CHAPTER 3: AFFECTED ENVIRONMENT

This chapter describes the existing environment that would be affected by the proposed Resource Management Plan Amendment (RMPA) alternatives. The resource information presented here is of sufficient detail to support and clarify the impact analyses provided in Chapter 4. The resources discussed in this chapter were identified by the general public and various groups and agencies with interest in the Brantley and Avalon Reservoirs RMPA Project Area (Project Area). The resource conditions have existed from 1998 to 2009; these conditions established the baseline for analysis of effects in Chapter 4: Environmental Consequences. Resource conditions were identified by on-site inspections; literature searches; contacts and coordination with local, State, and Federal agencies and personnel; and, in some cases, detailed technical reports.

3.1 REGIONAL SETTING

This section provides a baseline description of regional landscape characteristics of the Project Area. Location, climate, and geology can affect resource characteristics in the Project Area.

3.1.1 Location

The Project Area is located in the southern portion of the Pecos River Basin in southeastern New Mexico (Figure 1-1). It lies in Eddy County near the cities of Carlsbad and Artesia, New Mexico. Large, urban areas close to the Project Area include Albuquerque, New Mexico (approximately 225 miles, or 360 kilometers [km], to the northwest), Las Cruces, New Mexico (approximately 150 miles, or 240 km, to the west), and El Paso, Texas (approximately 140 miles, or 225 km, to the southwest). Other areas of regional interest include the Carlsbad Caverns and Guadalupe Mountains National Parks to the southwest. Elevations within the Project Area range from 3,260 feet (993 meters [m]) at Brantley Dam to 3,177 feet (969 m) at Avalon Dam. Principal access to the Project Area is via U.S. Highway 285 (US-285).

3.1.2 Climate

The Project Area climate is semi-arid with hot summers and mild winters. High temperatures from mid-May through mid-September usually exceed 90 degrees Fahrenheit (F) (32 degrees Celsius [C]). During this period, there is an average of 30 days when the temperature equals or exceeds 100 degrees F (38 degrees C). Winters are mild, dry, and sunny. In January, the coldest month, average daytime temperatures in the shade are near 58 degrees F (14 degrees C). Days with below-freezing temperatures (32 degrees F, 0 degrees C) are rare.

The Gulf of Mexico is the principal moisture source for this portion of New Mexico. The summer air circulation above the Gulf of Mexico brings the majority of moisture into New Mexico in the form of brief, but sometimes intense, summer thundershowers. The average annual rainfall is

approximately 12 inches (31 centimeters [cm]), the majority of which occurs May through October. During winter the average annual snowfall is 3.7 inches (9.4 cm). Because of the mild climate, snow seldom stays on the ground longer than a few hours.

Climate is the composite of generally prevailing weather conditions of a particular region throughout the year, averaged over a series of years. In New Mexico a recent study indicated that the mean annual temperatures have exceeded the global averages by nearly 50 percent since the 1970s (Enquist and Gori 2008). Similar to trends in national data, increases in mean winter temperatures in the southwest have contributed to this rise. When compared to baseline information, periods between 1991 and 2005 show temperature increases in over 95 percent of the geographical area of New Mexico. Warming is greatest in the northwestern, central, and southwestern parts of the state.

Ongoing scientific research has identified the potential impacts of anthropogenic (human-made) greenhouse gas (GHG) emissions, changes in biological carbon sequestration, and other changes from land management activities on the global climate. Through complex interactions of regional and global scale, these changes cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the Earth back into space. Although natural GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused carbon dioxide equivalent (CO2[e]) concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. The Intergovernmental Panel on Climate Change (IPCC) recently concluded that "warming of the climate system is unequivocal" and "most of the observed increase in globally average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentration" (IPCC 2007).

Global mean surface temperatures have increased nearly 1.33 degrees F from 1906 to 2005. Models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Northern latitudes (above 24 degrees north) have exhibited temperature increases of nearly 2.1 degrees F since 1900, with a nearly 1.8 degrees F increase since 1970 alone. Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHGs are likely to accelerate the rate of climate change.

In 2001 the IPCC indicated that by the year 2100, global average surface temperatures would increase between 2.5 and 10.4 degrees F above 1990 levels (IPCC 2001), depending on the assumptions made in the predictive model. The National Academy of Sciences has confirmed these findings, but also has indicated there are uncertainties regarding how climate change may affect different regions. More recently, the computer model predictions indicate that increases in temperature will not be equally distributed, but are likely to be accentuated at higher latitudes. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures are more likely than increases in daily maximum temperatures. Increases in temperatures would increase water vapor retention in the atmosphere, and reduce soil moisture, increasing generalized drought conditions, while at the same time enhancing heavy storm

events. Although large-scale, spatial shifts in precipitation distribution may occur, these changes are more uncertain and difficult to predict.

Several activities contribute to the phenomena of climate change, including the following: emissions of GHGs (especially carbon dioxide and methane) from fossil fuel development, large wildland fires, activities involving combustion engines, changes to the natural carbon cycle, and changes to radiative forces and reflectivity (i.e., albedo). It is important to note that GHGs will have a sustained climatic impact over different temporal scales. For example, recent emissions of carbon dioxide can influence climate for 100 years.

3.1.3 Geology

Brantley and Avalon Reservoirs are located within the geologic region know as the Permian Basin, so titled because much of the notable geology of the region had its origins in the Permian Period (245 to 286 million years ago [mya]), and because it centers on a reef and basin that existed in a shallow sea late in that period (Chronic 1987). In late-Permian times, in what is now southeast New Mexico and northwest Texas, Capitan Reef surrounded the Delaware Basin. Capitan Reef was east of the Ouachita Mountain Range, which blocked the prevailing easterly trade winds, putting the reef, basin, and surrounding shallow seas in a "rain shadow" (Stanley 1989). A rain shadow refers to the drier side of a mountain range resulting from moisture-laden clouds precipitating before crossing over the ridgeline. Over time the Capitan Reef developed upward and somewhat inward, while the Delaware Basin deepened. By the end of the Permian Period, the Delaware Basin was cut off from regular circulation with the ocean, and evaporites precipitated within and filled the basin (Hendrickson and Jones 1952, Kelly 1971, Stanley 1989).

Most of the economically important geologic resources were also formed or originated in the Permian Period. Within the Project Area oil and gas are found predominantly to the north of the Capitan Reef area, in the shallow, water-deposited sediments that occurred on the shoreward side of the reef front. In this "northwestern shelf" area (referring to the continental shelf on the northwest of the supercontinent Pangaea), later geologic movements resulted in a complex of small faults, anticlines, and synclines that created structures trapping oil and gas between impermeable strata (Chronic 1987). Oil and gas are also found among the buried Capitan Reef sediments and within the Central Basin Plateau east of the Delaware Basin (Stipp and Haigler 1956, BLM 1986a). Gas beds occur in the Delaware Basin, but they are so deep that it is presently not economically feasible to extract them (BLM 1994). As shallow seas evaporated during the Permian Period, evaporate minerals were deposited. Many of these remaining minerals have high economic values in today's market. These minerals include gypsum, anhydrite, salt, potash, and calcite (BLM 1994).

During the late Cenozoic Period (up to 12 mya), geologic activity in the region consisted mainly of uplift of Capitan Reef in the Guadalupe and Glass Mountains. The regional uplift and consequent dissolution of evaporites within the Pecos Valley created a complex of collapsed caverns, slumped

materials, alluvium, and river deposits (Hendrickson and Jones 1952, Kelly 1971, Reclamation 1982).

Currently, the north-south-oriented Middle Pecos Valley is bound to the west by broad, uplifted mountains and mesas, such as the Guadalupe and Sacramento Mountains. To the east of the valley is the low, gently sloping Llano Estacado Plain (Kelly 1971). The Guadalupe Ridge/Seven Rivers Hills and McMillan Escarpment cut across the valley in a northwestern direction, exposing the remnants of the ancient reef system that rimmed the Delaware Basin. The valley is mainly covered by terrace sediments and river alluvium deposited during the Quaternary Period (0 to 2 mya). The other major rock exposures in the Guadalupe Ridge/Seven Rivers Hills and McMillan Escarpment consist of the Tansill, Yates, and Seven Rivers Formations. Rocks within these formations are mainly clastic and reef-deposited sedimentary rocks and evaporites including limestone, dolomite, sandstone, mudstone, siltstone, and gypsum. Anhydrite, salt, and potash are also found within these formations, but are not often exposed as a result of weathering and dissolution patterns.

Most of the Pecos River tributaries drain the western highlands and include the Penasco, Fourmile Draw, North Seven Rivers, South Seven Rivers, and Rocky Arroyo. Very few drainages meet the Pecos River from the east, with only the Chalk Bluff Draw being notable.

3.2 RESOURCES OF CONCERN

Through the public scoping process for this Environmental Assessment (EA), the public and various interest groups and agencies identified resource concerns to be addressed in the process of implementing a RMPA for leasable minerals development at Brantley and Avalon Reservoirs. The identified resource concerns include: air quality; soils; cave and karst resources; water quality; vegetation; wildlife; fisheries; threatened, endangered, and other special status species (TES); cultural resources; Indian Trust Assets (ITAs); paleontological resources; social and economic values; Environmental Justice; recreation; rangeland and grazing; alternative energy, fluid minerals, and other extractive resources; transportation and access; and visual resources. This section describes the existing conditions of these resources of concern.

The Project Area boundary includes both Brantley and Avalon Reservoirs and an approximate 20-mile (32-km) stretch along the Pecos River above Brantley Reservoir and between the two reservoirs. Included are lands subject to inundation and a surrounding buffer above the reservoirs' maximum water storage elevations. Some of the following resource discussions include portions of the Pecos River as part of the Project Area, when relevant (e.g., fisheries, wildlife, and riparian-wetlands).

3.2.1 Air Quality

The Clean Air Act of 1970, as amended, established National Ambient Air Quality Standards (NAAQS) (40 Code of Federal Regulations [CFR] Part 50, 2006). The New Mexico Air Quality Bureau monitors air quality for the State. Eddy County is in Air Quality Control Region (AQCR) 155, also known as the Pecos-Permian Basin AQCR. The air quality surrounding the Project Area is generally "good" according to NAAQS, and AQCR 155 has been classified as an attainment area for all air pollutants identified in the NAAQS (eCFR 2008). The closest monitoring stations to the Project Area are in Carlsbad and Artesia. The Carlsbad station monitors ozone (O_3), nitrogen dioxide (NO_2), and fine particulate matter (PM2.5). The Artesia station, located approximately 15 miles (24 km) north of Brantley Reservoir, monitors sulfur dioxide (SO_2) and NO_2. Pollutants and O_3 monitored at these stations between 2006 and 2008 typically remained within acceptable criteria (NMENV 2010).

Air quality is determined by atmospheric pollutants and chemistry, dispersion meteorology and terrain, and also includes applications of noise, smoke management, and visibility. The Clean Air Act, as amended (42 USC §7401), was enacted by Congress to protect the public from the adverse effects of air pollution. Subsequently, the Environmental Protection Agency (EPA) established the NAAQS for criteria pollutants including carbon monoxide, NO_2, O_3, SO_2, particulate matter less than 10 microns, and lead. The NAAQS specify maximum concentrations for these criteria pollutants. The EPA also established Prevention of Significant Deterioration (PSD) provisions for use in protecting the nation's air quality. The PSD provisions classify air sheds into three classes, with the Project Area along the Pecos River classified as a Class II Air Quality Area. The area is in attainment status (i.e., it is below the significant thresholds for all the criteria pollutants and moderate increases in the criteria pollutants are allowed).

The primary causes of air pollution in the Project Area are from motorized equipment and dust storms caused by strong winds in spring. Particulates from nearby oil and gas production, agricultural burning, recreational and industrial vehicular traffic and ambient dust can also affect air quality. Emissions from the oil and gas industry are a concern in the Project Area because these can contribute to the formation of O_3. Air quality in the Project Area is considered generally good. The proposed action is not located in any of the areas designated by the EPA as "non-attainment areas" for any listed pollutants regulated by the Clean Air Act.

Greenhouse gasses, including carbon dioxide (CO2), methane (CH4), nitrous oxides, chlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, O_3, and aerosols are not currently regulated by Federal law. However, the EPA has promulgated a rule requiring mandatory reporting of GHG emissions from facilities that emit 25,000 metric tons of CO2(e) or more per year.

3.2.2 Soils

Soil Types

The soils found in the Project Area can generally be placed in two categories: (1) upland soils derived from geologic parent material through natural erosional processes, and (2) bottomland soils deposited by the Pecos River and its tributaries. The soils can be classified into types based on their composition, texture, and topographic position on the landscape. The soil types occurring in the Project Area and some of their characteristics are listed in Table 3-1. Complete descriptions and interpretations of these soil types are presented in U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) (formerly the Soil Conservation Service) Soil Surveys for Eddy County, New Mexico (USDA 1971).

Table 3-1. Soil Map Units within the Project Area.

SOIL MAP UNIT	SLOPE (PERCENT)	DEPTH TO PARENT ROCK IN INCHES (CENTIMETERS)	DEVELOPMENTAL CONSTRAINTS	
			RECREATIONAL DEVELOPMENT	BUILDING SITE DEVELOPMENT
Arno-Harkey-Anthony Association	0–1	0–87 (0–221)	Slight	Poor to Good
Limestone Rock Land-Ector Association	0–25	0–6 (0–15)	Slight	Good
Reagan-Upton Association	0–9	3–87 (7.6–221.0)	Slight	Fair to Good
Reaves Gypsum Land-Cottonwood Association	0–3	0–32 (0–81)	Slight	Poor to Fair
Simona-Pajarito Association	0–3	0–72 (0–183)	Slight	Good

Soils in the Project Area vary from flat, alluvial loams to steep, rocky outcrops, to exposed caliche surfaces. Seven soil associations are found throughout Eddy County, but five of these are found specifically within the Project Area. These include the following:

- Arno-Harkey-Anthony Association: loamy, deep soils from recently mixed alluvium.
- Limestone Rock Land-Ector Association: rockland and very shallow, stony, rocky, loamy soils over limestone; on hills and mountains.
- Reagan-Upton Association: loamy, deep soils and soils that are shallow to caliche; from old alluvium.
- Reaves Gypsum Land-Cottonwood Association: loamy soils that are very shallow to moderately deep over gypsum beds and gypsum lands.
- Simona-Pajarito Association: sandy, deep soils from wind-worked mixed sand deposits.

Soil Erosion

Soil erosion is not a major concern in the Project Area, except along certain riverine reaches of the Pecos River. Upstream of the old Lake McMillan Delta and north of the Brantley Reservoir, levees, steep banks, and channelization of the river into a straight, narrow space has increased the potential for erosion in these areas. Downstream of the delta, a pilot channel brings the Pecos River through the old Kaiser Channel (an irrigation channel originally excavated through the McMillan Delta for transporting water efficiently to McMillan Reservoir) to the breached McMillan Reservoir Levee. Banks in this section are especially prone to lateral erosion. Over time the channel will widen as sediments are removed and deposited into Brantley Reservoir. Erosion within the riverine section between Brantley and Avalon Reservoirs is relatively minor. Brantley Reservoir acts as a sediment trap and provides regulated flows to the Pecos River below the dam. This channel has more gently sloping banks covered by vegetation and is therefore not as erodible as upstream reaches.

Erosion potential in upland areas on certain soils is naturally high; however, it does not currently appear to be a major issue for water quality, rangeland resources, fisheries, or reservoir sedimentation.

Shoreline Erosion

Shoreline erosion on the margins of Brantley and Avalon Reservoirs does not presently appear to be a major concern. Much of the shoreline surrounding Avalon Reservoir has a shallow slope profile that dissipates wave action. The shoreline is further protected in some areas by dense vegetation. Brantley Reservoir has mainly shallow, sloped shorelines where unconsolidated sediments line the banks. Other portions of Brantley Reservoir's shoreline, however, consist of areas covered by coarse alluvial terrace materials and bedrock that efficiently armor the banks.

Sedimentation

Historically, the Pecos River has carried very high sediment loads, especially during high stormwater runoff periods. The river drains vast areas of arid grasslands and shrublands with highly erodible soil surfaces. The Pecos River was originally a meandering river with well-defined riparian vegetation zones and terrace-deposited sediments resulting from overbank flow occurrences (Hildebrandt and Omart 1982). With water resource development projects throughout the Pecos River watershed over the last 100 years, the system has been channelized, river terraces were modified for agriculture, rangeland was degraded, and riparian vegetation was eroded or removed. Currently, the Pecos River's high sediment load is deposited within all of the system's reservoirs. When Brantley Reservoir was built, sedimentation information was used to design a better system, one more able to accommodate such loading. As sediment fills the reservoir, the head gates of Brantley Dam can be raised to maintain a 42,000-acre-foot capacity for an estimated 100-year period, with an annual average of 7,000 acre-feet of sediment accumulation. Avalon Reservoir is not prone to high sediment loads since Brantley Reservoir currently acts as the main sediment trap. Only Rocky Arroyo enters into the Pecos River between Brantley and Avalon Reservoirs.

3.2.3 Cave and Karst Resources

The Project Area is located in gypsum karst terrain, a landform that is characterized by underground drainage through solutionally enlarged conduits. Gypsum karst terrain may contain sinkholes, sinking streams, caves, and springs. Sinkholes leading to underground drainages and voids are common. These karst features, as well as occasional fissures and discontinuities in the bedrock, provide the primary sources for rapid recharge of the groundwater aquifers of the region. The U.S. Bureau of Land Management (BLM) categorizes all areas within the Carlsbad Field Office as having either low, medium, high, or critical cave potential based on geology, occurrence of known caves, density of karst features, and potential impacts to fresh water aquifers.

The section of Project Area on the east side of the Pecos River north of Brantley Dam has a high potential for cave or karst occurrence, while the remainder of the Project Area has a medium potential (BLM 1997). A "high karst zone" is defined as an area in known soluble rock types that contain a high frequency of significant caves and karst features such as sinkholes, bedrock fractures that provide rapid recharge of karst aquifers, and springs that provide riparian habitat. A "medium karst zone" is defined as an area in known soluble rock types but may have a shallow insoluble overburden. These areas may contain isolated karst features such as caves and sinkholes. Groundwater recharge may not be wholly dependent on karst features but the karst features still provide the most rapid aquifer recharge in response to surface runoff.

Three caves with surface entries are found in the Project Area: Coffee Cave, Clark's Caverns, and Homogenized White Cave. They are located just east of Lake McMillan in the Seven Rivers Formation. The caves are unusual because they were developed in gypsum (Breisch and Meador 1973). The caves form mazes with several levels and thousands of feet of mapped passages. No unique speleothems (i.e., cave formations) are known to occur within the caves (Reclamation 1982), but some passages in Coffee Cave are up to 60 feet in width or height (Reclamation 1972). The cliff area near the caves has numerous sinkholes and fissures that may also be connected to other caves (BLM 1977). Access to the Project Area caves is not currently managed by any agency. In the past, cave visitors left trash and debris near the cave entrances and inside the caves (BLM 1977). Unknown features may also exist within the Project Area. Because of these factors, oil and gas development activities are subject to mitigation measures designed to adequately protect known and potential cave/karst resources.

Sinkholes and cave entrances collect water and can accumulate rich organic materials and soils. This, in conjunction with the stable microclimate near cave entrances, support a greater diversity and density of plant life that provides habitat for a greater diversity and density of wildlife, such as raptors, rodents, mammals, and reptiles. In addition, the interior of the caves support a large variety of troglobitic, or cave environment-dependent species. The troglobitic species have adapted specifically to the cave environment because of the constant temperatures, constant high humidity,

and total darkness. Coffee Cave and Homogenized White Cave are known to house summer bat colonies.

3.2.4 Water Quality

Surface Water Quality

Water quality indicators are measured and compared to standards adopted by the State of New Mexico Water Quality Control Commission (NMWQCC) and set forth in the New Mexico Administrative Code (NMAC): 20.6.2: Surface and Ground Water; and 20.6.4: Interstate and Intrastate Surface Waters. The standards apply to physical, chemical, and toxic constituents affecting water quality (NMAC 2005). Water quality can be affected by changes in water operations, sedimentation rates, oil and gas development, permitted livestock grazing practices, the intensity of recreation use, and other factors.

Sections 303(d) and 305(b) of the Clean Water Act (CWA) require each state to assess and list the quality of its waters in a tri-annual report to the EPA. Reservoirs and Rivers are considered impaired if they do not support designated uses. The 2006 – 2008 report lists both Brantley Reservoir and Avalon Reservoir as Impaired because of elevated mercury concentrations. Brantley Reservoir is also listed as Impaired because of DDT concentrations in fish tissue. Within the Project Area, the Pecos River is not fully supportive of the warmwater fishery designation (NMED/SWQB 2007).

Brantley Reservoir

Designated uses for Brantley Reservoir are irrigation storage, livestock watering, wildlife habitat, primary contact recreation, and warmwater fishery (NMAC 2005). Brantley Reservoir is listed as Impaired for warmwater fisheries because of elevated levels of Mercury and DDT in fish tissue. A May 2006 Fish Consumption Advisory recommends no consumption of any fish of any species from Brantley Reservoir because of elevated concentrations of DDT found in largemouth bass (*Micropterus salmoides*) and white bass (*Morone chrysops*) (NMED 2006). As per EPA guidance, fish consumption advisories are considered existing and readily available data that indicate non-attainment with CWA goals for "fishable" waters.

The U.S. Bureau of Reclamation (Reclamation) collected water quality data weekly at three sites on or near Brantley Reservoir during calendar years 2004 and 2005: at the reservoir inlet, at the reservoir outlet along the Pecos River, and at the deepest part of the reservoir near the dam. Brantley water quality data for total dissolved solids (TDS), dissolved oxygen (DO), Salinity, Conductivity, pH, and temperature are based on the 2005 sample season.

Total Dissolved Solids (TDS)

The TDS levels in the reservoir appear to vary with seasonal water operations (Reclamation 2006b). Overall, the TDS concentration drops during periods of peak inflow and rises when outflow volume decreases. Total dissolved solids levels remain above 2 grams per liter (g/L) for most of the year. Concentration of TDS ranged from 1.98g/L to 41 g/L at the outflow during 2005, averaging 3.8 g/L.

The TDS measurements were slightly higher at the outflow compared with the inflow. As at the inflow, concentration of TDS at the inflow site decreases as inflow volume increases. The relationship between TDS and outflow volume expressed as a linear function is stronger than at the inflow. Concentration of TDS at the dam generally increases with depth of water. Concentration of TDS seemed to increase the most at about 15 feet (4.6 m) below the reservoir surface. The minimum TDS statistic, however, increases at 25 feet (7.6 m) below the reservoir surface (Reclamation 2006b).

Dissolved Gasses

Dissolved oxygen as percent saturation and concentration was variable during the 2005 sampling period. Lower DO concentration at the inflow may be a result of increased plant productivity and warmer temperatures. Dissolved oxygen increases slightly when inflow increases. The outflow has lower DO levels than the inflow and seems to be related to dam releases. Dissolved oxygen also increases during a period of increased outflow that follows a period of minimal outflow. Dissolved oxygen generally decreases with increased depth at the dam, with a large drop occurring at a depth of 20 feet (6.0 m). Data indicate possible anoxic conditions at depths greater than 20 feet (6.0 m) during parts of the year (Reclamation 2006b).

Salinity

The average salinity at the inflow during this sampling period was 2.52, measured in Practical Salinity Scale Units (PSS). Salinity at the inflow ranged from 1.28 to 4.01 PSS. Salinity increased between January and June as inflow volume decreased. Salinity decreased between June and July, during the peak inflow. Between August and December, salinity fluctuated slightly, but generally stayed above 2 PSS. Salinity generally increased with depth, particularly at the 25-foot depth (Reclamation 2006b).

Conductivity

Mean specific conductivity is measured in milli-siemens per centimeter (mS/cm). At the inflow, values ranged from 2.52 to 7.30 mS/cm. As with TDS and salinity, specific conductivity also steadily increased during the sampling period until peak inflow, then dropped with spring runoff and remained below the specific conductivity. At the outflow, the mean specific conductivity was 5.94 mS/cm. Specific conductivity at the outflow ranged from 3.09 to 8.46 mS/cm. Specific conductivity was lower during periods of high outflow. At the dam, the mean specific conductivity was 5.27 mS/cm with a range of 3.07 to 8.16 mS/cm. Specific conductivity also increased with depth at the dam at depths of 25 feet or greater (Reclamation 2006b).

pH and Water Temperature

The State guidelines specify an acceptable pH range of 6.6 – 9.0. Brantley Reservoir maintains pH values within this range. The pH measurements at the inflow and at the outflow are similar, and have no obvious relationship to flow. The average inflow pH in 2005 was 8.26, with values ranging from 7.82 to 8.56. The average reservoir pH was 8.18, with a range of 7.16 to 8.58. The pH measurements

decrease in deeper water, dropping about 0.5 pH units between depths of 15 and 20 feet. This pattern is similar to other water quality constituents within the 2005 survey (Reclamation 2006b).

The State guidelines specify acceptable water temperatures will remain below 90 degrees F. Average water temperature of the inflow was 62.75 degrees F (17.08 degrees C). Throughout the year temperatures ranged from 36.1 to 80.7 degrees F (2.27–27.0 degrees C). Reflecting seasonal air temperatures, water temperatures increased between January and June, remained consistent between June and October, and decreased from October through December. The average outflow temperature was 62.66 degrees F (17.0 degrees C), ranging from 40.8 to 78.6 degrees F (4.8–25.8 degrees C). Average water temperature at the dam was 60.86 degrees F, ranging between 40.4 and 80.9 degrees F (4.6–27.1 degrees C). In general, water temperatures decreased only slightly with increasing depth. Temperatures do, however, show an increasing trend within each 5-foot (1.53 m) depth increment (Reclamation 2006b).

Avalon Reservoir

Designated uses for Avalon Reservoir are irrigation storage, livestock and wildlife watering, secondary contact recreation, and warmwater fishery. Water quality supports all uses except warmwater fishery, which is impaired because of elevated mercury concentrations found in fish tissue. Water quality information concerning the current status of Avalon Reservoir is limited. The SWQB lists the reservoir as eutrophic based on Carlson trophic state index (Carlson 1977, NMED/SWQB 1991). Total nitrogen to phosphorus ratios indicate that phosphorus is limiting in the reservoir. The Shannon-Wiener diversity indices indicate that phytoplankton and diatom diversity is good as well. Fish consumption guidelines for mercury were issued for Avalon Reservoir in 1993 and remain in place for channel catfish (*Ictalurus punctatus*). Atmospheric deposition is listed as the probable source of the mercury contamination (NMED/SWQB 1998).

The Pecos River

The Project Area includes the main stem of the Pecos River, from the headwaters of Brantley Reservoir upstream to Acme, New Mexico. Designated uses for this section of the Pecos River above Brantley Reservoir include: irrigation, livestock watering, wildlife habitat, secondary contact recreation (e.g., swimming, water skiing), and warmwater fishery (SWQCC 1995). The segment of the Pecos River from the headwaters of Brantley Reservoir upstream to Acme was listed on the 1996 303(d) list for total ammonia and mercury. A 1997 water quality survey (NMED/SWQB 1999) on this segment of the river documented as exceeding the chronic numeric standard for total ammonia on three occasions, but did not exceed the standard for mercury. The ammonia incidents were isolated and did not constitute violations of water quality standards. The 2008–2010 303(d) and 305(b) report does not list as Impaired any Project Area section of the Pecos River outside of the reservoirs (NMED/SWQB 2008).

Water quality in the Pecos River historically has been poor because of natural soluble minerals from surface waters, irrigation returns, and groundwater discharges containing high salinity levels (COE

1995, Reclamation 1982, Roberston 1997). Bank erosion is high during storm events, resulting in large quantities of sediment in the Pecos River.

A 1997 report attributes the most serious water quality degradation in the Pecos River to high TDS, sulfate, and chloride concentrations. According to this report, TDS values peaked upstream of Brantley Reservoir near Artesia and the Lakewood U.S. Geological Survey gages (Robertson 1997). The New Mexico Environment Department, Surface Water Quality Bureau (NMED/SWQB) (1999) conducted a three-season water quality survey on the lower Pecos River in 1997. Chemical, biological, and physical parameters were collected from below Sumner Reservoir to above Brantley Reservoir. This study found no values exceeding standards for sulfate or chloride concentrations.

Groundwater Quality

In the general vicinity of the Project Area, groundwater is often found near the Earth's surface. In the Pecos River alluvium water is found at depths of 20 to 50 feet (6 to 15 m). However, this water is not available to users because it too easily drains the Pecos River. Furthermore, groundwater quality is relatively good in the southern portion of the Project Area but water north of Brantley Reservoir has high salinity levels because of the alluvium's salinity. Near Brantley Reservoir, groundwater depths are between 100 and 200 feet (30 and 61 m) on both sides of the Reservoir. Near Avalon Reservoir, groundwater can generally be found between 50 to 100 feet (15 to 30 m) (Hendrickson and Jones 1952).

Within the Project Area two wells currently are being used for irrigation on the Seven Rivers Farm operated by the State of New Mexico Department of Game and Fish (NMDGF). These wells are classified as high or very high salinity wells. Both wells, however, are reported to be low in sodium levels. Calcium and sulfate ions are the most common ions and are likely derived from dissolution of gypsum or anhydrite. High salinity does not preclude use of these waters for irrigation because of the favorable ratio of ions present. Calcium sulfate (gypsum) is not harmful to crops and is often added to ameliorate high sodium and alkalinity problems. These waters, however, are only recommended for use in soils with moderate to rapid permeability, a condition found on most of the farm's soils (LSS 1992).

Project Area oil and gas wells pose a concern for groundwater resources. Oil and gas wells produce a few byproducts, namely waste oil and brine that have the potential to affect groundwater resources. However, numerous safe handling and removal rules exist to prevent groundwater, surface water, and soil contamination (BLM 1986b). There is no evidence that these requirements are not being met on either the active or closed wells in the Project Area.

3.2.5 Vegetation

The Project Area is near the boundary of two vegetative provinces: the Great Plains Grassland and the Chihuahuan Desert. The difference between these two vegetation types is apparent; Great Plains

Grassland areas are dominated by grasses and Chihuahuan Desert areas are dominated by shrubs. At the boundary, however, the distinction between these types is unclear. Although the actual mapping boundaries differ, both Dick-Peddie et al. (1993) and Brown and Lowe (1982) map the Project Area as Chihuahuan Desert Scrub and Desert Grassland.

Upland Plant Communities

Nine upland plant communities were identified and mapped in the Project Area using aerial photography and field surveys from 1998. Classification of the plant communities in the Project Area were made on an ecological framework, modified by the functional needs of resource analyses. Plant communities were identified based on areas with similar plant species, structure, and composition in a similar environment. Upland plant communities comprise approximately 77 percent of the Project Area and are described in greater detail in the Brantley and Avalon Reservoirs Resource Management Plan (Reclamation 2003). Table 3-2 lists each upland plant community, its area of coverage, and its percent of total Project Area.

Table 3-2. Upland Plant Communities in the Project Area.

PLANT COMMUNITY	ACRES (HECTARES)	PERCENTAGE
Arroyo Shrubland	1,439 (582)	3.36
Desert Plains Grassland	702 (284)	1.64
Disturbed Ground	1,785 (722)	4.17
Juniper Shrubland	11 (4)	0.02
Kochia-Dominated Area	2,943 (1,191)	6.87
Limestone/Gypsum Hills Shrubland	1,982 (802)	4.63
Mesquite Shrubland	4,474 (1,811)	10.44
Mixed Desert Shrubland	18,752 (7,589)	43.77
Saltbush Shrubland	773 (313)	1.80
Total Upland Vegetation	**32,861 (13,298)**	**76.70**

Riparian-Wetland Plant Communities

In this EA riparian-wetlands are defined as plant communities in the transition zone between aquatic (water) and terrestrial (land) habitats. Project Area riparian-wetlands occur in two general locations: along the shorelines and littoral zones of the Brantley and Avalon Reservoirs, and along reaches of the Pecos River in the Project Area. The mapping and analysis of riparian-wetland plant communities were concurrent with the mapping and analysis of upland vegetation. A total of 8,656 acres (3,503 hectares) of riparian-wetlands were identified in the Project Area.

At Brantley Reservoir, riparian-wetland habitat occurs along the shoreline in narrow bands, particularly in protected areas such as bays and coves. Because the bays and coves are somewhat protected from wind and wave erosion, the substrate is available for the establishment of riparian-wetland vegetation. Exposed shoreline supports little or no riparian-wetland vegetation because of shoreline erosion and/or unsuitable substrates to support vegetation establishment. Riparian-wetland

vegetation observed along the shoreline includes saltcedar (*Tamarix* spp.), rush (*Juncus* spp.), sedge (*Carex* spp.), bulrush (*Scirpus* spp.), Bermuda grass (*Cynodon dactylon*), and summer cypress (*Kochia scoparia*), saltcedar being the species most commonly observed. The primary influences on the condition of riparian-wetlands at Brantley Reservoir appear to be water level fluctuations and recreational use.

Saltcedar dominates the riparian-wetland plant communities bordering the Pecos River in the portion of the Project Area upstream of Brantley Reservoir. The river was straightened and channelized; subsequently it became greatly incised within its historic floodplain. Decadent stands of saltcedar with little or no understory vegetation border the river banks. Remaining understory vegetation includes Bermuda grass, rushes, and cattail (*Typha latifolia*). Although saltcedar stands are present on the historic floodplain, they are not considered riparian-wetland plant communities because riparian-wetland plant species are absent in their understories. The primary influence on the condition of riparian-wetlands along the Pecos River above Brantley Reservoir appears to be the lowering of water levels resulting from river incisement.

Saltcedar also dominates the riparian-wetland plant communities observed along the Pecos River between Brantley and Avalon Reservoirs. In general, the Pecos River is channelized with steep banks. This precludes the establishment of most riparian-wetland vegetation; however, saltcedar occurs in dense stands above the river. In a few isolated locations along the Pecos River between Brantley and Avalon Reservoirs where the river is not confined, small patches of cattail and narrow bands of rushes occur along the banks. The primary influence on the condition of riparian-wetlands along the Pecos River between the reservoirs appears to be fluctuations in river flows associated with the operation of Brantley Reservoir and grazing.

Avalon Reservoir is much older than Brantley Reservoir. Like Brantley Reservoir, the riparian-wetland vegetation occurs primarily in those areas protected from wind and wave erosion, as well as in the reservoir's inflow area. The most common riparian-wetland species observed at Avalon Reservoir was saltcedar; other species include rushes, bulrushes, Bermuda grass, plantain (*Plantago* spp.), cocklebur (*Xanthium* spp.), alkali sacaton (*Sporobolus airoides*), and giant sacaton (*Sporobolus wrightii*). The primary influences on the condition of riparian-wetlands at Avalon Reservoir appear to be water level fluctuations and grazing.

Riparian-wetlands serve many important ecological functions. Based on preliminary observation, it appears that the riparian-wetlands in the Project Area provide habitat for fish and wildlife, help stabilize the shorelines and riverbanks, improve water quality by filtering sediment, and provide recreational opportunities such as wildlife viewing and (in the case of saltcedar communities) providing shade and screening for campers in Primitive Recreation Areas. The functional value of a riparian-wetland is dependent on species composition, size, location, soils, and other factors.

Within the Project Area, all of the riparian-wetland plant communities are very similar in species composition and are dominated by the presence of saltcedar. Therefore, for the purposes of this

resource analysis, all of the riparian-wetland plant communities within the Project Area were considered a single habitat type even though there may be slight differences in plant species composition. Riparian-wetland plant communities in the Project Area include Marsh, Riparian Grassland, Tamarisk Shrubland, Unconsolidated Shoreline, and Open Water areas. These plant communities are described in greater detail in the Brantley and Avalon Reservoirs Resource Management Plan (Reclamation 2003). Table 3-3 lists each riparian-wetland plant community, its area of coverage, and its percent of total Project Area.

Table 3-3. Riparian-wetland Plant Communities in the Project Area.

PLANT COMMUNITY	ACRES (HECTARES)	PERCENTAGE
Marsh	5 (2)	0.01
Riparian Grassland	144 (58)	0.34
Open Water[a]	2,320 (939)	5.42
Tamarisk Shrubland	6,172 (2,498)	14.41
Unconsolidated Shoreline	15 (6)	0.03
Total Riparian-Wetland Vegetation	**8,656 (3,503)**	**20.21**

[a] Area of open water based on conditions present in May 1998.

Noxious Weed Species

Under the Federal Noxious Weed Act of 1974, noxious weeds are defined as plants that are "of foreign origin, are new to or not widely prevalent in the United States, and can directly or indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture, including irrigation, or navigation, or the fish or wildlife resources of the United States or the public health." Noxious weeds typically have characteristics that enhance their capability to successfully reproduce and spread over long distances. For example, these species often have prolific seed production, the ability to reproduce vegetatively, and highly effective means of seed dispersal (e.g., the presence of hooks or barbs on the seeds enabling them to attach to animal fur, clothing, vehicles, and equipment). These characteristics promote rapid natural spread into pristine or semi-pristine environments, thus interfering with composition, structure, and ecosystem processes of the native plant communities' species.

The Federal government maintains a noxious weed list including plants that are noxious mainly on lands not under state jurisdiction (i.e., U.S. territories and other possessions). Federal agencies have policies designating noxious weeds and managerial control measures, but these agencies often defer to county or state regulations concerning noxious weeds. State and local jurisdictions have authority to regulate noxious weeds over the rest of the country. New Mexico noxious weeds legislation includes the following: Harmful Plant Act (1976), Noxious Weed Act (1978), Harmful Weed Act 76-7-23 through 30, and the Noxious Weed Management Act of 1998. These noxious weed species are non-native and are presented in Table 3-4.

Table 3-4. Noxious Weeds in the State of New Mexico.

COMMON NAME	BOTANICAL NAME	ORIGIN [a]	GROWTH FORM[b]
African rue	*Peganum harmala*	E	F
Alfombrilla	*Drymaria arenarioides*	E	F
Arabiangrass	*Schizmus arabicusc*	E	G
bindweed	*Convolvillus arvense*	E	F
Black Henbane	*Hyoscyamus niger*	E	F
bull thistle	*Cirsium vulgare*	E	F
camelthorn	*Alhagi maurorum*	E	S
Canada thistle	*Cirsium arvense*	E	F
common toadflax	*Linaria vulgaris*	E	F
Dalmation toadflax	*Linaria dalmatica*	E	F
diffuse knapweed	*Centaurea diffusa*	E	F
Dyer's Woad	*Isatis tinctoria*	E	F
Euasian Watermilfoil	*Myriophyllum spicatum*	E	F
halogeton	*Halogeton glomeratus*	E	F
hoary cress	*Cardaria draba*	E	F
Hydrilla	*hydrilla verricillata*	E	F
jointed goat grass	*Aegilops cylindria*	E	F
leafy spurge	*Euphorbia esula*	E	F
Malta starthistle	*Centaurea melitensis*	E	F
Mediterraneangrass	*Schizmus barbatusc*	E	G
musk thistle	*Carduus Nutans*	E	F
onionweed	*Asphodelus fistulosis*	E	F
peppergrass	*Lepidium latifolium*	E	F
poison hemlock	*Conium maculatum*	E	F
punctureVine	*Tribulus terrestrisc*	E	F
purple loostrife	*Lythrum salicaria*	E	F
purple starthistle	*Centaurea calcitrapa*	E	F
Russian knapweed	*Acroptilon repens*	E	F
Russian thistle	*Salsola kalic*	E	F
Russian olive	*Elaeagnus augustofolia*	E	T
Scotch thistle	*Onopordum acanthium*	E	F
spotted knapweed	*Centaurea micranthos*	E	F
tamarisk (saltcedar)	*Tamarix chinensisc*	E	S
teasel	*Dipsacus fullonum*	E	F
Ulmus pulmila	*Siberian Elm*	E	T
whitetop	*Cardaria draba*	E	F
yellow starthistle	*Centaurea solstitialis*	E	F

Source: NRCS (2007)
[a] E = Exotic (non-native), N = Native.
[b] F = forb, G = grass or grasslike plant, S = shrub, T = tree shrub.

The BLM, along with other agencies, has completed a map of noxious weed occurrences for Eddy County. Their mapping identifies the noxious weeds of Malta starthistle (*Centaurea mlitensis*) and African rue (*Peganum harmala*) as occurring within the Project Area. Through surveying the Project Area, no other occurrences of noxious weeds were located, nor were a majority of the BLM's weed infestation populations located. This is likely the result of weed eradication efforts and the lack of suitable precipitation during the survey year.

Undesirable Species

In addition to noxious weeds, many other plant species are considered undesirable. The National Undesirable Plant Management Act of 1990 defines these plants as "undesirable, noxious, exotic, injurious, or poisonous, pursuant to State or Federal law." Several plant species that may occur in the Project Area are included in this category. Some of the undesirable plants are exotic but not designated as noxious because they are not invasive, are now considered naturalized, or are only pests under certain conditions (e.g., on crop lands). Native species, under Federal law, are not considered noxious, but several native species are considered undesirable. These particular species are agricultural pests either indicative of overgrazed rangeland or prevalent in other areas where extensive ecosystem disturbance has occurred. They are native plants that are not problematic in healthy ecosystems because their populations are low. In disturbed habitats, however, these undesirable plants occur in much higher numbers. Some of these plants are poisonous to livestock and wildlife, while others are simply unpalatable. In high numbers, these species indicate poor range conditions. Table 3-5 lists those species considered potential problems or disturbance indicators.

In the Project Area saltcedar and Russian olive are the most serious vegetation problems. The two species dominate vast portions of the northern half of the Project Area. In 1968 Reclamation began a Salt Cedar Clearing Program in the Brantley Reservoir area to clear the undesirable shrubs for recreational and land management purposes (W. Able 2000, pers. comm.). The work is performed under the jurisdiction of the Pecos River Basin Water Salvage Project (see Chapter 1).

3.2.6 Wildlife

Wildlife of interest to State and Federal agencies and the general public in the Brantley and Avalon Reservoir RMPA Project Area include special status species (Federal and State TES), big game, waterfowl, and general wildlife populations. Also of concern in the Project Area are wildlife use patterns in Tamarisk Shrublands before and after control practices are implemented. Wildlife habitat in the area supports populations of ungulates, carnivores, water birds, shore birds, upland birds, rodents, amphibians, reptiles, and raptors. Population numbers and composition vary with habitat suitability.

Table 3-5. Undesirable Plant Species that May Occur in the Project Area.

COMMON NAME	BOTANICAL NAME	ORIGIN
annual bursage	*Ambrosia acanthicarpa*	Native
Bermuda grass	*Cynodon dactylon*	Exotic
bitterweed	*Hymenoxys odorata*	Native
Black nightshade	*Solanum nigrum*	Exotic
Broom snakeweed	*Gutierrezia sarothrae*	Native
buffalobur	*Solanum rostratum*	Native
curly dock	*Rumex crispus*	Exotic
erect knotweed	*Polygonum aviculare*	Exotic
flixweed	*Descurainia sophia*	Exotic
Green foxtail	*Setaria viridis*	Exotic
horseweed	*Conyza canadensis*	Exotic
lamb's quarters	*Chenopodium album*	Exotic
large crabgrass	*Digitaria sanguinalis*	Exotic
London rocket	*Sisymbrium irio*	Exotic
Mexican devilweed	*Chloracantha spinosa*	Native
netseed lamb's quarters	*Chenopodium berlandieri*	Exotic
nettleleaf goosefoot	*Chenopodium murale*	Exotic
perrenial sowthistle	*Sonchus asper*	Exotic
pinnate mustard	*Descurainia pinnata*	Native
prostrate spurge	*Euphorbia prostrata*	Exotic
prostrate vervain	*Verbena bracteata*	Native
rabbitfoot grass	*Polypogon monspeliensis*	Exotic
Ridell's groundsel	*Senecio riddellii*	Native
rough cocklebur	*Xanthium strumarium*	Exotic
salsify	*Tragopogon dubius*	Exotic
sheep sorrel	*Rumex acetosella*	Exotic
silverleaf nightshade	*Solanum elaeagnifolium*	Native
spiny cocklebur	*Xanthium spinosum*	Exotic
stinkgrass	*Eragrostis cilianensis*	Exotic
storksbill	*Erodium cicutarium*	Exotic
summer-cypress	*Kochia scoparia*	Exotic
sweetclover	*Melilotus* sp.	Exotic
wild buckwheat	*Polygonum convolvulus*	Exotic

General Habitat

Approximately 80 percent of the wildlife habitat in the Project Area is composed of upland vegetation types (i.e., Mixed Desert Shrubland Arroyo Shrubland, Desert Plains Grassland, Juniper Shrubland, Kochia-Dominated Area, Limestone/Gypsum Hills Shrubland, Mesquite Shrubland, and Saltbush Shrubland). The majority of the upland vegetation types are located away from the waterways and contain relatively little understory because of natural conditions and grazing. Nevertheless, upland vegetation is important to a wide range of wildlife including rodents, big game, reptiles, non-game species, upland game birds, raptors, and songbirds.

Riparian-wetland vegetation types (i.e., Marsh, Tamarisk Shrubland, and Riparian Grassland) comprise about 20 percent of the wildlife habitat in the Project Area. Of this 20 percent, 98 percent

of the habitat is Tamarisk Shrubland. Riparian-wetland vegetation types are primarily located along the Pecos River and shorelines of Brantley and Avalon Reservoirs. Despite the limited riparian-wetland vegetation types, these habitats substantially add to the biological diversity of the Project Area by attracting diverse wildlife species that otherwise would not occur in the area. Riparian-wetland habitats are considered a limited resource in the surrounding arid environment, yet are used by a number of waterfowl, shorebirds, passerines, and amphibians.

The Brantley Wildlife Management Area, designated as part of the mitigation for the development of Brantley Dam and Reservoir, lies within the Project Area boundary. It is managed by the NMDGF and consists primarily of Tamarisk Shrublands of varying densities and open field areas. The NMDGF manages this area for upland species with techniques such as mowing strips, planting small grains, and controlled burning. Within the Brantley Wildlife Management Area, the Seven Rivers Waterfowl Management Area is used to grow corn and alfalfa primarily for waterfowl. Milo, wheat, and millet are also grown to a lesser extent.

Hunting waterfowl, upland game birds, big game, and furbearers is not allowed at Brantley Lake State Park. However, regulated hunting of these groups of wildlife is allowed on other Project Area lands that are administered by NMDGF and Reclamation. During the open season, waterfowl and upland game bird hunting is restricted to certain hours and days of the week on the Seven Rivers Waterfowl Management Area. Wildlife species that were documented within the Project Area during a multi-day site visit in 1998 are shown in Table 3-6.

Birds

A total of 179 bird species were documented in the general area during past studies, including 32 known and 25 suspected breeding species (Reclamation 1972). The Pecos River Valley is noted for its migratory waterfowl and shorebirds and, to a lesser extent, nesting and wintering species. The Project Area attracts a large number of waterfowl and shorebirds because of its complex of open water, riparian-wetland, and upland habitats. This complex provides resources required by water-dependent birds such as food items (e.g., fish, macroinvertebrates, emergent vegetation), sites to loaf and rest, protective cover, nest material, and secluded nesting areas. Such resources are directly associated with riparian-wetland vegetation types (Marsh, Riparian Grassland, and Tamarisk Shrubland) that are larger than 1.0 acre (0.4 hectare) in size and are within 100 feet (30 m) of the Pecos River and reservoir shores. Habitat quality for waterfowl and shorebirds is limited in some parts of the Project Area by the high degree of disturbance resulting from recreational use, cattle grazing, fluctuating water levels, and the invasion of large, mono-typic stands of Tamarisk Shrublands. Regardless, the Project Area contains areas that are particularly suitable for waterfowl and shorebirds. Common waterfowl and shorebird species include mallard (*Anas platyrhynchos*), gadwall (*Anas strepera*), northern pintail (*Anas acuta*), teal, (*Anas* spp.), redhead (*Aythya americana*), lesser scaup (*Aythya affinis*), Canada goose (*Branta canadensis*), sandhill crane (*Grus canadensis*), killdeer (*Charadrius vociferus*), American avocet (*Recurvirostra americana*), and black-necked stilt (*Himantopus mexicanus*) (Reclamation 1972).

Table 3-6. Wildlife Species Known to Occur within the Project Area.[a]

COMMON NAME	SCIENTIFIC NAME
BIRDS	
American coot	*Fulica americana*
American avocet	*Recurvirostra americana*
American white pelican	*Pelecanus erythrorhynchos*
bank swallow	*Riparia riparia*
barn swallow	*Hirundo rustica*
belted kingfisher	*Ceryle alcyon*
black-necked stilt	*Himantopus mexicanus*
brown pelican	*Pelecanus occidentalis carolinensus*[b]
burrowing owl	*Athene cunicularia*
canyon wren	*Catherpes mexicanus*
cliff swallow	*Hirundo pyrrhonota*
common loon	*Gavia immer*
common nighthawk	*Chordeiles minor*
double-crested cormorant	*Phalacrocorax auritus*
eared grebe	*Podiceps nigricollis*
greater roadrunner	*Geococcyx californianus*
great blue heron	*Ardea herodias*
great-horned owl	*Bubo virginianus*
green heron	*Butorides virescens*
herring gull	*Larus argentatus*
house sparrow	*Passer domesticus*
interior least tern	*Sterna antillarum*[b]
killdeer	*Charadrius vociferus*
mallard	*Anas platyrhynchos*
mourning dove	*Zenaida macroura*
northern harrier	*Circus cyaneus*
northern shoveler	*Anas clypeata*
red-winged blackbird	*Agelaius phoeniceus*
ring-necked pheasant	*Phasianus colchicus*
scaled quail	*Callipepla squamata*
snowy egret	*Egretta thula*
turkey vulture	*Cathartes aura*
western kingbird	*Tyrannus verticalis*
western meadowlark	*Sturnella neglecta*
white-winged dove	*Zenaida asiatica*
Wilson's phalarope	*Phalaropus tricolor*
MAMMALS	
blacktail jackrabbit	*Lepus californicus*
coyote	*Canis latrans*
raccoon	*Procyon lotor* (sign observed)
mule deer	*Odocoileus hemionus*
HERPETOFAUNA	
little striped whiptail	*Cnemidophorus inornatus*
turtle	unidentified
western whiptail	*Cnemidophorus tigris*

[a] Species observed by the RMP/EA Project Team during a multi-day site visit in May 1998.
[b] Species of special concern to the Federal Government or State of New Mexico.

Mudflats along the shores of the reservoirs and the Pecos River provide loafing and foraging areas for many species of waterfowl and shorebirds such as American avocets, black-necked stilts, killdeers, sandpipers, terns, and numerous duck species. Project Area mudflats are typically inundated during periods of high water and occur primarily within the footprint of Avalon Reservoir and immediately downstream along the Pecos River in areas where topographic relief is minor. Riparian Grasslands often border the mudflats.

One notable habitat area, a small Marsh below the Avalon Reservoir dam, supports high densities of waterfowl and shorebirds. This area is comprised of open water with emergent vegetation, several scattered cottonwoods, and stands of seepwillow (*Baccharis* sp.). The Marsh is bordered by Riparian Grassland and Tamarisk Shrubland communities and is likely used by breeding birds (e.g., teals, northern shovelers, and grebes) for nesting, foraging, and brood-rearing. Also, migrating and wintering birds likely use this area because of its abundance of food items and isolation. Arroyo outflow areas in the Project Area may also provide secluded sites for nesting and brood-rearing.

Other areas important to feeding waterfowl and shorebirds are near fish spawning areas, such as the shallow littoral zones containing inundated vegetation and shorelines of gravel and rock. Some waterfowl, including American coot (*Fulica americana*), common merganser (*Mergus merganser*), and herring gull (*Larus argentatu*), forage in deeper portions of Avalon Reservoir.

Raptors, such as red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), American kestrel (*Falco sparverius*), and golden eagle (*Aquila chrysaetos*) are known to occur throughout the Project Area. The upland areas provide an abundance of small mammal prey including kangaroo rat (*Dipodomys* spp.), house mouse (*Mus musculus*), deer mouse (*Peromyscus maniculatus*), and gopher (*Thomomys* spp.). Few roosting and nesting sites are available for raptors with the exception of 10.7 acres (4.3 hectares) of Juniper Woodland located in the upper draws of the Project Area. Raptors may also use mature stands of Tamarisk Shrubland for roosting and nesting.

Habitat for most songbirds is associated with the riparian-wetland areas. In particular, Marsh and Tamarisk Shrublands with dense growth and complex vertical structure support nesting, migrating, and wintering populations of songbirds. These habitats provide nesting sites, protective cover from weather and predators, and prey (e.g., seed, plant material, insects). The Project Area contains 4.7 acres (1.9 hectares) of Marsh and 6,171.7 acres (2,497.6 hectares) of Tamarisk Shrubland. Songbirds frequently use Arroyo Shrublands. The 1,439.2 acres (582.4 hectares) of Arroyo Shrubland in the Project Area are structurally diverse, making them attractive to a wide range of species. Songbirds inhabit other habitats in the Project Area but in reduced numbers and diversity.

Executive Order 13186, titled "Responsibilities of Federal Agencies to Protect Migratory Birds," signed on January 10, 2001, requires that Federal agencies evaluate the effects of Federal actions on migratory birds. A migratory bird inventory has not been completed for the Project Area. Common migratory birds that were documented in the Project Area in 1998 are listed in Table 3-6.

Mammals

Twenty-six mammal species were documented in the general Project Area (Reclamation 1972). An additional 40 species occur in the Pecos River Valley and may be present within the Project Area. Common mammals include deer mouse, blacktail jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus auduboni*), white-footed mouse (*Peromyscus leucopus*), coyote (*Canis latrans*), striped skunk (*Mephitis mephitis*), and raccoon (*Procyon lotor*). Mammals inhabit all vegetation types in the Project Area.

Furbearers known to occur in the Project Area include striped skunk, raccoon, coyote, ringtail (*Bassariscus astutus*), fox (*Vulpes*), muskrat (*Ondatra zibethica*), badger (*Taxidea taxus*), and bobcat (*Lynx rufus*). Most furbearers, except muskrats and ringtails, occur in upland and riparian-wetland habitats. Muskrats are more commonly associated with wet areas, such as the reservoirs, the Pecos River, canals, small ponds, and adjacent vegetation. Ringtails inhabit the rockier sites, such as those along Brantley Dam.

Big game species in the Project Area include mule deer (*Odocoileus hemionus*) and pronghorn antelope (*Antilocapra americana*). The Project Area is on the eastern edge of the mule deer range in New Mexico (Reclamation 1972). These species use all upland habitats and Riparian Grasslands for foraging. Areas of particular importance include 702.1 acres (284.1 hectares) of desert plains grasslands and 1,439.2 acres (582.4 hectares) of Arroyo Shrublands that provide cover and forage. The arroyos leading to the reservoirs are also used as movement corridors. However, species movement may be limited by five-strand barbed wire fencing in the Project Area. The reservoirs, the Pecos River, canals, and ponds provide important water sources.

The Project Area likely supports a high number of bat species because of the availability of roosting and nursery sites associated with several caves (e.g., Coffee Cave, Clark's Caverns, and Homogenized White Cave) and abandoned buildings at the McMillan Dam site in the Project Area. Aquatic resources (e.g., reservoirs, Pecos River, canals, and small ponds) and Marsh and Riparian Grassland habitats within the Project Area provide a source of insect prey for bats.

Herpetofauna

Fourteen species of amphibians and 57 species of reptiles are known to exist in the Pecos River Valley (Reclamation 1972). The little striped whiptail (*Cnemidophorus inornatus*) is the most common reptile. Other common herpetofauna include ornate box turtle (*Terrapene ornata*), Texas horned lizard (*Phrynosoma cornutum*), western hognose snake (*Heterodon nasicus*), gopher snake (*Pituophis melanoleucus*), prairie rattlesnake (*Crotalus viridis*), checkered whiptail (*Cnemidophorus tesselatus*), Woodhouse toad (*Bufo woodhousei*), and cricket frog (*Acris crepitans*). Reptiles can be found throughout the Project Area in all upland habitats. Garter snake (*Thamnophis* spp.), several turtle species (e.g., yellow mud turtle [*Kinosternon flavescens*] and Texas spiny softshell turtle [*Trionyx spiniferus*]) and amphibians are more typically associated with aquatic sites, such as the Marsh and Riparian Grassland habitats, the Pecos River, canals, and scattered ponds. Toads may also occur in the sandy areas of upland habitats.

3.2.7 Fisheries

Since Brantley and Avalon Reservoirs, as well as parts of the Pecos River, support essentially the same fish species, this discussion combines all three water resources. Conditions unique to a particular water body are noted where they occur.

Fish Species

A total of 26 species of fish representing 11 families are known to occur in the reservoirs and river within the Project Area (Table 3-7). All of the species listed have been documented in both reservoirs and the river within the Project Area (M. McInnis 1998, pers. comm.) with a few exceptions. The gray redhorse (*Moxostoma congestum*) and the blue sucker (*Cycleptus elongatus*) were extirpated above Brantley Reservoir during the 1900s and from the river section between Brantley and Bataan Dams as recent as 2004 (Zymonas and Propst 2007). The Mexican Tetra (*Astyanax mexicanus*) has been documented in low numbers in the Pecos River and Brantley Reservoir (S. Denny 2008, pers. comm.); only one fish was captured during recent surveys upstream of the Project Area in Chaves County (Davenport 2008). Smallmouth buffalo, black crappie, and threadfin shad have not been observed for several years but could still occur in Project Area reservoirs (S. Denny 2008, pers. comm.).

Fisheries Management

The primary sport fishes in Brantley and Avalon reservoirs are largemouth bass and walleye (*Sander vitreus vitreus*) (M. McInnis 1998, pers. comm.). Other important game species include channel catfish, white bass, spotted bass (*Micropterus punctulatus*), and white crappie (*Pomoxis annularis*). The primary forage fish in the reservoirs are gizzard shad (*Dorosoma cepedianum*), with other fishes from "bait-bucket" introductions making up a small part of the forage base.

Brantley and Avalon Reservoirs are open year round and provide limited angling opportunities for a variety of sport fishes. There are very few fish in Brantley Reservoir because of almost-yearly fish kills from golden algae (*Prymnesium parvum*). After the first algae kills, NMDGF stocked largemouth bass (northern and Florida strains), but stocking was suspended because of continued kills. No stocking has occurred in Avalon Reservoir for at least 10 years and fish occur in low abundance in this reservoir (S. Denny 2008, pers. comm.).

Daily bag and possession limits for Avalon Reservoir are shown in Table 3-8. Brantley Reservoir is catch-and-release only because of DDT contamination in fish. According to preliminary testing above and below the reservoir this contamination seems limited to Brantley Reservoir (S. Denny 2008, pers. comm.).

Table 3-7. Fish Species[a] Reported from Brantley Reservoir (BR), Avalon Reservoir (AR), and the Pecos River (PR) within the Project Area.

COMMON NAME (*SCIENTIFIC NAME*)	BR	AR	PR
Family *Atherinidae* - silverside			
inland silverside (Menidia beryllina)	X	X	X
Family *Catostomidae* - sucker			
gray redhorse (*Moxostoma congestum*)[b]		X	
river carpsucker (*Carpiodes carpio*)	X	X	X
smallmouth buffalo (*Ictiobus bubalus*)	X	X	X
Family *Centrarchidae* - sunfish			
black crappie (*Pomoxis nigromaculatus*)	X	X	X
bluegill (*Lepomis macrochirus*)	X	X	X
green sunfish (*Lepomis cyanellus*)	X	X	X
largemouth bass (*Micropterus salmoides)*	X	X	X
longear sunfish (*Lepomis megalotis*)	X	X	X
spotted bass (*Micropterus punctulatus*)	X	X	X
warmouth (*Lepomis gulosus*)	X	X	X
white crappie (*Pomoxis annularis*)	X	X	X
Family *Characidae* - tetras			
Mexican tetra (*Astyanax mexicanus*)			X
Family *Clupeidae* - herring			
gizzard shad (*Dorosoma cepedianum*)	X	X	X
threadfin shad (*Dorosoma petenense*)	X	X	
Family *Cyprinida*e - carp and minnow			
common carp (*Cyprinus carpio*)	X	X	X
fathead minnow (*Pimephales promelas*)	X	X	X
Pecos bluntnose shiner (*Notropis simus pecosensis*)	X		X
red shiner (*Cyprinella lutrensis*)	X	X	X
Family *Fundulidae* - killifish			
plains killifish (*Fundulus zebrinus*)	X	X	X
Family *Ictaluridae* - catfish			
black bullhead (*Ameiurus melas)*	X	X	X
channel catfish (*Ictalurus punctatus*)	X	X	X
flathead catfish (*Pylodictis olivaris)*	X	X	X
Family *Lepisosteidae* - gars			
longnose gar (*Lepisosteus osseus*)	X	X	X
Family *Percichthyidae* - temperate bass			
white bass (*Morone chrysops*)	X	X	
Family *Percidae* - perch			
bigscale logperch (*Percina macrolepida*)[b]	X	X	X
walleye (*Stizostedion vitreum*)	X	X	
Family *Poeciliidae* - livebearers			
western mosquitofish (*Gambusia affinis*)	X	X	X

[a] List of fishes from McInnis (1998).
[b] Listed as threatened by the State of New Mexico (NMDGF 1996).

Table 3-8. Daily Bag, Possession, and Size Limits for Fishes in Avalon Reservoirs.[a]

SPECIES	LIMITS		
	DAILY BAG	POSSESSION	SIZE
black bass (largemouth and spotted)	5	10	14 inches (35.5 centimeter) minimum size
black, white crappie	20	40	none
catfish (except bullheads)	15	30	none
walleye	5	10	none
white bass	25	50	none
all other warmwater game fishes	20	40	none

[a] These regulations apply Statewide except for the special size limit on largemouth bass (NMDGF 2008).

McInnis (1998, pers. comm.) indicated that habitat for primary sport fishes appears to be good, at least for adult fishes. Shallow littoral areas with inundated vegetation are seasonally available, as are gravel, rip-rap, and rocky shorelines. Gravel and rocky areas are preferred by littoral species, such as sunfish (*Centrarchid* spp.) and black bass (*Micropterus salmoides floridanus*), for spawning and nursery areas. Walleye are believed to spawn over the rip-rap along the dam, but reproduction and recruitment has not been successful because of water level fluctuations during the period of spawning and egg incubation. Fish numbers in both reservoirs are very low because of annual golden algae fish kills and discontinued stocking.

Water Quality

Nutrient levels in Brantley and Avalon Reservoirs are fairly high, in part because of stormwater runoff and irrigation water returns. Plankton and benthos densities are good, including *Daphnia* spp. The NMED/SWQB classified Avalon Reservoir as eutrophic, with good phytoplankton diversity. Brantley Reservoir was classified as meso-eutrophic, also with good phytoplankton diversity (NMED/SWQB 2003).

Negative impacts to the fishery are primarily associated with water level fluctuations that can negatively affect reproduction and recruitment of species (principally sunfishes and walleye) using littoral zones for spawning and nursery areas. Reductions in water level elevations in early spring during the spawning period can desiccate eggs, prematurely end spawning, and eliminate shallow water cover used by young fishes. Fish kills caused by golden algae blooms occur almost-yearly in Brantley Reservoir.

Warmwater fisheries in both Brantley and Avalon Reservoirs are listed as Impaired because of chronic levels of mercury concentration. Additionally, the State of New Mexico has determined eating fish from Brantley Reservoir is a serious health risk because of elevated concentrations of DDT in fish tissue. In a joint advisory, the NMDGF, NMED, New Mexico State Police (NMSP), and New Mexico Department of Health (NMDH) recommend no fish of any species be eaten from Brantley Reservoir (NMED 2006).

Recent studies of Project Area water quality indicate that chronic levels of mercury concentrations in surface waters of the Pecos Basin exceed the New Mexico Chronic Standards for warmwater fisheries. Fish species most likely to be affected by high mercury concentrations are piscivorus species. Piscivorus fish families reported in Brantley and Avalon Reservoirs and the Pecos River include walleye, catfish (*Ictaluridae* spp.), gar (*Lepisiteidae* spp.), white bass (*Percichthyidae* spp.), sunfish (*Centrarchidae* spp.), bass (*Centrarchidae* spp.), crappie (*Centrarchidae* spp.), perch and bigscale logperch (*Percidae* spp.) (Eddy and Underhill 1978). The smaller omnivorous fish species, including killfish (*Fundulidae* spp.), sucker (*Catostomidae* spp.), gizzard and threadfin shad (*Clupeidae* spp.), and carp and minnow (*Cyprinidae* spp.) provide a food source for various birds. Mercury contamination effects on fishes are demonstrated loss of vision, loss of equilibrium, rolling or side-to-side swimming, and reproductive and developmental problems (Sorenson 1991).

Because of the high mercury concentrations found in fish muscle tissue, fish consumption guidelines for Brantley and Avalon Reservoirs were issued by the NMED, the NMDH, and NMDGF. Fish consumption advisories for Brantley Reservoir recommend against eating any fish caught in this reservoir (NMED 2006). It is also recommended that women who are pregnant, breastfeeding, or planning to be pregnant, and children under 18 years of age should not eat channel catfish (19 inches [48 cm] or longer) from Avalon Reservoir and no more than one meal a month of channel catfish (up to 19 inches [48 cm]). For the general public it is recommended the consumption of no more than two meals a month of channel catfish (19 inches [48 cm] or longer) captured in Avalon Reservoir (NMDE et al. 2001).

3.2.8 Threatened, Endangered, and Other Special Status Species

A list of State and Federally protected species for Eddy County was reviewed (BISON-M 2008, NMHP 2008). Of the listed protected species, 11 are identified as either threatened or endangered at the Federal level, and 32 are protected at the State level. The blue sucker (*Cycleptus elongatus*) and grey redhorse (*Maxostoma congestum*) are listed as endangered and threatened by the State of New Mexico, respectively, and were historically found within the Project Area. The Federally protected species include: gypsum wild buckwheat (*Eriogonum gypsophylum*), least tern (*Sterna antillarum athalassos*), Mexican spotted owl (*Strix occidentalis lucida*), Pecos bluntnose shiner (*Notropis simus pecosensis*), piping plover (*Charadrius melodus circumcinctus*), and southwestern willow flycatcher (*Empidonax traillii extimus*) (Table 3-9). Of these, least tern, southwestern willow flycatcher, Pecos bluntnose shiner, and gypsum wild-buckwheat are the only species for which there is suitable habitat in the Project Area.

Wildlife

Two bird species of concern potentially occur in the Project Area (Table 3-9). The potential for species to occur in the Project Area was based on a site visit, habitat assessment, and detailed literature review. Surveys for wildlife TES were not conducted.

Table 3-9. Federal and State Listed Threatened, Endangered, and other Special-status Species that Potentially Occur at Brantley and Avalon Reservoirs.

COMMON NAME (*SCIENTIFIC NAME*)	USFWS STATUS[a]	NMDGF STATUS[b]
Wildlife		
interior least tern (*Sterna antillarum athalassos*)	E[c]	E
Mexican spotted owl (*Strix occidentalis lucida*)	T[d]	--[e]
northern aplomado falcon (*Falco femoralis septentrionalius*)	E	E
Pecos bluntnose shiner (*Notropis simus pecosensis*)	T w/ CH[f]	E
Pecos gambusia (*Gambusia nobilis*)	E	E
piping plover (*Charadrius melodus circumcinctus*)	T	T
Southwestern willow flycatcher (*Empidonax traillii extimus*)	E	E
Plants		
gypsum wild buckwheat (*Eriogonum gypsophylum*)	T w/ CH	E
Kuenzler hedgehog cactus (*Echinocereus fendleri* var. *Kuenzleri*)	E	E
Lee pincushion cactus (*Coryphantha sneedii* var. *leei*)	T	E
Sneed pincushion cactus (*Escobaria sneedii* var. *sneedii*)	E	E

[a] USFWS = Listed by U.S. Fish and Wildlife Service.
[b] NMDGF = Listed by New Mexico Department of Game and Fish.
[c] E = Endangered.
[d] T = Threatened.
[e] -- = No Agency Classification.
[f] T w/ CH = Threatened with Critical Habitat.

Least Tern

Least terns measure 8.3–9.4 inches (21–24 cm) long with a 20-inch (51-cm) wingspread. Sexes are alike, characterized by a black-capped crown, white forehead, grayish back and dorsal wing surfaces, snowy white undersurfaces, legs of various orange and yellow colors depending on sex, and a black-tipped bill whose color varies depending on sex. Immature birds have darker plumage than adults, a dark bill, and dark eye stripe on their white foreheads.

During the breeding season, the least tern's range is usually restricted to a reach of river near sandbars where nests are located. Ranges can vary considerably in size, especially for re-nesting birds who usually find sites away from the original nesting site. Terns are considered piscivorous and usually feed in shallow waters of rivers, streams, and lakes.

Nesting areas usually consist of sparsely vegetated sand and gravel bars in wide unobstructed river channels, or salt flats along lake shorelines. Nesting sites are usually located at higher elevations away from the water's edge because nesting starts when river flows are high and small amounts of sand are exposed (USFWS 1990).

The breeding population of interior least terns (*Sterna antillarum*) in New Mexico declined from about 60 birds in the early 1960s to three poorly producing nesting pairs annually from 1987 to 1990. Least terns were first recorded in New Mexico nesting at Bitter Lake National Wildlife Refuge in 1949 (USFWS 1990, 2006), and least terns have continuously nested on or adjacent to refuge

lands annually since then. Population counts over the period have been variable, ranging as high as 60 birds in 1961, but typically number 20 to 30 individuals during a breeding season.

For several years during the 1980s, the breeding colony was on a vegetation free area of the Roswell Test Facility adjacent to the refuge. The colony then shifted back to barren alkali flats on the refuge following the growth of vegetation at the off-refuge site. A 1997 survey of potential nesting habitat on BLM lands by the New Mexico Natural Heritage Program located two nests at the Grace Well flats just north of the refuge.

On June 9, 2004, five pairs of interior least terns were first observed in a backwater area of Brantley Reservoir on the Pecos River in Eddy County. It is unknown whether interior least terns had used areas around Brantley Reservoir for nesting in years prior to 2004. In 2004 a total of at least 14 adults were observed, with an estimated seven nests on the lakeshore. Six juvenile least terns were observed near the nesting area in late August. The nesting area used by least terns in 2004 spanned approximately 28 acres (USFWS 2006).

In 2006 least terns were first detected within the Project Area when a single adult was detected in mid-May. The number of least terns observed within the Project Area increased to 20 adults by late May. During summer 2006, two least tern nests were found on the west shore of Brantley Reservoir with three eggs in each nest. The nests found in 2006 were thought to have failed because of rapidly fluctuating lake levels (Doster 2006).

During 2007 the least tern population seemed to peak at five adults in late May and courtship behavior was observed. No nests were found during 2007 Project Area surveys (Doster 2007).

During the 2008 breeding season, a total of six least tern eggs were found in five nests along the western shoreline of Brantley Reservoir, northeast of Champion Cove. All nests were located well within the reservoir pool at an approximate elevation of 3,241 feet (988 meters). All eggs and nests were inundated once irrigation releases from upstream sources were initiated. In total, 30 adult least terns were documented within the Project Area during the 2008 breeding season (Doster 2009).

In 2006 approximately 84 acres (34 hectares) of least tern nesting and brood-rearing habitat was created along the western shoreline of Brantley Reservoir. These created habitat areas were not used by least terns during the 2008 breeding season. At the time when most least terns arrive at the Project Area, water levels in Brantley Reservoir were very low, leaving the created habitat sites more than 0.25 mile (0.40 kilometer) from the water's edge. As a result, the created habitat areas were much less attractive to terns that prefer to nest close to the water's edge (Doster 2009).

Southwestern Willow Flycatcher

The willow flycatcher is a widely distributed summer resident of much of the United States and southern Canada (Brown 1988). Currently, four subspecies of willow flycatcher are recognized in North America and distinguished by subtle differences in color, morphology, and breeding range

(Phillips 1948, Aldrich 1953, Unitt 1987, Browning 1993). One subspecies breeds east of the Rocky Mountains, *E. t. traillii*. Three breed west of the Rocky Mountains, *E. t. brewateri, E. t. adastus,* and *E. t. extimus* (Unitt 1987). Browning (1993) recognizes a fifth subspecies (*E. t. campestris*) that is said to occur in the central portion of the United States.

Historically, the southwestern willow flycatcher was widespread across the southwestern United States, breeding in riparian habitats ranging from sea level to approximately 7,000 feet in Arizona, southern California, New Mexico, southern Nevada, southern Utah, southwestern Colorado, west Texas, and extreme northwest Mexico (Phillips 1948, USFWS 1995, McKernan and Braden 2001). This species has been documented at a total of 109 sites on 43 drainages throughout the southwestern United States. The majority of the population occurs in Arizona, California, and New Mexico, accounting for 92 percent of all breeding territories (Marshall 2000).

In New Mexico southwestern willow flycatcher breeding territories have been documented on the upper, middle, and lower Rio Grande; the Rio Chama; the Zuni River; and the middle and lower Gila River (Marshall 2000). Although no southwestern willow flycatchers have been documented within the Project Area, suitable habitat is present along the Pecos River between Brantley and Avalon Reservoirs (R.H. Doster 2008, pers. comm.).

Plants

A list of State and Federally protected vegetation species for Eddy County was obtained from Natural Heritage New Mexico (NMNHP 2008). Of the seven species listed for Eddy County, four are Federally protected and another three are State protected. Of the species presented in Table 3-9, only the gypsum wild-buckwheat is known to occur within the Project Area (Reclamation 2003).

Gypsum Wild-buckwheat

Only three populations of the gypsum wild-buckwheat are known to exist in the world, all in Eddy County, New Mexico. One of these populations is found on both Reclamation and BLM lands in the lower Seven Rivers Hills area, immediately west of US-285 on the west side of the Project Area. On Reclamation lands the species occurs within the Mixed Desert Scrub habitat on the Seven Rivers Hills escarpment where approximately 50 individuals have been observed. An adjacent 540-acre (219-hectare) parcel of BLM land is designated as a Special Management Area (SMA) to protect the species and its habitat (Reclamation 2003). Critical habitat was designated for the species on the adjacent SMA lands in 1981. Typically, the plant is found on gypsum soils, most frequently on materials that have eroded from nearby gypsum outcrops. On the Seven Rivers Hills SMA, the terrain is mostly a complex of bare, steep slopes and deep, eroded arroyos (BLM 1986).

Fishes

The Pecos bluntnose shiner is the only Federally listed fish species that potentially occurs within the Project Area. Its distribution, abundance, and life history are provided below.

Pecos Bluntnose Shiner

Distribution and Abundance

The Pecos bluntnose shiner (*Notropis simus pecosensis*) is a cyprinid species endemic to the Pecos River in New Mexico and Texas. The abundance and distribution of the bluntnose shiner has declined since the mid 1900s largely because of habitat alterations to the Rio Grande and Pecos Rivers resulting from water diversions and the construction of impoundments (Hatch et al. 1985; USFWS 1987). Although there was some confusion regarding taxonomic status of the species, Chernoff et al. (1982) determined that two subspecies existed. The Rio Grande subspecies, now considered extinct, occurred from El Paso, Texas, north to the Chama River in New Mexico. The Pecos form historically occurred from the town of Santa Rosa to an area north of Carlsbad (USFWS 1987, Bestgen and Platania 1990).

Declines in the abundance of the Pecos bluntnose shiner were reported by Brooks et al. (1991). Their review of historic collections and comparisons with fish surveys conducted in the Pecos River from 1986 to 1990 also provided evidence of the reduction in the range of this species. Pecos bluntnose were captured sporadically from Sumner Dam downstream to the Brantley Reservoir inflow. As noted, the species historically occurred throughout the Pecos River in both New Mexico and Texas, but their range is now restricted to a 225-mile (362-km) section of the river between these two reservoirs (Hatch et al. 1985, Brooks et al. 1991). Hatch et al. (1985) warn that their distribution in this river section is tenuous because of periodic dewatering of many habitats for irrigation demands. A narrower range was reported by Brooks et al. 1995, indicating that collections during 1990 occurred only from approximately 4.8 miles (8 km) south of Fort Sumner downstream to an area near the Rio Felix confluence. There is also evidence that adult or breeding Pecos bluntnose shiner tend to be more common upstream of the Highway 70 bridge near Roswell. Downstream of the Rio Hondo confluence near Roswell, samples have included mostly eggs, larvae, and young bluntnose shiner (Brooks et al. 1991). Recent fish community monitoring surveys between the confluence of Willow Creek and the Bitter Lake National Wildlife Refuge indicate that Pecos bluntnose shiner catch rates have increased since 2005 because of more favorable hydrologic conditions. Results of these surveys indicate higher catch rates of Pecos Bluntnose shiner in the upper reaches of the section sampled than at lower reaches. Catch rates in lower reaches, including the Brantley Reservoir inflow, increased seasonally because of upstream reproduction (Davenport 2008).

Several factors have contributed to the imperiled status of the Pecos bluntnose shiner, but the most significant appears to be seasonal dewatering of substantial reaches of its historic habitat (Propst 1999, Davenport 2008). Other factors that have contributed to the decline of the Pecos bluntnose shiner locally include contaminants, non-native predators, and channel modification (NMDGF 2006). Non-native fish species include the plains minnow (*Hybognathus placitus*) and the Arkansas River shiner (*Notropis girardi*) (Sublette et al. 1990), which now comprise a large portion of the shiner guild and may result in increased inter-specific competition with Pecos bluntnose shiner.

The Pecos bluntnose shiner was listed by the NMDGF as a State threatened species in 1976. In 1987 the USFWS listed this species as Federally threatened and designated critical habitat (USFWS 1987). Critical habitat for the species was designated in two sections of the Pecos River. The first section extends from approximately 10 miles (16 km) downstream of Ft. Sumner and approximately 64 miles (103 km) further downstream. The second section starts near Hagerman and extends 37 miles (60 km) to the Highway 82 bridge, near Artesia. The designated critical area for this species does not extend into the Project Area. Brantley Dam is located approximately 15 miles (24 km) below the critical area boundary and does not affect the designated critical habitat (USFWS 1987). However, this species reportedly occurs seasonally in the headwaters of Brantley Reservoir because of the displacement of young fish from upstream habitats during flood events (USFWS 1992).

Within the designated critical habitat sections of the Pecos River, the channel is typically wide, sandy, and unstable. The shifting bed structure is a common attribute of suitable habitat for the Pecos bluntnose shiner, where the channel spreads out and becomes braided. This stretch of river is hydrologically characterized as a losing reach, where surface water is lost to seepage and evaporation. Under some conditions water losses in this portion of the river can be as high as 50 percent before the water reaches Acme. Downstream from Acme, the river is a gaining reach and is characterized by a narrowing and deepening channel, which decreases its value as shiner habitat.

Life History and Ecology

The Pecos bluntnose shiner is a relatively large shiner. Adults reach up to 3.5 inches (9 cm) (USFWS 1987). Hatch et al. (1985) reported sizes of three age classes with the age-2 fish ranging from 2.3 to 2.8 inches (59–72 millimeters [mm]) in total length. In the wild, bluntnose shiners may survive 3 years, but most in a population are age-1 or less (USFWS 1992).

The Pecos bluntnose shiner is a pelagic broadcast spawner. Spawning begins in early summer and ends in October (Sublette et al. 1990). Elevated flow (e.g., from spring runoff, storm events) is an environmental cue to initiate spawning (Platania 1995). Females release their nonadhesive, semi-buoyant eggs in the water column and males immediately fertilize them (Platania 1998). Life-history studies of this species have suggested that fertilized eggs hatch relatively quickly, within 24 to 48 hours, and their dispersal is more closely related to increased flow than to absolute water volume (Platania 1995). In the protolarvae stage, bluntnose shiners drift with the current and in 4 to 8 days move into protected, low-velocity habitats. Larvae and juveniles tend to be most common in slow-velocity shoreline habitats and small embayments and backwaters (Propst 1999). Platania (1995) suggested that this life-history strategy allows larvae to gain refuge from high flows at a very early stage. Backwaters, characterized by warm and relatively nutrient- rich waters, allow larvae to reach their maximum growth rate.

The Pecos bluntnose shiner is a drift feeder (Hoagstrom 2002), positioning itself in relatively calm water next to currents within the water column. Adult bluntnose shiners are mainly insectivorous, while young likely feed on zooplankton and small aquatic insects (Propst 1999). Hatch et al. (1985) found that the species occupies most major habitats within the river, but is most common in the main

channel, in low-velocity water, 6.5–16.1 inches (17–41 cm) deep, over a sandy substrate. More specifically, habitat use and availability studies conducted by Kehmeier et al. (2004) have indicated that Pecos bluntnose shiners commonly select low to moderate velocity plunge habitats and avoid higher-velocity runs and flats. Their study also indicated that plunge habitats selected by this species did not change significantly as a result of variations in discharge, while runs and flats increased significantly with discharge.

Permanent river flows are considered critical for the conservation of the Pecos bluntnose shiner (USFWS 1992). Valdez et al. (2003) and Kehmeier et al. (2004) reported that habitats more often used by Pecos bluntnose shiners were available in similar quantities despite substantial variations in discharge (i.e., 3–80 cfs) during their studies. These authors suggested that flexible management of the Pecos River based on water availability may be more appropriate than managing to provide minimum flows for the conservation of the Pecos bluntnose shiner. It has been hypothesized that predation pressure on Pecos bluntnose shiner and other prey species would increase in isolated pools during extended zero-flow periods (Larson and Propst 2000). Further, Hatch et al. (1985) have suggested that stream desiccation could be considered the main reason for the decline of the species in the Pecos River.

3.2.9 Cultural Resources

The Project Area and its area of impact include a variety of cultural resources. Cultural resources are those that tie the regional land use heritage to a concept of "time depth." Known Project Area cultural resources include archaeological sites (prehistoric and historic) and the Carlsbad Irrigation District (CID) National Historic Landmark. Reclamation will continue to conduct Section 106 review and compliance on oil and gas projects pursuant to a Programmatic Agreement with the BLM. The BLM is the lead agency for cultural resources compliance on projects that (1) involve permission to drill on BLM or Reclamation lands, including access roads and pipelines submitted as a package with a well; and (2) involve multiple surface land status, in which BLM is one of the parties (Reclamation 2002). Reclamation will periodically undertake archaeological field projects on its historic properties as part of its Section 110 stewardship responsibility. Reclamation will also continue to monitor the condition of its historic properties and fulfill its obligations under the Archaeological Resources Protection Act of 1979 (J. Hanson 2007, pers. comm.).

Archaeological Sites

An archaeological site is a location with physical evidence of past human use, occupation and/or activity. Features, structures, and accumulated artifacts left after the use of a site comprise this physical evidence. Patterns in the evidence are interpreted to provide an understanding of a site's use. Most of the Project Area archaeological sites can be tied to Native American groups and reflect prehistoric use. Some, however, contain elements illustrating the transition to historic lifeways. Fewer can be associated strictly with European American occupation of the region. This regional history progression provides a model dividing archaeological sites into distinct sets.

A total of 252 archaeological sites have been documented within the Project Area. This total combines the 202 sites documented during previous projects with those identified as a result of a 1999 inventory of a 1,500-acre (607-hectare) parcel of the current Project Area (Weymouth et al. 2000). Of all of the known sites within the Project Area, 80 percent are prehistoric, 12 percent are historic, and 8 percent possess both historic and prehistoric components. Reclamation is in the process of nominating to the National Register Historic Places (NRHP) 23 archaeological sites in the McMillan-Avalon segment of the Pecos River (J. Hanson 2007, pers. comm.).

The Carlsbad Irrigation District (CID)

In 1882 retired Lincoln County Sheriff Pat Garret returned to his ranch in Roswell, New Mexico. He devised a plan to dam the Pecos River and sell water to the farmers who would be attracted by the reclaimed lands. He gained financial backing from partnerships with prominent cattleman Charles B. Eddy, cigar manufacturer Robert Weems Tansill, and railman James J. Hagerman. This group founded the Pecos Irrigation and Investment Company. In the late 1800s, Avalon Dam was constructed. By 1890 it held back the Pecos River, and the first portion of an irrigation network was installed. By 1893 the Pecos Irrigation Company added McMillan Dam, located upstream, to its system. Problems with the dams and canals proved costly. Although the founders of the small irrigation company spent $2,000,000 on upkeep of the system, it was never made efficient (Hufstetler and Johnson 1993).

Violent floods swept the Pecos River in October 1904. Among the hardest hit was the Pecos Irrigation Company. The Carlsbad Reclamation Project, as it had come to be known, was so terribly underfunded that repairs to the damaged canals and waterworks proved impossible. The company went bankrupt and local farms went without water (Hufstetler and Johnson 1993).

On November 28, 1905, the Secretary of the Interior acquired, through the U.S. Reclamation Service (Reclamation Service), the Carlsbad Reclamation Project for $150,000. The Reclamation Service started reassembling the entire Carlsbad irrigation network. By 1907 most of the damaged irrigation system was repaired. The agency then implemented new technological advances in dam and gate design. By the next decade the Reclamation Service had built an impressive irrigation network. With better funding than their predecessors, the Reclamation Service was able to promote the irrigation district. This attracted many farmers seeking affordable land and Federally subsidized irrigation service (Hufstetler and Johnson 1993).

In 1964 CID facilities constructed between 1888 and 1949 as part of the Carlsbad Irrigation project or Improvement Company were listed as a National Historic Landmark (NHL). The CID was designated a NHL for its significance to “the historic evolution of western American reclamation activity and policy” (Hufstetler and Johnson 1991). The CID’s resources are representative of technological experimentation and evolution in irrigation structures during the late 19th and early 20th centuries (Hufstetler and Johnson 1991).

The NHL boundaries were defined in a revision to the NRHP in 1991. This district encompasses 5,464 acres (2,211 hectares) and at the time of the nomination revision, the area included McMillan Dam and Reservoir, Avalon Dam and Reservoir, and 28 canals, structures, and support buildings (Hufstetler and Johnson 1991).

In 1993 the National Park Service (NPS) incorporated the CID's NRHP nomination and numerous Historic American Building Survey/Historic American Engineering Record studies into a published history of the district (Hufstetler and Johnson 1993). Later that year the NPS assessed the McMillan gatekeeper's house, garage/boathouse, and gatehouse, and the outlet works for stabilization and potential restoration (Kline n.d.).

In 2000 ownership of the distribution system and other elements of the NHL were transferred to CID from Reclamation under terms outlined in a MOU, which ensures continued cultural resource protection. All historic properties included in the CID NHL will continue to be subject to Federal statute under the National Historic Preservation Act and the New Mexico State Cultural Properties Act, as appropriate (J. Hanson 2007, pers. comm.). All historic properties within the Brantley-Avalon area that are eligible for the NRHP but not part of the NHL also may require Section 106 review and compliance to determine the effects of any undertaking on the properties. State law also may apply (J. Hanson 2007, pers. comm.).

Traditional Cultural Properties (TCPs)

A traditional cultural property (TCP) is "one that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of that community" (Parker and King 1992). An initial TCP study for the Project Area was initiated in 1998, and correspondence with concerned Native American groups continued through 1999. Consultation was conducted with the Mescalero Apache, the Comanche, and the Kiowa because they are the most prominent in the Project Area's ethnographic history. Active correspondence with these groups was maintained throughout the initial TCP study. Each group recognizes the Project Area as having been occupied and utilized by their people. Ongoing correspondence allowed sufficient opportunity for the members of these groups to discuss their concerns about the RMP.

The initial TCP study summarized the ethnographic histories of each of the selected groups (Polk and Wenzel 2000). Each group's history, language, cultural practices, social organization, and subsistence strategies were taken into account. The Project Area's role in these aspects of culture was then analyzed. No TCPs have been identified, to date, within the Project Area by any of the tribes consulted.

Indian Sacred Sites

In 1996 President William J. Clinton signed Executive Order 13007: Indian Sacred Sites. Section 1 of the executive order requires that all executive agencies manage the lands under their jurisdiction in a manner that facilitates access and ceremonial use of Indian Sacred Sites by Indian religious

practitioners. This facilitation includes the avoidance of such sites in order to protect their physical integrity, feeling, and association.

To date, Reclamation has received no tribal claims regarding the sacred nature of any location within the Project Area. Correspondence with the Mescalero Apache, Comanche, and Kiowa was conducted in conjunction with the initial TCP study. Although all of the groups contacted made statements to the effect that they recognize the importance of the Pecos River to their general cultural heritage, no concern was voiced about the sanctity of any particular property at that time.

3.2.10 Indian Trust Assets (ITAs)

Indian Trust Assets are "legal interests" in assets held in trust by the U.S. Government for individual Indians or tribes. Lands, minerals, water rights, hunting and fishing rights, claims, titles or money are some of the assets held in ITAs. As assets held in trust, ITAs cannot be sold, leased, or alienated without the express approval of the U.S. Government. Secretarial Order 3175 and Reclamation policy require that Reclamation evaluate and assess impacts of a proposed project on ITAs. This requires inventorying all ITAs within the Project Area. Should any ITA be impacted, mitigation of impact must be undertaken.

The Comanche, Kiowa, Mescalero Apache, and the Bureau of Indian Affairs were contacted concerning possible ITAs in the Project Area. To date, none have been identified.

3.2.11 Paleontological Resources

Paleontology is the study of plant and animal fossil remains. It takes into account the stratigraphic orientation and geologic contexts of fossiliferous rocks in order to provide some understanding of paleoenvironments. The purpose of this section is to identify paleontological localities and fossil-bearing geologic strata and to provide an understanding of the potential impacts upon the Project Area's paleontological resources. Permian sedimentary rock formations mantled by Quaternary deposits comprise the bedrock geology of the Project Area. Most of the Permian deposits are remnants of the Permian Basin, which formed during the late Paleozoic (230 to 280 mya). Climatic changes caused the sea levels to fluctuate. Some portions evaporated completely, leaving large deposits of dolomite, potash, and gypsum.

Brantley and Avalon Reservoirs lie on top of the Artesia Group, between the San Andreas Formation (west) and Triassic Formation (east). The Artesia Group consists of five formations. These five are, in ascending order, Graysburg, Queen, Yates, Seven Rivers, and Tansill. The Graysburg and Queen Formations consist of sandstone, dolomite, and gypsum. Limestone, gypsum, and dolomite predominate the Seven Rivers Formation. The Yates Formation includes both sandstone and limestone with deposits of dolomite and gypsum. Dolomite and gypsum dominate the Tansill

Formation. This geology, based on information found in Kelley (1971), Lucas and Anderson (1994), and Hill (1996) is summarized below.

No fossil localities are known to exist within a 3-mile (5-km) radius of the Project Area (Lucas 1999). However, Project Area's geology is conducive to the preservation of fossil remains. Permian formations would most likely represent primitive marine life. Gastropods and pelecypods may also be represented. Echinoderms, corals, and trilobites may occur with diminished frequency. The paleontology of the Project Area is based largely on Donegan and DeFord (1950), Walter (1953), Hayes (1964), Croft (1978), Miller (1982), Wardlaw and Grant (1992), Harris (1993), Noe and Mazullo (1994) and Lucas and Morgan (1996).

Although no sensitive paleontological localities have been documented in the Project Area vicinity, some exposures of specific geologic strata may contain sensitive fossil elements. There is a high potential for paleontological resources to be in the Project Area. This potential is greatest wherever stable and well-stratified rock outcrops are exposed within the Project Area.

3.2.12 Social and Economic Values

This section describes the social and economic conditions in the RMPA area of influence. Information on the local economy, such as tourism, oil, gas, and grazing is included. The most recent demographic information on Eddy and Chaves Counties, and the communities affected by management of resources within the Project Area are described.

The area of influence, for social and economic analysis purposes, is described as Chaves and Eddy Counties, New Mexico. The principal communities under consideration are the Cities of Carlsbad (including North Carlsbad, a census designation given to the developed area just north of the incorporated city), Artesia, and Roswell.

Demographics

Population

Table 3-10 summarizes population characteristics comparing Chaves and Eddy Counties to the state as a whole. Table 3-11 summarizes demographic characteristics for communities in the Project Area that are potentially affected by resource management: Artesia, Carlsbad, North Carlsbad, and Roswell.

Eddy County

The U.S. Census 2000 population of Eddy County was 51,658 and there were 14,060 families or an average family size of 3.12 persons. Approximately 39 percent of the population was Hispanic and 70 percent lived in an urban setting. The largest urban area is the county seat, Carlsbad; 49.6 percent of the county population resided in Carlsbad in 2000.

Table 3-10. The 2000 Population Characteristics for Counties Influenced by Resource Management within the Project Area.

CATEGORY	NEW MEXICO		EDDY COUNTY			CHAVES COUNTY		
	Total	Percent of Total	Total	Percent of Total	Percent of State	Total	Percent of Total	Percent of State
U.S. Census 2000 [a]								
Persons	1,819,046	100.0	51,658	100.0	2.8	61,382	100.0	3.4
Families	466,515	100.0	14,060	100.0	3.0	16,077	100.0	3.4
Average family size	3.18	– [b]	3.12	–	–	3.17	–	–
Hispanic or Latino Ethnicity, Persons	765,386	42.1	20,023	38.8		26,904	43.8	
Urban:	1,238,037	68.0	36,211	70.1	2.9	45,194	73.6	3.7
Inside Urbanized Area	674,017	54.4	–	0.0	0.0	–	0.0	0.0
Outside Urbanized Area	564,020	45.6	36,211	100.0	6.4	45,194	100.0	8.0
Rural:	581,009	32.0	15,447	29.9	2.6	16,188	26.4	2.8
Farm	14,102	2.4	714	4.6	5.1	681	4.2	4.8
Nonfarm	566,907	97.6	14,733	95.4	2.6	15,507	95.8	2.7
2006–2008 3-Year Estimates [c]								
Persons	1,962,226	100.0	50,986	100.0	2.6	62,339	100.0	3.2
Families	482,189	100.0	13,518	100.0	2.8	16,341	100.0	3.4
Hispanic or Latino Ethnicity, Persons	873,171	44.5	21,443	42.1	2.5	30,298	48.6	3.5
Population Growth Projections [d]								
Persons, 2015	2,357,234	100.0	56,331	100.0	2.4	65,025	100.0	2.8
Persons, 2025	2,707,757	100.0	59,731	100.0	2.1	68,720	100.0	2.5

[a] Source: USCB 2010.
[b] No data available.
[c] 2006–2008 American Community Survey 3-Year Estimates (USCB 2010).
[d] New Mexico State Data Center (NMEDD 2010).

Based on the 2006–2008 American Community Survey, Eddy County had an estimated population of 50,986, approximately 2.6 percent of New Mexico's estimated total population of 1.96 million over the same period. This estimate represented a small decline in the county population from the Census 2000 population of 51,658. Population growth estimates by the State of New Mexico show that Eddy County is projected to grow at a slower rate than the state as a whole, but is expected to exceed 59,700 by 2025. The county Hispanic population proportion estimate for 2006–2008, 42.1 percent, was slightly higher than the 2000 county estimate (39 percent) and was slightly lower than the statewide estimate, 44.5 percent, in 2006–2008.

Table 3-11. The 2000 Population Demographics for Communities Influenced by Resource Management within the Project Area.

PERSONS	ARTESIA CITY Eddy County			CARLSBAD CITY Eddy County			CARLSBAD NORTH Eddy County			ROSWELL CITY Chaves County		
	Total	Percent of Total	Percent of County	Total	Percent of Total	Percent of County	Total	Percent of Total	Percent of County	Total	Percent of Total	Percent of County
Persons, 2000[a]	10,692	100.0	20.7	25,025	100.0	49.6	1,245	100.0	2.4	45,293	100.0	73.8
Persons, 2007[b]	10,485	100.0	20.6	25,033	100.0	49.0	–[d]	–	–	45,569	100.0	72.8
Total Families, 2000[a]	2,895	100.0	20.6	6,951	100.0	49.4	377	100.0	2.7	11,747	100.0	73.1
Persons of Hispanic Origin, 2000[a]	4,809	45.0	9.3	9,417	36.7	18.2	181	14.5	0.4	20,084	44.3	32.7
Persons of Hispanic Origin, 2006–2008[c]	–	–	–	10,296	40.7	20.2	–	–	–	23,223	50.1	37.3

[a] 2000 U.S. Census (Source: USCB 2010).
[b] 2008 New Mexico Statistical Abstract & Resources (NMEDD 2010).
[c] 2006-2008 American Community Survey 3-Year Estimates (USCB 2010).
[d] No data available.

Chaves County

Chaves County is slightly more populous than Eddy County, with a Census 2000 population of 61,382 and a 2006-2008 estimated population of 62,339. The average family size in 2000 (3.17) was similar to that of Eddy County (3.12) and the state as a whole (3.18) Chaves County is expected to grow to 68,720 persons by 2025. As with Eddy County, most of Chaves County's population was urban or urbanized (73.6 percent in the 2000 Census), residing primarily in the county seat of Roswell with 45,293 persons in 2000 and 45,569 in 2007. Nearly half (48.6 percent) of the County Population 2006–2008 was Hispanic.

Communities

Carlsbad and Roswell are the respective county seats of Eddy County and Chaves County. Each is a medium-sized city; the 2007 estimated population of Carlsbad was 25,033 persons and Roswell's estimate was 45,569 persons. The Hispanic populations of Carlsbad and Roswell were similar in proportion to their respective counties. Artesia and Carlsbad North are smaller towns located in Eddy County. Artesia's 2007 estimated population was 10,485. Carlsbad North's population was 1,245 in the 2000 Census. A more recent estimate for Carlsbad North was not available.

Income

Household and personal income characteristics are summarized in Tables 3-12 and 3-13. Median household income and per capita income in Chaves County is lower than statewide figures, both in the Census 2000 and 2006–2008 American Community Survey estimates. Eddy County also had values below the statewide figures in Census 2000, but was higher than the state estimates in 2006–2008. Consistent with these trends, the proportion of persons with income below the poverty level is higher in Chaves County (21 percent in 2000 and 20 percent in 2006–2008), compared to the state (about 18 percent in both census estimates). The Eddy County proportion was slightly lower in 2000 (17.2 percent), and even lower in 2006–2008 (14.4 percent).

Table 3-12. The 2000–2004 Income Characteristics for Counties Influenced by Resource Management within the Project Area.

CATEGORY	NEW MEXICO		EDDY COUNTY		CHAVES COUNTY	
	Number	Percent	Number	Percent	Number	Percent
Census 2000[a]						
Median Household Income	$34,133	–[b]	$31,998	–	$28,513	–
Per Capita Income	$17,261	–	$15,823	–	$14,990	–
Income below Poverty Level, Persons	328,933	18.1	8,885	17.2	12,936	21.1
Income below Poverty Level within Race/Ethnic Group[c]						
White alone	167,002	14.0	5,675	14.6	7,463	17.3
Black or African American alone	7,204	23.0	280	29.9	410	35.6
American Indian and Alaska Native alone	61,092	36.2	112	28.3	268	46.0
Asian alone	2,421	13.5	20	9.2	23	6.3
Native Hawaiian and Other Pacific Islander alone	144	11.9	–	–	3	6.0
Some other race alone	77,047	25.2	2,433	26.6	4,013	31.5
Two or more races	14,023	20.3	249	17.7	598	29.2
Hispanic or Latino Ethnicity, any Race	178,288	23.7	5,188	26.1	8,550	32.3
2006–2008 3-Year Estimates[d]						
Median Household Income	$43,202	–	$45,858	–	$37,536	–
Per Capita Income	$22,781	–	$25,151	–	$19,021	–
Income below Poverty Level, Persons	–	17.9	–	14.4	–	20.0

[a] 2000 U.S. Census (USCB 2010).
[b] Not applicable or no data.
[c] Percentages within race/ethnic group, persons for whom poverty status is known.
[d] 2006-2008 American Community Survey 3-Year Estimates (USCB 2010).

Table 3-13. The 2000 Poverty Characteristics for Communities Influenced by Resource Management within the Project Area.

CATEGORY	ARTESIA CITY Eddy County		CARLSBAD CITY Eddy County		CARLSBAD NORTH Eddy County		ROSWELL CITY Eddy County	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Census 2000[a]								
Median household income	$29,529	–[b]	$30,658	–	$52,361	–	$27,252	–
Per Capita Income	$13,085	–	$16,496	–	$27,192	–	$14,589	–
Income below Poverty Level, Persons	2,177	20.4	4,175	16.7	44	3.5	10,003	22.1
Income below Poverty Level within Race/Ethnic Group[c]								
White alone	1,259	16.4	2,925	15.0	44	4.0	5,757	18.6
Black or African American alone	48	25.4	173	26.4	–	–	388	35.2
American Indian and Alaska Native alone	36	28.1	53	31.7	–	–	252	48.6
Asian alone	13	32.5	7	4.5	-		19	5.6
Native Hawaiian and Other Pacific Islander alone	–	–	–	–	–	–	–	–
Some other race alone	667	28.0	966	23.4	–	–	3,100	32.1
Two or more races	154	42.3	51	7.4	–	–	487	28.6
Hispanic or Latino Ethnicity	1,521	29.9	2,051	22.1	12	6.0	6,650	33.1
2006–2008 3-Year Estimates[d]								
Median household income	–	–	$43,138	–	–	–	$35,869	–
Per Capita Income	–	–	$22,963	–	–	–	$19,065	–
Income below Poverty Level, Persons	–	–	–	11.2	–	–	–	21.0

[a] 2000 U.S. Census (USCB 2010).
[b] Not applicable or no data.
[c] Percentages within race/ethnic group, among persons for whom poverty status was known.
[d] 2006-2008 American Community Survey 3-Year Estimates (USCB 2010).

The communities differed quite a bit in household and personal income characteristics. Carlsbad North had the highest estimates for median household income and per capita income in the Census 2000 figures. The other three communities had estimates slightly below the statewide figures. Similarly the proportion of persons with income below the poverty level was much lower in Carlsbad North (3.5 percent) than the other communities or the statewide figure (18 percent). In the

2006–2008 American Community Survey, estimates are only available for the county seats, Carlsbad and Roswell. Income characteristics for Carlsbad were similar to the statewide figures for that period, while estimates for Roswell were somewhat lower.

Employment

The civilian labor force in Eddy County in August 2010 was 29,041 individuals, of which 1,730 were unemployed (6 percent). The labor force in Chaves County was 28,511, of which 2,326 were unemployed (8.2 percent). Statewide, the unemployment rate was 8.4 percent (NMDOL 2010). Employment characteristics by sector from the U.S. Census are summarized in Tables 3-14 and 3-15. The general patterns for the Project Area counties and communities are similar to the state as a whole except that there are proportionately more individuals employed in the private, for-profit sector and slightly fewer in the government sector proportionately. Carlsbad North was the exception, where proportionately there were more government workers (32.7 percent of the local civilian employed population); however, this figure is from the 2000 Census. A more recent estimate for Carlsbad North was not available.

In terms of employment by industry (Table 3-16), Eddy County is different from Chaves County and the state as a whole in having a larger proportion of the labor force in mining. Health Care and Social Assistance are the largest employment sectors in Chaves County and in the State as a whole. Average weekly wages (Table 3-17) are relatively higher in Eddy County as well. Eddy County ranked second to Los Alamos County out of 33 New Mexico Counties for average weekly wage in the first quarter of 2010. Chaves County was ranked 15th.

Housing

The Project Area counties appear to provide affordable living. In the 2006–2008 American Community Survey (USCB 2010), the median home prices in Eddy County ($85,600) and Chaves County ($81,400) were equal to 55 percent and 52 percent of the Statewide median of $154,900, respectively. Rent in the Project Area is also somewhat lower, from 11 percent to 16 percent lower than the State median of $661.

Local Economy

The local economy is historically linked to the extraction of mineral resources, principally potash and petroleum. Tourism also plays a role in the local economy. Over the years, ranching and agriculture, long important industries, have also generated much of the local economic activity. However, it is important to note that only about 5 percent of the total local population resides in rural areas.

Table 3-14. The 2000 Employment Characteristics for Counties Influenced by Resource Management within the Project Area.

WORKERS	NEW MEXICO		EDDY COUNTY			CHAVES COUNTY		
	Persons	Percent of Total	Persons	Percent of Total	Percent of State	Persons	Percent of Total	Percent of State
Census 2000 [a]								
Employed Persons 16 Years and Over	763,116	42.0	20,591	39.9	2.7	23,028	37.5	3.0
Private for Profit Wage and Salary Workers	518,466	67.9	15,310	74.4	3.0	16,713	72.6	3.2
Local Government Workers	84,120	11.2	2,028	9.8	2.4	1,788	7.8	2.1
State Government Workers	59,040	7.7	778	3.8	1.3	813	3.5	1.4
Federal Government Workers	30,029	3.9	667	3.2	2.2	1,546	6.7	5.1
Self-employed Workers	68,108	8.9	1,702	8.3	2.5	2,010	8.7	3.0
Unpaid Family Workers	3,353	0.4	106	0.5	3.2	158	0.7	4.7
2006–2008 3-Year Estimates [b]								
Civilian Employed Population 16 Years and Over	763,116	–	23,265	–	3.0	26,756	–	3.5
Private for Profit Wage and Salary Workers	522,466	68.5	17,168	73.8	3.3	19,875	74.3	3.8
Government Workers	173,189	22.7	4,236	18.2	2.4	4,142	15.5	2.4
Self-employed Workers	64,108	8.4	1,813	7.8	2.8	2,655	9.9	4.1
Unpaid Family Workers	3,353	0.4	48	0.2	1.4	84	0.3	2.5

[a] 2000 U.S. Census (USCB 2010).
[b] 2006–2008 American Community Survey 3-Year Estimates (USCB 2010).

Table 3-15. The 2000 Employment Characteristic for Communities Influenced by Resource Management within the Project Area.

WORKERS	ARTESIA CITY (EDDY COUNTY)			CARLSBAD CITY (EDDY COUNTY)			CARLSBAD NORTH (EDDY COUNTY)			ROSWELL CITY (CHAVES COUNTY)		
	Persons	Percent of Total	Percent of County	Persons	Percent of Total	Percent of County	Persons	Percent of Total	Percent of County	Persons	Percent of Total	Percent of County
Census 2000 [a]												
Civilian Employed Population 16 Years and Over	4,411	53.9	21.4	10,065	40.9	51.2	569	57.5	2.8	16,582	48.6	72.0
Private for Profit Wage and Salary Workers	3,285	74.5	15.6	7,688	76.4	37.3	341	59.9	1.7	12,107	73.0	52.6
Government Workers	732	16.6	3.6	1,674	16.6	8.1	186	32.7	0.9	3,079	18.8	13.4
Self-employed Workers	354	8.0	1.7	675	6.7	3.3	42	7.4	0.2	1,316	7.9	5.7
Unpaid Family Workers	40	0.9	0.2	28	0.3	0.1	0	0	0	80	0.3	0.3
2006–2008 3-Year Estimates [b]												
Civilian Employed Population 16 Years and Over	– [c]	–	–	11,446	45.3	–	–	–	–	20,277	43.8	–
Private for Profit Wage and Salary Workers	–	–	–	8,460	73.9	–	–	–	–	15,263	75.3	–
Government Workers	–	–	–	2,245	19.6	–	–	–	–	3,079	15.2	–
Self-employed Workers	–	–	–	693	6.1	–	–	–	–	1,869	9.2	–
Unpaid Family Workers	–	–	–	48	0.4	–	–	–	–	66	0.3	–

[a] 2000 U.S. Census (USCB 2010).
[b] 2006–2008 American Community Survey 3-Year Estimates (USCB 2010).
[c] No data available.

Table 3-16. Employment by Industry for First Quarter 2010 in the State of New Mexico and in Eddy and Chaves Counties.

INDUSTRY	NEW MEXICO			EDDY COUNTY			CHAVES COUNTY		
	Employers	Employees	Percent Employees	Employers	Employees	Percent Employees	Employers	Employees	Percent Employees
Agriculture, Forestry, Fishing and Hunting	747	9,331	1.2	40	362	1.6	79	1,223	5.7
Mining	913	17,390	2.2	114	3,815	16.4	53	389	1.8
Utilities	402	6,186	0.8	24	281	1.2	11	141	0.7
Construction	6,071	46,062	6.0	157	1,691	7.3	162	1,149	5.4
Manufacturing (31–33)	1,616	28,456	3.7	33	834	3.6	48	944	4.4
Transportation and Warehousing (48 and 49)	1,733	20,968	2.7	63	792	3.4	74	907	4.2
Wholesale Trade	3,004	21,526	2.8	70	527	2.3	67	688	3.2
Retail Trade (44 and 45)	6,452	89,718	11.6	164	2,218	9.5	213	2,801	13.1
Information	1,004	15,655	2.0	24	278	1.2	21	251	1.2
Finance and Insurance	2,746	21,754	2.8	73	653	2.8	96	595	2.8
Real Estate and Rental and Leasing	2,382	10,002	1.3	50	424	1.8	77	180	0.8
Professional, Scientific and Technical Service	6,387	54,856	7.1	90	979	4.2	126	580	2.7
Management of Companies and Enterprises	274	4,937	0.6	– [c]	–	–	11	49	0.2
Admin., Support, Waste Mgmt, Remediation	2,913	42,317	5.5	66	1,481	6.4	59	451	2.1
Education Services	1,111	84,113	10.9	39	2,018	8.7	40	2,412	11.2
Health Care and Social Assistance	5,893	121,494	15.7	134	2,744	11.8	247	4,048	18.9
Arts, Entertainment, and Recreation	879	16,200	2.1	–	–	–	20	267	1.2
Accommodation and Food Services	3,854	78,314	10.1	110	1,830	7.9	115	2,807	13.1
Other Services (except Public Admin.)	4,050	20,922	2.7	117	723	3.1	136	544	2.5
Public Administration	1,720	63,079	8.2	67	1,298	5.6	66	1,027	4.8
Unclassified establishments	22	13	0.0	0	0	0.0	1		0.0
All Industries	54,173	773,293	100.0	1,455	23,257	100.0	1,722	21,454	100.0

Source: New Mexico Department of Labor (NMDL 2010)
[a] Data not available.

Table 3-17. Comparison of State Employment and Wage Levels to Eddy and Chaves Counties, First Quarter 2010.

EMPLOYMENT AND WAGES	NEW MEXICO	EDDY COUNTY	CHAVES COUNTY
Total Average Employment	**773,293**	**23,257**	**21,454**
Average Hourly Wage [a]	**$17.90**	**$22.03**	**$14.25**
Average Weekly Wage	**$716**	**$881**	**$570**
Average Annual Wage [a]	**$37,232**	**$45,812**	**$29,640**

[a] Assumes a 40-hour week worked the year round.

Tourism

The Carlsbad Caverns and Guadalupe Mountains National Parks are major tourist attractions for the area. The Carlsbad Caverns were named a World Heritage Site in 1995, one of only 21 in the United States. Other tourism draws are Brantley and Avalon Reservoirs (specifically Brantley Lake State Park) and the Living Desert State Park. Cavern City Air Terminal is operated by the City of Carlsbad. One commercial airline offers daily service to Albuquerque. The El Paso International Airport is located approximately 140 miles (225 km) from Carlsbad by motor vehicle.

Oil and Gas Industry

The petroleum industry in New Mexico directly provided 13,000 jobs in 2003 (BMMR 2003, IPPA 2005). This amounted to 1.4 percent of the total non-agricultural jobs in the State (730,100) (BBER 2003). While the percentage is low for the state overall, gas industry jobs are geographically significant to the economies in the northwestern and southeastern portions of the state, where they are located. The San Juan Basin in northern New Mexico has 85 percent of the conventional natural gas in the state; the Permian Basin in southeastern New Mexico has 90 percent of the oil-linked natural gas.

Four in-state refineries, three located in the northwestern portion of the state and one in the southeast, refine about 40 percent of the state's crude oil production; the rest is transported to out-of-state refineries (NM 2003).

Oil and natural gas production contributes $1.3 billion annually through taxes and royalties on oil, natural gas, and carbon dioxide production (NMOGA 2007). The structure of the State General Fund is oriented toward oil and gas revenue, making up between 12 and 20 percent of the General Fund's revenues. In 2008 oil and gas revenues generated 20.39 percent of the General Fund at a total of $1.236 billion (Starbuck 2009). These monies finance New Mexico's schools, roads, and other public projects and services. In addition to these direct benefits, there are royalties that are deposited into the State's Land Grant Permanent Fund (LGPF) and the Severance Tax Bond Fund (STBF). Interest earnings from these funds are distributed to fund schools and hospitals, and to retire government debt (NMLFC 2008). In 2008 distribution from the LGPF totaled $390.5 million; distributions from the STBF totaled $177.2 million (Starbuck 2009).

Much of the state's oil and gas production comes from small producers (NM 2003). In general, the independent producers are those most severely harmed by oil industry difficulties. Independent petroleum producers range from "mom-and-pop" companies to large independents like Yates Petroleum Corporation, which employs 375 persons in Artesia and is the largest New Mexico-based oil and gas corporation (Artesia Chamber 2007). Most fields in New Mexico have a combination of oil and gas, which allows small producers to diversify. As one Farmington, New Mexico, oil producer noted in 1998, despite the fact that his income had been cut in half within 6 or 7 months, the company was able to stay economically viable because of natural gas production (AP 1998).

The oil and gas industry is an important part of Eddy County's economy and plays a smaller, but still substantial, role for Chaves County. In 2006 Eddy County had 10,880 wells, producing 230,231,429 cubic feet (Mcfs) of gas, and 17,619,424 barrels (bbls) of oil. Chaves County had 2,287 wells, producing 22,545,597 Mcfs of gas, and 467,507 bbls of oil. Eddy County ranks third in oil and gas production in the State; Chaves County ranks fifth in gas production, and sixth in oil production (EMNRD 2007). An oil refinery is located in Artesia, north of the Project Area.

The oil and gas industry contributes substantial numbers of jobs to the economy of both counties (Table 3-18). In Eddy County oil and gas extraction alone provided 1,046 jobs during 2005, up from 1,032 jobs during 2004. Data indicate an additional 59 jobs in 2006, for a total of 1,105 jobs. In Chaves County oil and gas extraction provided 273 jobs in 2005, up from 247 jobs during in 2004 (USBLS 2007). These jobs are significantly higher paying than many other jobs in the area. Employee earnings from oil and gas extraction in 2005 were more than $86 million, up from $75 million during 2004.

Table 3-18. Jobs and Wages from Oil and Gas Extraction, Eddy and Chaves Counties.

COUNTY	OIL AND GAS EXTRACTION JOBS	PERCENT OF ALL JOBS	OIL AND GAS EXTRACTION TOTAL WAGES	PERCENT OF TOTAL WAGES FOR ALL JOBS	OIL AND GAS EXTRACTION AVERAGE WEEKLY WAGES	OIL AND GAS EXTRACTION PERCENT OF AVERAGE WEEKLY WAGES FOR ALL JOBS
Eddy	1,046	6.2	$76,586,000	13.4	$1,409	215
Chaves	273	1.6	$10,261,000	6.6	$722	152

Source: USBLS (2007).

Most of the industry jobs in the area are oil and gas extraction jobs, but refining also provides jobs. The Navajo Refining Company in Artesia is the largest refinery in the State of New Mexico, with 470 employees (Artesia Chamber 2007). The refinery has a crude oil capacity of 83,000 bbls, and it distributes refined products in the southwestern United States including: El Paso, Texas; Albuquerque, New Mexico; Phoenix and Tucson, Arizona; and northern New Mexico (Holly Corporation 2007). The refinery does not rely solely on New Mexico producers; it purchases its

crude oil from producers both in southeastern New Mexico and in west Texas, and it recently purchased a crude oil gathering system in west Texas that will allow it to purchase crude oil in new areas of west Texas (Holly Corporation 2007).

The Project Area contains less than 2 percent of the more than 21,000 oil and gas wells in Eddy County. About half of those are in operation. In 2009 the Project Area contained a total of 330 wells permitted to more than 50 companies. Of these wells 32 percent (107) are dry, junked, suspended, service, or location only. About 8 percent (25) are permanently abandoned and an additional 3 percent (10) are temporarily abandoned. About 57 percent of the wells (188) are currently in operation: 141 of these wells are gas wells and 47 are oil wells.

Grazing Industry

General Economic Impact of Grazing in New Mexico

As of 1991 there were roughly 3,529 ranching operations on Federal lands in New Mexico, with a total of 2.1 million authorized animal unit months (AUMs) (Fowler et al. 1997). The Project Area represents 896 permitted AUMs, or less than 0.1 percent of the total AUMs authorized Statewide. According to an analysis of western states grazing prepared by the Range Improvement Task Force at New Mexico State University (NMSU), Statewide operations resulted in $99.4 million in direct expenditures within the state, or roughly $46.85 per AUM (Fowler et al. 1997). Expenditures include medical, dental, restaurant, movie, video, vehicle repair, gas, food, veterinary, and clothing expenses. It is reasonable to argue that a large percentage of these expenditures would result in direct economic impacts to the state (as opposed to a redistribution of existing economic activity) because much of the livestock production (65 percent) is for export from the state. Using the simple approach of applying the estimated proportion of export activity to total direct expenditures would result in a direct economic impact to the state of roughly $30.45 per AUM.

An economic impacts analysis prepared by the NMSU Range Improvement Task Force (NMSU 1999) indicates that the total livestock industry in New Mexico produces direct, indirect, and induced economic activity equal to more than $620 million. The amount attributable to a single AUM is $81.74 (NMSU 1999). Note that this figure has not been adjusted to reflect the amount of the industry involved in export activity—a common measure for isolating the economic impact of funds flowing into the regional economy versus a redistribution of local economic activity. According to a recent study, roughly 65 percent of livestock production is sold out of state, or "exported" from New Mexico. Applying this ratio to the overall estimated economic activity suggests that the State impact is in the range of $53 per AUM (NMSU 1999). Economic impacts in the Project Area, assuming $53 per AUM, should approximate $47,488 annually.

Other measures of economic contribution and productivity include a review of net and gross receipts. In 1991, a strong year for the western livestock industry, the average New Mexico operator generated $167 in net receipts per animal unit (AU). One AU is roughly equal to 11 AUMs in southern New Mexico where grazing occurs nearly year round. The total value of production per

AUM, which is essentially gross sales per AUM, was equal to $44.57 in 1991 and $31.33 in 1996 (NMSU 1995).

Overview of Grazing Fees

Grazing fees are charged using a formula established in the Public Rangelands Improvement Act of 1978 (PRIA) extended by Executive Order #12548 (enacted by President Ronald Reagan on February 14, 1986). The PRIA provides a base value of $1.23 per AUM "adjusted by indices of livestock market price and rancher operating cost" (Cody 1996). The 1986 Executive order created a minimum fee of $1.35 per AUM. Grazing fees established under PRIA for the years 1986 through 2009 are shown in Table 3-19. Reclamation charges $3.34 per AUM as its grazing fee in the Project Area.

Table 3-19. Grazing Fees from 1986 to 2009 under the Public Rangelands Improvement Act of 1978 (PRIA) Formula.

YEAR	AMOUNT PER ANIMAL UNIT MONTH	YEAR	AMOUNT PER ANIMAL UNIT MONTH
1986	$1.35	1998	$1.35
1987	$1.35	1999	$1.35
1988	$1.54	2000	$1.35
1989	$1.86	2001	$1.35
1990	$1.81	2002	$1.35
1991	$1.97	2003	$1.35
1992	$1.92	2004	$1.43
1993	$1.86	2005	$1.79
1994	$1.98	2006	$1.56
1995	$1.61	2007	$1.35
1996	$1.35	2008	$1.35
1997	$1.35	2009	$1.35

Sources: BLM (2009), Vincent (2007).

Role of Project Area Lands in Grazing Allotment Operations

The estimated percentage of each grazing allotment within the Project Area boundaries can provide an indication of the total land area being grazed—on both Project Area and adjacent BLM lands—within the six allotments. Of the estimated 26,445 acres (10,702 hectares) grazed on allotments containing both BLM and Project Area lands, the Project Area lands 11,523 acres (5,528 hectares) represent about 44 percent of the total. The Project Area lands represent an estimated 36 percent of the total AUMs permitted with the allotments.

Four of the six Project Area grazing allotments include portions of BLM, State, or private lands, along with the Project Area lands. The AUMs are also allocated among the various jurisdictions. Both AUM and acreage figures are provided in Table 3-20 to evaluate the reliance of specific grazing permit holders on the Project Area lands for their ranching operations.

Table 3-20. Grazing Permittee Reliance on Project Area Lands.

ALLOTMENT AND TRACT CONDITION	PERMITTED GRAZING AREA ON PROJECT AREA LAND (ACRES)	AUMS[a] ALLOWED BY EXISTING RECLAMATION PERMITS	TOTAL ACRES IN ALLOTMENT	TOTAL AUMS IN ALLOTMENT	PERCENT OF TOTAL AUMS IN ALLOTMENT ON PROJECT AREA LANDS	LEVEL OF RELIANCE ON PROJECT AREA LANDS
Ballard (Tract 16) (fair)	1,180	90	5,380	522	17	Low
Hyden (Tract 19) (fair)	1,368	120	1,600	120	100	High
Carter (Tract 17) (low-fair)	912	68	2,090	156	44	Moderate
Greenwood (Tract 15) (fair)	3,960	305	4,738	401	76	High
McNew (Tract 18) (fair)	1,508	120	1,678	132	91	High
Evans (Tract 14) (fair)	2,595	193	10,359	1,106	17	Low
TOTALS	**11,523**	**896**	**26,445**	**2,485**	**N/A[b]**	**N/A**

[a] AUM = animal unit month.
[b] N/A = Not applicable.

The six permittees have different levels of reliance on Project Area land for grazing. Four have a high level of reliance (more than 50 percent of their allotments are on Project Area land). Two have a low level of reliance (less than 20 percent of their allotments are on Project Area land) and one has a moderate level of reliance (between 20 percent and 50 percent of their allotment are on Project Area land). Note that the reliance on Project Area lands discussed in this section only relates to the proportion of land area or the permitted AUMs falling within the Project Area boundaries; it is not a reflection of the forage value of the Project Area versus other lands or any other factor.

3.2.13 Environmental Justice

Environmental Justice refers to the protection of human rights, particularly those of minority and lower-income populations. It further means that, to the greatest extent practicable and permitted by law, minority and low-income groups have the opportunity to participate prior to and during decision-making processes regarding government programs and activities affecting human health and the environment. It means that these groups are not to be affected in a disproportionately high and adverse manner by such programs. Environmental Justice means that such populations are allowed to share in the benefits of and are not excluded from the due processes associated with government activities involving human health and the environment. Environmental Justice is included in this document in compliance with Executive Order 12898, signed in 1994.

The 2006–2008 American Community Survey provides the most recent race characteristics for Eddy and Chaves Counties (Table 3-21). Approximately 42 percent of the Eddy County population and nearly 49 percent of the Chaves County population is of Hispanic or Latino origin. This percentage is consistent with the state as a whole, of which 44.5 percent of the population is Hispanic or Latino. New Mexico has the highest proportion of Hispanic population for any state in the United States.

Table 3-21. Population Composition by Race for New Mexico, Eddy County, and Chaves County.

HISPANIC OR LATINO AND RACE	NEW MEXICO		EDDY COUNTY		CHAVES COUNTY	
	Number	Percent	Number	Percent	Number	Percent
Hispanic or Latino (of any race)	873,171	44.5	21,443	42.1	30,298	48.6
Mexican	483,759	24.7	– [a]	–	23,880	38.3
Puerto Rican	7,595	0.4	–	–	179	0.3
Cuban	3,582	0.2	–	–	85	0.1
Other Hispanic or Latino	378,235	19.3	–	–	6,154	9.9
Not Hispanic or Latino	1,089,055	55.5	29,543	57.9	32,041	51.4
White	822,308	41.9	27,367	53.7	29,231	46.9
Black or African American	39,541	2.0	822	1.6	430	0.7
American Indian and Alaska Native	171,340	8.7	164	0.3	175	0.3
Asian	25,124	1.3	204	0.4	415	0.7
Native Hawaiian or Pacific Islander	625	0.0	0	0.0	0	0.0
Some other race	5,284	0.3	111	0.2	32	0.1
Two or more races	24,833	1.3	875	1.7	1,758	2.8
Total population	1,962,226	100.0	50,986	100.0	62,339	100.0

Source: 2006-2008 American Community Survey 3-Year Estimates (USCB 2010)
[a] Data not available.

Also from the 2006–2008 American Community Survey (and summarized in Table 3-12), about 14 percent of Eddy County's residents were living in poverty; Chaves County was noticeably higher at 20 percent. Statewide, about 18 percent of New Mexicans lived in poverty. The Statewide estimate remained consistent from the 2000 Census, as did the estimate for Chaves County. However, the 2006–2008 estimate for Eddy County (14.4 percent) was somewhat lower than the 2000 Census figure (17.2 percent), but close to the error margin of the American Community Survey estimate (+/- 2.5 percent).

3.2.14 Recreation Resources

When Brantley Reservoir was constructed it was identified as a much-needed, water-based recreation resource in a part of New Mexico where such recreation opportunities were lacking (State Parks 1981). Since completion of the dam in 1988 and the opening of Brantley Lake State Park in 1989, it has become a popular recreation area for residents of southwestern New Mexico and western Texas. In addition to Brantley Reservoir, other recreation resources in the area provide a variety of opportunities, including Carlsbad Caverns National Park and World Heritage Site, Living Desert State Park, Sitting Bull Falls, the unidentified flying object attractions in and around Roswell, and public lands under BLM jurisdiction. Lake Carlsbad, located within the City of Carlsbad, is a popular swimming and boating area that is readily accessed by local residents. The combination of these many attractions makes the area appealing to locals and visitors from other states and foreign countries seeking recreational activities.

Brantley Reservoir Recreation Opportunities and Facilities

The Brantley Lake State Park Management and Development Plan provides direction for the enhancement of recreational opportunities, the protection of park resources and the natural environment, and the facilitation of public input (State Parks 2003). This document set forth objectives, policies, improvements and changes proposed for implementation between 2002 and 2007. The park provides year-round recreation opportunities, including fishing, boating, and swimming. Camping, picnicking, and hiking are also enjoyed in conjunction with water-based activities. Fees are collected for use at all facilities.

Developed Recreation Opportunities

New Mexico State Parks (State Parks) manages the developed recreation areas, including the Visitor Center, Administration Area, Limestone Campground, East Side Day Use Area, and the Seven Rivers Day Use Area.

Visitor Center/Administration Area

The Visitor Center is located at the main entrance to the State Park. It is attractively landscaped with native materials and provides ample parking for short-term visits. Its facilities are accessible and offer opportunities for orientation, disseminating visitor and area information, and collecting user fees. Phones, restrooms, and a dump station are provided. This area includes a maintenance shop, boathouse, and three double-wide mobile homes for park staff. A 2.2-mile (2.5-km), interpretive loop trail connects the Visitor Center to the day use area, through Limestone Campground. Another 0.24-mile (0.38-km) loop trail connects the campground to the lake.

Limestone Campground

Located approximately 0.25 mile (0.40 km) from Brantley Reservoir, Limestone Campground is the park's only developed campground. It includes 52 overnight sites with defined parking areas, tables, grills, water, and electricity. Three sites have sewer hook-ups. Some of the sites (37) have shade structures with wind breaks, and 20 sites have tent pads. Two sites are being upgraded to meet

current requirements for Americans with Disabilities Act. The campground includes a group shelter area with picnic tables and barbeque grills, a bath house/comfort station (showers), a playground, and a trailhead for three nature/interpretive trails. Facilities are modern and attractive.

East Side Day Use Area

This area includes parking for picnicking and boat launching. Parking lot capacity is about 50 stalls for vehicles and vehicle/trailer combinations, and an additional 15 stalls for the picnic area (A. Fiala 1998, pers. comm.). There are 12 picnic sites with tables, grills, and shade/wind shelters, and a group shelter (State Parks 2003; S. Phipps 2007, pers. comm.). A parking lot, playground with shade structure, and volleyball court are located near the group shelter. Restroom facilities and accessible picnic facilities are provided. An interpretive nature trail connects the East Side Day Use Area with Limestone Campground and the Visitor Center. The boat ramp is concrete and accommodates launching two rigs simultaneously. A courtesy dock is adjacent to the ramp.

Seven Rivers Day Use Area

Located off US-285, this area provides boating and fishing access to the lake. It includes two vault toilets, four picnic shelters, a concrete boat ramp, a courtesy dock, and a fishing dock. The parking lot accommodates approximately 50 vehicles and vehicle/trailer combinations. A primitive road provides access to a primitive area for fishing and camping. No water or electricity is available on this side of the park (S. Phipps 2007, pers. comm.).

Primitive Recreation Opportunities (Managed)

Rocky Bay and South Bay Primitive Areas

Rocky Bay and South Bay primitive camping areas are managed by State Parks. Rocky Bay Primitive Area is on the east side, and South Bay Primitive Area is on the west. At capacity, State Park personnel estimate that there are approximately 100 campsites between these two areas (60 percent at South Bay and 40 percent at Rocky Bay). Fees are collected at the entrance for either day use ($5.00) or overnight camping ($8.00) (S. Phipps 2007, pers. comm.). Facilities are limited to a comfort station in the Day Use area for Rocky Bay and a vault toilet at South Bay. Both areas have been cleared of vegetation (usually saltcedar) to provide places for pitching tents or pulling recreational vehicles (RVs) near the shoreline.

Champion Cove Primitive Area

Champion Cove is an undeveloped recreation site located between the Brantley Wildlife Management Area and Brantley Lake State Park on the west side of the reservoir. It is a popular area that has been used heavily for more than 15 years. Through a 2003 Memorandum of Agreement (MOA) between the United States and Eddy County, the County leases the land from the United States and is responsible for recreation development and maintenance. The County provides sanitary services including vault toilets and dumpsters. The New Mexico State Police provide supplemental law enforcement in Champion Cove under a contract with the County.

Boating Activity

There have been no accurate boat counts for Brantley Reservoir. Based on available parking spaces and camping sites, State Parks personnel estimate that the reservoir can accommodate approximately 250 to 300 boats. Brantley Reservoir currently has a surface of 3,775 acres (1,528 hectares) at conservation pool (42,000 acre-feet), and approximately 260 surface acres (105 surface hectares) at minimum pool (2,000 acre-feet). As siltation occurs, it is anticipated that surface acres will increase in order to accommodate the required conservation pool. According to State Parks personnel, this fluctuation, as much as 1.0 foot (0.3 m) overnight, dramatically affects visitation and requires the relocation of facilities (docks) to accommodate water level changes.

Fishing Activity

Brantley and Avalon Reservoirs are open year round and provide limited angling opportunities for a variety of sport fishes. Brantley is a catch-and-release fishery because of fish contamination issues. As noted previously, NMDGF stocking in Brantley Reservoir was suspended because of continued golden-algae kills and no stocking has occurred in Avalon Reservoir for at least 10 years (S. Denny 2008, pers. comm.). Fishing for channel catfish in the Pecos River below the dam is a popular activity for recreational anglers.

Trails

In addition to three nature/interpretive trails that connect facilities at the State Park and provide recreation opportunities, there has been interest in developing a mountain bike trail at the State Park. Mountain bike groups have contacted the State Park and expressed interest in the trail; however, a trail location or design has not been finalized to date.

Caving Activity

An estimated 300–500 cave visitors explore or conduct research in Coffee Cave, Homogenized White Cave, and Clarks Caverns each year.

Recreational Vehicle (RV) Usage

Recreational vehicle usage is increasing at Brantley Lake State Park, resulting in an increased demand for more RV-developed sites. Approximately 50 percent of RV visitors are day users and the other 50 percent are overnight campers (A. Fiala 1998, pers. comm.).

Visitation and Visitor Characteristics

State Parks personnel report that most park visitation occurs between mid-March and Labor Day, with a major influx of visits from west Texas college students during Spring Break. Easter weekend is the busiest, and there is heavy visitation during Memorial Day and Labor Day weekends. On peak days, facilities are used at maximum capacity.

Table 3-22 shows visitation numbers based on vehicle counts, adjusted by a factor that equates to the number of persons per vehicle (approximately 2.2 in winter, 2.6 in spring and fall, and 2.9 in summer). Visitation numbers were provided by Brantley Lake State Park (A. Fiala 1998, pers.

Table 3-22. Changes in Visitation at Brantley Lake State Park, 1993 to 2009.

YEAR	NUMBER OF VISITORS	CHANGE IN VISITORS	CHANGE PER YEAR (APPROXIMATE)
1993	101,482	N/A[a]	N/A
1994	99,688	-1,794	-2%
1995	99,797	+109	+01%
1996	118,127	+19,330	+19%
1997	136,527	+18,400	+16%
1998	119,293	-17,234	-13%
1999	151,187	+31,894	+27%
2000	131,448	-19,739	-13%
2001	123,298	-8,150	-6%
2002	97,028	-26,270	-21%
2003	69,459	-27,569	-28%
2004	74,468	-5,009	-7%
2005	73,738	-730	-1%
2006	69,083	-4,655	-6%
2007	87,308	18,225	+26%
2008	73,248	-14,060	-16%
2009	79,800	6,552	+9%

Source: A. Stiteler, pers. comm. (2003, 2007, 2010)
[a] N/A = Not applicable.

comm.; A. Stiteler 2010, pers. comm.). The highest annual visitation between the 17-year period 1993 to 2009 occurred in 1999, with just over 151 thousand visitors. Visitation has dropped off since 2001, varying between a high of 97 thousand in 2002 to about 69 thousand in 2006. Visitation in 2009 was just under 80 thousand.

During spring and summer months, most of the visitors are local or from west Texas. During winter months, visitors come from northern states to enjoy the warm winter climate and visit other nearby attractions. During the spring and summer months, visitors are primarily families; in winter there are more couples and senior citizens.

Recreation Conflicts and Concerns

State Parks personnel said that most of the water skiing occurs in the open areas of Brantley Reservoir and fishing takes place in the inlets. Still, there are conflicts between anglers and boaters. Personnel also mention conflicts occurring more frequently because of increased personal watercraft use. Fluctuations in water level elevations are a frustration to park managers and appear to have an effect on visitation. According to State Parks personnel, when water levels are up (thus fewer areas suitable for access), visitation is down.

Avalon Reservoir Recreation Opportunities and Facilities

Avalon Reservoir is between Brantley Reservoir to the north and the City of Carlsbad to the south. Managed by the CID, its primary function is to divert water for irrigation into a canal system. Aside from a very primitive unpaved parking area and boat launch area, there are no developed recreation facilities at Avalon Reservoir.

According to Brantley Lake State Parks personnel, water-based recreation activity at Avalon Reservoir is minimal, presumably because the reservoir water level fluctuates so much and so frequently, and because the water is shallow. This is confirmed by the Avalon dam tender who observed some personal watercraft, canoes, and flat-bottomed fishing boats. No ski boats or swimmers were observed. The dam tender indicates that in past years, Avalon Reservoir was a popular windsurfing area; however, in recent years, these recreation users have gone elsewhere.

The primary recreation activity on land surrounding the lake is hunting (e.g. deer, duck, quail, and dove) (A. Fiala 1998, pers. comm.). Informal dispersed camping is occasionally observed near the Number 3 Spillway across the dam from the Dam Tenders Quarters. It is described as an open, shallow area that is ideal for families with children (P. Adkins 1998, pers. comm.). According to the Avalon Reservoir dam tender, the reservoir is primarily used by "old timers" who fish at Avalon Reservoir because the boat ramps are more accessible than those at Brantley Reservoir.

Brantley Wildlife Management Area Recreation Opportunities

The Brantley Wildlife Management Area is managed by the NMDGF, which allows day use only. The majority of the uses are fishing, hunting, hiking, photography, and wildlife viewing.

Pecos River Recreation Opportunities and Facilities

The stretch of the river between Brantley and Avalon Reservoirs is reportedly heavily used by anglers. However, there does not appear to be any specific information regarding recreation/angler use in the area.

3.2.15 Rangeland and Grazing

Project Area grazing is limited primarily to lands surrounding the Pecos River downstream of Brantley Reservoir. Reclamation currently manages Project Area grazing permits and allotments in this area. Some of these allotments are grazed in conjunction with BLM allotments on adjacent BLM and State-owned lands. Permittees are billed for the number of AUMs the Federal land can support. On lands adjacent to the Project Area, the BLM established studies monitoring range trend and providing valuable information for assessing proper stocking rates.

Reclamation land is only a portion of the total allotment area for most Project Area permit holders. Reclamation land in the Project Area consists primarily of upland range sites, with small draws occurring occasionally. The only true riparian areas in the grazed portion of the Project Area are on

lands surrounding Avalon Reservoir. Riparian areas around Avalon Reservoir have been invaded by saltcedar, which provides some shade for livestock but has no grazing value.

Project Area grazing management consists primarily of continuous, year-round stocking of cows and calves. Along stream channels and other water bodies within the Project Area, no physical separations (e.g., fences) exist, and if alternative livestock water sources are not readily available, cattle will congregate on the banks of Avalon Reservoir, in draws, or along the Pecos River. The Pecos River dissects the Project Area and is the primary source of water in most allotments.

Project Area floodplain lands are subjected to continuous, moderate-to-heavy grazing, as well as disturbance from recreational users. Excessive recreational use makes grazing these areas difficult, if not impossible, and increases the rate of succession of undesirable plants. These impacts concern Reclamation because many of these areas provide important habitat for other resources (e.g., fish and wildlife). The Main Canal, which diverts water from Avalon Dam, has a fence along its border, which keeps livestock from disturbing the canal.

Available soil moisture is the single most limiting factor for plant growth in southern New Mexico (Holechek et al. 1989, Herbel and Gibbens 1996). Plant production can be directly correlated to precipitation levels. The Project Area has the potential to support abundant amounts of forage at current grazing levels, even in years of less-than-average precipitation. However, increasing recreational use and increasing oil and gas site development have placed pressure on many of the Project Area grazing allotments. Portions of Project Area allotments display evidence of overgrazing and degradation from recreation users. Of all the grazing area in the BLM Carlsbad Field Office area, approximately 5 percent is in excellent condition, 50 percent is in good condition, 44 percent is in fair condition, and 1 percent is in poor condition (BLM 2007).

Project Area Grazing Allotments

Six grazing allotments within the Project Area, primarily surrounding Avalon Reservoir and the Pecos River below Brantley Dam, are leased to grazing associations or to individuals. These allotments total approximately 12,762 acres (5,165 hectares) of Reclamation lands within the Project Area. Of that total, 90 percent, or 11,523 acres (4,663 hectares), is permitted for grazing and 10 percent, or 1,239 acres (501 hectares), is not currently permitted. These allotments are summarized in Table 3-23 and are further described below.

Lonnie Evans Allotment (Tract Number 14)

The Lonnie Evans Allotment encompasses 2,595 acres (1,051 hectares) of permitted Reclamation land and 355 acres (144 hectares) that are not currently permitted for grazing. The permit for this allotment allows year-round use of 193 AUMs, for a stocking rate of 0.074 AUMs per acre per year for the Reclamation portion of this allotment. The overall condition of this allotment is good.

Table 3-23. Allotment Size and Animal Unit Month (AUM) Values.

AREA	ALLOTMENT					
	14	15	16	17	18	19
Total Area	2,950 acres (1,194 hectares)	4,078 acres (1,650 hectares)	1,614 acres (653 hectares)	2,090 acres (846 hectares)	1,741 acres (705 hectares)	1,600 acres (648 hectares)
Area Permitted for Grazing	2,595 acres (1,051 hectares)	3,960 acres (1,602 hectares)	1,180 acres (477 hectares)	912 acres (369 hectares)	1,508 acres (610 hectares)	1,368 acres (553 hectares)
Area Not Permitted For Grazing	355 acres (144 hectares)	0 acres (0 hectares)	434 acres (176 hectares)	227 acres (92 hectares)	223 acres (90 hectares)	0 acres 0 hectares
Permitted Animal Unit Months	193	305	90	68	120	120
Permitted Animal Unit Months/Acre	0.074	0.075	0.076	0.075	0.079	0.075

Greenwood Allotment (Tract Number 15)

The Greenwood Allotment encompasses 4,078 acres (1,651 hectares) of permitted land, though only 3,960 acres (1,603 hectares) involve Reclamation lands. The remainder is now on CID lands. Recreational use of the Reclamation portion of this allotment is high. The permit for this allotment allows the annual removal of 305 AUMs, giving a stocking rate of 0.075 AUMs per acre per year for the Reclamation portion of this allotment. Overall condition of this allotment is fair.

Ballard Allotment (Tract Number 16)

The Ballard Allotment encompasses 1,180 acres (477 hectares) of permitted Reclamation land and 434 acres (176 hectares) of land that are not currently permitted for grazing. Recreational use of the Reclamation portion of this allotment is high. The permit for this allotment allows year-round use of 90 AUMs, giving a permitted stocking rate of 0.076 AUMs per acre per year for the Reclamation portion of this allotment. The overall condition of this allotment is fair.

Carter Allotment (Tract Number 17)

The Carter Allotment encompasses 912 acres (369 hectares) of permitted Reclamation land and 227 acres (92 hectares) of land that are not permitted for grazing. Recreational use of the Reclamation portion of this allotment is high. The permit for this allotment allows year-round use of 68 AUMs, giving a stocking rate of 0.075 AUMs per acre per year for the Reclamation portion of this allotment. Overall condition of this allotment is low to fair.

McNew Allotment (Tract Number 18)

The McNew Allotment encompasses 1,508 acres (610 hectares) of permitted Reclamation land and an additional 223 acres (90 hectares) of land that are not currently permitted for grazing. Reclamation land consists of 64 percent of the allotment holdings. The permittee currently grazes 14 cow/calf pairs on this allotment. The remainder is contiguous to the Reclamation portion and is not fenced between deeded and State-owned lands. The permit for this allotment allows year-round use

of 120 AUMs, giving a stocking rate of 0.079 AUMs per acre per year for the Reclamation portion of this allotment. The overall condition of this allotment is fair.

Ron Hyden Trust Allotment (Tract Number 19)

The Ron Hyden Allotment encompasses 1,600 acres (648 hectares) of permitted land, though only 1,368 acres (553 hectares) involve Reclamation lands. The remainder is now on CID lands. The Reclamation portion of this allotment comprises 24 percent of grazing lands within this operation. The permit for this allotment allows year-round use of 120 AUMs, giving a stocking rate of 0.075 AUMs per acre per year for the Reclamation portion of this allotment. Overall condition of this allotment is fair.

3.2.16 Alternative Energy, Fluid Minerals, and Other Extractive Resources

Mineral resources are divided into three categories: locatable, leasable, and saleable. Locatable minerals include gold, silver, lead, zinc, and other "high value" metallic ores subject to the Mining Law of 1872, as amended by 30 U.S.C. Ch. 2. Leasable minerals are oil and gas, oil shale, coal, potash, phosphate, sodium, gilsonite, and geothermal resources. These are subject to lease under: the Mineral Leasing Act of 1920, as amended and supplemented (30 U.S.C. 181, et seq.); the Mineral Leasing Act for Acquired Lands as amended (30 U.S.C. 351-359); the Federal Coal Leasing Amendments Act, 1997 (30 U.S.C. 184, et seq.); and the Geothermal Steam Act of 1970 (30 U.S.C. 1001-1025).

Saleable minerals are of the common variety and include sand, stone, gravel, pumice, cinders, clay, and other minerals extracted in bulk. These minerals are subject to sale and disposal at the discretion of Reclamation under: the Act of July 31, 1947, as amended (30 U.S.C. 601 et seq.); the Act of July 23, 1955 (30 U.S.C. 601); the Act of September 28, 1962 (30 U.S.C. 611); and Section 10 of the Reclamation Projects Act of 1939 (43 U.S.C. 387). Mineral leasing on Reclamation lands is administered by the BLM under provisions of Title 43, Subpart 3100 of the CFR. Leasable minerals (i.e., oil and gas) are under discretionary authority, meaning they are open to development through application and permitting by the BLM with concurrence by Reclamation. Except for those minerals and conditions meeting the provisions of Section 10 of the Reclamation Projects Act of 1939, leases for mineral and geothermal resources on all land acquired or withdrawn by Reclamation are issued by the BLM per an interagency agreement between Reclamation and BLM dated December 1982.

Under this agreement the BLM will, in all issues involving fluid mineral and geothermal leases, request that Reclamation determine if leasing is permissible and if so, provide any stipulations required to protect the interests of the United States. Current Reclamation stipulations and conditions of approval for oil and gas leasing within the Project Area are provided in Appendix A. Additional Reclamation stipulations are developed and included as part of any permit to use Reclamation-withdrawn lands. The current stipulations primarily address oil and gas leasing and do not address other Project Area mineral resource developments.

Alternative Energy

In February 2003, the Department of Energy and the Department of Interior released the report "*Assessing the Potential for Renewable Energy on Public Lands*" (BLM 2003). The report weighed factors for producing energy from concentrated solar power (CSP), photo-voltaic (PV), wind, biomass, and geothermal facilities. The report indicates the potential for producing energy from biomass and geothermal resources is low in southeast New Mexico, although a portion of the Project Area north of Brantley Dam is within a region of known or potential geothermal resources.

The report indicates the potential for producing wind energy in the Project Area is poor to fair. Poor is defined as Class 2 with wind speeds of 12.5 to 14.3 miles per hour measured at an altitude of 50 meters. Fair is defined as Class 3 with wind speeds of 14.3 to 15.7 miles per hour measured at an altitude of 50 meters. Most of the Project Area falls within the Class 2 category. The report indicates the potential for CSP and PV in the Project Area are good, with an average of 5.5 to 6.5 kilowatt hour per square meter per day ($kWh/m^2/day$).

Oil and Gas

Since 1926, 330 wells have been drilled within the Project Area. Of the total known wells, 188 wells (57 percent) are in operation, 3 wells (1 percent) are suspended, 10 wells (3 percent) are temporarily abandoned, and 25 wells (8 percent) are permanently abandoned. In addition, 104 wells (31 percent) are dry, junked, service, or location only (Table 2-5).

In 2009 nine wells were in production within Brantley Reservoir's inundation zone, but they were above the maximum conservation pool (current reservoir level). If any wells are operational when the Brantley Reservoir floodgates are raised to the point that they are within the actual flood pool, adequate berming will be required to prevent inundation and potential water contamination (Reclamation 1982). Non-operational wells are closed according to the Carlsbad Resource Area RMP (BLM 1994).

Exact information about the production of Project Area wells is not available. Of the more than 21,000 wells estimated in Eddy County, less than 2 percent are located within the Project Area (GO-TECH 2009). Thus, it is not possible to determine what amount of oil and gas production comes directly from the Project Area. Because production numbers are not available on specific wells, it is not possible to evaluate the effect of increasing or decreasing the number of wells. Similarly, it is difficult to evaluate the impact on specific operators.

Oil and gas exploration and production operations typically produce some hazardous materials. These materials include drilling fluids, drilling muds, water, and crude oil. Additional hazardous materials typically associated with drilling and production operations include new and used motor oil, gasoline, diesel fuel, and other materials related to motor and machinery maintenance.

Exploration and production wastes are regulated by Code 43 of the Federal Regulations Part 3160 and are not considered hazardous waste materials. A number of management practices for oil and

gas exploration and production operations were specified in the Brantley Reservoir Project National Environmental Policy Act (NEPA) documents (Reclamation 1971, 1972, 1981, 1982) and the Carlsbad and Roswell District BLM NEPA documents (BLM 1986b, 1994). These practices should be sufficient to prevent adverse impacts from oil operations. The BLM is responsible for monitoring compliance with the specified practices.

Minerals

New Mexico leads the nation in potash production by providing more than 70 percent of total sales in the United States. The Carlsbad District in Southeast New Mexico is the largest potash producing area in the nation with Mosaic Potash, Inc., and Intrepid Potash, Inc., operating mines in the district. While potash mining and processing was once the number one regional industry, oil and gas have surpassed it. Competition with foreign sources and a lower demand for the region's potash have resulted in an uncertain future for this industry. It is, therefore, unlikely that potash exploration would occur within or near the Project Area in the near future. However, if market conditions change, this relatively rare resource may spur an exploration boom for potash minerals within the Project Area (BLM 1994). Reclamation's current stipulations do not address potash mining.

Aggregate Resources

A variety of aggregate resources are found within the Project Area, including gravel, sand, and caliche. Currently, neither sand nor gravel resources are used within the Project Area. These resources exist, however, and greater demands for them may occur in the future. Caliche, a calcareously cemented layer common near the surface of Project Area soils, is used as well pad and road base. This resource currently is not being extracted. Reclamation's current stipulations do not address removal of aggregate resources. No other extractable or saleable geologic resources are known to occur within the Project Area.

3.2.17 Transportation and Access

Project Area Access

U.S. Highway 285 provides the primary access from outlying populated areas to the Brantley and Avalon Reservoirs' vicinity, where available public activities include hunting, fishing, boating, camping, picnicking, wildlife observation, and other recreation-related opportunities. Direct access to Brantley Lake State Park is provided along Eddy County Road 30 (Capitan Reef Road) to East Brantley Road and along West Brantley Lake Road from US-285. Other roads in the vicinity provide access to points along the reservoir's shores, the Pecos River channel, and to general recreation areas in the Project Area. Table 3-24 lists the principal roads providing access to the Project Area, while Table 3-25 lists the primary and secondary roads providing access within the Project Area.

Table 3-24. Summary of Maintained Principal Access Roads to the Project Area.

ROAD NUMBER/ NAME	ADMINISTRATIVE JURISDICTION AND MAINTENANCE RESPONSIBILITY	TYPICAL ROAD WIDTH IN FEET (METERS)	SURFACE TYPE	CURRENT SURFACE CONDITION	ACCESS PROVIDED
U.S. Highway 285 (US-285)/ Seven Rivers Highway	NMSHTD[a]	48.0 feet (14.6 meters) divided with 16.0-foot (5.5-meter) shoulders	Asphalt Pavement	Good	From points north, west, and south to Project Area vicinity.
County Road 41/ Dayton Road	Eddy County	22.0 feet (6.7 meters)	Asphalt Pavement	Good	From US-285 to north boundary of Project Area.
County Road 38/ East Kincaid Ranch Road	Eddy County	22.0 feet (6.7 meters)	Asphalt Pavement	Good	From US-285 to northwest portion of Project Area.
County Road 35/Crane Road to County Road 34/Lake Road to County Road 37/ Forrest Lee Road	Eddy County	22.0 to 24.0 feet (6.7 to 7.3 meters)	Asphalt Pavement	Good	From US-285 to northwest portion of Project Area.
NM Highway 381/Lakewood Road	Eddy County	22.0 feet (6.7 meters)	Asphalt Pavement	Good	From US-285 to west portion of Project Area.
Pato Avenue	NMDGF[b]	22.0 feet (6.7 meters)	Graded Gravel	Good	From US-285 to Seven River Sanctuary Road.
County Road 33/ Sweetwater Road to Water	Eddy County	12.0 feet (3.7 meters)	Asphalt Pavement	Good	From Lakewood Road to Seven River Sanctuary Road.
County Road 34/ Lake Road (west)	Eddy County	24.0 feet (7.3 meters)	Asphalt Pavement	Good	General access to northwest and west portions of Project Area.
County Road 32/ Skyward Road	Eddy County	22.0 feet (6.7 meters)	Graded	Good	From US-285 to west portion of Project Area.
Carlsbad Relief Route	NMSHTD	48.0 feet (14.6 meters) divided with 16.0-foot (5.5-meter) shoulders	Asphalt Pavement	Good	Access across south portion of Project Area between US-285 Illinois Camp Road and US 62/180 (Hobbs Highway).
County Road 206/ Illinois Camp Road	Eddy County	24.0 feet (7.3 meters)	Asphalt Pavement	Good	General access along east portion of Project Area.
County Road 34/ Lake Road (east)	Eddy County	24.0 feet (7.3 meters)	Asphalt Pavement	Good	From Illinois Camp Road to east and southeast portion of Project Area.
County Road 236/Netherlin Road	Eddy County	24.0 feet (7.3 meters)	Graded	Good	From Illinois Camp Road to east portion of Project Area.

[a] NMSHTD = New Mexico State Highway and Transportation Department.
[b] NMDGF = New Mexico Department of Game and Fish.

Table 3-25. Summary of Maintained Primary and Secondary Access Roads in the Project Area.

CURRENT ROAD NUMBER/NAME	ADMINISTRATIVE JURISDICTION AND MAINTENANCE RESPONSIBILITY	ROAD LENGTH IN MILES (KILOMETERS)	TYPICAL ROAD WIDTH IN FEET (MEETERS)	SURFACE TYPE	CURRENT SURFACE CONDITION
Primary Access					
U.S. Highway 285 (US-285)/Seven Rivers Highway	NMSHTD[a]	5.0 miles (8.0 kilometers)	48.0 feet (14.6 meters) divided with 16.0-foot (5.5- meter) shoulders	Asphalt Pavement	Good
Carlsbad Relief Route	NMSHTD	1.0 mile (1.6 kilometers)	48.0 feet (14.6 meters) divided with 16.0-foot (5.5-meter) shoulders	Asphalt Pavement	Good
Carlsbad Relief Route Access Roads	NMSHTD	0.2 mile (0.3 kilometer)	24.0 feet (7.3 meters)	Asphalt Pavement	Good
Highway 137 (Queen Road)	NMSHTD	0.7 mile (1.1 kilometers)	24.0 feet (7.3 meters)	Asphalt Pavement	Good-Rough
Water Fowl Tour Route	NMDGF[b]	2.7 miles (4.3 kilometers)	12.0 to 22 feet (3.7 to 6.7 meters)	Graded	Good
Brantley Lake Road East	State Parks[c]	4.3 kilometers (2.7 miles)	24.0 feet (7.3 meters)	Asphalt Pavement	Good
Rocky Bay Primitive Area Road	State Parks[c]	1.0 mile (1.6 kilometers)	18 feet (5.5 meters)	Graded	Good-Rough
Brantley Lake Road West	State Parks[c]	0.8 mile (1.3 kilometers)	24.0 feet (7.3 meters)	Asphalt Pavement	Good
Seven Rivers Primitive Area Road	State Parks[c]	1.8 miles (2.9 kilometers)	18 feet (5.5 meters)	Graded	Good-Rough
County Road 206 (Illinois Camp Road)	Eddy County	3.4 kilometers (2.1 miles)	24.0 feet (7.3 meters)	Asphalt Pavement	Good
County Road 34 (Lake Road East)	Eddy County	2.8 miles (4.5 kilometers)	24.0 feet (7.3 meters)	Asphalt Pavement	Good
County Road 236 (Netherlin Road)	Eddy County	0.6 mile (1.0 kilometer)	24.0 feet (7.3 meters)	Graded	Good
County Road 604 (Loop Road[d])	Eddy County	0.8 mile (1.3 kilometers)	24.0 feet (7.3 meters)	Asphalt Pavement	Good
County Road 601 (High Noon Road)	Eddy County	4.1 miles (6.6 kilometers)	24.0 feet (7.3 meters)	Graded	Good
County Road 602 (Avalon Road)	Eddy County	1.4 miles (2.3 kilometers)	24.0 feet (7.3 meters)	Asphalt Pavement	Good
County Road 600 (Rains Road)	Eddy County	0.4 mile (0.6 kilometer)	24.0 feet (7.3 meters)	Asphalt Pavement	Good
County Road 30 (Capitan Reef Road)	Eddy County	6.2 miles (9.9 kilometers)	24.0 feet (7.3 meters)	Asphalt Pavement	Good
County Road 7 (Forrest Lee Road)	Eddy County	0.2 mile (0.3 kilometer)	24.0 feet (7.3 meters)	Asphalt Pavement	Good
Town of Carlsbad Roads	Town of Carlsbad	0.4 mile (0.6 kilometer)	-	-	-

Table 3-25. (Cont.)

CURRENT ROAD NUMBER/NAME	ADMINISTRATIVE JURISDICTION AND MAINTENANCE RESPONSIBILITY	ROAD LENGTH IN MILES (KILOMETERS)	TYPICAL ROAD WIDTH IN FEET (METERS)	SURFACE TYPE	CURRENT SURFACE CONDITION
Secondary Access					
Old Aggregate Haul Road	CID	2.1 miles (3.4 kilometers)	30 feet (9.1 meters)	Graded	Good-Rough
Brantley Dam Service Roads	CID	8.6 miles (13.8 kilometers)	12.0 to 15.0 feet (3.7 to 4.6 meters)	Graded	Good
Main Canal Roads	CID	3.2 miles (5.1 kilometers)	12.0 to 22 feet (3.7 to 6.7 meters)	Graded	Good-Rough
B.N.& S.F. Railroad Service Roads	BNSF Railroad	1.8 miles (2.9 kilometers)	18 feet (5.5 meters)	Graded	Good-Rough
Oil and Gas Roads	BLM/Oil and Gas Cos.[e]	30.0 miles (48.3 kilometers)	12.0 feet (3.7 meters)	Graded	Rough
Old U.S. Highway 285[f]	BOR[g]	0.8 mile (1.3 kilometers)	22.0 feet (6.7 meters)	Graded	Good
Champion Cove Road (South)	BOR[g]	0.4 mile (0.6 kilometer)	24.0 feet (7.3 meters)	Graded	Good
Champion Cove Road (North)	BOR[g]	0.7 mile (1.1 kilometers)	22.0 feet (6.7 meters)	Graded	Good
Unimproved and Unmaintained Roads	-	287.3 miles (462.4 kilometers)	Various	Unimproved	Rough

[a] NMSHTD = New Mexico State Highway and Transportation Department.
[b] NMDGF = New Mexico Department of Game and Fish.
[c] Maintenance assistance in the past has been provided by Eddy County, the CID, and the NMSHTD.
[d] County Road 604 is planned to be replaced by the proposed east leg of the Carlsbad Relief Route.
[e] Maintenance responsibility is specified in oil and gas lease and right-of-way agreements between the BLM and individual oil and gas companies.
[f] This portion of old U.S. Highway 285 provides access to the Champion Cove vicinity.
[g] Most recent road maintenance has been provided by the Eddy County Road Department in response to a petition to the County Commission by local residents.

Designated Roads

Maintained roads serving the Project Area vicinity are components of the New Mexico State Highway and Transportation Department (NMSHTD) system, the State Parks system, the Eddy County road system, Reclamation roads, BLM roads, CID roads, and oil and gas roads. State highway system roads that provide Project Area access are US-285 and the Carlsbad Relief Route. Current and forecasted traffic for US-285 is outlined in Table 3-26.

A railroad line located in the central portion of the Project Area was realigned when Brantley Dam was built in approximately 1985. The railroad is operated by the Burlington Northern Santa Fe Railway. The line runs from Texas to Clovis, New Mexico, and hauls principally sulfur, potash, and salt through the area. There are neither passenger services nor load-out sites near the Project Area. Sidings are provided for rail car storage near Avalon Reservoir and at Lakewood, New Mexico.

Table 3-26. Past and Projected Annual Average Daily Traffic (AADT) along U.S. Highway 285 (US-285) in the Vicinity of Brantley and Avalon Reservoirs.

TRAVEL COUNT STATION (PROJECT)	ANNUAL AVERAGE DAILY TRAFFIC (ADDT)		
Location	Year		
	1989	1997	2017
US-285, Junction NM 137 (Queen's Highway)	2,889	3,446 (+19%)[a]	4,596
US-285, Junction NM 381 (Lakewood Road)	3,909	3,996 (+2%)	5,330

Source: NMSHTD computerized highway database.
[a] Percent change in AADT between 1989 and 1997.

Unmanaged or Unmaintained Roads

Access throughout the Project Area is also provided by approximately 287 miles (462 km) of unimproved roads or two-track routes. None of these roads are managed or maintained by any of the entities listed above. Most of these roads or routes evolved indiscriminately through recreational use.

3.2.18 Visual Resources Management

The BLM uses a Visual Resource Management (VRM) system to inventory and manage visual resources on public lands. Although Reclamation does not utilize a VRM system, BLM's Carlsbad Field Office mapping of VRM classifications does include the Project Area. The primary objective of VRM is to maintain the existing visual quality of public lands and to protect unique and fragile visual resources. The VRM system uses four classes to describe the different degrees of visual modification allowed in the landscape. The VRM classes are visual ratings that describe an area in terms of visual quality, viewer sensitivity to the landscape, and the distance in which a viewer would observe an area. Once an area has been assigned a VRM class, that class can be used to analyze and to determine the visual impacts of proposed activities on the land, and to gauge the amount of disturbance an area can tolerate before it exceeds the visual objectives of the established VRM class (BLM 1980).

Existing VRM classes were assigned to areas within the Carlsbad Field Office through the BLM RMP planning process and were ultimately based on the management decisions made in the RMP document (BLM 1988). These VRM classes conform to the land-use allocations set forth in the RMP that covers the Project Area and are assigned using the guidelines and management objectives for VRM Classes I through IV. The VRM classes established for the Project Area as mapped by the BLM include Class III and Class IV areas.

The objective of the VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may

attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The objective of the VRM Class IV is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic landscape elements of color, form, line, and texture.