Chapter 3: Affected Environment and Environmental Consequences

Introduction

Scope of Analysis

This section describes the current condition and trends of resources that may be affected by the proposed action and the environmental consequences of the proposed action and no action alternative. The information in this EA is tiered to and derived primarily from the information in the *Carlsbad Project Water Operations and Water Supply Conservation EIS* (Reclamation 2006a), the *2006-2016 Biological Opinion* (US Fish and Wildlife Service 2006), the *Long-term Miscellaneous Purposes Contract EIS* (Reclamation 2006c), and site-specific studies for the Seven Rivers areas and for the Vaughan Pipeline (New Mexico Interstate Stream Commission 2007; Reclamation 2007). Information from these documents is incorporated by reference and will not be repeated here unless needed to clarify discussions, to meet a legal requirement, to provide site-specific detail or to address changes in the resource baseline. Each aspect of the environment that would be affected by the proposed action is discussed to the level of detail commensurate with the potential for environmental impact. The greatest potential for impacts would be to water resources and biology. Other resources discussed in this chapter include recreation, cultural resources, Indian trust assets, and Environmental Justice.

Leasing and delivering water through the ISC infrastructure would have negligible or no effect on air quality, noise, safety and human health, agricultural soils and land resources, visual resources, and socioeconomics. The only difference between the proposed action and the no action alternative would be duration of pumping and application of water to the river. Since the water would be leased from the state, effects on the local economy would be negligible and limited to positive inputs for equipment maintenance and servicing. There would be no disproportionate human health, economic and environmental impacts on any group of people, including minority and low-income populations.

Study Area

The direct impact area would be the point on the Pecos River where the water would be discharged. Because the proposed action includes changes in river inflows and reservoir storage, there would be potential for effects on water resources, biology and riparian habitat throughout the Pecos River system. Other effects could result in DeBaca County in the immediate vicinity of the well-field location and in nearby communities.

Water Resources

Climatic and Geomorphic Setting

The Pecos River Basin is generally considered to be semi-arid, with average rainfall in the Ft. Sumner area at 14 inches annually. Precipitation exhibits a distinct seasonality. In late fall and winter, lower-intensity precipitation typically associated with frontal storms enter the study area from the west and northwest. Weather patterns in July and August are characterized by scattered high-intensity thunderstorms which occur nearly daily, triggered by convective heating of a moisture-laden atmosphere. The moisture during the summertime "monsoon" season results from the atmospheric circulation from the Gulfs of Mexico and California to the south. Air temperatures vary within the region depending on location, but the basin is characterized by a high rate of evaporation due to wind and low humidity. Springtime is the most consistently windy period.

From Santa Rosa Dam to Sumner Lake, the Pecos River flood plain mostly is mostly incised into bedrock canyons of varying width and up to 300 feet deep. From Sumner Dam to Brantley Reservoir is a broad valley that was a relatively treeless, dry flood plain before the 1900s. Today, the lower valley, from the Near Acme gage to Brantley Reservoir, is covered by farm fields, and the flood plain includes mostly non-native invasive species, although there are ongoing efforts by several agencies to eliminate them.

Operational Priorities

Flood control is the foremost operational priority on the Pecos River; however, floods requiring regulation are relatively infrequent in the Pecos River system. Irrigation deliveries of Carlsbad Project water to Brantley reservoir (and eventually Avalon reservoir) through block releases for use by the Carlsbad Irrigation District (CID) and bypass of Fort Sumner Irrigation District's (FSID) entitlement through Sumner Dam for diversion at FSID's diversion dam are next in priority to flood control. A "bypass" of water is defined as inflow to Sumner or Santa Rosa dam that is allowed to flow through the reservoir for irrigation (such as FSID's diversion right) or for augmenting the instream flow for the shiner. Bypasses of Carlsbad Project supplies through Sumner Dam when available (such as during the non-irrigation season) for augmenting river flows for the shiner are next in priority. FCP releases are a last effort in the chain of priority for keeping the river continuous and are used when bypasses cannot be used and scheduling a block release is not permissible with the exception of emptying the FCP at the end of the calendar year in order to utilize any left over FCP storage completely. Since the FCP agreement with CID is on a "use or lose" basis annually, FCP storage is used in lieu of bypassing starting at the end of the irrigation season (November 1st). Otherwise if the storage is not used, it is reset at the end of the calendar year and Reclamation is allotted a new FCP for the new calendar year (effectively losing access to that water allotted in the previous calendar year). Left over FCP storage is used in lieu of bypassing since FCP storage depletions are paid for up front by an exchange with CID at Seven Rivers; whereas bypassing depletion is paid back

with Carlsbad Project Water Acquisition (CPWA), of which the unused portion of CPWA is credited and is not lost if left unused. This means that leaving an unused portion of the FCP at the end of the year is a wasted resource, but using this unused portion of the FCP in lieu of bypassing allows for it to be credited in the form of CPWA. The water leasing action contemplated in this document would be to use pumping to avoid intermittency and to help remain in compliance with the 2006 - 2016 Biological Opinion. Pumping would occur in the hottest, driest months of the year. If needed to meet target flows, the bypass operation will be used during spring. During summer, we anticipate relying on the water leasing action as a first priority. If water leasing is insufficient to cover target demands for keeping the river continuous, FCP releases and water leasing may be used in tandem for this purpose. Also, if bypass is available to meet some water demands, water leasing and FCP releases, in that respective priority order, may be used to supplement bypasses. Please refer to the EIS for further statistical information on block releases and FSID diversions (Reclamation 2006a.)

Streamflows

Streamflows in the study area are derived from two primary sources: snowmelt runoff from the headwaters of the Pecos River in the Sangre de Cristo mountain range and monsoon (and other event) rainfall in the study area. To a lesser extent, ground water inflows from mountain front recharge infiltrating into the Roswell and Capitan Reef aquifers, and subsequently discharging into the Pecos River, also contribute to streamflows in the study area. For a synopsis of streamflows in the entire study area, please refer to the Water Resources section in Chapter 3 of the EIS (Reclamation 2006a). For the purpose of this document, examination of streamflows is most important at the Near Acme gage since this area is critical in determining whether flow in the Pecos River is continuous. Figure 3.1 is a flow duration curve, which depicts the percentage of time that historic (or modeled) flow rates met or exceeded a given flow rate, at the Near Acme gage for the entire period of record at the gage (with the exception of provisional data) and Figure 3.2 depicts historic intermittency at the gage for the entire period of record.

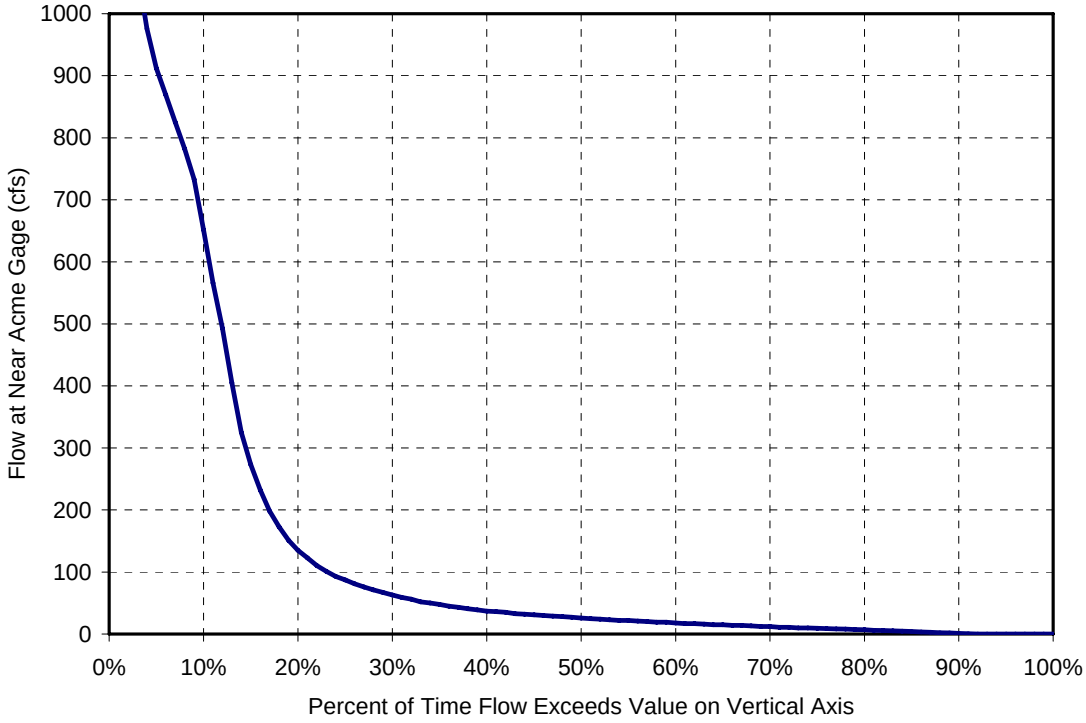

Figure 3. 1 Flow duration at the USGS Near Acme gage for the historic period of record (7/1937 through 12/2006).

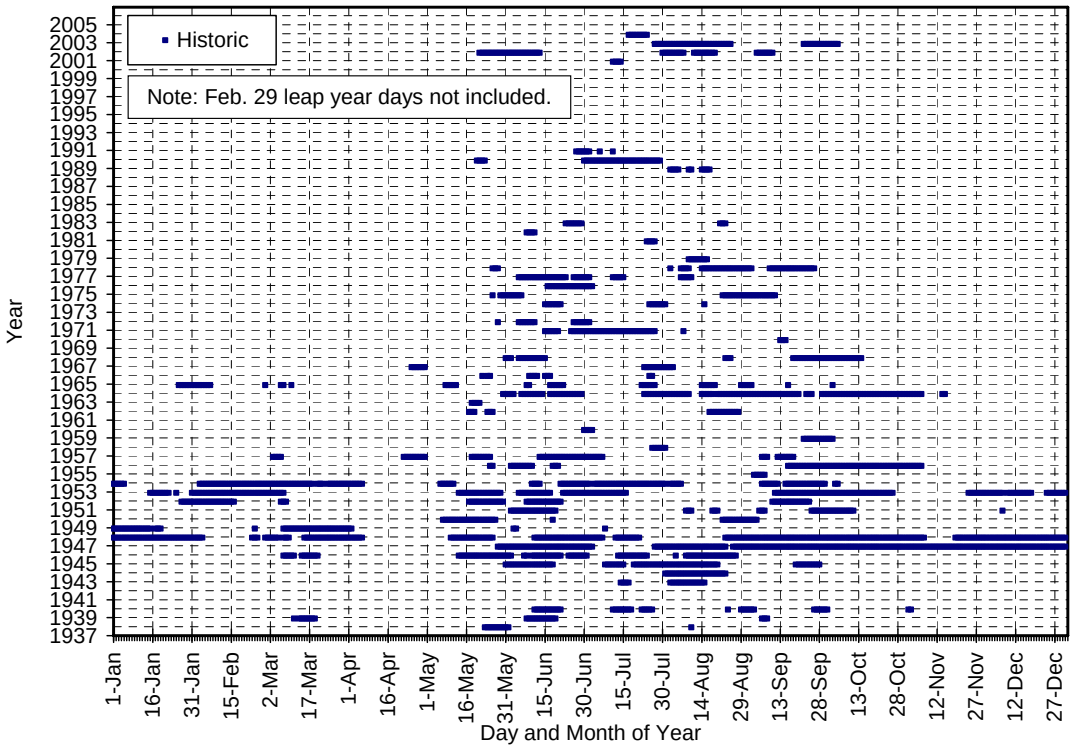

Figure 3. 2 Historic periods when intermittency occurred at the USGS Near Acme gage (7/1937 through 12/2006).

Reservoir Storage

Four reservoirs are located within the study area on the mainstem of the Pecos River; they include: Santa Rosa Reservoir, Sumner Reservoir, Brantley Reservoir, and Avalon Reservoir. With the exception of the 500 acre-foot FCP, all of the reservoir storage is utilized for irrigation within the Carlsbad Project. Including the FCP, the maximum allowable entitlement storage or "conservation storage" for the Carlsbad Project is 176,500 acre-feet. This maximum storage is divided among the four reservoirs depending on sedimentation levels in Sumner and Avalon reservoirs (Reclamation 2006a). Table 3.1 contains pertinent information about the reservoirs including purpose, conservation storage limits, total storage, ownership, year completed, and minimum pool (Reclamation 2006a).

Although Brantley reservoir has a maximum conservation storage of 40,000 acre-feet, it also exhibits additional storage because of its direct connection with the Major Johnson aquifer, which is a large aquifer at the southern boundary of the Roswell Basin Artesian aquifer. This additional storage for reservoirs is often referred to as "bank storage". The estimated total conservation storage for Brantley reservoir including bank storage is close to 63,000 acre-feet. Since approximately 10,000 acre-feet of water still remains in the banks at the minimum storage of 2,000 acre-feet, roughly 13,000 acre-feet of this extra storage is available to the Carlsbad Project.

Table 3.1 Pecos River Reservoirs

Reservoir	Purpose(s)	Ownership	Year completed	Allowable conservation storage space[1] (acre-feet)	Total storage capacity[2] (acre-feet)	Minimum pool (acre-feet)
Santa Rosa	Flood control and irrigation	Corps	1980	92,236	438,364	0
Sumner	Irrigation and flood control	Reclamation	1937	40,398	93,828	2,500
Brantley	Irrigation and flood control	Reclamation	1988	40,000	414,466	2,000
Avalon	Irrigation	Reclamation	1907	3,866	4,466	600

[1] Excludes minimum pool.
[2] Top of flood pool; accounts for sedimentation using latest surveys; does not include flood surcharge space.

Reservoir Evaporation

Reservoir evaporation is significant in the study area since all of the reservoirs are located in the arid desert climate of Eastern New Mexico. Pecos River RiverWare modeling indicates average annual evaporation from these four reservoirs is around 45,000 acre-feet/year. Some reservoirs experience lower evaporation rates per unit

area because of their physical location in Eastern New Mexico. Typically temperatures increase from upstream to downstream along the Pecos River so it follows that evaporation rates also increase. Santa Rosa has the lowest average unit evaporation rate at 68 inches per year, Sumner averages 84 inches per year, and Avalon and Brantley reservoirs experience an average of 89 inches per year (Reclamation 2006a).

Unit evaporation is not the only parameter affecting total reservoir evaporation. The amount of storage contained in a reservoir compared to the amount of surface area exposed to the atmosphere is also important. Ratios are dependent on the particular geometry (or bank storage effect) in the reservoir at a given storage level. A comparison of ratios at the conservation limit of each reservoir is as follows. For the ratio of exposed surface acres to acre-feet of storage, Santa Rosa is most efficient at 26. Brantley reservoir is second most efficient, which is somewhat attributable to its large bank storage capacity, with a ratio of 19. Sumner is third most efficient, which is mostly due to the many years of sedimentation that has accumulated in the reservoir and its resultant shallow depth compared to Santa Rosa and Brantley. Sumner has a ratio of 15 acre-feet of storage per acre of water surface exposed to the atmosphere. Although its storage capacity is rather small, Avalon is least efficient with a ratio of 5 acre-feet of storage per acre of exposed water surface.

Reservoir storage is an important concept in understanding depletions from the Pecos River System and it is also a key parameter in net depletions or changes to the Carlsbad Project's water supply due to changes in river operations. Changing river operations can affect storage levels and detention times at reservoirs, which ultimately affects the amount of evaporation that occurs within them.

Ground Water

Ground water in the study area includes two major confined aquifers and a shallow unconfined aquifer underlying the entire mainstem of the Pecos River within the study area. The two major confined aquifers include the carbonate aquifer in the Roswell Artesian Basin and the Capitan Reef Complex, which is a large arc shaped aquifer underlying most of the Carlsbad area that stretches east into West Texas. Both the shallow and the confined aquifers are linked to the Pecos River. The proposed water lease agreement involve changing uses for wells that pump from a local aquifer in the Ft. Sumner area. In the case of the proposed water lease agreement, the aquifer in the Ft. Sumner area is known to have a direct connection to the Pecos River (Chudnoff, et. al. 2005). Aquifer tests indicate that in this area the aquifer may be a confined or a leaky-confined aquifer (Chudnoff, et. al. 2005).

Water Quality

Impaired waters and salinity are generally the two biggest factors in water quality in the study area. The four reservoirs and five river reaches within the Pecos River study area are listed as impaired waters (Reclamation 2006a). Four of the river reaches are listed as impaired primarily due to nutrient loading not supporting a typical warm water fishery (New Mexico Water Quality Control Commission

[NMWQCC] 2004). Reservoirs are listed as impaired and probable causes listed include: mercury found in fish tissue, nutrient/eutrophication biological indicators, and sediment/siltation (NMWQCC 2004).

Salinity is primarily an issue for irrigation since high salinity can stunt crop growth or possibly even result in plant mortality. Salinity is typically measured as Total Dissolved Solids (TDS), but is often approximated using Electrical Conductivity (EC). Waters in the Pecos River study area are governed by TDS standards, but the standards have not been exceeded (Reclamation 2006a). EC (and subsequently TDS) generally increases from upstream to downstream in the study area. Median EC measurements range from less than 1,000 micro-Siemens per centimeter (µS/cm) above Santa Rosa to over 6,000 µS/cm at Artesia and over 4,000 µS/cm downstream of Brantley Reservoir (Reclamation 2006a). Generally, irrigation water stored in Santa Rosa and Brantley reservoirs does not exhibit a high enough concentration of TDS to affect crops; however, Brantley reservoir has known water quality problems at times mostly from upstream irrigation return flows that tend to increase TDS. These TDS increases occur as low discharge (~100 cfs or less) enters the reservoir from the Pecos River. CID sometimes uses block releases, large blocks of water (>1000 cfs) with low TDS, to dilute the concentration of TDS in Brantley reservoir (Reclamation 2006a). Ground water is also known to generally increase in salinity in the upstream to downstream direction in the Pecos River study area (Reclamation 2006a).

Biological Resources

Wildlife and Habitat

A detailed discussion of the wildlife and habitat along the Pecos River and reservoirs is found in the Carlsbad EIS (Reclamation 2006a). Vegetation in the vicinity of the Vaughan pipeline discharge point includes native and non-native riparian vegetation, surrounded by farms and fallowed farmland. This habitat supports a wide variety of birds, mammals, amphibians, and reptiles.

Generally, small-bodied fishes dominate the riverine fish community in the Pecos River; however, other aquatic species, including reptiles and amphibians are also dependent upon Pecos River flows. Below the Vaughan Pipeline discharge point, the Pecos River enters a broad alluvial plain where the river is more typical of a Plains stream, with a relatively wide channel and a shifting sand substrate. Shallow runs and braided channels are prevalent, and there are small wetlands along the river and in oxbows. This reach provides the necessary habitat components for the Pecos bluntnose shiner and other aquatic species but has been subject to intermittency when base inflows are low and are diverted.

Changes to water levels and quality in the reservoirs are expected to be negligible; therefore reservoir fisheries, wildlife and habitat are not discussed here.

Threatened, Endangered and Special Status Species

Special status species are those listed as threatened or endangered under provisions of the Federal Endangered Species Act of 1973, as amended (ESA); those proposed or considered as candidates for such listing; and those considered as rare or species of concern by the Service, NMDGF, and New Mexico Energy, Minerals and Natural Resources Department, Forestry Division. The ESA grants listed species protections from harassment, harm, or destruction of habitat.

There are over 65 known sensitive status species known to occur in Guadalupe, DeBaca, Chaves, and Eddy Counties. Of these, the only federally protected species that is likely to be impacted by the proposed action is the Pecos bluntnose shiner (*Notropis simus pecosensis*).

The shiner is a state and federally threatened species. It is a small fish that is native to the Pecos River in New Mexico. The shiner was first collected in 1874 in the Rio Grande of New Mexico (Federal Register 52(34): 5295-5303). The Service designated the shiner as a federally threatened species, with critical habitat, in 1987 under ESA. At the time of listing, the Service identified the "most important factors in the species' decline as reduced flow in the main channel of the river because of water storage, irrigation, and water diversion" (Federal Register 52(34): 5295- 5303).

There is scientific consensus that maintenance of a dynamic sand bed channel with low-velocity areas and avoidance of intermittency are essential elements of shiner habitat.. The ongoing drought, combined with the continued demands on the river for irrigation and compact deliveries to Texas, may be putting additional strain on the genetic diversity of the remaining population and thus the long-term survival of the shiner.

Designated critical habitat for the shiner is divided into two reaches. The boundary of the upper critical habitat is located near the Vaughan Pipeline discharge point at the confluence of Taiban Creek and extends downstream to Crockett Draw. The lower critical habitat reach is from Hagerman to Artesia. The upper critical habitat has a wide sandy river channel with only moderately incised banks and provides habitat suitable for all age classes. The lower critical habitat is deeply incised, has a narrow channel, and has a compacted bed. Although the lower critical habitat has permanent flow, the habitat is less suitable for shiners and only smaller size classes are common in this reach. Lack of growth, reduced survival, and reduced recruitment in this reach is attributed to poor habitat conditions and the periodic downstream displacement of eggs, larvae, and small juveniles.

Recreation

The affected environment for recreation includes the recreational opportunities that exist along the Pecos River. A detailed discussion of the attendance, use and

expenditures associated with recreation is found in the Carlsbad EIS (Reclamation 2006a). Changes to water levels and quality in the reservoirs are expected to be negligible; therefore reservoir-based recreation is not discussed here.

Small watercraft and other flotation devices can be used on the upper reaches of the Pecos River in the spring if flows are sufficient. Fishing, however, appears to be the primary activity on the river. Fishing and other recreational activities depend on the availability of water, as well as public access which is limited. Public access below Sumner Dam is provided by the State park. Other public access is available at State and county highway bridges and across public land managed by the Bureau of Land Management (BLM). BLM does not have any developed recreation sites or river access sites along the Pecos River. The area of the river in which the greatest amount of recreational use takes place is likely directly downstream from Sumner Dam. The presence of the State park, with its camping and picnicking facilities, restrooms, and easy access, makes this a popular river recreation area (Reclamation 2006a).

Cultural Resources

This section identifies cultural resources that may be affected by the proposed action. The affected environment for cultural resources includes the existing water channels or active flood zones of the Pecos River corridor.

Cultural resources include past and present expressions of human culture and history in the physical environment, such as prehistoric and historic archaeological sites, buildings, structures, objects, districts, natural features, and biota, which are considered important to a culture, subculture, or community. Cultural resources also include aspects of the physical environment that are a part of traditional lifeways and practices, and are associated with community values and institutions. Historic properties are a subset of cultural resources that meet specific eligibility criteria found at 36 CFR 60.4 for listing on the National Register of Historic Places (NRHP).

Cultural resources have been organized into prehistoric resources, historic resources, and traditional cultural properties. These types are not exclusive, and a single cultural resource may have multiple components. Prehistoric cultural resources refer to any material remains, structures, and items used or modified by people before Europeans established a presence in New Mexico in the early 17th century. Historic cultural resources include material remains and the landscape alterations that have occurred since the arrival of Europeans in the region. Traditional cultural properties are places associated with the cultural practices or beliefs of a living community. These sites are rooted in the community's history and are important in maintaining cultural identity. Examples of traditional cultural properties for Native American and Hispanic communities include natural landscape features, places used for ceremonies and worship, places where plants are gathered to be used in traditional medicines and ceremonies, places where

artisan materials are found, and places and features of traditional subsistence systems, such as community-maintained irrigation systems and traditionally used fields, grazing areas, and firewood-gathering sites..

A detailed cultural setting and site record search for the Pecos River basin is included in the cultural resource technical report (Tetra Tech, Inc., 2004), prepared in support of the Carlsbad Project Water Operations and Water Supply Conservation EIS (Reclamation 2006a). The affected environment for cultural resources is identified as the area of potential effects (APE), as described in the National Historic Preservation Act (36 CFR 800.16). The APE is defined as the geographic area within which federal actions may directly or indirectly cause alterations in the character or use of historic properties. Because the proposed action only involves the lease, and delivery of water, the APE for cultural resources for the proposed changes in water operations includes existing water channels or active flood zones. No additional construction, ground disturbance, changes in water storage, control and delivery infrastructure, or new land abandonment is proposed. Cultural resources, primarily archaeological sites, bridges, and water storage, control and delivery infrastructure are located in the existing water channels and active flood zones. No traditional cultural properties have been identified in the Pecos River Basin during tribal consultations conducted for the Carlsbad EIS (Reclamation 2006a). Letters describing the range of supplemental water proposals were sent to representatives of twelve tribes and Native American pueblos on January 22, 2007 (See Chapter 6). No traditional cultural concerns have been identified to date.

Indian Trust Assets

Indian Trust Assets (ITAs) are legal interests in assets held in trust by the United States through the Department of the Interior, Bureau of Indian Affairs, for Indian tribes or individual Indians. This trust responsibility requires that all federal agencies, including Reclamation, ensure their actions protect Indian Trust Assets.

“Assets” are anything owned that has monetary value. The asset need not be owned outright but could be some other type of property interest, such as a lease or a right of way. They can be real property, physical assets, or intangible property rights. Common examples of trust assets may include lands, minerals, hunting and fishing rights, water rights, other natural resources, and money. “Legal interest” means there is a primary interest for which a legal remedy, such as compensation or injunction, may be obtained if there is improper interference. Trust assets do not include things in which a tribe or individual have no legal interest, such as off-reservation sacred lands in which a tribe has no legal property interest. It should be noted that other federal laws pertaining to religious or cultural laws should be addressed if impacts to such lands were to occur from Reclamation actions.

No issues involving Indian Trust or specific ITAs were identified in the Pecos River Basin during the preparation of the Carlsbad EIS (Reclamation 2006a).

Letters regarding the range of supplemental water proposals were sent to representatives of twelve tribes and Native American pueblos on January 22, 2007 (See Chapter 6). No ITA issues have been identified to date.

Environmental Justice

An evaluation of environmental justice impacts is mandated by Executive Order 12898 on Environmental Justice (February 11, 1994). Environmental justice addresses the fair treatment of people of all races and incomes with respect to Federal actions that affect the environment. Fair treatment implies that no group of people should bear a disproportionate share of high and adverse human health and environmental impacts from a Federal action.

The impacts of an action can be considered disproportionately distributed if the impacts imposed on a specific group are greater than the percentage of the total population represented by that group. A group is typically defined by race, ethnicity, income class, or community identity. Evaluating potential environmental justice concerns requires an understanding of where the project impacts are likely to occur and where potentially affected groups are located. The analysis relies on demographic data from sources such as the U.S. Census Bureau, individual counties and municipalities, and local school districts to determine the location of different groups of people. Census demographic data and state economic development figures are typically the most complete and comparable information available for individuals and households. Demographic data compiled from the Census Bureau sources for the EIS are repeated here in Table 3.2. .

Table 3.2 Population of study area by race and Hispanic ethnicity

Race and Hispanic origin	Chaves County		De Baca County		Eddy County		Guadalupe County		Four-county Region	
	Total	Percent of total	Total	Percent of total	Total	Percent of total	Total	Percent of total	Total	Percent of total
White	44,167	72.0	1,882	84.0	39,438	76.3	2,530	54.1	88,017	73.4
Black or African American	1,209	2.0	1	0.0	805	1.6	62	1.3	2,077	1.7
American Indian and Alaskan native	694	1.1	21	0.9	646	1.3	53	1.1	1,414	1.2
Asian	323	0.5	5	0,2	231	0.4	25	0.5	584	0.5
Native Hawaiian and other Pacific races	34	0.1	0	0,0	47	0.1	2	0.0	83	0.1
Other race	13,042	21.2	281	12.5	9,129	17.7	1,828	39.1	24,280	20.2
Two or more races	1,913	3.1	50	2.2	1,362	2.6	180	3.8	3,505	2.9
Hispanic or Latino (can be of any race)	26,904	43.8	790	35.3	20,023	38.8	3,801	81.2	51,518	42.9

The annual per capita income for the State of New Mexico in 2005 was $27,889. The 2005 per capita personal income by county is as follows: Chaves County: 24,880, DeBaca County: $ 22,565, Eddy County: $29,983, and Guadalupe County: $16,455 (Reclamation 2006a).

These data indicate that the distribution of population by race and ethnicity is similar for each of the study area counties, except for Guadalupe County, which has a very large percentage of residents who identify themselves as of "other race" and ethnically Hispanic. Race is considered by the U.S. Census Bureau a separate concept from Hispanic origin (ethnicity). People who identify their origin as Spanish, Hispanic, or Latino may be of any race. The per capita income of Guadalupe County is much lower than the rest of the counties in the study area and the state as a whole.