benefit even though the State does not always have the necessary data to establish statistical correlation between the implementation of BMPs and an improvement in water quality. In many instances, changes in 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. Due to this "ecological lag time:, NMED is exploring the use of other indicators of improvement. NMED has begun to develop protocols for assessing sedimentation through the use of biological and geomorphological methodologies. NMED also recognizes the need for and plans to develop protocols for assessing riparian areas and how they influence water quality.

Public Land

Comparatively, the number of miles of riparian areas on public lands is small, only 433 (*USDI, BLM 1997 Public Land Statistics*). There are no estimates of the miles of ephemeral channels on public lands. Undoubtedly, many of the 433 miles of riparian areas on public lands have been impacted by grazing in the past. Of the 163 water quality-limited stream reaches identified by NMED (1998), approximately 46 have public lands within their watershed. Forty-two of these (91 percent) have grazing identified as one of the probable sources of pollutants.

Water quality can be improved. For example, riparian areas with lush vegetation contribute to improved water quality and removal of sediment as the water moves through, rebuilding floodplains and reducing erosion of streambanks. Riparian areas also act as a sponge to hold water in streambanks and release water slowly, increasing the amount of water available year-long.

Under the Clean Water Act and a Memorandum of Understanding with the NMED, BLM is the designated agency for water quality management on public lands and is responsible for the control and reduction of NPS pollution on these lands. NPS pollution can be directly related to land use practices, and sediment related pollutants are likely the most significant contribution from public land activities (NMWQCC, 1998). One of the key tools in reducing NPS 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 NPS pollution concerns. This effort is coordinated with the State of New Mexico NPS Management Program outlined in (NMWQCC 1994). Examples of BMPs that have been used on public lands include the following:

- **Grazing** - grazing plans and systems, reducing livestock, redistributing livestock (fences, wells, salting, etc.), modifying grazing seasons, using rangeland treatments to improve condition (brush control, seeding, etc.) and modifying treatments to reduce soil disturbance
- **Roads and Rights-of-Way** - Minimizing soil disturbance, rerouting to avoid streams, stream armoring**,** stream crossings, controlling runon and runoff, and designing structures to withstand storms.
- **Recreation** - road closures, providing sanitary facilities
- **Riparian** - protecting areas, controlling saltcedar, plantings of desirable species
- **Oil and Gas** - closing and remediating pits, reseeding areas, building erosion control dams or berms, and avoiding leasing in sensitive areas

While the BMP terminology is relatively new, the concept is not. Nearly 50 years ago, BLM and other Federal agencies began restoring western landscapes, as demonstrated by the efforts undertaken since the 1950s in the Rio Puerco watershed to control erosion and sedimentation through reseeding of depleted

rangelands and construction of hundreds of erosion control dams, as well as adjustments to grazing management practices (*Rio Puerco Special Project Evaluation Report, 1972)*.

BLM implementation of BMPs is documented in a report produced by the EPA Region 6 entitled New Mexico Best Management Practices Study, July 30, 1998. The study looked at 20 randomly chosen BLM grazing sites and found 265 practices implemented on those sites which could be considered as BMPs.

GRAZING ADMINISTRATION

The current Rangeland Management Program can be more easily understood with some historical background of how it has developed, both successfully and with some setbacks, over the past century.

Rangelands were significantly changed around the turn of the century. Many areas that were previously grasslands were converted to brush lands. In the south, creosote and mesquite came to dominate the landscape while in the north, sagebrush and piñon/juniper trees became most common. "The explanations for vegetation change seem to be as numerous as the explainers themselves. Recent workers tend to view vegetation change as the result of several, factors, none of which can always be singled out as the most influential. Clearly, [historic] livestock grazing'...must bear justly the responsibility of a number of evils, but it has become a convenient scapegoat for a multitude of situations where the proper answer should be 'Nobody knows'"(Allred 1996).

Prior to 1934, the federal government did not control livestock grazing on public land. In 1934 the Taylor Grazing Act (TGA) was signed. It sought "to stop injury to the public grazing lands by preventing overgrazing and soil deterioration: to provide for their orderly use, improvement, and development; [and] to stabilize the livestock industry dependent upon the public range" (TGA 1934).

In the 1930s and 1940s the Division of Grazing, later the Grazing Service, later BLM, worked through the grazing advisory board, to identify where the public lands were, what had been the prior use by ranchers, what the range conditions were, and where range improvements were needed. Through this consultation, the Division was able to establish future grazing allotment boundaries, seasons of use, types of livestock and preference. Preference was identified in AUMs and was attached to base properties controlled by the various permittees/lessees. Permits and leases were then developed in concert with the preference, allotment boundaries, season of use, and kind of livestock. Where the land could not support the preference levels of use, a portion of the preference was placed in suspended nonuse and the permit or lease reflected the remaining portion as active use.

In the 1950s there was a significant drought. In New Mexico, the drought was perhaps second only to one that had occurred nearly 700 years earlier from 1275 to 1299. Many acres of grassland were thinned. Black grama losses were reported as high as 30 percent on conservatively grazed areas to 100 percent on ungrazed areas. In addition to the grass, shrubs and trees were lost (Allred 1996).

In the 1950s and 1960s the BLM worked to construct range improvements and treated the land to reduce erosion and help the land recover. In the mid-1960s BLM added grazing programs that would improve the range condition.

In the 1960s and 1970s large sagebrush and pinon-juniper chainings were completed in the northwestern part of the state to improve watershed conditions, wildlife habitat, and livestock forage. Slash piles were burned, and the chained areas often seeded to perennial grasses.

In the 1970s, the BLM began preparing EIS as part of the Rangeland Management Program. This usually included conducting rangeland surveys to project grazing capacity. Once the capacities were estimated and the EISs complete, the BLM started making livestock grazing adjustments.

In the 1980s, the BLM began using multiple-year monitoring to confirm or adjust grazing capacities. Usually an allotment was monitored for five-years and then the studies were evaluated. After evaluation, the allotment's capacity was adjusted to be consistent with the monitoring. In some cases the capacity was adjusted upward and in some cases it was adjusted downward. In most cases, the adjustments were incorporated through agreement between the permittee and BLM. In some cases, allotment plans were developed to incorporate land treatment and/or more intensive grazing management to achieve the management objectives.

In 1986 the *Public Land Statistics* reported that the following range conditions were present in New Mexico:

Excellent	1 percent
Good	24 percent
Fair	48 percent
Poor	23 percent
Unclassified	4 percent

Photo 3-19

By the 1990s, the BLM had ensured that most of the allotment stocking rates were consistent with the grazing capacities established by rangeland monitoring or surveys. There were exceptions, however; these often included low priority allotments such as small scattered tracts. Often, BLM does not regulate the actual grazing numbers on these tracts unless there are unusual circumstances.

By 1995, the BLM reported that only 4 percent of public lands in New Mexico showed a downward trend. (USDI, BLM 1995 - *National Range Inventory Report*) A combination of factors may have been responsible for the downward trend. First of all, many brush and tree species continued to increase. The loss of the fire cycle also appeared to be a major contributor. Although it may have been in part due to grazing animals removing the fine fuels, a major contributor was the BLM's past fire control program (Swetnam and Betancourt 1990).

In other cases, the problem may have been animal concentration. Some areas (due to topography, water, or vegetation) appeal to animals more than others. Although an allotment may be stocked properly, concentration areas continue to be grazed above optimum levels. The BLM is now focusing on solving these problems. For example, BLM's first priority is to ensure that riparian areas are properly functioning and management is not adversely affecting them.

Forty one percent of Public lands were showing an upward trend by 1995. (USDI, BLM 1995 - *National Range Inventory Report*) These acres may not meet the optimum condition today; however, current management practices will allow the land to achieve the objectives.

Fifty-five percent of public lands were showing a static trend by 1995 (USDI, BLM 1995 - *National Range Inventory Report*), meaning that the current condition has stabilized. This condition often exists where optimum conditions have been achieved, where the land is dominated by brush species, and at the lower seral stages. Where deep rooted brush species dominate, change comes very slowly, even under optimum management programs, unless the programs include brush and tree control. To improve these lands, BLM cooperates with individual ranchers to develop rangeland programs that include improved grazing distribution, grazing deferment, and brush control. Success has been made in thinning sagebrush with the herbicide Spike 20-P in northern New Mexico. As sagebrush was thinned there was increased herbaceous vegetation production resulting in increased ground cover. This increased production and ground cover resulted in watershed protection and erosion reduction as well as wildlife and livestock forage benefits.

By 1996, the BLM changed its range condition reporting categories; however, a direct comparison can be made between the new and old categories. The following figures that were reported in the *Public Land Statistics* 1996 show a rapid improvement since 1986:

PNC (excellent)	1 percent
Late Seral (good)	35 percent
Mid Seral (fair)	46 percent
Early Seral (poor)	14 percent
Unclassified	3 percent

(* Total does not equal 100 percent due to rounding)

Photo3-20

Although percentages of the PNC and mid-seral ecological stages remained virtually unchanged, the late seral increased by 45.8 percent and early seral was reduced by 39.1 percent. The PNC condition is not always the desired condition for the public lands, since it may not always provide the best mix of vegetation for desired biological and social values (Council of Agriculture Science and Technology 1996). Maximum vegetation diversity, often the most desirable objective for livestock and some species of wildlife, occurs frequently not at climax, but in the mid-to late seral stages (USDI, BLM, 1990-*State of the Public Rangelands*). This is because the mix of plants for use on the area may be suboptimal and other stages often provide for more diversity (Council of Agriculture Science and Technology, 1996).

Current Grazing Management

Today the BLM administers livestock grazing on federal land under the authority of Sections 3 and 15 of the TGA of 1934. Other laws governing livestock grazing on federal land include the Bankhead-Jones Farm and Tenant Act, National Environmental Policy Act NEPA, FLPMA and PRIA.

Livestock grazing is authorized through grazing permits and leases which are typically issued for a 10-year term. The preference includes active use and suspended nonuse. For the active use, the permit/lease identifies the number and types of livestock and periods of use.

Suspended nonuse represents that portion of the preference that is held in suspense by BLM and cannot be activated by the permittee/lessee. Often the suspended preference is the result of BLM's monitoring program indicating that the grazing capacity of an allotment is not adequate to support full preference numbers.

Each year the permittee/lessee is provided the opportunity to apply for a portion of the active use to be in nonuse. The nonuse that is initiated by the permittee/lessee is different from suspended nonuse. When BLM approves the nonuse applied for by the livestock operator, the operator does not have to pay for the identified AUMs.

BLM records show that 1,891,665 active use AUMs of preference are currently attached to base properties for New Mexico. Of the 1,968,341 AUMs of preference, 76,676 AUMs are held in suspended nonuse. BLM records show that 1,891,665 AUMs of forage from the lands BLM administers are active or available for use. Preference, suspended nonuse, and active use are all reflected on the permits and/or leases.

In New Mexico, more than 2,000 operators are authorized to graze livestock on 2,193 allotments. Of these allotments, 1,321 have livestock grazing authorized by permits issued under Section 3. There are 872 grazing allotments where grazing is authorized by leases under Section 15 of the TGA. Allotments vary in size in regard to the number of active AUMs. The smallest allotment contains one AUM, while the largest has 37,940 AUMs. The types of livestock authorized to graze on the public lands include cattle, horses, bison, sheep, and goats. Sheep and goats can be found mostly in the Las Cruces, Carlsbad, Farmington, Albuquerque, Roswell and Taos Field Offices.

Seven FOs are responsible for administering the grazing regulations on public lands at the local level. (see Map 1-1) However, each office is distinct, varying in size, types of resource programs, budget, and personnel. These factors and others affect the intensity of management devoted to the public lands. The number of permits, leases and AUMs for each field office are shown in Table 3-6.

The laws mentioned above direct the BLM in its responsibility to authorize and manage livestock grazing use under the principles of multiple use and sustained yield, and to prevent the degradation of the rangeland resources by providing for their orderly use, improvement, and development. Early planning documents such as the Management Framework Plan (MFP) and grazing EIS's established resource objectives along with management actions needed to attain them. Valid MFP decisions and related information were later incorporated to support the BLM's present planning document, the RMP. Today, BLM combines the RMP and EIS to fulfill their commitment to implement a livestock grazing program that is in compliance with NEPA.

RMP/EIS documents have been written for each field office which is responsible for implementing its individual RMP decisions. (For a list of the various RMP's refer to Chapter 1.)

TABLE 3-6
NUMBER OF PERMITS AND LEASES AND AUMS BY FIELD OFFICE

	Total Preference AUMs	Active Use Preference AUMs	Suspended Preference AUMs	Section 3 Permits	Section 15 Leases
Carlsbad	402,185	367,717	34,468	200	62
Farmington	121,970	112,855	9,115	130	34
Las Cruces	638,975[1]	634,350	4,625	368	211
Albuquerque	146,294	145,272	1,022	112	135
Roswell	367,049	353,092	13,957	203	211
Socorro	238,472	233,359	5,113	204	56
Taos	53,396	45,020	8,376	104	163
Total	1,968,341	1,891,665	76,676	1321	872

1 Does not include AUMs of forage for McGregor Range.

Source: BLM Grazing Authorization and Billing System files

Allotment Classification

In the 1980s, BLM developed allotment classification criteria to assist individual field offices in identifying allotments with the highest priority for public investments. Allotments in the "Improve" category were the highest priority for management attention and range improvement investment.

Allotments were placed in one of three categories based on BLM criteria as shown below. The criteria for each category were numerous and seldom would an allotment meet all criteria for a category.

- "Maintain" (M) category
  - present range condition is satisfactory
  - allotments have a moderate or high resource production potential, and are producing near their potential (or trend is moving in that direction)
  - no serious resource-use conflicts/controversies exist
  - opportunities may exist for positive economic return from public investments
  - present management appears satisfactory
  - other local criteria

- "Improve" (I) category -
  - present range condition is unsatisfactory
  - allotments have a moderate or high resource production potential, and are producing at low to moderate levels
  - serious resource-use conflicts/controversy exist
  - opportunities exist for positive economic return from public investments
  - present management appears unsatisfactory
  - Other local criteria

- "Custodial" (C) category -
  - present range condition is not a factor
  - allotments have a low resource production potential, and are producing at low to moderate levels
  - limited resource-use conflicts/controversy may exist
  - opportunities for positive economic return on public investments do not exist or are constrained by technological or economic factors
  - opportunities exist to achieve the allotments potential through changes in management
  - other local criteria

Allotments within each category do not have to meet all the criteria to be managed according to the category objectives. Grazing allotments within New Mexico have been categorized as follows:

Category M	870 allotments	4,765,981 acres
Category I	561 allotments	6,747,894 acres
Category C	762 allotments	1,329,018 acres

The categorization of allotments has allowed BLM to direct attention to those areas where grazing management is needed most to improve the resource or resolve serious resource use conflicts.

Such a mechanism to resolve use conflicts has been needed, especially in view of the perception some individuals or groups have had toward livestock grazing. During the last decade, grazing by livestock on public land in the United States has come under increasing public scrutiny. Concerns are that such grazing has caused and is continuing to cause, among other things, diminished are biodiversity, deteriorated range condition, increased soil erosion, desertification, depleted watersheds and riparian areas, (e.g., banks of a river or other body of water), impoverished wildlife habitat, declining wildlife population, and decreased recreational opportunities and experiences Council of Agriculture Science and Technology 1996).

The grazing program is part of the BLM's overall multiple use management program for public lands. To authorize grazing use or grazing related actions, other uses of the lands or resource values (wildlife, wilderness, recreation, mining, etc.) are addressed only as they relate to, or may be affected by, livestock grazing use.

A variety of management actions or tools are available to properly manage grazing on public rangelands in accord with multiple use mandate. These include grazing systems, rangeland improvements and their proper placement, fire, salting, and others. Implementation of these actions, within each category, is conducted in conjunction with "careful and considered consultation, cooperation, and coordination with lessees, permittees, and landowners involved..." as required by Section 8 of (PRIA).

A useful tool for Rangeland Management has been the Allotment Management Plan (AMP), which is an action plan between the permittee and BLM, with input from the interested public. AMPs or other Livestock Activity Plans (LAPs) have been developed on 290 allotments, and also include those plans prepared by other agencies or plans developed by permittees. AMPs have helped BLM to be successful in resolving conflicting issues and meeting goals, by prescribing grazing use (grazing systems), rangeland improvements, and other actions, along with identifying specific objectives for grazing and objectives from other activity plans e.g., Habitat Management Plans. The BLM has expended much effort managing and improving the public rangelands; however, credit also must be given to many grazing permittees who, through their cooperation and good stewardship, have likewise contributed to the improvement of the public rangelands.

Grazing systems provide deferment or periodic rest of the rangeland from livestock grazing. When used with other techniques, they can successfully allow for plant growth and regrowth. Plants are affected more when grazed during their active growth, and especially so if they do not have the time to recover from defoliation before the end of the growing season. However, season-long use is not an inherently inappropriate management system. If all the proper tools are used to obtain a fairly uniform grazing distribution after range readiness and if the correct utilization level is reached, season-long grazing need to be neither destructive nor undesirable (Heady and Child 1994). When designing a grazing system, many factors must be considered, including the needs of the allotment, fencing, cost, stocking rate, water, salt, utilization level desired, and management objectives, among other considerations. Continuous grazing should not be discounted as long as objectives can be met. (Bedell, 1992)

Management Issues

A number of riparian areas exist around the state. Livestock grazing can be compatible. However, it depends on the extent to which grazing management considers and adapts to certain basic ecological relationships. Grazing management practices that improve or maintain the upland may not improve or maintain the riparian area. To be managed effectively, the whole pasture containing the riparian zone and the whole watershed is considered.

Plant species such as snakeweed, piñon-juniper, sagebrush, mesquite, and others affect the stability of soils and the productivity of rangelands, reducing the amount of forage available for livestock and wildlife. Through returns from livestock grazing fees, a total of

233 brush control or land treatment projects have been performed on thousands of acres to achieve a desired plant community. This has benefited both wildlife and livestock, as well as watershed and other resource values. For example, pronghorn antelope have been relocated to some of the land treatment areas to reintroduce or increase the population.

In considering other resource uses, fences have been modified in some areas so as not to obstruct the movement of deer and antelope. Fence design standards are available to meet a variety of resource management situations. RMP decisions in some Field Offices have directed the modification of some existing fences. The fences are modified by removing specific sections (100 to 200 feet) and replacing them with 4-or 5- strand wire.

The increasing number of elk in some areas is a concern. Elk compete with livestock for forage and have contributed to certain public lands being heavily grazed. Over 100,000 acres in some 20 allotments are affected by this problem. Unrestricted grazing by great numbers of wild ungulates (e.g., deer or elk), also can affect rangelands detrimentally (Chase 1986, Cole 1971)

WILD HORSES AND BURROS

The Wild Free Roaming Horse and Burro Act of 1971 requires wild horses and burros to be managed at appropriate levels and prohibits their relocation to areas where they had not lived before 1971. One of the act's goals is to manage populations to create an ecological balance on federal land.

A prerequisite for resource decisions and activities in the BLM is land use planning. For wild horses and burros, planning first addresses the question of whether a herd area is to be a Herd Management Area (HMA). A herd area is an area that was used by wild horses or burros as habitat in 1971 when the act was passed. A HMA is a herd area where the land use planning process has determined that wild horses or burros will be managed. In New Mexico, BLM has identified one HMA, the Bordo Atravesado HMA located 15 miles east of Socorro. The boundaries of the HMA are the same as those for the Bordo Atravesado grazing allotment. This 16,000 acre unit supports 273 head of cattle, a herd of about 50 wild horses and deer and pronghorn antelope.

An HMA Plan was developed for the area in 1980 and amended in 1985. The amendment reflected the new appropriate management level of 50 wild horses, an increase from the old level of 32.

The apparent range condition is fair to good within the wild horse HMA. Range studies indicate that the trend is static. This condition should be maintained so long as the appropriate management level is maintained and not exceeded.

When studies indicate an excessive use of forage, arrangements are made to remove a selected number of wild horses from the range. In 1995, monitoring indicated forage use of 46 to 54 percent. As a result, 29 wild horses were removed from the 71 head on the range.

Although there are problems encountered between livestock and wild horses, cattle usually do not pose a problem for the wild horses. The operator exercises control over his cattle and their movement from pasture to pasture. The entire herd (273 head) is periodically moved out of a pasture, providing it with deferment from cattle grazing, which benefits the wild horses.

Wild horses are also found within the Farmington Field Office. Some 85 to 100 run mostly on the Carson National Forest and occasionally on BLM lands. The area used by the wild horses is 80,000 acres in size - 75,000 acres of Forest Service land and 5,000 acres of BLM land. The Forest Service is the lead agency for managing the wild horses in this area, and with some assistance from the BLM, conducts population counts, monitoring, and gathering.

WILDLIFE

Big game animals are found throughout New Mexico on public lands. In addition to these animals, public lands provide habitat for other wildlife including a large number of mammals, birds, reptiles, fish, and amphibians. The BLM manages public lands to provide for wildlife habitat under the multiple use concept mandated by the FLPMA.

Some limiting factors potentially affecting wildlife populations are not within BLM's control. For example, although BLM has responsibility for management of the wildlife habitat, the animals themselves are often

managed by other agencies. Additionally, natural events such as drought, fire, disease, and predation can severely reduce wildlife populations. When natural events such as a wet cycle occur, and habitat conditions are favorable for a certain species, then populations can increase dramatically, such as often happens with quail populations.

The combination of rancher-provided livestock water and BLM-provided water through the use of range improvement funds received from grazing fees, has improved wildlife habitat for a number of wildlife species dependent upon year-long water provided by pipelines and associated drinking troughs on most of the allotments within the state of New Mexico. The use of land treatments (prescribed fire, chemical, and mechanical) has improved wildlife habitat by reducing the amount of undesirable brush species; increasing ground cover and litter with grasses, shrubs, and forbs; and decreasing soil erosion. In some cases, increasing the number of range improvements may negatively affect wildlife habitat, by encouraging livestock use and disturbance of wildlife seclusion areas; for example, reduction of ground cover for ground nesting birds or disturbance to big game fawning and calving areas (Krausman 1996).

The following is a 30 year summary for selected big game species on public lands based on estimated numbers of big game animals (USDI, BLM 1966, 1976, 1986, 1989, 1996 - *Public Land Statistics)*.

Antelope	**Year**	**Numbers**
	1947	9,251
	1956	7,085
	1966	7,500
	1976	8,700
	1986	4,700
	1996	7,320

Antelope numbers are not cyclic, but population estimates appear to fluctuate perhaps due to habitat conditions, such as drought or hunter harvest.

Mule Deer	**Year**	**Numbers**
	1947	18,300
	1956	12,570
	1966	43,000
	1976	37,000
	1986	28,700
	1996	31,000

The deer numbers appear to be decreasing on public lands. This is consistent with the statewide trend for the species. The reasons for this trend have not been positively identified by the New Mexico Department of Game and Fish.

Elk	**Year**	**Numbers**
	1947	0
	1956	0
	1966	170
	1976	1,100
	1986	1,700
	1996	6,000

Elk numbers have increased substantially on public lands and have become an issue within the state with livestock operators. The NMDGF has responsibility for managing elk, and has agreed to regulate wildlife populations on the public lands consistent with resource capability (Memorandum Of Understanding between NMDGF and BLM 1990). They are in the process of addressing the elk issue. Possible habitat degradation and the potential loss of livestock AUMs are issues of concern.

Public meetings for all regions within the state were conducted in the summer of 1997 to gather information and concerns on elk population levels and cooperatively establish goals and objectives. The NMDGF will control the elk population according to biological data and the outcome on issues from these meetings (personal comm. Dan Sutcliffe, NMDGF 1997).

Javelina	**Year**	**Numbers**
	1947	0
	1956	200
	1966	600
	1976	650
	1986	800
	1996	3,470

Javelina numbers are growing rapidly on public lands. However, they do not appear to be causing resource damage and therefore have not created a concern.

Bighorn Sheep	**Year**	**Numbers**
	1947	67
	1956	0
	1966	30
	1976	44
	1986	60
	1996	170

Bighorn sheep numbers are increasing on public lands due to a joint recovery and transplanting program between BLM and NMDGF.

Bear	Year	Numbers
	1947	NA
	1956	NA
	1966	NA
	1976	0
	1986	0
	1996	181

Bear numbers appear to be increasing and dispersing in New Mexico. This has created a growing number on public lands.

Turkey	Year	Numbers
	1947	NA
	1956	NA
	1966	NA
	1976	NA
	1989	100
	1996	1,000

Turkey numbers are increasing on public lands.

Barbary Sheep	Year	Numbers
	1947	NA
	1956	NA
	1966	200
	1976	340
	1986	500
	1996	450

Barbary sheep are an introduced species brought to New Mexico in the 1960s by the NMDGF and private interests. Their numbers appear to have peaked in the 1980s.

Wildlife Habitat by MLRA

The following is a brief description of wildlife habitat in the nine MLRAs. The diverse, intermingled plant communities offer numerous habitats for a variety of wildlife species in each MLRA.

36 - New Mexico and Arizona Plateaus and Mesas

Most of this area supports grassland vegetation with large quantities of shrub species present, providing food and cover for wildlife. Piñon-juniper woodlands are located at the higher elevations and along escarpments.

Mule deer range throughout this MLRA. Populations are down, consistent with the trend for mule deer throughout New Mexico. Several factors are suspected for this recent decline such as predators, drought which leads to poor habitat quality, competition with elk and effects breeding and fawn survival, increased hunting pressure, and poaching on public lands.

Rocky Mountain elk reside on public land in the higher elevations of this MLRA and increase in numbers during the winter months. All herds seem to be increasing and expanding throughout their range and are competing with livestock for forage. Due to this increase in elk numbers, some upland and riparian habitats are being degraded, especially during severe winters. Black bear and mountain lion are scattered throughout the MLRA in the pinon-juniper woodland and escarpments, preying upon the dwindling deer herds and other prey-base species. Other mammals such as bobcat, coyote, gray fox, tassel-eared squirrel, black-tailed jack rabbit, desert cottontail, deer mouse, brush mouse, Townsend's ground squirrel, and white-tailed prairie dog can be found throughout the MLRA.

Merriam's turkey use this MLRA, as well as the Ignacio Chavez Wildlife Special Management Area in the Albuquerque Field Office. Scaled quail, Gambel's quail, and mourning dove are the primary game birds within the MLRA. Several areas within the MLRA have been identified as wildlife areas of special management concern for raptors such as nesting sites, feeding areas, and seasonal habitat needs. The golden eagle, prairie falcon, ferruginous hawk, and bald eagle are the primary raptors. Other raptor and avian species include burrowing owl, American kestrel, red-tailed hawk, sage thrasher, sage sparrow, black-billed magpie, gray flycatcher, horned lark, and several other passerine and song bird species.

Most common reptiles include the collared lizard, prairie lizard, eastern fence lizard, western whiptail, striped whipsnake, western garter snake, western rattlesnake, western ground snake, western skink, and common bullsnake.

37 - San Juan River Valley Mesas and Plateaus

This MLRA supports wildlife that use the sagebrush and desert shrub community of Northwestern New Mexico. In higher elevations some pinon-juniper and mountain mahogany along with western wheatgrass and galleta can be found. Sagebrush tends to be the dominant shrub species. These sagebrush areas contain less species diversity than other plant communities and are typically associated with the cold desert where snow and cold weather causes wildlife to use habitat areas in seasonal patterns (wintering areas). This habitat is considered a biotic zone between the high coniferous regions and the lower grassland areas. As a result, the sagebrush community can be used as a singular habitat type for some species or in conjunction with other vegetational habitats for migratory species.

Pronghorn antelope commonly live within the sagebrush community where sagebrush is lower than 24 inches tall and a variety of forbs and other forage occupy the stand. Within the Farmington Field Office, scattered small herds of pronghorn antelope can be found in sagebrush and desert shrub-grassland types. However, even though there are large areas of apparently suitable habitat, the population is estimated to be less than 100 animals and is considered to be declining, possibly due to poaching (Farmington RMP 1988). To take advantage of available habitat, about 85 antelope were released on Ensenada Mesa in March 1989. They declined from those numbers but, apparently stabilized at approximately 60-70 head. A combination of factors may be why antelope are not present in large numbers on Ensenada Mesa according to the Farmington FO wildlife biologist. These factors include: climatic fluctuations, the quality of habitat, predation, and dry water sources.

Mule deer are residents relying upon browse for food and various topographic features for cover and escape routes. This area provides significant winter habitat for migrating deer and elk herds from the Carson and Santa Fe National Forests. Black bear and mountain lion are scattered throughout MLRA in the piñon-juniper woodland and rough canyons. Other mammals such as bobcat, coyote, gray fox, black-tailed jack rabbit, desert cottontail, deer mouse, brush mouse, Townsend's ground squirrel, and white-tailed prairie dog can be found throughout the MLRA.

Areas within the MLRA that have received special management attention in the Farmington Field Office are raptor nesting areas for golden eagle, prairie falcon, and ferruginous hawk; and bald eagle wintering areas. Other raptor and avian species include burrowing owl, American kestrel, red-tailed hawk, sage thrasher, sage sparrow, black-billed magpie, gray flycatcher, horned lark, and several other passerine species.

Most common reptiles include the sagebrush lizard, eastern fence lizard, western whiptail, garter snake, western rattlesnake, western ground snake, western skink, and common bullsnake.

39 - Arizona and New Mexico Mountains

This MLRA is covered with an extensive stand of ponderosa pine. Because of the broad elevation range, the area supports various habitats including alpine vegetation, conifer forests, oak woodlands, and grasses; resulting in large wildlife populations.

The BLM within the state of New Mexico manages very little habitat of this type. Mule deer live in coniferous and deciduous forests, preferring rough terrain for cover and shrubs for food. Elk utilize the higher country during the summer and migrate to lower elevations during the winter. Other mammals common to the forest are mountain lion, black bear, coyote, bobcat, golden mantled ground squirrel, Albert's squirrel, chipmunk, and porcupine.

Resident birds that use the forests include the pygmy nuthatch, Steller's jay, mountain chickadee, Cassin's finch, northern flicker, northern goshawk, red-tailed hawk, sharp-shinned hawk, Mexican spotted owl, and great-horned owl.

Common reptiles include the wandering garter snake, pine gopher snake, and western rattlesnake. The most common amphibians include the Rocky Mountain toad and common leopard frog.

The coniferous and deciduous forests continue to be used heavily for recreational purposes, causing wildlife displacement.

41 - Southeastern Arizona Basin and Range

This MLRA lies within the Coronado National Forest in Hidalgo County, with a small portion overlapping

onto BLM lands. The area supports forest, savanna, and desert shrub vegetation.

Mule deer are scattered throughout the MLRA, and are most abundant in or near the various mountain ranges. Coues' whitetail deer occupy a limited range in southwestern New Mexico (Hidalgo County). The Coues' whitetail prefer the grass, mixed shrub, and conifer mountains, which are relatively undisturbed or are in or near the potential climax community. Javelina are scattered within the riparian areas, grasslands, and pinon-juniper woodlands of the MLRA. The larger concentrations exist in the southern portion of Hidalgo County.

Other mammals associated with this small MLRA include coyote, badger, black-tailed jackrabbit, black-tailed prairie dog, bannertail kangaroo rat, white-throated wood rat, and numerous smaller mammals.

Scaled quail, Gambel's quail, and mourning dove are the primary upland game bird species. Swainson's and ferruginous hawk, lesser nighthawk, Chihuahuan raven, verdin, cactus wren, pyrohuloxia, and McCown's longspur are just several other bird species that use the MLRA.

Reptiles and amphibians occurring within the MLRA include the southern prairie lizard, whiptail, western hog-nosed snake, Mexican black-headed snake, and massasauga, and green toad.

42 - Southern Desertic Basins, Plains, and Mountains

This MLRA makes up a large portion of south-central and southern New Mexico. This area supports desert grass-shrub vegetation with isolated piñon-juniper desert mountains intermingled. Many desert species are physiologically and morphologically adapted to survive extreme environmental conditions (low, erratic rainfall and highly variable temperatures). Many mammals do not require free water but depend upon their own metabolic water and water conservation strategies (nocturnal). Because of these extreme environmental conditions, desert wildlife are highly dependent upon microhabitats, especially those that provide water and thermal cover, such as vegetation patches, rock, soil, and surface debris (litter). Small changes in these microhabitats can alter species abundance and diversity.

With rapid expansion of human activities into desert habitats, many habitat components crucial to species existence are being altered, especially those important to humans and wildlife.

Desert habitats possess some of the most unusual wildlife within the state. Numerous wildlife species use or occupy the hot and dry Chihuahuan Desert shrub type of New Mexico. Desert mule deer are widespread throughout the area and rely upon various browse species for food and topographic features for cover and escape routes. Several small pronghorn antelope herds are found throughout the MLRA. Desert bighorn sheep are intensively managed in the southwestern portion of this MLRA. The bighorn population is less than 100 animals and has been fluctuating between 75 and 100 animals for the past several years (USDI, BLM Mimbres RMP 1993). Competition for feed with deer and livestock is a major concern in the bighorn sheep-occupied mountain ranges (USDI, BLM, Mimbres RMP 1993). Important food items include mountain mahogany, cactus, winterfat, oak, and some grasses and forbs. Disease and predation are other serious problems that are affecting the size and health of the bighorn sheep population.

Javelina use the desert floor west of the Sacramento Mountains where desert plant species such as prickly pear, agave, ocotillo, sotol and scattered junipers are more abundant. A herd of Iranian ibex, an exotic species, occupies the Florida Mountains south of Deming, New Mexico. Numerous releases occurred in the 1970s totaling 73 animals. In 1990, the population ranged from 400 to 500 animals, with a carrying capacity set in 1988 for 400 animals. Their diet primarily consists of mountain mahogany, silktassel, and oak. Oryx are located within the MLRA, primarily on military withdrawn lands. In recent years, they have moved onto BLM lands in the Las Cruces, Socorro, and Roswell Field Offices. There is some concern from permittees on the competition for forage between oryx and livestock and the destruction of fences from these large exotic mammals moving through the area (personal comm. Bill Stephenson 1994).

Barbary sheep (Audad) are scattered throughout the rolling hills and canyons. In the early 1980s, populations were high and competition with mule deer and range sheep for forage-primarily browse species-was occurring. Since then, Barbary sheep populations

have dropped and are somewhat stable under the current hunting regulations.

Other mammals associated with this small MLRA include coyote, kit fox, spotted skunk, Merriam's kangaroo rat, rock squirrel, southern grasshopper mouse, spotted ground squirrel, black tailed prairie dog and numerous other small mammals.

Scaled and Gambel's quail, and mourning and white winged dove are the primary upland gamebirds within the MLRA. Raptor species dependent upon topographic features or large brush species for nesting sites include the Harris hawk, prairie falcon, great-horned owl, burrowing owl, and American kestrel. Several avian species that use the southern desert include the Chihuahuan raven, Crissal thrasher, canyon towhee, and other passerine birds.

The southern desert provides a large diversity of reptiles and amphibians. Some of these include the side-blotched lizard, Clark's spiny lizard, lesser and greater earless lizard, desert iguana, Gila monster, sidewinder, and numerous other reptiles.

48 - Southern Rocky Mountains

This area supports forests on upper slopes, alpine tundra above timberline, and shrub-grass vegetation at lower elevations. Rocky Mountain elk are the primary big game animal occupying the area year-round. Mule deer are scattered throughout the area during the warmer seasons and migrate to lower elevations in the winter. Several transplants for Rocky Mountain bighorn sheep have been conducted in recent years and have been successful in the northern part of the Pecos wilderness and Wheeler Peak areas. Blue grouse use the lodgepole pine, spruce, and fir forests. Small isolated populations of Merriam's turkey occupy this MLRA and are usually associated with the ponderosa pine forest at lower elevations. Black bear, mountain lion, and other game species use the area on a year-round basis.

51 - High Intermountain Valleys

Wildlife species within this MLRA are generally common varieties due to the diversity of habitats. All of the land description lies within the Taos Field Office. Mule deer are scattered throughout the area with the habitat in relatively good condition. Rocky Mountain elk primarily reside in the northern portion of the unit; however, small resident populations occur on Pot Mountain, Cerro Montoso, Guadalupe Mountain, and West Picuris. The winter population increases as wintering elk migrate to the San Antonio/Pot Mountain Wildlife Habitat Area (WHA). It is not uncommon to see an additional 1,500 head of elk during a severe winter within the WHA. Pronghorn antelope habitat is extensive in the San Antonio/Pot Mountain WHA. The population is below optimum, but is increasing (850 animals) (Taos RMP 1988). Black bear and mountain lion occur in limited numbers in mountainous areas and along the Rio Grande Gorge. Other mammals associated with this MLRA include coyote, bobcat, ringtail cat, gray fox, black-tailed jackrabbit, white-tail prairie dog, spotted skunk, rock squirrel, northern grasshopper mouse, and numerous other small mammals and rodents.

Upland game birds include the mourning dove, scaled quail, Merriam's turkey, band-tailed pigeon, and blue grouse, none very common on public lands within the MLRA. The upper portions of the Rio Grande provide significant habitat for raptor nest sites. Some of these are sensitive to human presence, including the prairie falcon and golden eagle. Other raptors that use the deep rim-rock canyon and upland sites for prey include the great-horned owl, red-tailed hawk, and American kestrel.

70 - Pecos-Canadian Plains and Valleys

This MLRA supports wildlife species dependent on the plains grassland vegetation, which is dominated by short- and mid-grasses. However, there are some large areas of public land on the eastern boundary of the MLRA having significant amounts of tall grasses (bluestems) and shinnery oak. Within the Roswell Field Office, this area is known as the Mescalero Sands or Caprock WHA and encompasses approximately 570,00 acres of which 270,000 acres are of public domain. Another area north and west of Roswell known as the Macho WHA encompasses approximately 1,750,000 acres of which 634,000 acres are federal domain.

Desert mule deer are scattered throughout the MLRA, especially near large concentrations of shrubs and brush, drainages, and the shinnery oak sandhills. Pronghorn antelope are the most common large herbivorous mammal in the open grasslands.

Competition for space and forage occurs on sheep allotments within the Roswell and Carlsbad Field Offices, primarily within the Macho WHA for the pronghorn antelope, in search of forage and fawning areas, especially during drought periods (USDI, BLM 1986 - *Macho Habitat Management Plan, 1986*).

In southeastern New Mexico, the lesser prairie chicken is the primary upland game bird for which the BLM manages habitat. Prairie chickens are found almost exclusively in the shinnery-oak dune/tallgrass community and depend heavily on the residual growth of little and sand bluestem for nesting habitat. Over the past seven years the population has dropped considerably, not only in New Mexico but all over the occupied range. A petition for listing the species as threatened has been received by the U.S. Fish and Wildlife Service (USFWS). An interstate working group has be formed to address certain issues within the petition and its validity. The Roswell Field Office has also initiated a longterm study on the prairie chicken to determine habitat requirements and use areas and hopefully gain biological data that will be helpful in making sound management decisions.

Scaled and bobwhite quail, morning dove, and ring-necked pheasant are other upland game girds associated with this MLRA.

Numerous other birds use the grasslands due to the variety in grasses, forbs, and shrubs. The most common birds include the horned lark, killdeer, western meadowlark, vesper sparrow, pyrohuloxia, mockingbird, and loggerhead shrike. Raptors include the Harris, red-tailed, ferruginous, and Swainson's hawks; great-horned owl; burrowing owl; and American kestrel.

The warm prairie environment in this MLRA supports a large number of reptile species compared to higher elevations. The more common reptiles include the short-horned lizard, lesser earless lizard, eastern fence lizard, sanddune lizard (special status species), western box turtle, coachwhip, bullsnake, prairie rattlesnake, and western rattlesnake.

77-Southern High Plains

The majority of this MLRA is under private and state ownership.

Pronghorn antelope are the most common large herbivorous mammal in the open grasslands, but desert mule deer may be present near shrubs and brush associated with drainages and topography.

The largest predator on the grasslands is the coyote. Other carnivorous mammals include the kit fox, and badger. The grasslands also support ground squirrel, prairie dog, pocket gopher, and pocket mice.

Birds are numerous within the grasslands due to the variety in grasses, forbs, and shrubs.

Reptiles are scattered throughout the MLRA, but due to climatic conditions and habitat, reptiles lack the diversity compared to the southern desert regions.

Riparian Habitat Areas

Riparian habitat is perhaps the most significant, yet smallest habitat type occurring on public lands within the state. Functioning riparian areas in all climatic regimes support a diverse array of plant communities providing a variety of food, cover, and water, and often contain special ecological features that are not often found in upland sites. Numerous wildlife species occupy or use riparian areas for forage, water, and nesting and denning sites.

Wildlife assemblages in riparian areas are characterized by large numbers of bird species, including waterfowl (such as geese, ducks and grebes), shorebirds (cranes, herons, egrets, rails, gulls), predators including owl and hawk species, woodpeckers, belted kingfishers, and songbirds (dippers, swallows, warblers, flycatchers, jays, and wrens). Migrating birds also use the areas as resting places in the spring and fall seasons.

Lowland riparian ecosystems harbor more species of reptiles and amphibians than do other ecosystems in the state due to warmer temperatures, abundant shelter, and large numbers of insects and other animals available for food. The more common reptiles and amphibians are tiger salamander, leopard frog, chorus frog, Great Plains toad, painted turtle, yellow mud turtle, water snake, garter snake, and bullsnake.

The quality of fisheries has a direct correlation to the health of the riparian community and the best opportunity for improving fisheries is to restore degraded riparian areas.

Special Status Species

For this EIS, informal Section 7 Consultation under the Endangered Species Act was initiated with the USFWS on October 23, 1996 (Appendix C-1). The USFWS responded with a list of species by county on November 8, 1996 (Appendix C-2). The list identifies 60 federally listed, proposed, and candidate species in New Mexico. The BLM has identified 40 of the 60 as potentially occurring on the public lands (Appendix C-3, Table A).

BLM policy requires that state listed and BLM sensitive species also be considered in BLM planning efforts. In addition to the USFWS list, this EIS also incorporates the BLM Sensitive Species List, animal species listed by the (NMDGF), and plant species listed by the New Mexico Division of Forestry and Resource Survey as endangered or threatened. A total of 149 of the 202 species are likely to occur on public lands. These species are listed in Appendix C-3, Table B.

In order to evaluate of the habitat use and distribution characteristics of the species on the lists, several categories were developed, including a habitat description which was classified broadly as biome, and restricted distribution. Table 3-7 shows the number of

TABLE 3-7
NUMBER OF SPECIAL STATUS SPECIES BY HABITAT TYPE (BIOMES)

HABITAT (BIOMES)	TOTAL ACRES OF PUBLIC LANDS	NUMBER OF SPECIES STATEWIDE	PERCENT OF SPECIES STATEWIDE	NUMBER OF SPECIES ON PUBLIC LAND	PERCENT OF SPECIES ON PUBLIC LANDS
WETLAND/ RIPARIAN/ AQUATIC	244 segments[1]	111	44	76	29
WOODLANDS	3,104,000	107	42	89	34
DESERT	4,453,000	56	22	55	21
CONIFER FOREST	13,000	54	21	31	12
GRASSLAND	5,668,000	48	19	40	15
TUNDRA	0	1	<1	0	0
UNKNOWN		1	<1	1	<1
TOTAL	13,495,000	262	100[2]	189	100[3]

Source: BLM Files

[1]The 244 segments represents approximately 13,7000 acres.

[2]The total percent of species is more than 100% because many species occupy more than one habitat.

[3]The total percent of species is more than 100% because many species occupy more than one habitat.

special status species by biome (habitat type). Some species occurred in more than one category, and therefore the total of percentages do not add to 100.

Based on species listing, the wetland/riparian/ aquatic and woodland habitats in New Mexico are the habitats of the most concern. This is in agreement with the New Mexico Gap Analysis Project (Thompson et al., 1996), which found that vertebrate species richness was greatest in riparian corridors, foothills, and mid-elevation mountainous areas.

Eighty-eight species (35 percent of them) exhibited a form of endemism or naturally restricted occurrence. For example, 34 species (13 percent) occur in the Bootheel Area of southern Hidalgo County. This area is influenced by the extension of the Sierra Madre ecosystem into the United States from Mexico in this area. In addition, species richness is generally higher in the southern desert and grassland MLRAs (MLRAs 41 and 42) than in the more northerly areas. This is roughly consistent with the habitat distribution of special status Species described above.

Federally listed species with local or regional concerns with regard to public land management were identified in the recent statewide formal Section 7 consultations. These include the southwestern willow flycatcher, with its proposed critical habitat (riparian habitats); Pecos bluntnose shiner with its designated critical habitat (aquatic habitat in the Pecos River); Pecos gambusia (aquatic habitat in Pecos River); spikedace (aquatic habitats in the Gila River); loachminnow (aquatic habitats in the Gila River); Razorback Sucker with its designated critical habitat (aquatic habitats in the San Juan River); Colorado River squawfish with its designated critical habitat (aquatic habitats in the San Juan River); and aplomado falcon (Chihuahuan Desert grasslands habitats in the Las Cruces Field Office); Mesa Verde cactus (Great Basin Desert); Sneed's pincushion cactus (Chihuahuan Desert); Zuni fleabane (Socorro Field Office); peregrine falcon (Caballo portion of the Las Cruces Field Office), Sacramento prickly poppy (Caballo portion of the Las Cruces Field Office); and least tern (aquatic/riparian/wetland habitats in the Roswell Field Office).

RMP Biological Opinions

Formal consultations were initiated in January 1996 to bring each of the eight RMPs into compliance with the requirements of Section 7 of the Endangered Species Act. Specifically, the consultations addressed the impacts of land use allocations in the RMPs on species that were listed as threatened endangered, that had not been consulted on previously. The consultations were concluded in May 1997 with Biological Opinions from the USFWS, which are summarized in Table 3-8. The USFWS issues Biological Opinions to determine whether an action will jeopardize the continued existence of a species - either a Jeopardy or Non-jeopardy determination is issued as the opinion. The following are included with a Biological Opinion:

- Reasonable and Prudent Alternatives - non-discretionary (required) actions applied to a Jeopardy determination. They are actions that can be implemented in a manner consistent with the intended purpose of the action, are within the legal authority of the agency, are economically and technologically feasible, and avoid the likelihood of jeopardizing the continued existence of a species or adverse modification of critical habitat.

- Incidental Take - an official permitting of taking (defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting a listed species) that is incidental to an agency action, but not a part of the action. An implementation of the action.

- Reasonable and Prudent Measures - binding on all permits and permittees engaging in activities covered by Incidental Take. Reasonable and Prudent Measures may also be applied without an Incidental Take statement.

- Conservation Recommendations - discretionary actions suggested by USFWS to minimize or avoid the adverse effects of an action. Implementation of Conservation

- Recommendations is discretionary by the agency.

TABLE 3-8 RMP BIOLOGICAL OPINIONS				
	Reasonable and Prudent Alternatives	**Incidental Take**	**Reasonable and Prudent Measures**	**Conservation Recommendations**
TAOS RMP, TAOS FIELD OFFICE				
Opinion: Jeopardy for the southwestern willow flycatcher				
Southwestern Willow Flycatcher	1. Develop a management plan for the flycatcher. 2. Allow no livestock grazing in occupied or potential habitat from April 15 to September 15. 3. Allow no new construction or expansion of campgrounds in occupied or potential habitat.	Two birds (one pair)	1. Reduce likelihood of cowbird parasitism. 2. Allow no modification of occupied or potential habitat.	1. Continue flycatcher surveys. 2. Summarize upland vegetation and soils trend data to aid in flycatcher management. 3. Assess the impacts of winter grazing on riparian vegetation. 4. Continue to exclude riparian areas from grazing and monitor vegetation and soil responses. 5. Monitor recreation uses in flycatcher habitat. Assess the effectiveness of management actions.
RIO PUERCO RMP, ALBUQUERQUE FIELD OFFICE				
Opinion: Non-jeopardy for the southwestern willow flycatcher				
Southwestern Willow Flycatcher	None	None	None	1. Continue flycatcher surveys. 2. Allow no grazing in potential habitat without completing Section 7 consultation. 3. Allow no habitat modification or vegetation manipulation in potential habitat. Complete a programmatic consultation on vegetation manipulation. 4. Summarize upland vegetation and soils trend data to aid in flycatcher management. 5. Develop a management plan for the flycatcher. 6. Assess the impacts of winter grazing on riparian vegetation. 7. Continue to exclude riparian areas from grazing and monitor vegetation and soil responses.
WHITE SANDS RMP, LAS CRUCES FIELD OFFICE				
Opinion: Non-jeopardy for the southwestern willow flycatcher, aplomado falcon, Sacramento prickly poppy, and peregrine falcon				
Oil and Gas Leasing	None	Not Applicable	None	1. Complete a programmatic Section 7 consultation on oil and gas leasing in the field office.

TABLE 3-8
RMP BIOLOGICAL OPINIONS

	Reasonable and Prudent Alternatives	Incidental Take	Reasonable and Prudent Measures	Conservation Recommendations
Southwestern Willow Flycatcher	None	None	None	1. Continue surveys. 2. Complete a grazing/riparian management plan for Percha Creek. 3. Complete the RMP amendment designating the Three Rivers Petroglyph Area ACEC, and exclude the riparian area from grazing. 4. Monitor any flycatcher nests for success and cowbird parasitism. 5. Initiate a cowbird trapping program if nest parasitism exceeds 10 percent. 6. Identify and survey any potential habitat on public land along the Rio Grande. 7. Identify and evaluate any livestock concentration areas adjacent to the Rio Grande corridor. Manage these areas to minimize use by cowbirds.
Aplomado Falcon	None	None	1. Initiate a research project to determine the extent of habitat in the Caballo portion of the Las Cruces Field Office. 2. Compare the suitability of habitat and livestock management practices between potential habitat in Caballo and occupied habitat in Chihuahua, Mexico. 3. Within five years, evaluate research project data to determine the need for changes in management to facilitate recovery of the aplomado falcon.	None
Sacramento Prickly Poppy	None	None	None	1. Complete the RMP amendment for expansion of the Sacramento Escarpment Area of Critical Environmental Concern (ACEC). 2. Monitor prickly poppy populations every three years.

TABLE 3-8 RMP BIOLOGICAL OPINIONS				
	Reasonable and Prudent Alternatives	**Incidental Take**	**Reasonable and Prudent Measures**	**Conservation Recommendations**
Peregrine Falcon	None	None	1. Complete the RMP amendment for expansion of the Sacramento Escarpment ACEC. 2. Monitor historic or suitable habitat or consider habitat occupied in the absence of monitoring information. Reduce or eliminate any documented adverse impacts.	1. Develop a Site Management Plan for historical/suitable habitat. 2. Reduce disturbance within 1 mile of historic/suitable habitat. 3. Schedule management activities in accordance with Johnson 1994.
MIMBRES RMP, LAS CRUCES FIELD OFFICE				
Opinion: Jeopardy for the southwestern willow flycatcher Non-jeopardy for the aplomado falcon, Sneed's pincushion cactus, loachminnow, and spikedace				
Southwestern Willow Flycatcher	1. Revise Mimbres RMP to eliminate grazing from the Gila Lower Box. 2. Initiate a cowbird trapping program if nest parasitism exceeds 10 percent. 3. Allow no livestock grazing in occupied or potential habitat from April 15 to September 15. Manage to improve potential habitat and maintain occupied habitat. Assess the effects of winter grazing on habitat suitability. 4. Develop a management plan for the flycatcher.	Two pair	1. Continue to survey habitat in the Gila River. Monitor nest success and nest parasitism for two seasons. 2. Determine whether public land livestock management activities contribute to cowbird populations within 5 miles of the Gila Lower Box, Rio Grande near Radium Springs, and other occupied nest sites as discovered. 3. Identify and survey any potential habitat on public land along the Rio Grande.	None

TABLE 3-8 RMP BIOLOGICAL OPINIONS				
	Reasonable and Prudent Alternatives	**Incidental Take**	**Reasonable and Prudent Measures**	**Conservation Recommendations**
Aplomado Falcon	None	Indeterminate, indexed to habitat in Mexico and the results of the research project	1. Initiate a research project to determine the extent of habitat in the Mimbres portion of the Las Cruces Field Office. 2. Compare the suitability of habitat and livestock management practices between potential habitat in Mimbres and occupied habitat in Chihuahua, Mexico. 3. Within five years, evaluate research project data to determine the need for changes in management to facilitate recovery of the aplomado falcon.	None
Sneed's Pincushion Cactus	None	None	None	1. Complete the locatable mineral withdrawal for the Organ/Franklin Mountains Area of Critical Environmental Concern. 2. Issue guidance to include specific protective mitigation measures being used in the field for Sneed's pincushion cactus protection for locatable minerals exploration.
Loachminnow, Spikedace	None	Indeterminate, indexed to habitat trend	1. Manage grazing on 810 acres of uplands around the Gila Middle Box to minimize erosion impacts on the Gila River. 2. Manage public land watersheds of the Gila River to minimize erosion impacts on the Gila Middle Box. 3. Monitor spikedace and loachminnow populations and their habitats in the Gila Middle Box and Gila Lower Box to determine trend.	None
SOCORRO RMP, SOCORRO FIELD OFFICE				

TABLE 3-8 RMP BIOLOGICAL OPINIONS				
	Reasonable and Prudent Alternatives	**Incidental Take**	**Reasonable and Prudent Measures**	**Conservation Recommendations**
Opinion: Non-jeopardy for the Zuni fleabane and aplomado falcon				
Zuni Fleabane	None	None	None	1. Complete a mineral withdrawal on the Sawtooth ACEC.
Aplomado Falcon	None	None	None	1. Initiate a research project to determine the extent of habitat in the Socorro Field Office. 2. Rank potential habitat for suitability and reintroduction. Survey potential habitat for presence of aplomados for a minimum of two years. 3. Compare the suitability of habitat and livestock management practices between potential habitat in Socorro and occupied habitat in Chihuahua, Mexico. 4. Within five years, evaluate research project data to determine the need for changes in management to facilitate recovery of the aplomado falcon.
CARLSBAD RMP, CARLSBAD FIELD OFFICE				
Opinion: Non-jeopardy for the Pecos bluntnose shiner				

TABLE 3-8 RMP BIOLOGICAL OPINIONS				
	Reasonable and Prudent Alternatives	**Incidental Take**	**Reasonable and Prudent Measures**	**Conservation Recommendations**
Pecos Bluntnose Shiner	None	None	None	1. Continue policy of no new oil and gas leasing on lands within the 100-year floodplain of the Pecos River unless it can be demonstrated that other mandatory protective measures will provide adequate protection. 2. Determine if Bureau of Reclamation measures provide protection equal to or greater than BLM measures. If not, meet with the Bureau of Reclamation to encourage strengthening of their measures. 3. Change wording in the Carlsbad Draft RMPA/EIS for land use allocation to protect the 100-year floodplain of the Pecos River rather than just riparian areas. 4. Eliminate exceptions to the no surface occupancy policy for 100-year floodplains where they would cause habitat degradation for bluntnose shiners. 5. Compile conditions of approval and other pertinent information for oil and gas operations and other activities in the 100-year floodplain into a single guidance document for the ease of understanding by applicants. 6. Consider potential habitat, in addition to critical and occupied habitats, when evaluating no surface occupancy requirements or project reviews.
Roswell RMP, Roswell Field Office				
Opinion: Non-jeopardy for the Pecos bluntnose shiner, Pecos gambusia and interior least tern				

TABLE 3-8 RMP BIOLOGICAL OPINIONS				
	Reasonable and Prudent Alternatives	**Incidental Take**	**Reasonable and Prudent Measures**	**Conservation Recommendations**
Pecos Bluntnose Shiner	1. Monitor bluntnose shiner populations and habitat. 2. Give priority to implementing management prescriptions for the North Pecos River ACEC and developing and implementing a strategic watershed management plan for the Pecos River from Yeso Creek to the Bitter Lake National Wildlife Refuge. 3. Continue the policy of no new oil and gas leasing on lands within the 100-year floodplain of the Pecos River unless it can be demonstrated that other mandatory protective measures will provide adequate protection. 4. Change wording in the Draft RMPA/EIS for the land use allocation to protect the 100-year floodplain of the Pecos River rather than just riparian areas. 5. Eliminate exceptions to the no surface occupancy policy for 100-year floodplains where they would cause habitat degradation for bluntnose shiners. 6. Compile conditions of approval and other pertinent information for oil and gas operations and other activities in the 100-year floodplain into a single guidance document for the ease of understanding by applicants.	None	None	None

TABLE 3-8
RMP BIOLOGICAL OPINIONS

	Reasonable and Prudent Alternatives	Incidental Take	Reasonable and Prudent Measures	Conservation Recommendations
Pecos Gambusia	1. Map the source and movement of subsurface water that supplies springs occupied by Pecos gambusia on the Bitter Lake National Wildlife Refuge and Salt Creek Wilderness Area. Close those lands mapped to oil and gas leasing unless mandatory protective measures ensure no aquifer contamination. 2. For leases within the mapped area, apply protective measures to prevent water contamination and monitor oil and gas activities to detect surface or subsurface accidents soon enough to avoid harm to the aquifer and the associated populations of Pecos gambusia. 3. Continue policy of no new oil and gas leasing on lands within the 100-year floodplain of the Pecos River unless it can be demonstrated that other mandatory protective measures will provide adequate protection. 4. Change wording in the Draft RMPA/EIS for the land use allocation to protect the 100-year floodplain of the Pecos River rather than just riparian areas. 5. Eliminate exceptions to the no surface occupancy policy for 100-year floodplains where they would cause habitat degradation for Pecos gambusia. 6. Compile conditions of approval and other pertinent information for oil and gas operations and other activities in the 100-year floodplain into a single guidance document for the ease of understanding by applicants.	None	None	None
Interior Least Tern	None	None	None	1. Conduct breeding season surveys in potential habitat for interior least terns. 2. If breeding birds are found, develop a management strategy to protect the habitat.

TABLE 3-8
RMP BIOLOGICAL OPINIONS

	Reasonable and Prudent Alternatives	Incidental Take	Reasonable and Prudent Measures	Conservation Recommendations
FARMINGTON RMP, FARMINGTON FIELD OFFICE				
Opinion: Jeopardy for the southwestern willow flycatcher, Colorado River squawfish, and razorback sucker Non-jeopardy for the Mesa Verde cactus General Conservation Recommendations: Amend the RMP as appropriate to incorporate new management direction				
Southwestern Willow Flycatcher	1. Develop a management plan for flycatchers that maps and describes occupied and potential habitat, prioritizes areas for surveys, and prescribes management for grazing and habitat improvement activities. 2. Allow no livestock grazing in occupied or unsurveyed potential habitat. 3. Allow no vegetation manipulation that would degrade flycatcher habitat or prevent improvement of habitat. Survey for flycatchers before removing saltcedar. Do not remove saltcedar if flycatchers are detected. Retain some saltcedar for structure until establishment of native species. It is suggested a programmatic Section 7 consultation on saltcedar removal be conducted.. 4. If nesting flycatchers are found, monitor nest success and parasitism. Evaluate and minimize land use practices within 5 miles of occupied habitat acting as concentration sites for cowbirds. Initiate cowbird trapping if appropriate.	None	None	1. Continue to survey potential habitat for flycatchers. Prioritize and map areas to be surveyed. Maintain and establish a database to store survey data. 2. Assess the impacts of recreational activity. 3. Summarize upland vegetative and soils trend information on areas adjacent to riparian habitat. 4. Exclude the river tracts and other riparian areas from grazing and monitor soil and vegetation response.

TABLE 3-8
RMP BIOLOGICAL OPINIONS

	Reasonable and Prudent Alternatives	Incidental Take	Reasonable and Prudent Measures	Conservation Recommendations
Colorado River Squawfish and Razorback Sucker	(Note: These species were covered under a 1993 Biological Opinion (Jeopardy Determination), that contained nine reasonable and prudent alternatives associated with potential contamination of the San Juan, Animas, and La Plata rivers by polycyclic aromatic hydrocarbons (PAHs). Those reasonable and prudent alternatives are modified and carried forward in this opinion.) Existing Reasonable and Prudent Alternatives 1. Sample the three rivers and upland sites (172 sites) for streamflow and collect water and sediment samples for chemical analysis. 2. Sample a population of approximately 800 federal oil/gas well sites (40 samples to be taken) at a 95 percent confidence interval for PAH types and concentrations. 3. Sample 12 soil pedons not subject to potential PAH contamination to establish a background contamination level. 4. Sample atmospheric contamination by PAHs at 12 sites. 5. Sample drainages containing greater than 100 parts per million PAHs. In addition, collect additional samples from drainages (and springs in those drainages) near facilities suspected of contributing contamination. 6. Use the results of the monitoring to immediately apply remedial action through changes in stipulations and development of BMPs. 7. Conduct long-term monitoring at sites previously sampled. 8. Ensure data are automated for statistical and spatial analysis. 9. Support the San Juan Basin Recovery Implementation Program. New Reasonable and Prudent Alternatives 1. Map, summarize, and analyze data already collected. Continue monitoring studies and forward all data and results to the USFWS. 2. Item 4 of the original reasonable and prudent alternatives is amended to use different methodology.	None	None	None

TABLE 3-8 RMP BIOLOGICAL OPINIONS				
	Reasonable and Prudent Alternatives	**Incidental Take**	**Reasonable and Prudent Measures**	**Conservation Recommendations**
Mesa Verde Cactus	None	None	None	1. Exclude portions of the habitat from grazing, and monitor to determine differences in population trend between grazed and ungrazed.

Source: Biological Opinions from USFWS on eight RMPs in New Mexico. (1997).

RECREATION

New Mexico has a growing number of visitors seeking a wide variety of recreational opportunities. The 1996 Statewide Comprehensive Outdoor Recreation Plan for New Mexico included statewide surveys to determine opinions regarding park, recreation, and open space interests and priorities. The surveys identified the most popular recreation activities of New Mexico residents to be jogging/walking, shore fishing, picnicking, hiking, sightseeing, nature viewing, swimming, developed and primitive camping, pleasure driving, and bicycling.

Recreation and tourism on public lands is one of the fastest growing segments of the state economy. Recreation and tourism is ranked as first in jobs and second in revenue by the New Mexico Tourism Department in Santa Fe. The top four reasons people visit New Mexico according to the State Tourism Department are for the open space character, cultural tourism, history of the various regions, and outdoor recreation opportunities.

Federal lands help satisfy the growing public demand for outdoor recreation. In 1996, the public made 3.2 million visits to New Mexico public lands for outdoor recreation (BLM Recreation Management Information System, 1996). The BLM-administered public lands in New Mexico offer a variety of recreational opportunities. The land includes desert mountain ranges, whitewater rivers, caves, rugged lava flows, arid desert expanses, rolling pinon-juniper wooded terrain, forested Ponderosa hillsides, sand dunes, and multi-colored badlands landscapes. Most of the uses depend on the natural and cultural features of the land. However, a great deal of recreation occurs near towns because the public lands are open for free non-commercial recreational use and are easily available.

Visitors participate in traditional activities including picnics, piñon nut harvesting, camping, recreational shooting, hunting, fishing, hiking, horseback riding, sightseeing, and risk-seeking sports such as rock climbing, mountain biking, caving, and whitewater boating. Visitors also enjoy wildlife viewing, visiting historic sites, wind sailing, and driving off-highway vehicles.

Because of this growing interest and participation in outdoor recreation, significant demands are placed on some existing recreation sites and facilities. More recreation sites and facilities, and upgrades of existing sites, are needed to satisfy the demands of a growing population.

Recreation activities are managed through the RMPs prepared by the Field Offices. Recreation projects are generally implemented in priority order. EISs or Environmental Assessments with public input are prepared before surface-disturbing site-specific recreation projects are undertaken. The BLM issues special use permits for competitive and commercial recreation activities such as motorized competitive events, outfitter and guide services, and tours.

The BLM in New Mexico has 10 high-use developed sites. They include the Wild Rivers Recreation Area, Angel Peak, Orilla Verde, Datil Well, Three Rivers, Valley of Fires, La Cueva, Dripping Springs, El Malpais National Conservation Area, and Aguirre Springs. The Wild Rivers Recreation Area is the only developed recreation site that allows livestock grazing in the picnic and camping areas.

In addition to the developed sites, recreation on public lands focuses on the following attractions:

- 3 National Wild and Scenic Rivers
- 1 National Conservation Area
- 3 National Wilderness Areas
- 7 National Recreation Trails
- 1 National Scenic Trail
- 7 National Back Country Byways
- 76 Areas of Critical Environmental Concern
- 600 Wild Caves
- 24 Adventures in the Past historic and Prehistoric Sites
- 10 Watchable Wildlife Viewing Sites
- 12 Off-Highway Recreation Vehicle Areas
- 25 Special Recreation Management Areas
- 3 recreation Pilot Fee Projects

In addition to these attractions and specific locations mentioned above, many New Mexicans use the public lands for traditional seasonal uses such as picnics, recreational shooting, hunting big game, and pinon nut harvesting. Many of these uses involve use of off-highway vehicles for access.

Motorized vehicles not travelling on designated roads or in a designated off-highway vehicle recreation area create new tracks that damage vegetation, soils, and

riparian areas. Unauthorized off- highway vehicle use and road proliferation are a concern for visitors and resource managers. Additional issues that affect recreation users and resource managers are littering, vandalism, illegal fuelwood cutting, and controlling visitor use. Attempts to improve these issues are addressed in BLM RMP Amendments, EISs Environmental Assessments, educational programs, volunteer projects, fee sites, and permits.

As with all multiple uses, there are conflicts that develop between uses. Conflicts between livestock grazing and recreational use develop from time to time. With the exception of the Wild Rivers Recreation Area, livestock have been excluded from all developed recreation sites. The facilities at the Wild Rivers Recreation Area were placed in a concentration area. Recreation visitor complaints include livestock destroying property by trampling, livestock becoming a hazard for mountain bikers using the hike/bike treadway, and creating sanitation problems at picnic and camp sites. A satisfactory solution to the multiple conflicts has not been developed at this time.

Most undeveloped recreation sites are accessible to grazing. Typical complaints by recreational users at undeveloped sites refer to livestock degradation of scenic quality, water quality, vegetative trampling, and overgrazing creating soil erosion. However, some areas that are frequently used for recreation are not grazed or are grazed lightly. For example, the Rio Grande corridor administered by BLM is closed to grazing, as are portions of the Rio Chama corridor.

WILDERNESS

In 1984, Congress designated both the Bisti and De-Na-Zin Wilderness, totalling 26,400 acres of public land in New Mexico. In 1987, Congress designated the Cebolla and West Malpais wilderness areas (WAs), totalling 102,500 acres of public land. In 1996, Congress added 16,525 acres linking the Bisti and De-Na-Zin WAs creating one larger Bisti/De-Na-Zin WA. The total acreage of New Mexico's three designated BLM WAs is 145,425 acres.

The total acreage for New Mexico BLM Wilderness Study Areas (WSAs) is 955,964 acres in 55 areas. These areas await Congressional action.

The Wilderness Act of 1964 and BLM's *Interim Management Policy for Lands Under Wilderness Review*, (1995), does not preclude livestock grazing in wilderness.

LANDS AND REALTY

In managing the public lands in the state of New Mexico, the BLM is responsible for permitting a wide variety of actions involving public lands. The realty program is responsible for granting rights-of-way, permitting temporary use areas, acquiring easements, and facilitating the acquisition or disposal of public lands. The realty program also processes land withdrawals, Recreation and Public Purposes Act applications, and land use permits. In addition to permitting activities, compliance inspections on grants and permits are conducted to ensure that any stipulations attached to permits are being adhered to. Depending upon the needs of each Field Office and the communities around them, the types and numbers of realty actions will vary across the state.

Rights-of-Way

Rights-of-way are the most common applications received in the lands program (Automated Lands and Minerals Record System, 1996). Rights-of-way, leases, and permits are granted to qualified individuals, businesses, and governmental entities for the use of public lands. Rights-of-way actions are coordinated, to the fullest extent possible, with federal, state, local, and tribal government agencies, adjacent landowners, and interested individuals and groups. All right-of-way applications are considered on a case-by-case basis and are subject to site-specific environmental analysis. Each project proposal contains mitigation measures and stipulations in order to minimize or avoid impacts that may result from surface-disturbing activities.

Rights-of-way are generally linear in nature. They may involve the transmission of oil and gas and their related products or utility-oriented lines including power, water, and phone lines or communication sites. Rights-of-way are also granted to businesses and private individuals for access roads. Table 3-9 shows the numbers of rights-of-way grants issued in 1996, the acres for those rights-of-way grants, and the field office that issued the rights-of-way grant.

Because of the topographic and land ownership constraints that exist in each field office and the BLM’s efforts to minimize environmental damage from the

TABLE 3-9 RIGHT-OF WAY GRANTS ISSUED IN 1996		
Office issuing the Right-of-Way Grant	**Number of Right-Of-Way Grants issued**	**Acres of Right-of-Way Grants issued**
Farmington	169	1995
Albuquerque	8	50
Taos	14	75
Socorro	13	100
Las Cruces	31	350
Roswell	31	245
Carlsbad	270	1515
Total Statewide	536	4330

Source: USDA, BLM 1996, Automated Lands and Minerals Record System.

construction of rights-of-way, the Bureau has encouraged the placement of new rights-of-way within, or adjacent to, existing rights-of-way. As a result, de facto right-of-way corridors have been developed over the years on public lands.

In addition, each BLM field office's land use planning has resulted in rights-of-way windows or corridors being designated as the preferred location for future placement of transmission lines. Other areas have been designated as rights-of-way exclusion and avoidance areas that place restrictions or stipulations on rights-of-way in order to protect the special or sensitive resource values within those areas. Rights-of-way that exist in exclusion or avoidance areas are recognized as grandfathered, and the operation, maintenance, and renewal of those facilities is allowed to continue within the scope of the original rights-of-way grant.

Land Ownership Adjustment

There are generally three categories in which the public lands administered by the BLM can be placed. (USDI, BLM, Farmington RMP, 1988). They are retention exchange, or acquisition zones. In 1976, the FLPMA was passed. Congress declared that public lands be retained in federal ownership unless, as a result of land use planning, it was determined that disposal of particular parcels would serve the national interest. (Public Law [P.L.] 94-579, Sec.102a, Oct. 21,1976).

It was determined through the land use planning process that land ownership adjustment was an issue to be dealt with in each field office. As a result, retention zones and potential disposal and acquisition zones have been designated in planning documents.

Retention zones usually consist of consolidated blocks of public land or public land that contain resources of national, state, or regional significance. Examples of such resources are habitat for threatened or endangered species, riparian areas, wetlands, and important cultural resources (USDI, BLM, Farmington RMP, 1988). While lands in retention zones will usually remain under BLM administration exchanges within retention zones may be possible if it is clearly determined that it is in the best interest of the public (USDI, BLM, Socorro RMP, 1989.

Disposal zones generally contain tracts of isolated or scattered parcels of public land and resources that are difficult to manage. Acquisition zones are generally areas where land and resource management can be improved by consolidating public lands in contiguous

land ownership patterns. These proposed acquisition areas are often located in Special Management Areas for the benefit of wildlife habitat, watersheds, land treatment areas, grazing administration, cultural values, or wilderness and recreation areas. There are a number of ways that adjustments can be made in land ownership. The BLM determined that major land transfer actions be handled in the following order of preference: (1) transfers with the state of New Mexico; (2) private exchanges (3) Recreation and Public Purpose Act patents; (4) withdrawals to other federal agencies, (5) public sales, and (6) other methods of adjustment.

Exchanges and Sales

All exchange or sale proposals must be conducted in accordance with Sections 203 and 209 of FLPMA and the requirements of NEPA. Extensive public review is required for each proposal. Existing authorized permits, leases, rights-of-way, and licenses are considered valid existing rights, which remain with land disposed to other parties.

Although exchanges and sales may involve acreage of considerable size, at fair market value, the process is slow and complex. Therefore, few exchanges or sales are completed each year.

When an exchange is initiated, grazing permittees and lessees are given a two-year notice of cancellation of their permit or lease. If the BLM disposes of land, holders of valid permits or cooperative agreements covered by Sections 4 and 15 of the TGA are reimbursed for financial investments they have made in rangeland improvement projects on public land.

In 1994, the BLM State Director for New Mexico and the New Mexico State Commissioner of Public Lands signed a new Memorandum of Understanding establishing a comprehensive, long-term statewide land exchange program between the BLM and the State of New Mexico. The objectives of this program are: " 1) to improve the land management potential of both state and federal lands; 2) eliminate unnecessary federal and state conflicts generated by existing ownership patterns; 3) facilitate the management of state and public lands by substantially realigning the scattered state and public sections to create solid blocks or consolidated land ownership; and 4) develop procedures that are most expeditious and cost effective." (1422G910-MOU-9401).

The following are acres identified in the RMPs for disposal.

Field Office	Acres
Albuquerque	58,000
Las Cruces	340,460
Farmington	324,940
Taos	84,518
Carlsbad	220,700
Socorro	100,320
Roswell	103,670

Recreation and Public Purposes Act

The BLM, under the Recreation and Public Purposes Act (68 Statute 173; 43 United States Code (U.S.C.) 869 et. seq.) has the authority to lease or patent public land to governmental or qualified non-profit entities for public parks, building sites, correction centers, or other public purposes at less than fair market value. The BLM classifies, for purposes of the act, the amount of land required for efficient operation of the projects described in an applicant's development plan. Applications are processed under the requirements of NEPA and are subject to public review. After a Recreation and Public purposes Act application is approved, the BLM periodically reviews the areas leased or sold to ensure continued compliance with the terms of the lease or patent.

Public Land Withdrawals

Withdrawals are formal actions that set aside, withhold, or reserve federal land by statute or administrative order for public purposes (USDI, BLM, Roswell RMP, 1994). While it is BLM policy to keep public lands open for public use and enjoyment, there are conditions that warrant the removal or withdrawal of certain lands from general use. The integrity of special uses is ensured through the withdrawal of public lands. Types of withdrawals include mineral withdrawals in Special Management Areas to protect important resource values or withdrawing land for water power and reservoir sites.

Secretarial orders have been used to withdraw public lands from general use by transferring management responsibility to other Department of Interior agencies, such as the Bureau of Indian Affairs and the Bureau of Reclamation. In addition, public lands have been trans-

ferred by Executive Order to agencies outside of the DOI such as the Department of Agriculture (USDA) U.S. Forest Service (FS), the Department of Defense (DOD), and the Federal Aviation Administration (FAA). In such cases, both the lands and the responsibility for their management are transferred.(USDI, BLM, Rio Puerco RMP, 1986).

To keep as much of the public land open to the widest variety of uses, withdrawals are reviewed on a periodic basis to ensure that the reasons for the withdrawals are still valid and that only the acreage needed remains in a withdrawn status. Upon revoking or modifying a withdrawal, all or part of the withdrawn land may be returned to multiple use management.

Access

As the population of New Mexico continues to grow, so does the need to use public lands. This is especially true for people seeking recreational opportunities. Because of increasing use, problems have surfaced in areas where public lands are isolated and there is no legal access. It is difficult for the BLM to effectively manage isolated parcels of public lands where no legal access exists.

To help reduce access problems, some field offices are developing transportation plans. The plans identify where easements are needed and existing roads are present, but are not needed for efficient transportation to and across public lands. Normally only one or two easements are acquired each year for each office.

CULTURAL RESOURCES

Introduction

Culture has been defined as "the traditions, beliefs, practices, lifeways, arts, crafts, and social institutions of any community, be it an Indian tribe, a local ethnic group, or the people of the nation as a whole" (*National Register Bulletin 38*). Cultural resources are the fragile and nonrenewable 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 (TCP) 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. Both historic properties and Traditional Cultural Properties can be eligible for inclusion in the National Register of Historic Places. Congress has declared that "the spirit and direction of the Nation are founded upon and reflected in its historic heritage" and that "the historical and cultural foundations of the Nation should be preserved...in order to give a sense of orientation to the American people" (National Historic Preservation Act of 1966).

The BLM has legislated responsibilities to manage and protect cultural resources under laws such as the Antiquities Act of 1906, Executive Order 11593, Archaeological and Historic Preservation Act of 1974, American Indian Religious Freedom Act of 1978, Archaeological Resources Protection Act of 1979, PL 96-550 and National Historic Preservation Act of 1966. Sections 106 and 110 of the National Historic Preservation Act require federal agencies to inventory and evaluate historic properties on federal land and ensure that they are taken into account before authorizing any federally funded or permitted undertaking. The act and its implementing regulations require that the BLM identify and evaluate any historic properties within a project's area of effect and consult with the State Historic Preservation Officer (SHPO) and Advisory Council on Historic Preservation (ACHP) prior to approval. The BLM has a Programmatic Memorandum of Agreement with the New Mexico SHPO and ACHP under which projects can be approved prior to individual consultation if it has been determined that they will have no effect on historic properties that are included in or eligible for inclusion in the National Register of Historic Places. If a historic property cannot be avoided, BLM consults with SHPO to agree on measures to mitigate adverse effect to the site. A proposed nationwide Programmatic Agreement between BLM and ACHP may soon replace the existing statewide Programmatic Agreement. Under the new national Programmatic Agreement, Section 106 compliance of a routine and non-controversial nature would be handled internally without case-by-case review by the ACHP or SHPO. Before this agreement can go into effect, BLM will be obligated to establish an internal Preservation Board, revise BLM Cultural Resource Management manuals and handbooks, develop state-specific BLM/SHPO protocols, train field managers and staff, and certify offices to operate under the revised procedures.

Of the 13,500,000 acres of public land in New Mexico, approximately 1,015,000 acres, or 7.5 percent, have been inventoried for archaeological and historic properties. To date, 25,947 sites have been recorded on BLM land in New Mexico.

Overview

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. The last ice age was receding at that time and the climate was cooler and wetter. Small, highly mobile groups of people travelled continually in search of game, which was procured by various methods including killing or disabling large herding animals, such as bison, by driving them into arroyos or over cliffs. Subsistence strategies and technology from this period were fairly uniform, with an emphasis on procuring large, now extinct, game species such as mammoth and an extinct form of bison. More than 100 archaeological sites from this period have been recorded on BLM-administered land in New Mexico.

The second broad time period is referred to as the Archaic Period, from about 6,000 B.C. to 0 A.D. The climate was becoming warmer and drier, population was increasing, and the small, still highly mobile bands began exploiting a much wider variety of food resources, with an increasing dependance on plant foods. Grinding stones or "manos" appeared in the stone tool assemblage and projectile point styles became more regionally differentiated. During the second half of the period agriculture was introduced, probably from Mexico, but it did not become a major focus until much later. More than 1,500 Archaic sites have been recorded on BLM-administered lands 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 0 A.D. to Spanish contact in the late-sixteenth century. Local differentiation continued and became more marked. The Anasazi Culture in northwestern New Mexico is renowned for its magnificent masonry architecture and the Mogollon heartland in southwestern New Mexico is best known for its beautiful Mimbres bowls. 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 9,000 sites from the Pueblo Period have been recorded on BLM land in New Mexico.

After about 1200 A.D., Pueblo groups shifted drastically in different regions but persisted. Athapaskan 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.

Today, as communities in the United States become more and more homogeneous, New Mexico's multicultural heritage stands out as a unique cultural landscape and plays an important role in attracting tourists to the state. New Mexico was settled first by Indians, then by Hispanics, and finally by Anglo peoples. Current distribution of the three ethnic populations tends toward areas of single-group dominance resulting from the sequence of occupation, economic bases of the different groups, and past solutions to conflict between groups. This separation of cultures has provided for the continuance and evolution of distinct traditions of language, art, culture and religion. Five out of the top nine reasons tourists visit New Mexico are related to cultural resources (including museums, Indian Reservations, performing arts, historical and archaeological sites, and festivals and fairs), accounting for a large percentage of New Mexico's $2.2 billion a year tourism industry (Office of Cultural Affairs 1996).

PALEONTOLOGY

New Mexico has a fossil record that includes almost all of the geologic periods from the Cambrian (500+ million years ago) to the Recent (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. Many of them still have not been found anywhere else. Study of these fossils plays an important role in subdisciplines of the field of paleontology such as paleobotany, paleoecology, paleobiogeography and biostratigraphy. (Mike O'Neill, personal comm. 1996.)

Fossil deposits on public lands can be subject to damage and destruction as a result of federally funded and permitted development, as well as from off-road vehicle use and unauthorized collection. BLM's policy is to locate, evaluate, and classify paleontological resources on public land and give them full consideration in all aspects of public land management. BLM also has responsibility for facilitating appropriate scientific and educational uses of paleontological resources. These responsibilities are mandated in FLPMA and NEPA. At the field office level, paleontology is managed under various programs such as cultural resources, geology, and recreation.

MINERAL RESOURCES

Mineral resource extraction is a major use of the public lands in New Mexico. Exploration, development, and production of minerals occurs either under lease, by sale (mineral materials), or by location (mining claims). Leasable mineral activity is concentrated in the southeastern and northwestern quadrants of the state. Mineral material sales occur throughout the state at scattered sites that are usually situated near most towns and cities in New Mexico, especially areas where cities are expanding rapidly. One exception is the significance and number of caliche pits in the southeast part of the state associated with oil and gas development. The hard rock minerals claims, by the nature of occurrence of the minerals, are generally located in the mountainous regions of the state. There are nearly 10,000 active mining claims on public lands in New Mexico.

The primary salable minerals are caliche, sand and gravel, building stone, and decorative rock. These minerals are developed by use permits and sold by weight or unit volume from quarries or pits. There are approximately 1,200 caliche pits in southeastern New Mexico, of which 300 are actively used. On average, these pits may cover from 1 to 5 acres, although some are over 15 acres in size. Sand and gravel operations are the next most common, located near population centers and used for construction and paving aggregate.

The majority of active locatable mining operations are on patented claims which are no longer in the public domain. The activity on public land claims consists of a few dozen exploratory drilling operations, and recreational collecting and panning. These "small miner" operations may affect up to 100 acres of public land annually. There are public lands involved in the expansion of four copper mines in the southwestern part of the state. While less than 50 acres of BLM land are presently impacted within open pit mining, future expansion will involve more than 200 acres of BLM land inside pit boundaries and more than 1,600 acres for tailings disposal, haul roads, and waste rock disposal areas. Although considered a dormant activity, there are a few uranium claims on public land in the McKinley County area.

The primary leasable minerals are oil and gas, coal, and potash. During calendar year 1995, the federal government collected a little over $236.5 million in leasable mineral royalties, rents ,and other revenue. Of this total, a little over $119 million was disbursed to the State of New Mexico (USDI, Minerals Management Service State Minerals Summaries 1995).

Oil and Gas

A total of 33,829 oil and gas wells have been drilled on public land in New Mexico. Of these, 23,240 are currently producing. There are 10,562 oil and gas leases, of which 6,022 are producing leases covering 3,640,000 acres. Oil and gas drilling activity varies from year to year depending on various factors such as market economics, equipment availability, and the status of reservoir plays. Based on filings over the last 10 years, an average of just under 900 permits to drill are received annually by BLM field offices for federal lands in New Mexico. The amount of land affected by oil and gas development may vary from about ¾ acre to as much as 5 acres per well depending on the depth of the well and the length of the access road. Most well locations are less than 2 acres. During 1995, a little over 953 billion cubic feet of natural gas, 27.6 million barrels of oil, and 9.2 billion cubic feet of carbon dioxide were produced from federal leases in New Mexico. The total sales value of this production was approximately $1,579,000,000 (USDI, Minerals Management Service Minerals Revenue, 1995).

Coal

There are 11 federal coal leases in Northwestern New Mexico, of which six are currently producing. These leases are being developed by five active coal mines potentially affecting 11,897 acres of public land. During 1995, 6,242,364 short tons of coal were produced from these leases, worth about $184,000,000. There are two federal coal leases in western New Mexico covering 6,440 acres. A mine permit to develop those two leases is currently pending (USDI, Minerals Management System Minerals Revenue 1995).

Potash

The potash leases in southeast on New Mexico are being developed by five underground mining operations. There are two inactive and two abandoned mines in this potash area. While the mining operations themselves are underground, tailings ponds, mills and ancillary facilities at the mines occupy up to several hundred acres at each site. During 1995, about 762,000 short tons of sylvite and 568,000 short tons of langbeinite worth 109.7 million dollars were produced from the potash leases. Also, about 222,000 tons of sodium and sulfur, worth about $700,000 were produced from leased federal land (USDI, Minerals Management Service Minerals Revenue 1995).

NATIVE AMERICAN CULTURAL ISSUES

Certain locations on the landscape may be important to Native American groups for a variety of reasons including collection of traditional plants and minerals, hunting, and the presence of sacred sites and shrines. Another way in which places can be important is for instruction. Places serve as reminders of people and events from the past, tales of which are used for instruction and admonition. Even the places themselves are considered to instruct, admonish, and impart wisdom once the stories have been learned.

A number of laws protect Native American concerns and require consultation with Native American tribes under certain circumstances. These laws include NEPA, the American Indian Religious Freedom Act, the National Historic Preservation Act, Native American Graves Protection and Repatriation Act NAGPRA, and Archaeological Resource Protection Act. Topics of consultation may include potential for adverse effect on historic properties (including Traditional Cultural Properties), policies or actions which could affect free practice of traditional religion, disposition of human remains, associated funerary objects and sacred objects, and general concerns about the effect of a proposed project on the environment.

ECONOMIC CONDITIONS

This section describes the current economic situation of the State of New Mexico. As a part of the entire New Mexico economy; the range livestock sectors are a very minor portion; however, when New Mexico is considered as a group of economies (counties), the number of agricultural economies are greater than the number of urban economies. The total level of economic output for New Mexico is approximately $60 billion, including the $18 billion household sector. The impact from changes to the range livestock industry will be negligible to the urban economies, but highly imposing to the rural counties with large acreage of BLM land. Land ownership by County is shown in Table 3-10.

This project has no affect on the Payments in Lieu of Taxes (PILT) to the counties, however, a table showing the latest payments has been included in the EIS. PILT payments are determined on a formula basis, with the number of federal acres constituting the principal determining variable. The logic behind PILT payments is that federal lands within county boundaries are not part of the county's tax base. Therefore, the county should be compensated for lost revenue opportunities. This EIS is not considering changes of ownership of land within the county. Therefore, there is no difference between the current situation and the alternatives. The livestock tax base will change with the alternatives, which are incorporated in the State/Local government sector of the Input-Output model used for this analysis. The PILT to the counties is shown in Table 3-11.

An Input-Output (I-O) model developed by (NMSU) Department of Agricultural Economics and Agricultural Business was used to determine the current economic conditions in New Mexico, estimate the changes that would occur directly to the range livestock industry, and estimate the total impact to the state's economy that would occur with implementation of the rangeland management alternatives presented in the EIS on BLM lands. The following describes an input-output model and the methodology used in development of the New Mexico models.

An Input-Output model is a mathematical representation of the purchases and sales patterns within a region or

TABLE 3-10

LAND OWNERSHIP OF NEW MEXICO BY COUNTY, 1994

County Name	Square Miles	Acres	BLM	Percent	USFS	Percent	Total Federal	Percent	State	Percent	Indian	Percent	Private	Percent
Bernalillo	1,166	746,240	12,820	1.72	75,764	10.15	154,590	20.72	32,201	4.32	222,527	29.82	336,922	45.15
Catron	6,928	4,433,920	592,907	13.37	2,222,126	50.12	2,799,004	63.13	533,037	12.02	0	0.00	1,101,879	24.85
Chaves	6,071	3,885,440	1,175,698	30.26	40,332	1.04	1,265,500	32.57	722,473	18.59	0	0.00	1,897,467	48.84
Cibola	4,540	2,905,600	399,608	13.75	322,060	11.08	656743	22.60	229,746	7.91	689,551	23.73	1,329,560	45.76
Colfax	3,757	2,404,480	1,215	0.05	70,061	2.91	15,740	0.65	278,189	11.57	0	0.00	2,110,551	87.78
Curry	1,406	899,840	0	0.00	0	0.00	3,862	0.43	60,667	6.74	0	0.00	835,311	92.83
DeBaca	2,325	1,488,000	35,377	2.38	0	0.00	90,848	6.11	234,570	15.76	0	0.00	1,162,582	78.13
Dona Ana	3,807	2,436,480	1,122,974	46.09	0	0.00	1,821,515	74.76	286,910	11.78	0	0.00	328,055	13.46
Eddy	4,182	2,676,480	1,403,002	52.42	135,013	5.04	1,648,563	61.59	477,730	17.85	0	0.00	550,187	20.56
Grant	3,966	2,538,240	292,249	11.51	885,502	34.89	1,294,877	51.01	367,685	14.49	24,000	0.95	851,678	33.55
Guadalupe	3,031	1,939,840	49,584	2.56	1,752	0.09	120,053	6.19	117,810	6.07	0	0.00	1,701,977	87.74
Harding	2,126	1,360,640	603	0.04	0	0.00	70,506	5.18	344,981	25.35	0	0.00	945,153	69.46
Hidalgo	3,446	2,205,440	740,665	33.58	76,589	3.47	893,679	40.52	354,431	16.07	11,000	0.50	946,330	42.91
Lea	4,393	2,811,520	427,854	15.22	0	0.00	466,952	16.61	873,748	31.08	0	0.00	1,470,820	52.31
Lincoln	4,831	3,091,840	524,717	16.97	398,744	12.90	1,103,482	35.69	301,841	9.76	0	0.00	1,686,517	54.55
Los Alamos	109	69,760	0	0.00	30,036	43.06	64,448	92.39	0	0.00	0	0.00	5,312	7.61
Luna	2,965	1,897,600	746,547	39.34	0	0.00	786,150	41.43	534,951	28.19	10,670	0.56	565,829	29.82
McKinley	5,449	3,487,360	231,251	6.63	190,200	5.45	564,580	16.19	183,974	5.28	2,158,410	61.89	580,396	16.64
Mora	1,931	1,235,840	7,561	0.61	100,993	8.17	107,642	8.71	81,638	6.61	0	0.00	1,046,560	84.68
Otero	6,627	4,241,280	939,568	22.15	563,681	13.29	2,886,626	68.06	449,908	10.61	460,255	10.85	444,491	10.48
Quay	2,875	1,840,000	819	0.04	0	0.00	14,535	0.79	237,714	12.92	0	0.00	1,587,751	86.29
Rio Arriba	5,858	3,749,120	559,004	14.91	1,413,169	37.69	1,953,173	52.10	108,530	2.89	646,932	17.26	1,040,485	27.75
Roosevelt	2,449	1,567,360	7,706	0.49	0	0.00	38,517	2.46	211,140	13.47	0	0.00	1,317,703	84.07
Sandoval	3,710	2,374,400	526,289	22.17	384,434	16.19	987,297	41.58	80,192	3.38	650,380	27.39	656,531	27.65
San Juan	5,514	3,528,960	801,366	22.71	0	0.00	1,039,281	29.45	168,416	4.77	2,110,692	59.81	210,571	5.97
San Miguel	4,717	3,018,880	48,644	1.61	340,451	11.28	394,215	13.06	173,808	5.76	0	0.00	2,450,857	81.18
Santa Fe	1,909	1,221,760	72,124	5.90	245,046	20.06	336,157	27.51	85,857	7.03	79,548	6.51	720,198	58.95
Sierra	4,181	2,675,840	855,540	31.97	383,674	14.34	1,830,310	68.40	361,195	13.50	0	0.00	484,335	18.10
Socorro	6,647	4,254,080	943,131	22.17	619,549	14.56	2,318,458	54.50	609,854	14.34	56,680	1.33	1,269,088	29.83
Taos	2,203	1,409,920	219,733	15.58	521,984	37.02	733,325	52.01	97,144	6.89	62,288	4.42	517,163	36.68
Torrance	3,345	2,140,800	19,537	0.91	153,881	7.19	207,787	9.71	299,805	14.00	16,300	0.76	1,616,908	75.53
Union	3,830	2,451,200	758	0.03	0	0.00	58,725	2.40	441,946	18.03	0	0.00	1,950,529	79.57
Valencia	1,068	683,520	23,271	3.40	15,865	2.32	43,291	6.33	22,000	3.22	160,000	23.41	458,229	67.04
New Mexico	121,365	77,673,600	12,782,122	16.46	9,190,906	11.83	26,770,431	34.47	9,364,091	12.06	7,359,233	9.47	34,177,925	44.00

Sources: U.S. Department of Commerce. 1994. 'County and City Data Book 1994'. Government Printing Office, Washington D.C.
Diemer, Joel A. and Alvarez, Rossana C. 1990. 'New Mexico Land Use, By County 1982 - 1988'. Agricultural Experiment Station Research Report 644, College of Agriculture and Home Economics, New Mexico State University. Las Cruces, NM
Williams, J.L. 1986. "New Mexico in Maps.' P 261. University of New Mexico Press, Albuquerque, New Mexico
New Mexico Stockman, 1994. Directory of New Mexico Agriculture. pp. 172-254.

TABLE 3-11 PAYMENT IN LIEU OF TAXES FISCAL YEAR 1998 NEW MEXICO	
COUNTY	**PAYMENT**
Bernalillo	$ 78,447
Catron	$135,359
Chaves	$862,022
Cibola	$594,818
Colfax	$ 51,449
De Baca	$ 29,317
Dona Ana	$861,402
Eddy	$952,074
Grant	$726,599
Guadalupe	$ 42,995
Harding	$ 41,257
Hidalgo	$259,795
Lea	$302,413
Lincoln	$436,112
Los Alamos	$ 25,905
Luna	$532,492
McKinley	$297,391
Mora	$ 80,663
Otero	$950,398
Quay	$ 1,293
Rio Arriba	$805,720
Roosevelt	$ 7,647
San Juan	$617,775
San Miguel	$282,331
Sandoval	$656,496
Santa Fe	$227,415
Sierra	$349,715
Socorro	$440,358
Taos	$536,551
Torrance	$124,403
Union	$ 40,937
Valencia	$ 23,785
TOTAL	$11,375,334

Source: BLM files

economy. It is essentially a “map" of the economic linkages among industries within an economy and between these industries and the rest of the world. This map shows the interdependence of the Industries within an economy and quantifies impacts from external changes to the economy. With this information it is possible to accomplish the following:

- describe the present economic situation of an industry by tracing the current dollar flows though the economy and

- forecast the initial effects of external changes in an industry by modifying the specifications of the model, and observing the resulting changes in the overall economy. The NMSU Department of Agricultural Economics and Agricultural Business, in cooperation with University of Wyoming and the University of Nevada Cooperative Extension Service, developed an Input-Output model for the state of New Mexico and Chaves County. The original model, developed at the University of Wyoming, was adapted from Micro IMPLAN tables (Olson and Scott 1994), a widely used national model. The model for NMSU was customized with New Mexico data to adequately define the spending patterns of New Mexico industries. The agriculture industries were expanded to include of all major crops produced in the state and provide a comprehensive description of agriculture. Each agricultural sector's 1992 sales and expenditures were based on the three-year average (1991 through 1993) of NMSU crop (Libbin and Hawkes 1991, 1992, 1993) and livestock (Torell and Hawkes 1991, 1992, 1993) cost and return estimates and New Mexico agricultural statistics (New Mexico Agricultural Statistics Service 1991, 1992, 1993). In 1997 the coal, oil and gas, and fed cattle sectors were updated with primary data for the state of New Mexico. The values of production and expenditure data were used to develop direct requirement coefficients for the model. Employment and income data from the U.S. Commerce Department's Bureau of Economic Analysis (BEA 1992), were used to calculate sector employment and income for all standard industrial classifications included in the model.

Direct (primary) economic influence can be used to predict indirect and induced (secondary) economic effects using the New Mexico Input-Output model. These influences have a ripple effect throughout the economy of New Mexico, caused by the interactions between industries, secondary spending, and the interdependence of the industries.

In analyzing the economic situation of federal forage AUMs, a value of production per AUM is required as an input into the model as a direct influence. In estimating the value of production per AUM, it was determined that a single year would misrepresent the effects to the economy. Since cattle prices follow a cycle it was determined that a 12-year (1985 through 1996) average of values per AUM would encompass a full price cycle between two lows in the cycle (Figure 3-1). The value of production per AUM and the number of AUMs were run in the NMSU New Mexico Input-Output model to predict the total economic losses to the New Mexico economy. In 1992, the cattle industry fared well, it was an extremely wet year, (Figure 3-2) and cattle prices were at a high. If this was the year used as input data, the economic situation would be overestimated. The other extreme would be to use 1996, when New Mexico was in a drought (Figure 3-2) and cattle prices were at a low (Figure 3-1). This year would underestimate the economic situation. Although sheep and goats do not follow the same price cycle as cattle, values per AUM and numbers of AUMs were used for the same 12 year period. Because there is a greater number of cattle AUMs than sheep and goat AUMs, the cattle cycle was used. In 1992[3] the range cattle[4] industry directly provided almost $314 million in economic activity to the state of New Mexico, including $19 million in personal income and 2,632 Full Time Equivalents (FTEs)[5]. This industry provided total (direct and indirect) economic activity of over $620 million. of which almost $97 million was in personal income from 5,500 FTEs. The sheep[6] industry directly provided $10 million in economic activity for the state of New Mexico, which included $976,000 in personal income and 299 FTEs. Indirectly the industry provided

---

[3]1992- Base year for the New Mexico Input-Output Model, an average of 1991, 1992, 1993.

[4]Range Cattle Industry - includes beef cow - calf and yearling operations. Does not include dairy cattle, sheep and goats, or fed cattle (feedlots).

[5]FTE - Full time equivalent - One full time, 40 hours per week, job.

[6]Sheep- includes sheep and goat operations.

FIGURE 1

CATTLE PRICES 1950 - 1997

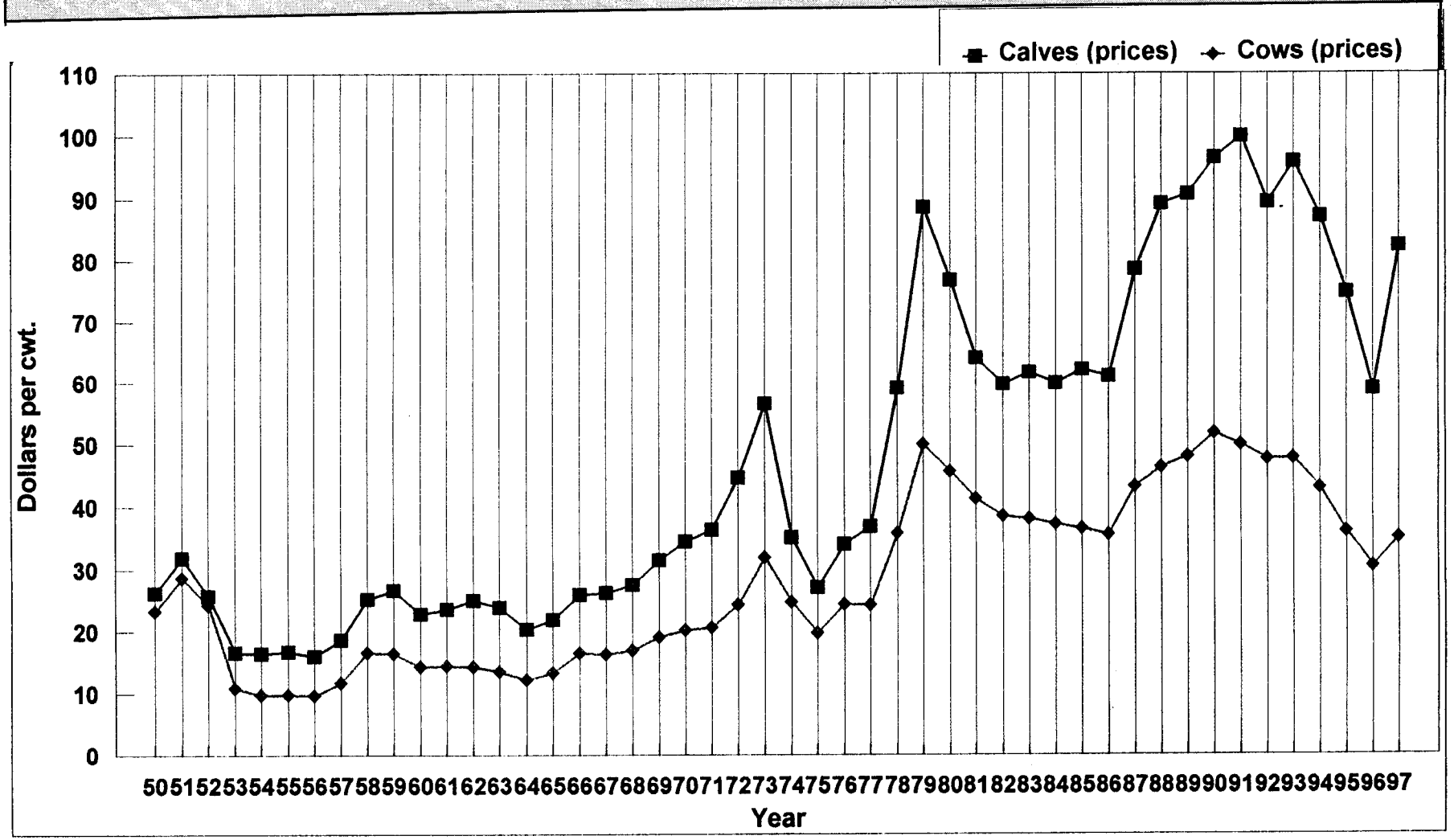
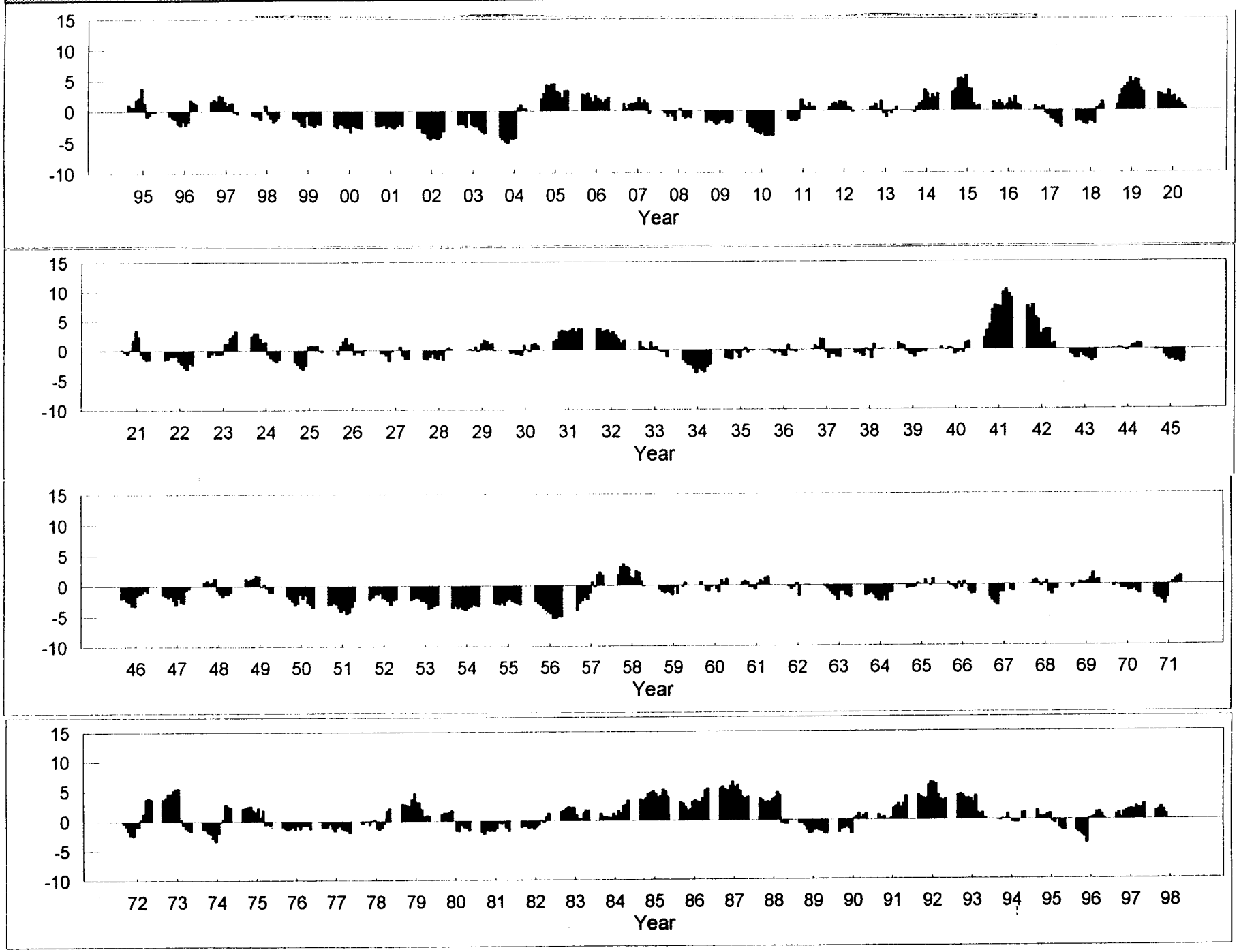


FIGURE 3-2
PALMER DROUGHT SEVERITY INDEX (PDSI)
NEW MEXICO



$22 million in economic activity, $3.5 million in personal income and 192 FTEs.

HUMAN DIMENSION

Human dimension describes the financial, social and cultural components that are important for NEPA assessment. The declaration in the National Environmental Policy Act (section 101(a)) states:

> The Congress, recognizing the profound impact of man's activity on the interrelations of all components of the natural environment, particularly the profound influences of population growth, high-density urbanization, industrial expansion, resource exploitation, and new and expanding technological advances and recognizing further the critical importance of restoring and maintaining environmental quality to the overall welfare and development of man, declares that it is the continuing policy of the Federal Government, in cooperation with State and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony and fulfill the social, economic, and other requirements of present and future generations of Americans. **(Emphasis added)**

The New Mexico State University natural resources program has developed a triangle, (Polley, 1996) that represents three necessary requirements for properly functioning conditions: (1) physical resources (water, soil, air), (2) biotic resources (plants and animals), and (3) the human dimension (management, communities, infrastructure). The human dimension includes the financial capital, science, general public involvement, coordination with state, local, tribal and federal governments, professional management, and the participation of the occupiers and users of the land necessary for achieving natural resource goals described in NEPA.

Recent research has focused attention on the need to incorporate human dimension as a key component to meeting properly functioning resource conditions. (Box, 1993, Finch and Tainter, 1993 and Kennedy, Fox, and Osen, 1994). This is especially true because the professional natural resource manager for BLM uses a combination of direct and indirect management of the resources. For example, resource managers may study and monitor the conditions of the land as they change over time. They may also directly participate in activities such as land treatments. However, they often depend on indirect management. For example, a ranchers may be relied upon to provide labor and capital to manage their use of the land in an appropriate fashion to meet land management objectives.

Financial, Social and Cultural Conditions

Financial

Financial Conditions for a Properly Functioning Rangelands:

Allen and Hokstra, (1994) state that "...a stable and adequate economic base is a requirement for sustainability" (for reaching a properly functioning healthy rangeland condition). As a business, the public land rancher looks at the net return on his/her investment, according to resource economist John Nalivka, (1993):

The net return to the ranchers are the result of combining all of the resources (feed, water, capital, and management) and because it results in an economic return to the ranchers, their long term incentive is to enhance the total productivity of these resources and use them more effectively. The management of these resources in an environment of risk and uncertainty to produce a marketable product at a competitive cost is the essence of determining the value of the ranch. In other words, the economic condition of the business which is dependent upon scientific condition and sustained yield of the renewable grazing resource determines the economic value of the ranch. The economic well-being of each ranch subsequently contributes to the economic health of the industry and the industry contributes to the economy of the county, state and Western U.S. as a whole. A secure and optimal balance of forage, water, market access, and capital access is the key to the long term viability of any operation more specifically, the public land ranchers, where the major consideration of range livestock operations and their ability to manage risk and maintain economic viability is access to and the ability to utilize a forage base which is well balanced with regard to availability, quality, and seasonal use.

In short, as the range improves in productivity with the help of the ranchers, the ranchers should re-establish their profitability and pay the variable costs. Once the profitability is achieved, the rancher will invest capital to improve the healthy ranges. The improved healthy ranges will provide a more secure environment for family and community stability. With improved security and stability, the rancher will have greater incentive to further invest in public land improvements.

Historically "federal land policies have encouraged development and investment by the grazing permittees and lessees. The Taylor Grazing Act (TGA) provided enhanced stewardship, financially stable communities and livestock industry" (Fowler, 1994). The Act's key features provide for security and tenure for ranchers and establishment of a long term carrying capacity attached to base water or land. These features encourage investment and commitment on the part of the ranchers. In return, TGA states that "Grazing privileges recognized and acknowledged shall be adequately safeguarded, but the creation of grazing district or the issuance of a permit pursuant to the provisions of this Act shall not create any right, title, interest, or estate in or to the land".

Financial Environment

The section contains an analysis of the current financial conditions of typical BLM dependent ranches in the State of New Mexico that may be affected by the alternatives. The purpose of this analysis was to establish a base line for comparison. (see Appendix D).

Four regions of the State were studied for the purpose of this analysis: Central Mountain Region; Northwest Region; Southeast Region; and Southwest Region. The following sections contain a summary of the analysis by region. As used in this document the term head means Animal Unit Yearlong (AUY) - the forage required to sustain a 1,000 lb animal or equivalent for a full year.

Central Mountain Region: There are four typical ranch size categories in this region: extra-small (53 head); small (133 head); medium (284 head); and large (485 head). These ranches are composed of mixed ownership of grazing land including: private land, New Mexico State Trust Land lease, USFS permit, and BLM permit or lease. None of the typical ranches in this region is more than 27 percent dependent on BLM grazing, with some as little as 12 percent dependent on BLM grazing.

Under current conditions, based on the 10-year-average budgets, all typical ranches in the region are meeting and are above the Financial Threshold for Production (Table 3-12). The extra-small ranch is the only size that does not meet the Financial Threshold for Risk (Table 3-13). It could not, under current conditions, increase production to meet this threshold. An extra-small ranch does pay at least half if its fixed overhead costs from ranching income. The small ranch pays a very small portion of the overhead, while the medium and large ranches pay overhead, with some residual return to investment.

Northwest Region: There are four typical ranch size categories in this region: extra-small (20-21 head); small (109 head); medium (301 head); and extra-large (657 head). These ranches are composed of mixed ownership of grazing land including: private land, New Mexico State Trust Land lease, USFS permit, and BLM permit or lease. The dependency on the BLM permit grazing ranges from a low of 23 percent dependent (extra-large) to a high of 68 percent (extra-small).

Under current conditions, based on the 10-year-average budgets, all typical ranches in the region are above the Financial Threshold for Production (Table 3-12). Only one ranch (extra-large) is currently above the Financial Threshold for Risk (Table 3-13). The typical small ranch could not, under current conditions, meet the Financial Threshold for Risk. The typical small ranch does pay an average of 61 percent of its fixed overhead costs from ranching.

Southeast Region: There are five typical ranch size categories in this region: extra-small (53 head); small (102 head); medium (260 head); large (473 head); and extra-large (741 head). These ranches are composed of mixed ownership of grazing land including: private land, New Mexico State Trust Land lease, and BLM permit or lease. The dependency on the BLM permit grazing ranges from a low of 45 percent dependency (extra-small, medium, large and extra-large) to a high of 58 percent dependency (small).

Under current conditions, based on the 10-year-average budgets, all typical ranches in the region are above the Financial Threshold for Production (Table 3-12). Three of the five ranches (medium, large, and extra-large) are also currently above the Financial Threshold for Risk (Table 3-13).

Table 3-12 Current Condition Summary Affected Ranches Meeting Financial Threshold for Production				
	Central Mountain Region	Northwest Region	Southeast Region	Southwest Region
Extra-small ranches	Meeting	Meeting	Meeting	Meeting
Small ranches	Meeting	Meeting	Meeting	Meeting
Medium ranches	Meeting	Meeting	Meeting	Meeting
Large Ranches	Meeting	--n/a--	Meeting	Meeting
Extra-large ranches	--n/a--	Meeting	Meeting	Meeting

Source: Southwest Center for Resource Analysis Report - prepared by Rita D Harbison, M.B.A. -WNMU.

Table 3-13 Current Condition Summary Affected Ranches Meeting Financial Threshold for Risk				
	Central Mountain Region	Northwest Region	Southeast Region	Southwest Region
Extra-small ranches	Not Meeting	Not Meeting	Not Meeting	Not Meeting
Small ranches	Meeting	Not Meeting	Not Meeting	Not Meeting
Medium ranches	Meeting	Not Meeting	Meeting	Not Meeting
Large Ranches	Meeting	--n/a--	Meeting	Not Meeting
Extra-large ranches	--n/a--	Meeting	Meeting	Not Meeting

Source: Southwest Center for Resource Analysis Report - prepared by Rita D Harbison, M.B.A. -WNMU.

Southwest Region: There are five typical ranch size categories in this region: extra-small (21 head); small (100 head); medium (231 head); large (425 head); and extra-large (1,264 head). These ranches are composed of mixed ownership of grazing land including: private land, New Mexico State Trust Land lease, and BLM permit or lease. The dependency on the BLM permit grazing ranges from a low of 62 percent dependency (small, large, and extra-large) to a high of 64 percent dependency (medium).
Under current conditions, based on the 10-year-average budgets, all typical ranches in the region are above the Financial Threshold for Production (Table 3-12). None of the five typical ranches is currently meeting the Financial Threshold for Risk (Table 3-13).

Summary

Under current conditions, all 16 ranch size categories not meeting the standard are meeting the Financial Threshold for Production, while seven of these ranch size categories are also currently meeting the Financial Threshold for Risk.

Local governments and schools are supported by the tax base created from the private land portions of the ranch, livestock taxes, fees and expenses, maintenance and capital improvements.

Social

This section presents an overview of the social trends and conditions of New Mexico and the public lands.

Social Conditions for Properly Functioning Rangelands

There are social considerations that are prerequisites for the human dimension of properly functioning rangelands. These social considerations are population growth and urban interface.

Population Influx and Changing Demographics

New Mexico and the western intermountain region are experiencing unprecedented population in-migration and economic growth. The in-migration is due part to the growing number of retirees moving into New Mexico. There will be 650,000 more New Mexicans in 2015 than in 1995...This is the equivalent of adding the combined current populations of Albuquerque, Las Cruces, Santa Fe and Roswell. (Condrey and Guillen, 1996).

The population influx into rural communities is increasingly driven by globalization of the economy and the resultant disconnect between income and lifestyle. That is to say, many former urbanites are now moving into small western communities where they can work out of their homes (Werther, 1997 and Hecox and Ack, 1996). The in-migration can have significant social and economic effects on small communities, driving up the cost of living and pushing affordable homes beyond the reach of current and future low to moderate income families (Gevanious, 1997, Herbert, 1996).

Findings of a New Mexico growth management study, commissioned by New Mexico legislature, reinforces the costs and benefits to New Mexico as:

> Benefits of growth include higher tax revenues, more jobs, new businesses, and increased economic growth...Baby boom generation has been influential in driving the demand for schools, housing and shopping, plus the infrastructure to serve them...Growth varies widely throughout New Mexico, as does its effects. Some communities grow with their landscapes, cultures, economies and overall character will change dramatically. How a community is fiscally [and environmentally] affected is often contingent upon the rate, location and type of growth...The effects on New Mexico brought by high growth rates often collide with growing desire to protect the state's assets such as water, unique character and way of life...(Condrey and Guillen, 1996).

Recent studies underscore this shift in population, as well as the related effects on natural resources, environmental quality, human settlements and infrastructure, necessary for sustainability. (Hecox and Ack, 1996, Farley, 1995, Wright, 1993, Condrey and Guillen, 1996).

"The demise of the western landscape is taking place because of the piecemeal subdivision and development of fields, floodplains, and forests ... a few acres at a time" and, while the "destruction of ecological and open space resources is tragic enough,...assaults on "place"...fracture the union of land and culture [with]

equally grave implications. (Wright, 1993). These implications are clear enough to the people who face the problems of a region reeling in sweeping political and economic change. Once the communities and individuals whose values stand as the fundamental beliefs of America's best find themselves displaced and disinherited from the land they hold sacred, we are left with the question: "If we are reflections of the places where we live, what will become of us if we exist in a landscape of fear, pollution, monotony, and lost promise? (Wright 1993).

Population Growth and Public Lands

Human settlement continues to affect the biological, physical and human dimensions of ecosystems. The population growth will continue to occur on the urban fringe of existing small towns and cities in New Mexico. The rate and magnitude of urban growth and its effects on healthy public lands varies according to the size of the human settlement and the proximity between urban land interface and public lands. The areas adjacent to this growth experience the most significant adverse effects to public lands (Steiner, 1997 and Werther 1997).

Urban Interface Effects on Public Lands

The urban interface is the zone adjacent to cities and towns where the public lands and their resources are more frequently and intensively used for legal and illegal activities.

According to urban interface research and BLM reports (BLM Urban Reports 1997), effects on healthy public lands stem from the current increase in urban areas. The effects on the interface zones include: trash dumping, shooting firearms, wildfires, uncontrolled pets (dogs and cats), air and noise pollution, damage or theft of natural resource and improvements, poaching, violation of archeological sites, unauthorized OHV travel, trespassing, vandalism and a general increase in criminal activities, as well as effects from residential subdivisions, and water quality and depletion of the water tables. Public land management challenges in the future will focus on urbanization impacts. (Steiner, 1997, Werther 1997, Daugherty and Snider, 1997).

Newcomers to the State consider public lands as a very attractive amenity. Smaller communities are also very attractive for relocation. The population influx will continue into the foreseeable future with increasing effects on public lands.

Cultural

The purpose of this section is to describe the present living custom and cultural environment.

Historically, New Mexico has been dominated by three cultures Native American, Hispanic and Anglo-Celtic. New Mexico today is a blending of these cultures. Although each of the cultures has its distinct features, each has roots to rural origins and the raising of livestock on native rangelands. However, the rapid increase population the New Mexico is bringing with it some new citizens that do not have the same attachment to the livestock grazing on rangelands. Therefore, the attitudes and effects could be quite different between rural and urban cultures. The culture sections are divided into the Traditional/Rural and Urban descriptions.

Traditional/Rural

<u>Livestock Based Culture</u>

The manner in which the common or public domain lands of New Mexico were used for raising livestock grew out of a blending of Spanish, Native American and Anglo-Celtic customary uses of the land. As settlements were established, the people used water and forage on the surrounding rangelands for the purpose of raising their livestock. The rangelands were generally suitable for raising livestock, which, under Spanish and Mexican law were held and grazed in common. The provisions of the Treaty of Guadalupe-Hidalgo created an expectancy that land grantees' customary grazing would continue under American law.

At the end of the Mexican-American War, the United States signed a treaty with Mexico called the Treaty of Guadalupe-Hidalgo. The Treaty was signed in 1848 and applied to most of the lands in New Mexico today. Article VIII of the Treaty of Guadalupe-Hidalgo specified that:

> Mexicans now established in territories previously belonging to Mexico, and which remain for the future within the limits of the the United States, as defined by the present treaty, shall be free to continue where they now reside, or to remove at any time to the Mexican republic, retaining the property which they possess in the said territories, or disposing there of, and removing the proceeds wherever

> they please, without their being subjected, on this account, to any contribution, tax, or charge whatever.
>
> Those who shall prefer to remain in the said territories, may either retain the title and rights of Mexican citizens, or acquire those of citizens of the United States. But they shall be under the obligation to make their election within one year from the date of the exchange of ratification of this treaty; and those who shall remain in the said territories after the expiration of that year, without having declared their intention to retain the character of Mexicans, shall be considered to have elected to become citizens of the United States.
>
> In the said territories, property of every kind, now belonging to Mexicans not established there, shall be inviolably respected. The present owners, the heirs of these, and all Mexicans who may hereafter acquire said property by contract, shall enjoy with respect to it guaranties equally ample as if the same belonged to citizens of the United States.

The terms of the Treaty continue intact, however there is controversy with different interpretations of the Treaty. The rural citizens of New Mexico believe the Treaty should be honored and protected by the United States. In response to the controversy, Senators and Representatives from New Mexico continue to seek additional studies to determine the validity of certain land claims arising out of the Treaty of Guadalupe-Hidalgo of 1848.

After the United States began its occupation of New Mexico, the Anglo-Celtic ranchers established cattle operations here. They carry forward a cattle-centered culture thousands of years old. (McWhiney, 1988.) By the time the Taylor Grazing Act was passed all three ranching cultures (Spanish, Native American and Anglo-Celtic) were established.

In 1934, the U.S. Congress enacted the Taylor Grazing Act which provides for grazing leases and permits:

> ... permits to graze livestock ... to such bona fide settlers, residents, and other stock owners ... Preference shall be given in the issuance of grazing permits to those within or near a [grazing] district who are landowners engaged in the livestock business, bona fide occupants or settlers, or owners of water or water rights. The Taylor Grazing Act goes on to state, PROVIDED FURTHER, That nothing in the Act shall be construed or administered in any way to diminish or impair any right to possession and use of water for mining, agriculture, manufacturing, or other purposes which has heretofore vested or accrued under existing law validly affecting the public lands or which way be hereafter initiated or acquired and maintained in accordance with such law. So far as consistent with the purposes and provisions of this Act, grazing privileges recognized and acknowledged shall be adequately safeguarded, but the creation of a grazing district or the issuance of a permit pursuant to the provisions of this Act shall not create any right, title, interest, or estate in or to the lands".

The intent of Congress was to provide stockholders with "...some type of assurance as to where and what kind of range they may have and depend upon in the way of pasturage" (78 Congressional Record). The grazing privileges were subsequently adjudicated to determine who was eligible for a grazing preference. The term "grazing preference" represents a preference for a grazing permit. The grazing preference was attached to the base property of the ranch and was transferred to the party who owned or controlled the base property. The completion of the adjudication process provided predictability and security of tenure to livestock operators. This predictability and certainty in grazing permits provides the security to obtain financing for livestock capital, operations and improvements on the public land.

While the Secretary of the Interior has the authority to regulate the grazing to protect the rangeland. Good range management and proper stewardship of the rangeland is ultimately linked to the security and tenure of the adjudicated preference grazing permit/lease. (Martin, 1981, Kelso, 1983, Archer, and Snider, 1984). When predictability and certainty are removed, not only do the ranch finances and family suffer, but the incentive for good stewardship and investment into healthy rangeland improvements is stifled.

The existence of rural families and communities continues to depend foremost on the availability of land for livestock, mining, timber, and other resources. Land is the life and well-being of the rural culture in

New Mexico. Working the land is the center piece of their livelihood; supported by multiple sources of supplemental income from wages and jobs in town. The land and water based cultures of New Mexico depend on use of natural resources that are derived from land and water. Such uses include ranching, mining, and timber harvesting which leads to sustainability of these communities. These customs include long term use, land ethics and stewardship of the land by individuals and communities.

Customs & Cultures of Counties

For the Resource Management Plan Amendment/ Environmental Impact Statement process, New Mexico counties, Indian tribes and pueblos of New Mexico were asked to define their customs and cultures in their own terms.

The customs and cultures of rural New Mexico are outgrowths of the people's values, beliefs, and ways of life, combined with all other aspects of living, which weave a complex whole. These customs and cultures are practiced within a relationship between people and place. Appendix E contains statements of the customs and cultures by the New Mexico counties, Indian tribes and pueblos in their own words.

Place is the site or sites marking the life of a person the story of their life and that of the lives that came before them. All of these attributes are embodied in the structures they call home, the communities, and the environment.

The customary uses of the lands continue to be for croplands, grazing, timber and mining that support rural communities and are contribute to the overall State's economy. The commitment to the land that they live and work on is so powerful as to evoke words like: "I don't want to be here [alive], if I can't live here [this person's ranch]." It should be clear then that *place* and identity are virtually inseparable. This is especially true of rural New Mexico where people often cannot, will not, separate themselves from the land they call home (Smith, 1994). Such a separation would destroy the very identity of those people. The customs and cultures that rural New Mexicans practice on their landscape is inclusive of their home and family and the community. It is a bond between people and *place* that is no less than the bond between flesh and blood; it is wholly dependent upon the fabric of land, people, and community being intact and stable.

The importance of community stability is expressed in the statements of custom and culture from the counties. An example of a commonly held feeling on community is: “I will pass along many of the beliefs and values that are cherished by our rural society..." It is within *place* that the values of a region are cultivated. For the people of rural New Mexico, values are products of their history and their experiences with the land that are essential to the continuation of their way of life. These

values include the “meaning of heroism, the relation of the individual to family and community, the nature of patriotism, the value of freedom, the challenge of making a home" (Cronon, 1992).

Rural and Urban Values

Public land means something different to rural New Mexicans than it does to the weekend visitors from the city. This is due mostly to the way rural and urban people associate with land in general and their relationship toward landscape. Rural people formed their relationship to the land with a "blood and blister intimacy", causing them:

> ... to have different interactions with the rangelands than urban societies, often resulting in different perceptions, values and uses. Many modern conflicts over rangeland or wildlife issues are conflicts of agricultural (utilitarian) and urban (biocentric) values about human relationships with the use of nature (Kennedy, Fox and Osen, 1995).

Rural people see land, public or private, with a keener eye than merely utilitarian. Land is literally and figuratively the ground upon which these people have built their existence--an existence based on the customs and cultures developed by their predecessors over centuries of land use in New Mexico. For a person related to this view of public lands it is helpful to understand the land base cultures and tenure in the discussion below.

Just as threatening to the rural people of New Mexico as public land policies that adversely affect the land based cultures, is the sometimes swift displacement of community and regional values by the influx of people who bring vastly different sets of values and ways of life to the land.

The migration of people into New Mexico has led to sometimes painful clashes of interests and values in rural areas of the state, including the use of public lands. This is putting it lightly when uprooting a family from the only *place* they have ever known is a very real possibility. Rural communities have endured the impacts of rural-life seekers from large population centers, escaping from the more frantic life. The results of this growth is felt by local residents who must pay higher property taxes for services demanded by the newcomers.

Urban

New Mexicans, Public Opinion and Public Lands

The future of public lands in New Mexico will be guided not only by principles and practices of sound resource management but by public opinions and preferences of New Mexicans. While this has been the case in the past, the future will increasingly include the urban dwellers. While the discussion has focused on displacement of land based cultures and in-migration, public opinion seems to provide some optimism and a framework for the future.

University of New Mexico's Public Policy Center conducted public opinion survey May of 1995. Conclusions from the survey included the following two relevant points:

In considering the proper top priority of the different multiple uses on public rangelands, New Mexicans rate the potential uses as follows:

Point 1

49% view environmental preservation as top priority,
23% view commercial uses as top priority,
22% view recreational uses as top priority, and
6 % view all three as having equal priority

Point 2

A substantial majority (over 75%) of New Mexico citizens believe it to be moderately to extremely important to preserve ranching as a way of life in the state (Baca, 1996).