3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This section describes the current condition of resources in the study area that may be affected by the Proposed Action. Resources and related topics include geomorphology and soils, hydrology and hydraulics, water quality, cultural resources, air quality and noise, fish and wildlife, vegetation and wetlands, threatened and endangered species, socioeconomics, visual and aesthetic resources, net water depletions, environmental justice, and Indian Trust Assets (ITAs).

The Isleta Reach of the MRG, which extends from the Isleta Diversion Dam to the San Acacia Diversion Dam (see Figure 1.1), has been identified by Reclamation and the NMISC, as well as the Collaborative Program, as a segment of the river where habitat/ecosystem restoration projects would be highly beneficial to all life stages of the silvery minnow.

3.2 GEOMORPHOLOGY AND SOILS

The MRG lies in an asymmetric, elongated valley along the Rio Grande Rift (Hawley 1978; Chapin 1988). Connected alluvium-filled sub-basins defined by normal faulted mountain ranges dominate the rift valley. The land flanking the Rio Grande Basin on the east is predominantly mountainous with the western face of the Manzano Mountains merging colluvial-alluvial fans and stream terraces sloping down and westward toward the Rio Grande (Bartolino and Cole 2002; MEI 2002). The geologic surface west of the river is ancestral Rio Grande alluvial deposits. The river channel flows in a wide valley with a fertile but narrow (2–3 miles [3–5 km] wide) floodplain that has been cultivated for centuries. The soil associations in this area are classified as Torrifluvents-Calciorthids-Torriorthents, deep and highly stratified mixed alluvial soils that encompass the sloping floodplain, steep terraces, and alluvial fans adjacent to and above the Rio Grande (NMISC 2002; National Resource Conservation Service [NRCS] 2006; Reclamation 2007). A detailed description of this soil association is provided in the NRCS (2006) Custom Soil Resource Report for Valencia County, New Mexico.

Historically, the Rio Grande has continuously reworked valley deposits on the active floodplain. However, in the twentieth and twenty-first centuries, floodway constriction and channel stabilization projects have confined the natural course of the river. For example, dams, levees, and jetty jacks have been used to create channel banks that control the location of the river, preventing flow from reaching the historic floodplain and causing sediment to accumulate within the levees (MEI 2003). Reclamation reports that, since 2001, the channel in the Isleta Reach has narrowed drastically, which can be attributed to vegetation encroachment into the active channel (Massong et al. 2007). The channel narrowing process has been accelerated by the accretion and attachment of bars to the river bank (MEI 2006). The historical floodplain in the reach has become disconnected from the river in all but the wettest years. This bar and island accretion has contributed to decreasing habitat heterogeneity and limited channel habitat diversity for the silvery minnow (Remshardt and Tashjian 2005).

Geomorphology plays an important role in describing the evolution of the Rio Grande and in influencing the spatial extent and species diversity of vegetation in riparian areas. The present-day Isleta Reach channel is composed of several varieties of loamy soils, including Gila and

Vinton loam, Brazito sandy clay, silt, and sand, similar to the composition of ancestral river deposits. The surface layers are brown loamy fine sand overlying a pale brown and light yellow loamy sand (NRCS 2006). The soil is slightly calcareous and mild-moderately alkaline (NRCS 2006). In addition to the erosion and transport of sediment through the mainstem channel, tributary streams can contribute large volumes of sediment to the system.

Existing channel and channel-margin conditions in the Isleta Reach are the result of channelization of the river, hydrologic modifications that have reduced the magnitude of the frequently occurring peak flows and the degradational response of the river to reduced upstream sediment supply and the presence of non-native vegetation species (MEI 2008). In combination, these drivers have resulted in stabilization of the river planform and disconnection of the channel from its floodplain, which together have caused loss of habitat for the various life stages of the silvery minnow. Restoration of silvery minnow habitat essentially requires redistribution of the sediment mass that is stored within mid-channel and bank-attached bars that are currently disconnected hydrologically.

3.3 HYDROLOGY AND HYDRAULICS

3.3.1 HYDROLOGY

The MRG, as defined in the Collaborative Program, is the portion of the Rio Grande from the Colorado/New Mexico state line southward to the headwaters of Elephant Butte Reservoir and includes the Rio Chama watershed. Most of the annual flow and discharge of the Rio Grande that reaches the MRG is generated in the headwaters of the river basin in Colorado and in the Rio Chama in northern New Mexico.

Most of the discharge volume of the Rio Grande is derived from late spring snowmelt runoff events, which in some years produce large volumes of water that briefly alter the hydrograph of the river. The moderate and high flows associated with the seasonal snowmelt, as well as other channel altering events, such as monsoonal rains, have the capacity to carry high sediment loads. However, human activities have produced significant changes in the hydrology of the Rio Grande during the past century. The operation of numerous upstream dams (Heron, El Vado, and Abiquiu Reservoirs on the Rio Chama, Jemez Canyon Dam on the Jemez River, and Cochiti Dam on the Rio Grande) have significantly affected flows in the river by storing and releasing water in a manner that generally decreases the spring flood peaks and alters the timing of the annual hydrograph. Of the 100 greatest daily discharges since 1942 at the Central gage (08330000), all have occurred prior to the construction of Abiquiu (1963) and Cochiti (1975) Dams (USGS 2003). However, these operations have not caused significant changes in the average annual flow volumes, but seem only to affect the magnitude, timing, and duration of peak flows. According to USGS gage data, average daily flow for the Central gage for the pre-reservoir period from 1942 to 1974 was 1042.70 cfs, while average daily flow for the post-reservoir period from 1975 to 2002 was 1395.75 cfs.

An analysis of gage records from the Rio Grande Floodway near Bernardo (USGS Gage No. 08330010) were used to develop mean daily flow duration and flood frequency curves (MEI 2008). The Bernardo gage provides the best representative flow record for the study reach following cessation of flows in the low-flow conveyance channel period. MEI (2008) used the flood-frequency values developed by the USACE (2007b). Based on the volume of flow, the hydrological record was divided into wet, normal, and dry years (Figure 3.1) Wet years represent the top third percentile (67 through 100 percentile) of flow volumes; normal years represent the 34 through 66 percentile of flow volumes; and dry years represent the bottom third (less than 33 percentile) of flow volumes (MEI 2008). Flow duration curves were developed for wet, normal, and dry water years (Figure 3.2). Based on the design objective of 25 days inundation the 6.8% exceedance value is approximately 3,440 cfs. However, an exceedance value can be determined for wet, normal, and dry years. From the individual wet, normal, and dry flow duration curves (Figure 3.2), the 6.8% exceedance values are 4,550 cfs, 2,990 cfs, and 2,290 cfs, respectively (MEI 2008).

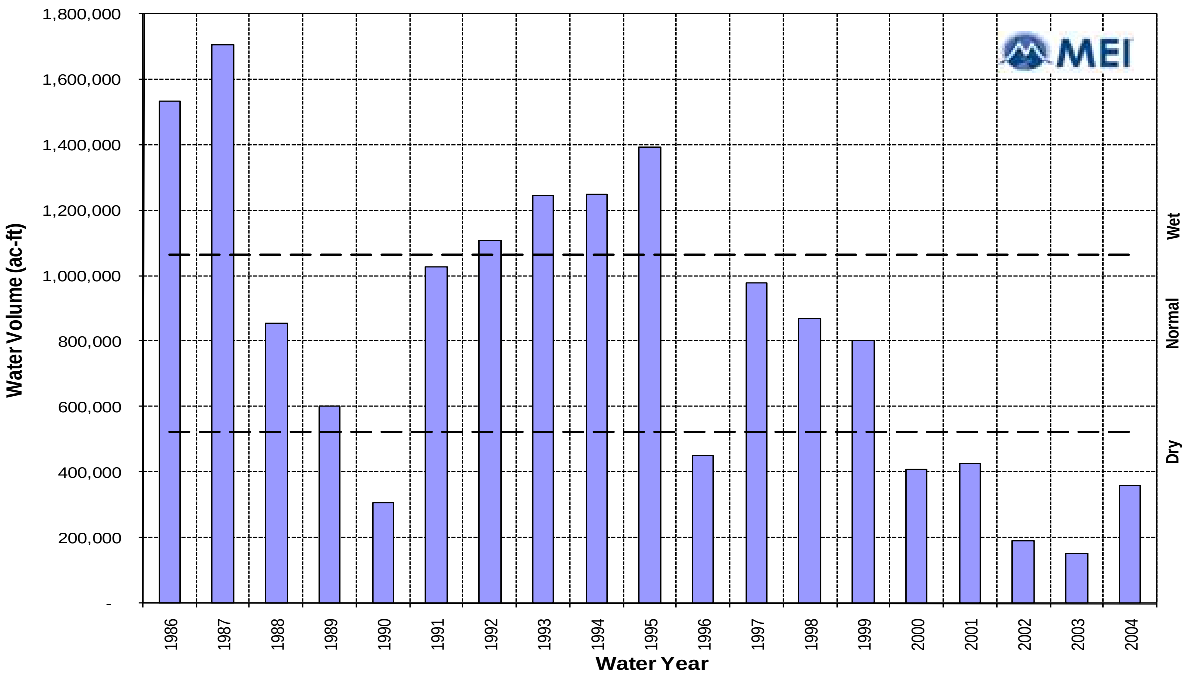

Figure 3.1. Annual flow volume at the Rio Grande at Bernardo, NM gage (USGS Gage No. 08330010) for the post–low-flow conveyance channel period (WY1986 – WY2004).

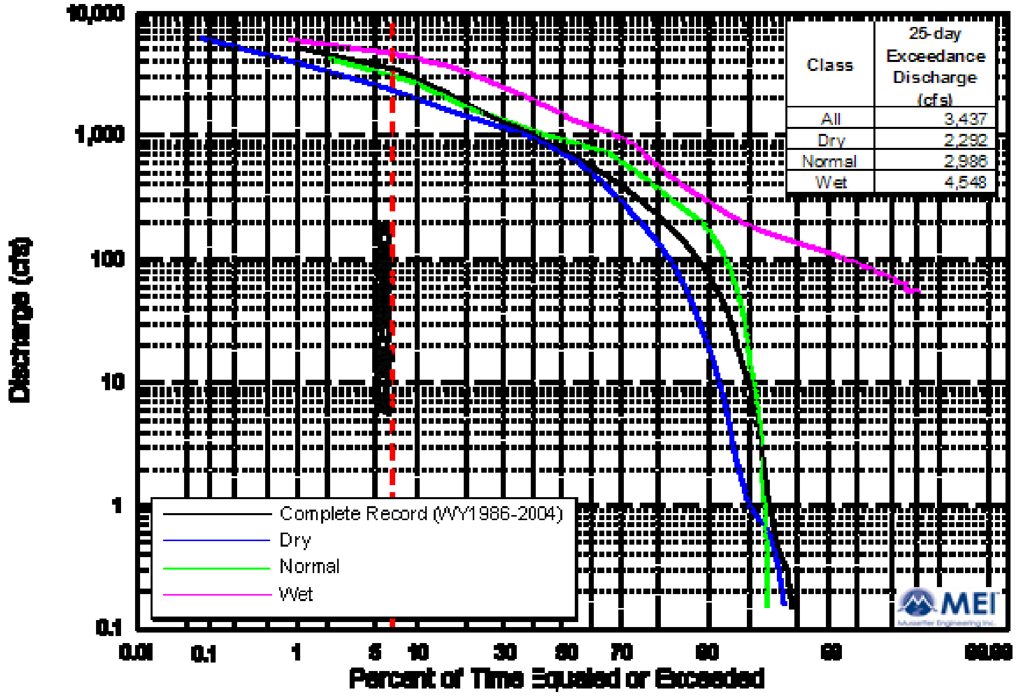

Figure 3.2. Computed mean daily flow-duration curves for the complete record and dry, wet, and normal years in the post-Cochiti Dam period at the Bernardo gage.

Peak flood discharges in the Isleta Reach have been moderated (Figure 3.3) since the closure of Cochiti Dam. Since 1986, and no releases from Cochiti Dam have exceeded 8,000 cfs (MEI 2008). The result is a reduction in flood frequency and a subsequent reduction in larger fluvial geomorphology events in the reach. The inflows into the Isleta Reach are a function of the water releases out of Cochiti Reservoir, the withdrawal of Rio Grande water at the Angostura and the Isleta Diversion Dams for agricultural purposes, and numerous ephemeral tributaries, including municipal stormwater diversion channels, both within the Isleta Reach and immediately upstream. Some of the diverted agricultural water is returned to the Rio Grande at the many ditch outfalls in the Isleta Reach, including the Peralta Wasteway and the LP1DR return flows.

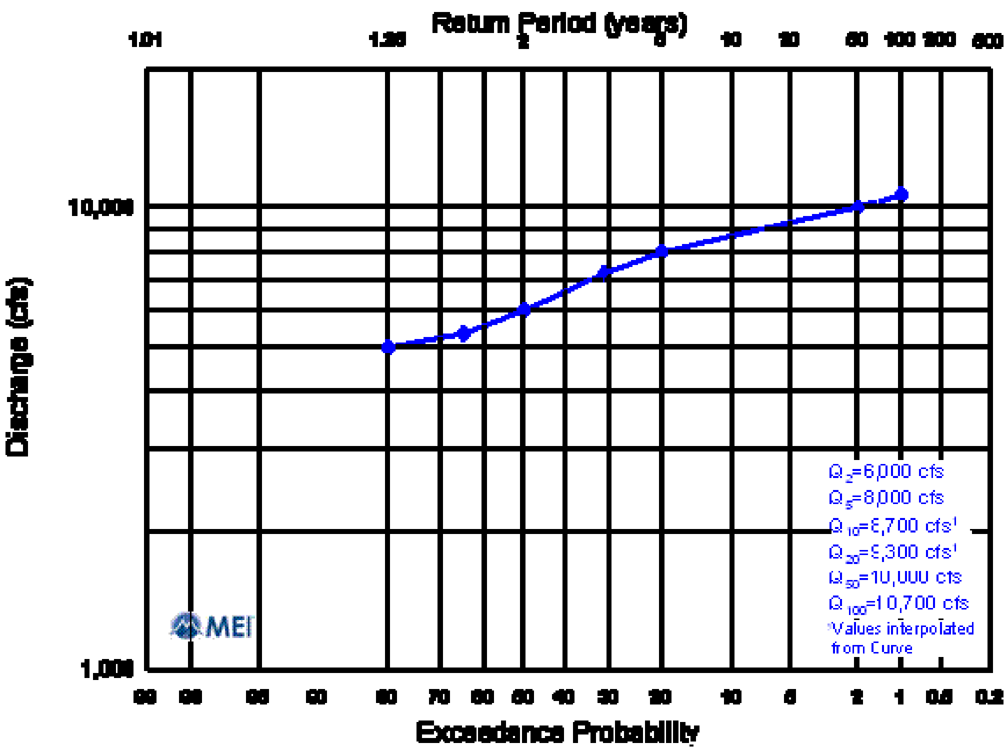

Figure 3.3. Exceedance probability for the Isleta Reach (MEI 2008).

3.4 WATER QUALITY

Current information for the water quality of the river system in the MRG is available from the USGS, the USACE, Reclamation, the University of New Mexico, the New Mexico Environment Department, and the USFWS, as well as other sources. Water quality constituents that are typically monitored include surface water temperature, pH, turbidity, dissolved oxygen (DO), suspended sediments (SSED), conductivity/total dissolved solids (TDS), and fecal coliform. These data may be collected in the Rio Grande, in adjacent canals, or within reservoirs. Typically, personnel at specific riverine, canal, or reservoir locations collect the data with automatic data logging devices at stream gage stations. Long-term water quality data for the Isleta Reach is lacking, but the available data for the Albuquerque Reach are characterized by a high degree of seasonal variability for several water-quality measures, as detailed in Table 3.1.

Table 3.1. Average Water Quality Data by Constituent for the Central Avenue Gage, Approximately 10 Miles (16 km) Upstream of the Upper Boundary of the Isleta Reach

Season	Turbidity (NTU)	DO (mg/L)	pH	Conductivity (mg/L)	Water Temp (°C)	TDS (mg/L)	Fecal coliform (col/100mL)	SSED (mg/L)
Nov–Feb	9.12	10.19	8.08	391.86	6.66	255.08	N/A	539.01
Mar–June	45.57	8.66	7.97	359.11	15.90	209.74	82.50	1167.12
July–Oct	25.67	8.03	8.13	387.95	18.89	273.17	8.00	2114.67

NTU=nephelometric turbidity unit; DO=dissolved oxygen; TDS=total dissolved solids; SSED=suspended sediments
Source: USGS 2003; Data are from 1975–2001.

The USGS has identified the following items as contributors in this region to water pollution: cyanide, fire retardant slurry, impervious surface/parking lot runoff, municipal point source discharges, on-site treatment systems (septic and similar decentralized systems), wastes from pets, and waterfowl.

New Mexico Environment Department water quality standards exist for stream and river reaches throughout the state of New Mexico. The water quality standards (Appendix D) are from the New Mexico Water Quality (NMWQ) Control Commission, as amended through May 23, 2005, and are for two reaches: 1) the mainstem of the Rio Grande from the headwaters of Elephant Butte reservoir upstream to the Alameda Bridge (NMWQ Standards [20.6.4.106]) and 2) the mainstem of the Rio Grande from Alameda Bridge upstream to the Angostura diversion works (NMWQ Standards [20.6.4.105]). The Elephant Butte to Alameda Reach encompasses all of the Isleta Reach and its subreaches. General criteria established to sustain and protect existing or attainable uses of surface waters of the state are found in the New Mexico Administrative Code (NMAC) (20.6.4.13). These general criteria apply to all surface waters of the state at all times.

3.5 CULTURAL RESOURCES AND TRADITIONAL CULTURAL PROPERTIES

3.5.1 CULTURAL HISTORY

Cultural resources include archaeological sites, sites eligible for the State Register of Cultural Properties and/or the National Register of Historic Places (NRHP), and properties of traditional religious or cultural importance (traditional cultural properties [TCPs]).

The indigenous population in the Rio Grande valley of New Mexico dates back at least 12,000 years (Cordell 1997:67–68). The steady influx of peoples of European descent into the Rio Grande valley of present-day New Mexico from the sixteenth century onward has given rise to a diverse cultural mosaic and has left a multitude of varied cultural resources that are more than 50 years old throughout the state. The state was part of the Spanish Colonial Empire until Mexico won its independence in 1821. Twenty-five years later, in 1846, New Mexico was claimed by the United States. These successive cultures have left archaeological sites (habitation, mining, industrial, and other), standing structures, bridges, utilities, and a network of irrigation canals and acequias more than 50 years old (Arrowsmith 1963; Cordell 1997:67–68; Rivera 1998; Van Citters 2003). However, archaeological resources in the LP1DR and Peralta subreaches of the Rio Grande floodplain are limited because of poor preservation, the result of flooding episodes, and a long history of agricultural use of the valley floor prior to the existence of a preservation ethic.

3.5.2 TRADITIONAL CULTURAL PROPERTIES

Reclamation has initiated consultation with Native American tribes and pueblos that may have an interest in the project and project area to determine if any TCPs must be considered in the decision-making process. Because of the sensitive nature of the Rio Grande for Native Americans, no decision would be made regarding the Proposed Action prior to conclusion of the tribal consultations.

3.6 VEGETATION AND WETLAND RESOURCES

The riverbank ecosystem found directly along the main channel of the MRG consists of open sand bars, riverbank areas with herbaceous and shrubby vegetation, and small, seasonally saturated or inundated areas characterized by a variety of hydrophytic wetland flora. Open sand bar areas are subject to frequent disturbance from erosion caused by flood events and typically have little or no vegetation establishment. Sparse growth on sand bars of young cottonwood, coyote willow, saltcedar, and a variety of herbaceous vegetation is occasionally found following reduced river flows, but because these areas are prone to frequent disturbance during moderate- and high-flow events, the vegetation typically does not have the opportunity to mature.

Herbaceous and shrubby vegetation is common along the riverbank in areas where the river channel has become deeply incised. Russian olive and saltcedar is prevalent throughout the floodplain, but especially along the channel margins. Vegetation has successfully established along the channel margins due to a decrease in overbank flooding, which results in a lack of scouring, displacement, and removal of substrate immediately adjacent to the riverbank. The root structures of the riverbank vegetation serve to reinforce the riverbank, causing less erosion, deeper channel incision, and a decrease in the potential for lateral river migration.

Wetland vegetated areas are located adjacent to the riverbank and are typically found in areas that are frequently saturated and/or inundated for at least a portion of the growing season. The number of these areas within the riparian ecosystem of the Rio Grande has substantially decreased, probably due to the lack of overbank flooding and lateral migration, and the increase in river channel incision. Common wetland vegetation in the project area includes common three-square (*Scirpus americanus*), narrowleaf cattail (*Typha angustifolia*), softstem bulrush (*Scirpus validus*), Baltic rush (*Juncus balticus*), and coyote willow.

Like the riverbank riparian vegetation, characteristics of vegetated islands within the river channel have changed significantly, due perhaps in part to the current drought. The lack of peak flows that alter island morphology and periodically remove island vegetation have resulted in the establishment and maturation of woody vegetation, which has been linked to the islands becoming more permanent features of the river channel (Fluder 2004). Because of the stability provided by the vegetative root structure of plants (especially large, woody species) found on islands, the potential for lateral migration of the river channel has been dramatically decreased, while the potential for continued incision of the river channel has increased.

Non-native species, such as saltcedar, Russian olive, and Siberian elm (*Ulmus pumila*), may have a competitive advantage over native riparian species in a condition of altered hydrological regimes that are exacerbated by the current climatological conditions. Non-native plant reproductive cycles are not as strongly tied to seasonal flood peaks as are their native counterparts. Additionally, these invasive species are able to withstand the drier soil conditions that result from channel incision and the reduction in peak flows.

The LP1DR Subreach was heavily impacted by the Belen fire in February 2007, which destroyed a large portion of the cottonwood-dominated bosque on the west bank of the project area. This area has been identified by the MRGCD as an important restoration area, particularly as it is now subject to on-going invasion by non-native saltcedar and Russian olive. Following a large fire, such as the Belen fire, extensive invasive species colonization (e.g., saltcedar and Russian olive) frequently occurs (Busch and Smith 1995; Stuever 1997; Smith et al. 1998). The intent of the preferred action is to enhance the riparian and wetland habitats in this area of the reach and to encourage greater inundation and subsequent rehabilitation of the native vegetation in the burned area.

Despite the considerable attention that has been devoted to the ecology and biodiversity of the neighboring riparian bosque (Hink and Ohmart 1984; Crawford et al. 1993), little is known about the in-channel bars, which are perhaps the bosque's most diverse and biologically active component. These dynamic environments support young wetland and riparian vegetation along with most of the natural regeneration of Rio Grande cottonwoods in the river corridor (Milford and Muldavin 2004).

3.7 FISH AND WILDLIFE

Decreases in the river channel elevation relative to the floodplain, changes in the hydrologic and sediment regime, functions of the river channel, and the introduction of predatory species (game fish) have significantly impacted the fauna of the Rio Grande. The Rio Grande drainage in New Mexico historically supported at least 21 and perhaps 24 native fish species, representing nine or ten families (Propst 1999). Since the beginning of European settlement along the Rio Grande, this system has lost a larger proportion of its native fish fauna than any other major drainage in New Mexico. Shovelnose sturgeon (*Scaphirhynchus platorhynchus)*, longnose gar (*Lepisosteus osseus*), American eel (*Anguilla rostrata*), speckled chub (*Machrybopsis aestivalis aestivalis*), and Rio Grande shiner (*Notropis jemezanus*) have been extirpated from the Rio Grande in New Mexico, and blue catfish (*Ictalurus furcatus*), if it persists, occurs only in Elephant Butte Reservoir. Rio Grande bluntnose shiner (*Notropis simus simus*) and phantom shiner (*Notropis orca*) are extinct. The silvery minnow is the only state and federally protected fish species currently inhabiting the Rio Grande, but Rio Grande sucker (*Catostomus plebeius*) and Rio Grande chub (*Gila pandora*) may warrant state protection (Propst 1999).

Common fish species of the MRG include the silvery minnow, red shiner (*Cyprinella lutrensis*) river carpsucker (*Carpiodes carpio*), flathead chub (*Platygobio gracilis*), fathead minnow (*Pimephales promelas*), longnose dace (*Rhinichthys cataractae*), white sucker (*Catostomus commersoni*) common carp (*Cyprinus carpio*), western mosquitofish (*Gambusia affinis*), and channel catfish (*Ictalurus punctatus*) (Dudley and Platania 2008). Western mosquitofish, white sucker, and common carp are introduced species that are now common throughout the MRG.

In addition to the aquatic ecosystem of the Rio Grande, the riparian corridor of the MRG historically supported a wide diversity of herpetological species. Prior to increased anthropogenic control, the river system periodically spilled into the floodplain, contributing both water and nutrients that supported a number of reptilian and amphibian species that no longer inhabit the area. In the most intensive biological survey of the MRG to date, Hink and Ohmart (1984) found 18 different species of amphibians and reptiles in the MRG. Eastern fence lizard (*Sceloporus undulatus*), New Mexican whiptail (*Aspidoscelis neomexicanus*), and Woodhouse's toad (*Bufo woodhousii*) were common and widespread. Several species common to the MRG, such as bullfrog (*Rana catesbeiana*), leopard frog (*Rana pipiens*), and Woodhouse's toad, are ubiquitous throughout the state. Others, such as the chorus frog (*Pseudacris triseriata*) and the common garter snake (*Thamnophis sirtalis*), are unique to the MRG (Hink and Ohmart 1984).

Throughout the year, riparian communities of the MRG provide important habitat during breeding and migration for many birds. Hink and Ohmart (1984) recorded 277 species of birds within 163 miles (262 km) of MRG bosque habitat. Stahlecker and Cox (1997) documented 126 species in Rio Grande Nature Center State Park and estimated that 60 to 65 species of birds breed in the park in most years. The 10 most common species during the winter of 1996–1997 were Dark-eyed Junco (*Junco hyemalis*), American Crow (*Corvus brachyrhynchos*), American Goldfinch (*Carduelis tristis*), White-crowned Sparrow (*Zonotrichia leucophrys*), American Robin (*Turdus migratorius*), Canada Goose (*Branta canadensis*), Red-winged Blackbird (*Agelaius phoeniceus*), Mallard (*Anas platyrhynchos*), European Starling (*Sturnus vulgaris*), and House Finch (*Carpodacus mexicanus*). The 10 most common species in the bosque during the summer of 1997 were Black-chinned Hummingbird (*Archilochus alexandri*), Red-winged Blackbird, Black-headed Grosbeak (*Pheucticus melanocephalus*), Spotted Towhee (*Pipilo maculatus*), Brown-headed Cowbird (*Molothrus ater*), Mourning Dove (*Zenaida macroura*), Bewick's Wren (*Thryomanes bewickii*), Black-capped Chickadee (*Poecile atricapillus*), Cliff Swallow (*Petrochelidon pyrrhonota*), House Finch, and European Starling (Stahlecker and Cox 1997). The most abundant bird species found along the river in winter were Mallard, Canada Goose, and Wood Duck (*Aix sponsa*). Red-tailed Hawk (*Buteo jamaicensis*), Cooper's Hawk (*Accipiter cooperii*), Western Screech Owl (*Megascops kennicottii*), and Great-horned Owl (*Bubo virginianus*) also occur in the proposed project area (Stahlecker and Cox 1997).

Hink and Ohmart (1984) recorded 35 mammal species in their study of the MRG, and Campbell et al. (1997) observed 14 mammal species in their survey of the Albuquerque Reach. Based on both surveys, the most common small mammals in the proposed project area include white-footed mouse (*Peromyscus leucopus*), western harvest mouse (*Reithrodontomys megalotis*), and house mouse (*Mus musculus*). Large mammals in the area include coyotes (*Canis latrans*), raccoon (*Procyon lotor*), beaver (*Castor canadensis*), muskrat *(Ondatra zibethicus*), pocket gopher (*Thomomys bottae*), and rock squirrel (*Spermophilus variegates*). Several species of bats also utilize the MRG.

3.8 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

The agencies that have primary responsibility for the conservation of plant and animal species in New Mexico are the USFWS, under authority of the ESA; the New Mexico Department of Game and Fish (NMDGF), under authority of the New Mexico Wildlife Conservation Act of 1974; and the New Mexico Energy, Minerals and Natural Resources Department, under authority of the New Mexico Endangered Plant Species Act. These agencies maintain lists of plant and animal species that have been classified, or are potential candidates for classification, as threatened or endangered (Table 3.2).

Protection from harassment, harm, or destruction of habitat is granted to species protected under the ESA. The New Mexico Wildlife Conservation Act and New Mexico Endangered Plant Species Act protect state-listed species by prohibiting taking without proper permits.

Table 3.2 Threatened (T), Endangered (E), Species of Concern (S), and Candidate (C) Plant and Wildlife Species That Could Occur within the Project Area

Common Name (*Scientific name*)	Status		General Habitat
	FED	STATE	
Fish			
Rio Grande silvery minnow (*Hybognathus amarus*)	E	E	Silt and sand substrates within slow backwaters
Birds			
Common Black-hawk (*Buteogallus anthracinus*)	–	T	Woodlands along lowland streams
Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)	C	–	Dense riparian shrub
Southwestern Willow Flycatcher (*Empidonax traillii extimus*)	E	E	Dense riparian groves of willow or saltcedar
Bell's Vireo (*Vireo bellii)*	S	T	Select for lowland riparian vegetation
Bald Eagle (*Haliaeetus leucocephalus alascanus*)	–	T	Timbered riparian areas
Mammals			
New Mexican jumping mouse (*Zapus hudsonius luteus*)	C	E	Riparian vegetation, dense grass and willows
Plants			
Pecos sunflower (*Helianthus paradoxus*)	T	–	Saturated soils of spring-fed desert wetlands

3.8.1 FISH

Rio Grande Silvery Minnow (*Hybognathus amarus*)

The Rio Grande silvery minnow was federally listed as endangered under the ESA on July 20, 1994 (Federal Register [FR] 1994a), and is listed as endangered by the State of New Mexico. The final recovery plan for the silvery minnow was released in July 1999 (USFWS 1999). The primary objectives of the decision are to increase numbers of the silvery minnow, enhance its habitat in the MRG valley, and expand its current range by re-establishing the species in at least three other areas in its historic range (USFWS 2003).

Critical habitat was designated on February 19, 2003 (FR 2003). The critical habitat designation extends from Cochiti Dam downstream to the utility line crossing the Rio Grande upstream of the Elephant Butte Reservoir delta in Socorro County, excluding all Pueblo lands. Thus the project area lies entirely within the critical habitat designation.

The silvery minnow is a moderate-sized, stout minnow that reaches 3.5 inches (9 cm) total length and spawns in the late spring and early summer, coinciding with high spring snowmelt flows (Sublette et al. 1990). The silvery minnow is omnivorous, feeding primarily on diatoms (Shirey 2004; Magaña 2007). These fish travel in schools and tolerate a wide range of habitats (Sublette et al. 1990), but generally prefer low-velocity areas (<0.33 feet per second [10 cm/second]) over silt or sand substrate that are associated with shallow (<15.8 inches [40 cm]) braided runs, backwaters, or pools (Dudley and Platania 1997). Adults are most commonly found in backwaters, pools, and habitats associated with debris piles, whereas young-of-year occupy shallow, low-velocity backwaters with silt substrates (Dudley and Platania 1997). Habitat includes stream margins, side channels, and off-channel pools where water velocities are low or reduced from main-channel velocities. Stream reaches dominated by straight, narrow, incised channels with rapid flows are not typically occupied by silvery minnow (Bestgen and Platania 1991).

The species is a pelagic spawner that produces 3,000 to 6,000 semi-buoyant, non-adhesive eggs during a spawning event (Platania 1995; Platania and Altenbach 1998). There may be more than one spawning peak during spring runoff and increased summer monsoon flows (USFWS 2003). Eggs and larvae may drift for 3 to 5 days and be transported from 134 to 223 miles (216–359 km) downstream (Platania 1995). Recent data from augmentation and relocation projects suggest that dispersal of eggs, larvae, and older age classes is usually less than 10 miles (16 km) (Remshardt and Davenport 2003; Porter and Massong 2004; Dudley et al. 2005). Silvery minnow larvae can be found in low-velocity habitats where food (mainly phytoplankton and zooplankton) is abundant and predators are scarce.

Platania (1995) suggested that historically the downstream transport of eggs and larvae of the silvery minnow over long distances was likely beneficial to the survival of their populations. The spawning strategy of releasing floating eggs allows recolonization of reaches impacted during periods of natural drought (Platania 1995). The results of two egg drift studies (SWCA 2007b) suggest that the egg retention in the Isleta Reach is higher than in the Albuquerque Reach, with bead retention rates during the high flow ascending limb and the constant high flow experiments. It is thought the greater egg retention rates in the Isleta Reach may be a result of differences in channel geomorphology and the size and numbers of inundated areas; the Isleta Reach shows a greater area of inundated vegetated surface areas. These results are consistent with Porter and Massong (2006) who found that bead retention was generally highest in flooded shoreline areas (e.g., benches and shelves) and on flooded island and sand bar surfaces.

Results from an SWCA (2008e) fisheries monitoring study at the Los Lunas Habitat Restoration Project site suggests that floodplain inundation provides important spawning habitat. To be effective, floodplain inundation must be sustained to exceed a threshold that provides adequate time for parental stock to occupy the floodplain, for embryos to develop and hatch, and for young-of-year to develop at least to the juvenile stage to enable fish evacuation when the floodplain drains (SWCA 2008e). The conclusions of this study support a working hypothesis that silvery minnow adaptively and preferentially spawn in low water exchange habitats and that restoration of inundated floodplains is a plausible strategy, along with the creation of backwater and other hydrologic retentive floodplain habitats, to minimize the downstream displacement of eggs and larvae (SWCA 2008e).

Swimming studies demonstrate that silvery minnow can traverse distances equivalent to 30 miles (50 km) in 72 hours (Bestgen et al. 2003). Bestgen et al. (2003) also recorded silvery minnow speed bursts up to 100 to 120 cm/second (60.0–72.0 m/minute) for periods of five to fifteen seconds.

The 2003 BiOp (USFWS 2003) lists the following primary constituent elements of silvery minnow critical habitat:

1. Throughout silvery minnow life-history, a hydrologic regime that provides sufficient flowing water with low to moderate currents capable of forming and maintaining a diversity of aquatic habitats, such as backwaters, shallow side channels, pools, eddies, and runs of varying depth and velocity. These characteristics are necessary for silvery minnow life-history stages in given seasons (e.g., habitat with sufficient flows from early spring [March] to early summer [June] to trigger spawning; flows in the summer [June] and fall [October] that do not increase prolonged periods of low or no flow; relatively constant winter flow [November through February]).
2. The presence of eddies created by debris piles, pools, or backwaters, or other refuge habitat within unimpounded stretches of flowing water of sufficient length (river miles) to provide a variety of habitats with a wide range of depths and velocities.
3. Substrates predominantly of sand or silt.
4. Water of sufficient quality to maintain natural, daily, and seasonally variable water temperatures in the approximate range of more than 1ºC (35ºF) and less than 30ºC (85ºF) and mitigate degraded conditions (e.g., decreased dissolved oxygen, increased pH).

Silvery minnow population have been surveyed in the Isleta Reach have since 1994 on an ongoing basis by the American Southwest Ichthyological Research Foundation (Dudley et al 2006; Dudley and Platania 2007a, 2007b, 2008), Reclamation, the NMISC, and the USFWS. In 2004, an increased abundance of silvery minnow was observed (Dudley et al. 2005). This observed increase shows that population data vary temporally and geographically. Monitoring early in 2005 revealed low minnow numbers (Dudley et al. 2006); however, numbers rose drastically in June 2005 and remained high into 2006. High spring flows in 2007 and 2008 appeared to stimulate spawning, which resulted in relatively high silvery minnow numbers (Dudley and Platania 2007a, 2008). In these years, the Isleta Reach consistently records greater numbers and proportions of silvery minnow collected; in 2007, Dudley and Platania's counts near the U.S. 380 Bridge near San Antonio, New Mexico in the San Acacia reach were 7.53 per 100 square meters, compared to 22.19 silvery minnow per 100 square meters at their sampling site near the Belen Bridge in the Isleta reach (Dudley and Platania 2007a, 2007b, 2008). Most minnows were collected in low velocity habitats, such as shoreline and backwater areas (Dudley and Platania 2007a, 2007b, 2008). A recent study (SWCA 2008d) monitored silvery minnow densities and water quality parameters daily in the channel, as well as in any isolated pools during periods of dewatering, in both the Isleta and San Acacia reaches. Isolated pools were seined daily to monitor silvery minnow populations in relation to other species. Silvery minnow were found in some of the pools in the Isleta Reach.

3.8.2 BIRDS

Common Black-hawk (*Buteogallus anthracinus*)

The Common Black-hawk is listed as threatened by the State of New Mexico and may occur in the Isleta Reach (NMDGF 2004a). Though the Common Black-hawk is considered rare in Valencia County, nesting was observed in the Isleta Reach during the summer of 2003 (Williams

2003). The species primarily occupies riparian woodlands, particularly areas with well-developed cottonwood galleries, or a variety of woodland and marsh habitats along permanent lowland streams. Breeding Common Black-hawks require mature riparian forest stands near permanent water. The diet of this riparian-obligate species consists mainly of fish, insects, crayfish, amphibians, and reptiles, but occasionally they would take small mammals and birds. Loss of riparian habitat poses the greatest risk to the species. In 1996, the NMDGF estimated there were 60 to 80 breeding pairs in the state.

Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)

The Western Yellow-billed Cuckoo is a USFWS candidate subspecies that occurs locally along riparian corridors throughout New Mexico. Ideal habitat appears to be dominated by cottonwood canopy with a well-developed willow understory. The Yellow-billed Cuckoo’s diet consists mainly of caterpillars but may also include other insects, some fruit, and the occasional lizard or frog (NMDGF 2004b). The breeding range of Yellow-billed Cuckoo extends from California and northern Utah north and east to southwestern Quebec and south to Mexico. In New Mexico, historical accounts indicate that the Yellow-billed Cuckoo was very common along the Rio Grande but was rare statewide (NMDGF 2004b). Both Hink and Ohmart (1984) and Stahlecker and Cox (1997) reported Yellow-billed Cuckoo as a nesting bird in the bosque of the MRG.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

The Southwestern Willow Flycatcher was listed as endangered without critical habitat designation on February 27, 1995 (FR 1995). Critical habitat was designated on July 22, 1997 (FR 1997), but was later withdrawn. In October 2004, the USFWS proposed a new extent of critical habitat, which was finalized in October 2005 (FR 2004, 2005). The historic range of the flycatcher includes riparian areas throughout Arizona, California, Colorado, New Mexico, Texas, Utah, and Mexico (FR 1993). The flycatcher is an insectivore that forages in dense shrub and tree vegetation along rivers, streams, and other wetlands (USFWS 2003) and prefers dense riparian thickets, typically willows with a scattered cottonwood overstory. Dense riparian woodlands are particularly important as breeding habitat.

The extent of critical habitat within Valencia County extends from the southern Isleta Pueblo boundary for 44.2 miles (71.1 km) to the northern boundary of Sevilleta National Wildlife Refuge (FR 2005). Thus, the project area lies entirely within the critical habitat designation. As described in the 2003 BiOp, declining flycatcher numbers have been attributed to loss, modification, and fragmentation of riparian breeding habitat; loss of wintering habitat; and brood parasitism by the Brown-headed Cowbird (USFWS 2003). Habitat loss and degradation are caused by a variety of factors, including urban, recreational, and agricultural development; water diversion and groundwater pumping; and channelization, dams, and livestock grazing.

In 2005, three flycatchers were detected at the Los Lunas Restoration Project site close to the proposed project area, and six flycatchers were detected at areas within the Isleta Reach between the Los Lunas and Belen bridges. All these detections occurred in late May and early June 2005; however, since no detections were made in subsequent surveys, it is believed that the flycatchers were probably migrants (Siegle 2005). During surveys by Reclamation in the area between the south boundary of Isleta Pueblo downstream to the Rio Puerco confluence, 30 flycatchers were observed in 2005, 28 in 2006, and 44 in 2007 (Moore and Ahlers 2006a, 2006b, 2008). However, no flycatchers were fledged from nests in this subreach during this period (Moore and Ahlers 2006a, 2006b, 2008). Of the 44 flycatcher recorded in 2007, 33 were determined to be migrants, four were deemed to be late migrants, five were identified as male territories, and two formed a pair and nested south of U.S. Highway 60 (Moore and Ahlers 2008), which is well downstream of the project area.

Flycatcher nest sites in the Isleta Reach are most often located near the active river channel and in areas of inundation (Parametrix 2008). Work in the Los Lunas Subreach determined that burned cottonwood areas with a willow-dominated understory are probably the most suitable breeding habitat in the Belen Subreach (Siegle 2005). The Belen fire area exhibits these characteristics; therefore, restoration at the LP1DR site could potentially enhance flycatcher habitat in this portion of the Isleta Reach. Monitoring results suggest that small areas of highly suitable habitat currently exist within adjacent sites in the Belen Subreach (Reclamation 2002). These sites are apparently unoccupied by breeding flycatchers. The closest breeding populations that could serve as sources for flycatcher dispersal into the proposed sites are 14 miles (22.5 km) upstream of the Peralta Subreach at the Isleta Pueblo or 20 miles (32 km) downstream of the LP1DR site at the La Joya/Rio Puerco site. However, much of the riparian habitat in the Belen Subreach, including the restoration site, is currently suitable as stopover habitat for migrating flycatchers as confirmed by presence/absence surveys (Siegle 2005).

Bell's Vireo (*Vireo bellii*)

The Bell's Vireo is listed by the USFWS as a species of concern and as threatened by the State of New Mexico. Bell's Vireo is occasionally found during summer months in the lower MRG. The species uses cottonwood and willow habitat patches of 0.25 to 3.0 acres (0.1–1.25 hectares) in riparian corridors throughout the southwestern United States and Mexico. The species is suffering from the effects of habitat loss throughout its historic range. The species has also been impacted by Cowbird parasitism, with an estimate that 70% of all nests are abandoned because of parasitism.

Bald Eagle (*Haliaeetus leucocephalus*)

The Bald Eagle has been removed from the Federal List of Endangered and Threatened Wildlife in the lower 48 States of the United States. The Bald Eagle would continue to receive protection from the Bald and Golden Eagle Protection Act, the MBTA, and the State of New Mexico (FR 2007), as it is still listed by the State as threatened. Bald Eagles are associated with habitats near open water. In New Mexico, Bald Eagles commonly winter in areas adjacent to rivers and lakes or where carrion is available. The major food items for Bald Eagles in New Mexico are waterfowl, fish, and carrion (NMDGF 2004c). Bald Eagles are uncommon during the summer and have limited breeding sites in New Mexico, with documented nests in the extreme northern and western portions of the state. The number of birds wintering in the state has been steadily increasing. The Bald Eagle commonly winters along the Rio Grande, and over-wintering Bald Eagles have been recorded within the project area, where a few individuals may roost in tall cottonwood trees near the river.

3.8.3 MAMMALS

New Mexican Jumping Mouse (*Zapus hudsonius luteus*)

The New Mexican jumping mouse (*Zapus hudsonius luteus*), also known as the New Mexico meadow jumping mouse, is listed by the USFWS as a species of concern and is considered threatened by the State of New Mexico. The species is endemic to New Mexico and Arizona. It is restricted to mesic habitats, preferring permanent streams, moderate to high soil moisture, and dense and diverse streamside vegetation consisting of grasses, sedges, and forbs (NMDGF 2004d). In the Rio Grande valley, the species occurs mainly along the edges of permanent ditches and cattail stands.

3.8.4 PLANTS

Pecos Sunflower (*Helianthus paradoxus*)

The Pecos sunflower (*Helianthus paradoxus*) was afforded threatened species status under the ESA, as amended, on October 20, 1999 (FR 1999). The Pecos sunflower is the only sunflower capable of growing directly in the saturated soils of spring-fed, saline desert wetlands. These wetlands are most commonly desert springs and seeps that form wet meadows called cienegas. These are rare wetland habitats in the arid Southwest region (Hendrickson and Minckley 1984). The soils of these desert wetlands are typically saline or alkaline because the waters are high in dissolved solids and high rates of evaporation leave deposits of salts, including carbonates, at the soil's surface. Soils in these habitats are predominantly silty clays or fine sands with high organic matter content. Studies by Van Auken and Bush (1997, 1998) showed that Pecos sunflower grows in saline soils, but seeds germinate and establish best when precipitation and high water tables reduce salinity near the soil's surface. Like all sunflowers, this species requires open areas that are not shaded by taller vegetation (USFWS, Pecos Sunflower [*Helianthus paradoxus*] Recovery Plan 2005).

Incompatible land uses, habitat degradation and loss, and groundwater withdrawals are historic and current threats to the survival of Pecos sunflower. The loss or alteration of wetland habitat is the main threat. The lowering of water tables through aquifer withdrawals for irrigated agriculture and municipal use, diversion of water from wetlands for agriculture and recreational uses, and wetland filling for conversion to dry land uses destroyed or degraded desert wetlands before this sunflower was listed as threatened.

3.9 SOCIOECONOMICS

This analysis does not focus on all aspects of economics within the proposed project area, but considers only the projected economic costs of the Proposed Action and economic statistics at the state, county, and local levels to describe the economic context of the project.

The proposed project location is in Valencia County, New Mexico. In 2006, New Mexico had an estimated population of 1,954,599, with 66,152 persons residing in Valencia County as of the 2000 census (U.S. Census Bureau 2006). Valencia County, considered rural in character, is approximately 1,067 square miles (2,763.51 km^2) in area, with an average of 61.9 people per square mile.

In 2000, Valencia County had a median household income of $34,099, and in 2002 the per capita personal income in Valencia County was $20,598. This represents an increase of 18.9% from the levels recorded in 1997. This 2002 figure was 67% of the national per capita income, which was $30,906 (U.S. Census Bureau 2004a, 2004b).

For the last decade, the MRG as a whole has experienced rapid population growth, particularly in Bernalillo and Valencia counties. The result is an urban and suburban corridor, extending from the Town of Bernalillo in Sandoval County to Belen in Valencia County, which is essentially a single metropolitan unit despite each community in the area's distinct geographic borders. As such, each community in this region is economically interconnected with its surrounding communities.

It is expected that this project would bring some minor economic multipliers to the towns closest to the project areas. Construction crews would likely patronize local businesses for supplies such as fuel and food. Many of the economic benefits associated with this project would remain within the greater metropolitan area.

3.10 VISUAL AND AESTHETIC RESOURCES

The bosque area within the project area is valued for the visual and aesthetic appeal of mature forest and flowing water in an arid landscape. The bosque is also valued for its wildlife-watching opportunities.

The bosque and river are visible to the public from bridge crossings, such as the U.S. Highway 6 Bridge in Los Lunas, Main Street Bridge in Belen, U.S. Highway 346 Bridge near Bosque, and U.S. Highway 60 Bridge near Bernardo. These bridge vistas of the river and bosque provide thousands of urban residents with a regular and important visual aesthetic experience. The Belen Division of the MRGCD has a bosque access policy to allow for recreation within the river and bosque regions, typically used for hunting and fishing. No motorized vehicles except maintenance and emergency vehicles are allowed in this portion of the bosque, making the aesthetic experience of the recreating public one of a forest and riverside that is full of the sounds and sights of water and forest.

3.11 AIR QUALITY AND NOISE

The proposed project area lies within New Mexico's Air Quality Control Region 152. Region 152 includes most of Valencia County, which is in attainment for all criteria pollutants (carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur oxides) of the National Ambient Air Quality Standards (NMAC 2004). The closest Class I area (a national park or wilderness area) is Manzano Mountain Wilderness, east of the proposed project area. Air quality in the project area is considered to be good. Due to inversions and an increase in the use of wood-burning stoves, carbon monoxide and airborne particulates are occasionally high in the Rio Grande valley during winter months. All vehicles involved in project activities would have emission control equipment that has passed state emissions tests. A fugitive dust permit would be obtained from local municipalities if necessary, and Best Management Practices (BMPs), such as wetting down disturbed areas to minimize dust, would be followed during project activities.

Noise levels are limited to 90 decibels A-weighted (dBA) averaged over an 8-hour day by the Occupational Safety and Health Administration (29 Code of Federal Regulations [CFR] 1910.95). No worker may be exposed to 115 dBA averaged over an 8-hour day without hearing protection.

3.12 NET WATER DEPLETIONS

The Rio Grande Compact (1939) limits the amount of surface water that can be depleted annually in the MRG based upon the natural flow of the river measured at the Otowi gage near Los Alamos. In addition, the NMOSE has determined that the MRG is fully appropriated. Therefore, any increase in water use in one sector must be offset by a reduction in use in another sector to ensure that neither *Indian Water Rights*, other existing water rights, nor New Mexico's ability to meet its downstream delivery obligations are impaired. Additionally, the New Mexico State Water Plan (NMOSE/NMISC 2003) states that habitat restoration projects should not increase net water depletions, or that if depletions should occur they would be offset through a permitting process established by the NMOSE.

3.13 ENVIRONMENTAL JUSTICE

Executive Order 12898 (FR 1994b), Environmental Justice in Minority and Low-Income Populations, requires consideration of adverse impacts that would disproportionately affect such populations. The population of Valencia County has proportionately more persons of Hispanic and Native American background and fewer persons of African-American or Asian background than the national averages. Ethnic populations in the State of New Mexico are proportionally similar to those in Valencia County. It should be recognized that persons of Hispanic background might also claim identification with another ethnic group as well.

3.14 INDIAN TRUST ASSETS

Indian Trust Assets (ITAs) are legal interests in assets held in trust by the United States Government for Indian tribes or Indian individuals. Some examples of ITAs are lands, minerals, water rights, hunting and fishing rights, titles, and money. ITAs cannot be sold, leased, or alienated without the express approval of the U.S. Government. Secretarial Order 3175 and Reclamation ITA policy require that Reclamation assess the impacts of its projects on ITAs. An inventory of all ITAs within the proposed project area is required. If any ITAs are impacted, mitigation or compensation for adverse impacts to these assets is required.