

Chapter 5

Cumulative Impacts

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Council on Environmental Quality regulations implementing the National Environmental Policy Act define cumulative impacts as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (Federal or non-Federal) or person undertakes such actions”(40 Code of Federal Regulations section 1508.7).

Relevant past, present, and reasonably foreseeable projects evaluated for this cumulative impact analysis are listed in table 5.1. There are numerous past, present, and reasonably foreseeable actions in the study area; however, the analysis focuses on actions that may have a continuing, additive, and significant relationship to the effects of the proposed action. This process was conducted through public scoping, consultation with cooperating agencies and other stakeholders in the study area, and conversations with staff at the Bureau of Reclamation (Reclamation) and New Mexico Interstate Stream Commission (NMISC).

The identified actions for cumulative effects assessment generally would be implemented within the next 5 years; therefore, in order to capture all potential operational effects, a 15-year time period was assumed. The geographical scope of analysis is the Pecos River basin. The cumulative impacts analysis provides an overview of the likely impacts of the individual actions, followed by the likely net cumulative effects when combined together. Unless noted, the cumulative impacts would be similar for all alternatives. The section is organized by resource, as presented in chapters 3 and 4. If impacts to a resource are not anticipated from the identified action, the action may not be included in the impact matrix.

Table 5.1 Relevant past, present, and reasonably foreseeable actions for cumulative impact analysis

Project name	Project description	Time period
<p>Pecos River Compact (Compact) and U.S. Supreme Court Amended Decree</p>	<p>Interstate stream compacts are agreements developed between States and ratified by those States and the U.S. Congress. Interstate compacts apportion surface waters of selected streams that cross State borders and are both State and Federal law. The Compact, entered into by Texas and New Mexico in 1948, requires delivery of water from the Pecos River into Texas. The consequences of not complying with Compact delivery obligations can be severe. In 1974, Texas filed a lawsuit against New Mexico for under delivery of water required</p>	<p>Compact implemented in 1948; Amended Decree in 1988. Ongoing; duration indefinite.</p>

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Table 5.1 Relevant past, present, and reasonably foreseeable actions for cumulative impact analysis

Project name	Project description	Time period
	<p>by the Compact. In 1988, the U.S. Supreme Court entered an Amended Decree, which appointed a River Master and established an accounting method to verify State-line water deliveries that the River Master would use to verify proportioning of Pecos River flows. The U.S. Supreme Court Amended Decree further established that, in the future, New Mexico is only permitted to pay its water delivery obligations with water rather than with a monetary payment. NMISC engages annually in projects to augment deliveries to Texas to remain in compliance with the Pecos River Compact.</p>	
<p>Pecos River Carlsbad Project Settlement Agreement (Settlement Agreement), Reclamation and NMISC</p>	<p>The Settlement Agreement was executed by NMISC, Carlsbad Irrigation District (CID), Reclamation, and the Pecos Valley Artesian Conservancy District (PVACD) on March 25, 2003, to settle ongoing litigation in the Pecos River basin and to provide a mechanism to ensure long-term compliance with the Pecos River Compact and the U.S. Supreme Court Amended Decree. The Settlement Agreement includes an acquisition program that authorizes NMISC to purchase up to 6,000 acres of land and water rights in CID and up to 12,000 acres of land and water rights above Brantley Dam, which includes PVACD and the Fort Sumner Irrigation District (FSID). Additionally, per the Settlement Agreement, the State will construct or purchase a well field(s) capable of producing 15,750 acre-feet of water per year.</p>	<p>Agreement executed in 2003. Ongoing; duration indefinite.</p>
<p>Long-term Miscellaneous Purposes Contract Environmental Impact Statement (MPEIS), Reclamation and NMISC</p>	<p>Reclamation is proposing to execute a long-term (40-year) contract with CID to allow NMISC to use water up to 50,000 acre-feet for purposes other than irrigation. Like the Settlement Agreement, the project is needed to maintain long-term compliance with the Compact and meet State line flows in accordance with the Pecos River Compact and U.S. Supreme Court Amended Decree. An EIS evaluating the replacement of the existing short-term contract and any third party contracts is being conducted concurrently with the Carlsbad Project Water Operations and Water Supply Conservation EIS. The EIS assumes that NMISC would continue to lease approximately 3,416 acres each year, but could fallow up to 11,600 acres as needed on a temporary basis.</p>	<p>Anticipated Record of Decision (ROD) in 2006</p>
<p>Pecos River Basin Water Salvage Project, Reclamation</p>	<p>The Pecos River Basin Water Salvage Project is a Reclamation-funded project designed to control salt cedar growth from the Sumner Dam area to the New Mexico-Texas State line. Clearing activities conducted by Reclamation began in 1967 and continued until 1971, during which about 53,950 acres were cleared at various locations between Sumner Lake, New Mexico, and Pecos, Texas, a distance of about 370 miles. After a hiatus, the clearing program was reinitiated. Since 1995, the program has been limited to about 30,000 acres in the Pecos River basin of New Mexico.</p>	<p>Project began in 1967 and is expected to continue indefinitely.</p>

Table 5.1 Relevant past, present, and reasonably foreseeable actions for cumulative impact analysis

Project name	Project description	Time period
<p>Carlsbad Project Vegetation Management Program, Reclamation</p>	<p>An environmental assessment/biological assessment has been completed on the Carlsbad Project Vegetation Management Program. The program consists of research and treatment components, both targeting the pest salt cedar (<i>Tamarix</i> sp.) and potentially other invasive plants such as kochia. The research component includes studies of biological agents, herbicides, and mechanical methods; revegetation; and herbicide residue. The treatment component includes potential aerial application of an herbicide that would be implemented in cooperation with CID and the Carlsbad Soil and Water Conservation District. Lands in the Vegetation Management Program area include 7,829 acres. No quantifiable water salvage was anticipated in the environmental assessment.</p>	<p>2004-14</p>
<p>Pecos River Restoration Project, U.S. Army Corps of Engineers and Chaves County, New Mexico</p>	<p>The U.S. Army Corps of Engineers, Albuquerque District, in conjunction with Chaves County, New Mexico, proposes to restore 84 acres (10,013) linear feet of Pecos River channel and eradicate 52 acres of salt cedar. The work would be carried out at four separate sites. At the first site, 2,960 feet of river restoration south of the U.S. Highway 380 bridge, blocked segments of the channel would be reconnected to the river and the degraded channel would be redesigned. At the second site, at the confluence of the Rio Hondo and the Pecos River, the river channel would be redesigned to prevent flooding of adjacent agriculture fields. This work is also intended to improve aquatic and riparian habitat. At the third site, 4,500 linear feet of channel would be restored above the Wichita Bridge near Dexter. The channel would be modified to allow for a smooth transition through the bridge to protect the bridge. At the fourth site, bridge drains would be installed through Wichita Bridge. The drains installed through the highway embankment would alleviate the negative effect the bridge restriction imposes upon the natural riverine, the upstream effect, and the channel restriction through the bridge. Salt cedar would be removed at each of the sites.</p>	<p>Anticipated implementation in 2007-2008.</p>
<p>Pecos River Restoration at Bitter Lake National Wildlife Refuge, U.S. Fish and Wildlife Service (Service)</p>	<p>The Service is preparing an environmental assessment on actions to restore portions of the Pecos River channel through the Bitter Lake National Wildlife Refuge, near Roswell. In the 1940s, channels were excavated to straighten portions of the river and decrease damage to the bordering agricultural lands from flooding and bank erosion. These channels cut off natural meanders from the mainstem of the Pecos River. The excavation of straight channels, encroachment by non-native vegetation, and reservoir control of flows have degraded the ecological functioning of the river. The Service proposes to restore riverflows into these meanders with the intention of improving habitat for the threatened Pecos bluntnose shiner (shiner) and other aquatic and riparian species. Five reaches or river segments have been identified for potential restoration. Restoration options will be tailored to the specific characteristics of</p>	<p>Anticipated implementation beginning in 2007.</p>

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Project name	Project description	Time period
	each reach and include mechanical diversion of the river into original meanders, reworking of channel morphology, vegetation removal, and bank lowering.	
State Water Plan, New Mexico Office of the State Engineer (NMOSE) and NMISC	The State Water Plan is a strategic management tool for the purposes of: (1) promoting stewardship of the State's water resources (2) protecting and maintaining water rights and their priority status (3) protecting the diverse customs, culture, environment, and economic stability of the State (4) protecting both the water supply and water quality (5) promoting cooperative strategies, based on concern for meeting the basic needs of all New Mexicans (6) meeting the State's interstate compact obligations (7) providing a basis for prioritizing infrastructure investment (8) providing Statewide continuity of policy and management relative to our water resources	Approved 12/2003. Ongoing; duration indefinite.
Regional water plans, NMOSE and NMISC	<p>There are ongoing regional planning efforts overseen by NMISC to develop information, analysis, and documentation, to address the region's available water supply, projected future demand, and means of meeting future demand. This planning is done at the regional level and brings together stakeholders including elected officials, representatives of private industry, public agencies, and private citizens.</p> <p>The Lower Pecos Valley Water planning region includes Chaves County, Eddy County, and portions of De Baca, Lincoln, and Otero Counties. The principal river basin is the lower Pecos River. The principal aquifers underlay the Fort Sumner basin, the Roswell basin, the Hondo basin, the Peñasco basin, the Carlsbad basin, and the Capitan basin.</p> <p>The Northeastern New Mexico Regional Water Planning region encompasses a large portion of the northeastern part of the State and includes DeBaca County, except that portion downstream from Sumner Dam on the Pecos River.</p> <p>The Mora-San Miguel-Guadalupe Water Planning Region includes all of Mora, San Miguel, and Guadalupe Counties.</p>	<p>The Lower Pecos Valley Water Plan was completed.</p> <p>The Northeastern New Mexico Regional Water Plan is in progress.</p> <p>Mora-San Miguel-Guadalupe Water Plan was completed.</p>
Water Resources Conservation Program, NMISC	This program was established by New Mexico Statutes, Annotated (NMSA) sections 72-1-2.2, which called for NMISC to purchase, retire, and place in a State water conservation program adequate water rights over a period of years to increase the flow of water in the Pecos River and diminish the impact of manmade depletions of the streamflow and, therefore, meet the State's future	Implemented 1991. Ongoing; duration indefinite.

Table 5.1 Relevant past, present, and reasonably foreseeable actions for cumulative impact analysis

Project name	Project description	Time period
	obligations under the Pecos River Compact and the U.S. Supreme Court Amended Decree.	
Agricultural Conservation Reloan Program, NMISC	Under the Agricultural Conservation Reloan Program, NMISC makes low-interest loans available to irrigation entities in the Pecos River basin to reloan to farmers for various farming improvements. These low-interest loans are used for leveling irrigated lands, lining irrigation ditches, installing underground and low-energy precision application sprinkler irrigation systems, constructing irrigation return flow conservation systems, lining irrigation reservoirs, installing meters, drilling and equipping irrigation wells, and constructing similar facilities for the distribution and application of water for irrigation so that waters of the State of New Mexico may be conserved.	1950s. Ongoing; duration indefinite.
New Mexico Salt Cedar Control Project, New Mexico Department of Agriculture (NMDA)	NMDA is currently administering the New Mexico Salt Cedar Control Project through local soil and water conservation districts along the Pecos River. This project primarily uses aerial spraying to control salt cedar along the river banks with the hopes of reducing water loss caused by this plant. A total of 14,107 acres of salt cedar were sprayed in 2002 and 2003 under this program.	Ongoing; duration indefinite.
Environmental Quality Incentives Program (EQIP), Natural Resource Conservation Service (NRCS)	Under the Farm Security and Rural Investment Act of 2002, EQIP provides a voluntary conservation program for farmers and ranchers to promote agricultural production and environmental quality. Conservation programs (e.g., land leveling or improved irrigation systems) are subject to NRCS technical standards adapted for local conditions. EQIP may cost-share up to 75 percent of the costs of certain conservation practices.	Ongoing; program is subject to annual Congressional appropriations.
Malaga Bend Salinity Alleviation Project, U.S. Geological Survey, Pecos River Compact Commission	A highly saline aquifer unit in the extreme southern part of New Mexico is hydrologically connected to the surface waters of the Pecos River. To improve the quality of the river water entering Texas, water has been pumped from the saline aquifer into evaporation ponds. Adjustments have been made to Compact delivery obligations to allow New Mexico to receive credit for water that would otherwise be delivered to Texas. There have been problems with salty water returning to the aquifer and difficulty in determining the effects of the project on Pecos River water quality.	Initiated in 1963, suspended in 1976, and reinstated in 2001. Ongoing, duration indefinite, but will be reevaluated in 2007.
Cascades at Carlsbad, City of Carlsbad Community Development Department	The Cascades at Carlsbad is an educational/ scientific, commercial, and entertainment destination on a 35-acre Burlington Northern, Santa Fe Railway brownfield site centered on a canal. A water park and the National Cave and Karst Research Institute are currently under construction. The institute is dedicated to research and education in cave and karst science and will include labs, offices, and a visitor's center. Future mixed-use developments are planned for the site.	Initial phase of development scheduled to open in 2006.

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Table 5.1 Relevant past, present, and reasonably foreseeable actions for cumulative impact analysis

Project name	Project description	Time period
<p>Cheese processing facility, Curry County, Glanbia Foods</p>	<p>Glanbia Foods is constructing a \$192-million, 300,000-square-foot facility near Clovis, New Mexico, which will be North America's largest cheddar cheese plant. Glanbia's plant will employ 205 workers and will receive about 766,000 gallons or 6.6 million pounds of milk a day. Dairies supporting this plant would employ up to 8,800 persons. Annually, the plant will produce more than 250 million pounds of cheese and 16.5 million pounds of whey-protein products, generating a projected \$340 million in sales.</p>	<p>Open in 2006.</p>
<p>Active Water Resources Management, NMOSE</p>	<p>In response to legislation (section 72-2-9.1 NMSA 1978), NMOSE adopted Rules and Regulations for Active Water Resources Management on December 30, 2004. The regulations are designed to establish a framework for NMOSE to supervise the physical distribution of water and to administer the available water supply by priority date or alternative administration, as appropriate. These Statewide rules and regulations provide that, when necessary, junior water rights that otherwise would be curtailed will be able to temporarily acquire senior water rights from owners participating in the water rights marketplace in an expedited manner. Ultimately, rules and regulations specific to the Pecos River basin will be drafted and promulgated.</p>	<p>Initiated 2005; duration indefinite.</p>
<p>Potash mining activity, Lee and Eddy Counties</p>	<p>Potash mining continues to be an important part of the economy of Lee and Eddy Counties and a major user of ground water and generator of wastes. There are three potash projects that may be developed east of Carlsbad, subject to approval of mining plans and market prices. These would use ground water from wells east of the river.</p> <p>Intrepid Potash is developing plans to extract potash out of old mines by putting water into the mines and precipitating the potash out in ponds. The pond would occupy 250 acres and would require water use at a rate of 500-700 gallons per minute intermittently over a 30-year period. The proposed mining operation is located about 20 miles east of Carlsbad.</p> <p>Mosaic Potash is proposing to develop a salt tailings disposal operation at the old Laguna Grande mine approximately 20 miles east-southeast of Carlsbad. No additional water would be needed because they would use water from existing operations. The tailings disposal area may cover several square miles.</p> <p>Intrepid Potash also proposes to develop a langbeinite extraction operation about 25 miles east of Carlsbad.</p>	<p>Ongoing; duration indefinite. Industry is very sensitive to world markets and government incentives. Implementation of new ventures is unknown.</p>

Table 5.1 Relevant past, present, and reasonably foreseeable actions for cumulative impact analysis

Project name	Project description	Time period
Oil and gas exploration and development, multiple counties	The leasing, exploration, and development of oil and gas resources within the Pecos River basin are administered by the Bureau of Land Management (BLM). In recent years, these activities have increased in the basins.	Ongoing; duration indefinite.
Closure of Cannon Air Force Base (AFB), Clovis, NM	Cannon Air Force Base was recommended by the Pentagon for closure under the Base Realignment and Closure (BRAC) process. The BRAC Commission agreed with the recommendation to disestablish the 27th Fighter Wing and to distribute its aircraft to other bases but determined that Cannon AFB should remain open until December 31, 2009, during which time the Secretary of Defense would seek other newly identified missions with all military services. If the Secretary does not find a mission, Cannon AFB will be closed. The Pentagon forecasts that about 2,700 jobs on the base and another 2,000 positions off the base would be lost, with an economic loss to the Clovis area estimated at about \$200 million a year.	2009

1. Water Resources

Table 5.2 summarizes the cumulative impacts of the proposed action on water resources in relation to other projects or programs (ongoing or reasonably foreseeable future actions) in the Pecos River basin. Impacts are mostly described qualitatively; selected water resource indicators, including changes to Carlsbad Project water supply, changes to flows at the New Mexico-Texas State line, and flow frequency were used to differentiate these impacts.

Table 5.2 Cumulative impacts on water resources

Ongoing or reasonably foreseeable future actions	Impact
Pecos River Compact and U.S. Supreme Court Amended Decree	<p>Carlsbad Project water supply: No cumulative impacts are anticipated.</p> <p>State-line flows: Past and ongoing delivery obligations would continue. No cumulative impacts are anticipated.</p> <p>Riverflow frequency: Negative impacts to flow frequency at the Near Acme gage are not anticipated. In a priority call situation, Reclamation will bypass all incoming flows (up to channel capacity) to provide flow in the river and potentially increase conditions for the shiner.</p>
Pecos River Carlsbad Project Settlement Agreement, Reclamation, NMISC	Carlsbad Project water supply: Under the Settlement Agreement, retirement and subsequent fallowing of 4,500 to 6,000 acres of farmland in CID is anticipated. Water associated with the retired or fallowed lands would be used for meeting Compact obligations and for increasing the average allotment to remaining CID irrigators. Model results indicate the Settlement Agreement will have a 0.2- to 0.4-foot entitlement increase for

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Table 5.2 Cumulative impacts on water resources

Ongoing or reasonably foreseeable future actions	Impact
	<p>the remaining farmers in the Carlsbad Project after retirement of project lands. Because retirement within CID is also possible as a Carlsbad Project water acquisition (CPWA) option, cumulative retirement could be as great as 6,000 acres for the Settlement Agreement and nearly 2,000 acres for the reoperations considered in this EIS.</p> <p>State-line flows: The Settlement Agreement will have positive impacts on State-line flows for alternatives coupled with land retirement water acquisition options. However, impact analysis of changes to cropping pattern options considered in this EIS shows that medium-water-use options are a detriment to State-line flows, while low-water-use options are a benefit to State-line flows. The medium-water-use cropping pattern water acquisition option could undermine at least part of the positive impacts from the Settlement Agreement. When only considering CID return flows and ground water gains, all of the changes to cropping pattern water acquisition options would undermine at least part of the positive impacts from this project.</p> <p>Riverflow frequency: No additional impacts to the shiner are anticipated from this project.</p>
<p>Long-term Miscellaneous Purposes Contract, Reclamation and NMISC</p>	<p>Carlsbad Project water supply, State-line flows, and riverflow frequency: No cumulative impacts are anticipated.</p>
<p>Pecos River Basin Water Salvage Project, Reclamation</p>	<p>Carlsbad Project water supply and shiner flow frequency: This project has cleared a total of 33,230 acres from Sumner Dam to the New Mexico-Texas State line. Either salvage or increased losses from this project, translating to accretions or depletions to Carlsbad Project water supply, could occur because of changes in evapotranspiration. Bank destabilization also may occur, which, in turn, may increase depletions to the Carlsbad Project water supply. Without quantification (and demonstration of actual salvage or loss), hydrologic impacts to both the Carlsbad Project water supply and the shiner are unknown. Assuming cleared and maintained acreages will change (arguably) implies that this project will have cumulative impacts.</p> <p>State-line flows: If salt cedar is cleared using Federal dollars and actual salvage amounts are measured, this project could increase the State of New Mexico's delivery obligation to Texas.</p>
<p>Carlsbad Project Vegetation Management Program, Reclamation</p>	<p>Carlsbad Project water supply and shiner flow frequency: Without further details of this project, including cleared and maintained acreage and estimated water salvage, cumulative impacts cannot be quantified. Either salvage or increased losses from this project could occur. Without quantification (and demonstration of actual salvage or loss), hydrologic impacts to both the Carlsbad Project water supply and the shiner are unknown. No quantifiable water salvage was anticipated in the EA. Assuming cleared and maintained acreages will change (arguably) implies that this project will have cumulative impacts.</p> <p>State-line flows: If salt cedar is cleared using Federal dollars and actual salvage amounts are measured, this project could increase the State of New Mexico's delivery obligation to Texas.</p>

Table 5.2 Cumulative impacts on water resources

Ongoing or reasonably foreseeable future actions	Impact
	<p>Riverflow frequency: No cumulative impacts are anticipated.</p>
<p>Pecos River Restoration Project, U.S. Army Corps of Engineers and Chaves County, New Mexico</p>	<p>Carlsbad Project water supply: This project will create additional depletions between Sumner Dam and Brantley Reservoir from river widening (increased seepage and evaporation) and bank lowering (increased overbank flooding and subsequent increased evaporation and infiltration). However, because the restored areas are so small, it is likely that these depletions will not be measurable or quantifiable. If salt cedar clearing is demonstrated to provide water salvage, the cleared salt cedar areas may reduce or eliminate additional depletions caused by other restoration activities.</p> <p>State-line flows: Restoration activities, other than clearing salt cedar, will cause new net depletions. However, the proposed area is so small that these depletions may not be quantifiable (and/or may be negligible). If salt cedar is cleared using Federal dollars and actual salvage amounts are measured, this project could increase the State of New Mexico's delivery obligation to Texas.</p> <p>Riverflow frequency: Flow frequency and intermittency cumulative impacts are not anticipated because these areas are well into the river reaches known to be kept perennial by base inflows between the Near Acme and Artesia gages.</p>
<p>Pecos River Restoration at Bitter Lake National Wildlife Refuge, Service</p>	<p>Carlsbad Project water supply: Restoration activities may create additional depletions between Sumner Dam and Brantley Reservoir as a result of river widening (increased seepage and evaporation) and bank lowering (increased overbank flooding and subsequent increased evaporation and infiltration). Quantification is dependent on the length of river and adjacent acreage restored. If salt cedar clearing is demonstrated to provide water salvage, the cleared salt cedar areas may reduce or eliminate additional depletions caused by other restoration activities. The Service anticipates water salvage in excess of losses.</p> <p>State-line flows: Restoration activities, other than clearing salt cedar, will cause new net depletions. If salt cedar is cleared using Federal dollars and actual salvage amounts are measured, this project could increase the State of New Mexico's delivery obligation to Texas.</p> <p>Riverflow frequency: The location of the proposed restoration is in the vicinity of the reach where base inflows begin to accrue to the Pecos River. Further study is warranted to determine whether base inflows or water salvaged from salt cedar removal would offset any negative hydrologic impacts in terms of flow frequency and intermittency.</p>
<p>Water Resources Conservation Program, NMISC</p>	<p>Carlsbad Project water supply: Increased retirement or curbing of manmade depletions to increase Pecos River flows will positively impact the Carlsbad Project water supply.</p> <p>State-line flows: Increased retirement or curbing of manmade depletions to increase Pecos River flows will positively impact flows at the State line.</p> <p>Riverflow frequency: Increased retirement or curbing of manmade depletions to increase Pecos River flows will positively impact flows needed for the shiner.</p>

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Table 5.2 Cumulative impacts on water resources

Ongoing or reasonably foreseeable future actions	Impact
<p>Agricultural Conservation Reloan Program, NMISC</p>	<p>Carlsbad Project water supply: Conservation of water diverted (pumped) from the deep artesian aquifer in the Roswell basin will negatively impact return flows from the Pecos Valley Artesian Conservation District over the short term. The State has funded programs for reducing the application of water to irrigated acreage using such technology as laser-leveling or low energy precision application (LEPA) technology. Smaller PVACD return flows will cause a cumulative (negative) impact to the Carlsbad Project water supply in the short term. However, it is anticipated that these impacts will be reduced or eliminated from increasing base inflows (as a result of water conservation in PVACD) 20 to 100 years in the future. Impacts from all other (surface water) irrigation efficiency improvement activities (assuming these activities immediately increase riverflows) will be positive cumulative impacts. It should be noted that these conservation programs also could result in the same diversion and an increased consumptive irrigation requirement and yield from the irrigated lands. Recent modeling also shows that large retirements and increased aquifer levels can cause increased losses through evapotranspiration or directly from the ground surface.</p> <p>State-line flows: Impacts to State-line flows would follow the same depletion trends described for Carlsbad Project water supply.</p> <p>Riverflow frequency: The program will result in lower riverflows between the Near Acme and Near Artesia gages because of conservation of pumped irrigation water (and subsequent reduction in return flows) in the short term. It is not anticipated that reduced return flows in PVACD as a direct result of conservation will cause intermittency, but lower flows over the short term are anticipated. The reach where these impacts will occur overlaps with lower critical habitat for the shiner. Impacts from all other (surface water) irrigation efficiency improvement activities (assuming these activities immediately increase riverflows) will be positive cumulative impacts to the shiner.</p>
<p>New Mexico Salt Cedar Control Project, NMDA</p>	<p>Carlsbad Project water supply and riverflow frequency: Without further details of this project, including annual cleared amounts, maintained acreage, and estimated water salvage, cumulative impacts cannot be quantified. Either salvage or increased losses from this project, translating to accretions or depletions to the Carlsbad Project water supply, could occur because of changes in evapotranspiration. Bank destabilization may also occur, which, in turn, may increase depletions to the Carlsbad Project water supply. Without quantification (and demonstration of actual salvage or loss), hydrologic impacts to both the Carlsbad Project water supply and the shiner are unknown. Assuming cleared and maintained acreages will change (arguably) implies that this project will have cumulative impacts.</p> <p>State-line flows: If salt cedar is cleared using Federal dollars and actual salvage amounts are measured, this project could increase the State of New Mexico's delivery obligation to Texas.</p>

Table 5.2 Cumulative impacts on water resources

Ongoing or reasonably foreseeable future actions	Impact
Cascades at Carlsbad, City of Carlsbad Community Development Department	Carlsbad Project water supply, State-line flows, riverflow frequency: No cumulative impacts are anticipated.
Active Water Resources Management, NMOSE	Carlsbad Project water supply, State-line flows, riverflow frequency: No cumulative impacts are anticipated.
Potash mining activity, Lee and Eddy Counties	Carlsbad Project water supply, State-line flows, riverflow frequency: No cumulative impacts are anticipated.
Oil and gas exploration and development, multiple counties	Carlsbad Project water supply, State-line flows, riverflow frequency: No cumulative impacts are anticipated.
Closure of Cannon Air Force Base, Clovis, New Mexico	Carlsbad Project water supply, State-line flows, riverflow frequency: No cumulative impacts are anticipated.

The reasonably foreseeable action that would have the greatest cumulative impact on water resources in the study area is the Settlement Agreement. Because this EIS considers water right purchase and leasing as possible CPWA options as a solution to water resource supply problems, it would additionally impact farmers in the basin. Water conservation projects may augment Carlsbad Project water supplies and help increase State-line flows, but the level of this conservation may reach a point of diminishing returns and, in fact, may introduce new net depletions if taken too far (losses from rising ground water tables). Other projects, such as restoration and water salvage activities along the river, are small, and would not have a significant cumulative impact on water resources in the basin because of their limited size.

2. Water Quality

Table 5.3 summarizes the cumulative impacts of the proposed action on water quality in relation to other projects or programs (ongoing or reasonably foreseeable future actions) in the Pecos River basin.

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Table 5.3 Cumulative impacts on water quality

Ongoing or reasonably foreseeable future actions	Impact
Pecos River Compact and U.S. Supreme Court Amended Decree	Past and ongoing actions to ensure that Compact delivery obligations are met have resulted in negligible effects on water quality. No cumulative effects are anticipated.
Pecos River Carlsbad Project Settlement Agreement, Reclamation, NMISC	The leasing of water rights would reduce the amount of lands subject to leaching through irrigated agriculture, leading to a net benefit of decreased additions of salinity to the water resources of Pecos River basin. Additional flows in the river would dilute saline inflows and result in a possible reduction in electrical conductivity in the river. These effects would likely be negligible.
Long-term Miscellaneous Purposes Contract, Reclamation and NMISC	Anticipated leasing of water rights and release under a long-term contract are assumed to be the same as are those seen under the current NMISC leasing program, resulting in no anticipated additional change to water quality.
Pecos River Basin Water Salvage Project, Reclamation	This project involved the removal of salt cedar from 33,230 acres before 1973. The current activity is restricted to maintaining that acreage free of salt cedar. No cumulative impacts are anticipated.
Carlsbad Project Vegetation Management Program, Reclamation	Salt cedar deposits salt on its leaves and on the soil in the immediate vicinity of the plant. The salt can subsequently be washed off into surface drainages or into the ground water, in either case increasing the total dissolved solids (TDS) of the water. The vegetation management program is experimental, but would reduce salt cedar and, to some extent, TDS. No cumulative impacts are anticipated.
Pecos River Restoration Project, U.S. Army Corps of Engineers and Chaves County, New Mexico	Effects likely would be the same as any of the other salt cedar control projects.
Pecos River Restoration at Bitter Lake National Wildlife Refuge, Service	Effects likely would be the same as any of the other salt cedar control projects.
State Water Plan, NMOSE and NMISC	Section C.8 of the State Water Plan addresses watershed restoration that focuses on protecting water supplies and complying with the Endangered Species Act of 1973, as amended. Water quality improvement is also a consideration. The State Water Plan also formalizes the regional plans and their effects. (See next entry.)
Regional water plans, NMOSE and NMISC	Several of the alternatives described in the regional water plan for the Pecos Valley are similar to CPWA options evaluated but not carried forward in this document. These include water conservation, dewatering the Lake McMillan delta, watershed management, desalination, cloud seeding, and importing water from the Salt River basin. Insofar as the water plan alternatives are implemented, they could be additive. The cumulative impact would be dependent upon the quality of the source water.

Table 5.3 Cumulative impacts on water quality

Ongoing or reasonably foreseeable future actions	Impact
Water Resources Conservation Program, NMISC	The water conservation program is designed to extend existing water supplies to provide water for other uses through retirement of lands that historically had been irrigated and, thus, subject to salinity leaching from the soil profile. If there are no additional changes in flow in the Pecos River that are related to the effects of the Water Resources Conservation Program, there would be no cumulative impacts.
Agricultural Conservation Reloan Program, NMISC	This program should have the same effect as any other water conservation program. The specific effects would depend on the location and use to which the conserved water is put.
New Mexico Salt Cedar Control Project, NMDA	Effects likely would be the same as any of the other salt cedar control projects.
Malaga Bend Salinity Alleviation Project, U.S. Geological Survey, Pecos River Compact Commission	The water quality effects of the project are being evaluated. Because the project is designed to reduce the inflow of highly saline water into the Pecos River, it is anticipated that it is likely to decrease salinity at downstream locations.
Cascades at Carlsbad, City of Carlsbad Community Development Department	Water quality impacts would be more like those related to increased storm water runoff and the types of pollutants it carries. No cumulative impacts are anticipated.

Overall, many of the cumulative actions strive to increase or maintain riverflows, which would have a beneficial net effect on water quality. Likewise, less agricultural use of water could reduce salinity, as less drain and tailwater would enter the Pecos River system. Conversely, any future development in the basin likely would degrade water quality as a result of increased waste loadings to the river. Only activities directly related to agricultural development likely would be considered cumulative to the Carlsbad Project water operations addressed in this EIS.

3. Agricultural Soil and Land Resources

Table 5.4 summarizes the cumulative impacts of the proposed action on agricultural soils and land in relation to other projects or programs (ongoing or reasonably foreseeable future actions) in the Pecos River basin.

Table 5.4 Cumulative impacts on agricultural soils and lands

Ongoing or reasonably foreseeable future actions	Impact
Pecos River Compact and U.S. Supreme Court Amended Decree	No cumulative effects are anticipated. Past actions to meet Compact obligations have impacted water availability and may have reduced farm acreage and ability to leach salts from soils.
Pecos River Carlsbad Project Settlement Agreement, Reclamation, NMISC	Retirement or temporary fallowing of irrigated lands called for in the Settlement Agreement could reduce prime farmland (PF) and farmland of Statewide importance (FSI) acreage by up to 6,000 acres in CID and 12,000 acres above Brantley Dam, which includes PVACD. Approximately 3,416 acres are already fallowed. Retirement or

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Table 5.4 Cumulative impacts on agricultural soils and lands

Ongoing or reasonably foreseeable future actions	Impact
	fallowing within CID is also considered as a water acquisition option in this EIS. The maximum acreage of retired farmland needed for water right retirement would be approximately 2,000 acres in CID. Therefore, the combined effect of the Settlement Agreement and this EIS could reach a total of 8,000 acres in CID. Due to the availability of other CPWA options under this EIS, affected acreage is expected to be less.
Long-term Miscellaneous Purposes Contract EIS (MPEIS), Reclamation and NMISC	NMISC would continue to lease and fallow about 3,416 acres. The fallowing of the 164 acres owned by NMISC is not expected to change, resulting in no anticipated cumulative impact. Fallowing of lands and water rights could reduce PF and FSI acreage, but the MPEIS expects this change to be temporary and that most land would be eventually returned to production.
Pecos River Basin Water Salvage Project, Reclamation	This project would result in the beneficial reduction of noxious weeds and soil salinity in areas currently infested with salt cedar, as well as a general improvement in soil salinity on irrigated lands.
Carlsbad Project Vegetation Management Program, Reclamation	This program would result in beneficial reduction of noxious weed infestations and a reduction in soil salinity.
Pecos River Restoration Project, U.S. Army Corps of Engineers and Chaves County, New Mexico	This project would result in slight beneficial reduction in the acreage infested with noxious weeds and protection of agricultural lands from flooding.
Pecos River Restoration at Bitter Lake National Wildlife Refuge, Service	This project would result in slight beneficial reduction in the acreage infested with noxious weeds and protection of agricultural lands from flooding.
State Water Plan, NMOSE and NMISC	The plan itself would have no effect; some elements of plan are evaluated above.
Water Resources Conservation Program, NMISC	The program would result in less PF and FSI acreage.
Agricultural Conservation Reloan Program, NMISC	The program would benefit soil salinity. Improved water application efficiencies would “even out” water applications and deep percolation in a field. Salinity would be reduced in portions of fields that were underirrigated, and water salvage would occur in portions of field that were overirrigated. The average yield of the entire field should increase.
New Mexico Salt Cedar Control Project, New Mexico Department of Agriculture	This project would result in the beneficial reduction in the acreage infested with noxious weeds and an associated beneficial effect on soil salinity levels, especially in areas formerly infested with salt cedar.
Environmental Quality Incentives Program, NRCS	This program would result in improvements in agricultural efficiency on participating farms, which could increase instream flows; conversely, if such lands are retired or fallowed under this or any other program, the yield may not be as high as projected.

Table 5.4 Cumulative impacts on agricultural soils and lands

Ongoing or reasonably foreseeable future actions	Impact
Cheese processing facility, Curry County, Glanbia Foods	This facility may increase the demand for alfalfa hay and alfalfa production. Increased alfalfa acreage would lead to farmers stacking their water allotments on lands growing alfalfa. Stacking water on alfalfa would increase fallowing of other lands and reduce the acreages of other crops, reduce irrigated acreage, and slightly decrease PF and FSI acreage.

The only significant cumulative adverse impact of the actions considered in this EIS and the other related actions would be a permanent or temporary reduction in the acreages of PF and FSI in New Mexico, because lands must be irrigated to qualify for these important farmland designations in the Pecos River area. A small portion of the retired lands would not be well suited for irrigation. On the basis of net depletions of about 3,000 acre-feet, the maximum acreage of retired farmland needed for water right retirement under this action would be about 1,500 acres. This impact would occur only if forbearance CPWA options are chosen. This acreage is less than 1 percent of the irrigated land in the impact evaluation area and is not considered significant. However, if all the forbearance actions listed in table 5.4 are needed, land retirement and fallowing for water right acquisition could be substantial in the Pecos River impact evaluation area and would be considered a significant adverse impact to PF or FSI. It is not likely that all forbearance actions would occur or be permanent.

Important farmlands are a valuable natural resource and are generally decreasing in other areas of the Nation. This decrease is reducing the long-term food security of the Nation. Loss of PF in arid Western States is considered serious; however, it may not be as serious as losses in humid areas because water, not arable land, is the most limiting factor in these areas. It is important to protect lands retired from irrigation from wind and water erosion and soil salinity damage. In any case, irrigation structures and other onfarm infrastructure tend to deteriorate following land retirement or long-term fallowing. In the event water supplies become available in the future, these lands would probably require releveling and installation of updated irrigation systems.

Beneficial cumulative impacts include a reduction in the acreages infested with salt cedar and other noxious weeds. Reduction of salt cedar acreage would reduce nonbeneficial consumptive use, which would provide more water for crop yields and leaching of salts from croplands. Salt cedar use large amounts of water and concentrate salts in the shallow aquifer systems connected to the river. Salt cedar also increase soil salinity locally in infested areas. This increase is associated with the salts in the leaf tissue that are deposited on the ground surface following annual leaf fall. In the absence of present and past State and Federal programs, the acreage infested with salt cedar in the impact evaluation area would almost certainly exceed 100,000 acres, compared to the present infestation of about

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25,000 acres. This is considered a major beneficial cumulative impact to agricultural land and soil resources. Only about 10,000 acres are currently heavily infested with salt cedar suitable for full water salvage potential (estimated by Reclamation at about 1 acre-foot per acre under optimum conditions) of land reclaimed from salt cedar infestation.

A significant beneficial decrease in soil salinity and an increase in crop yields per acre are expected with onfarm irrigation infrastructure improvements planned for both State reloan programs and Federal programs, including EQIP, and the water conservation option plan proposed in this EIS. The current Federal and State programs have improved many existing farmlands to the point that the proposed water acquisition option may not be able to provide as much onfarm water savings as originally predicted.

The large cheese processing facility in Curry County could increase the acreage of alfalfa, which could counteract the beneficial effects of the proposed options involving changing cropping patterns from alfalfa to crops that consume less water. An increase in alfalfa demand could also increase the price of hay, which would increase the cost of these cropping pattern change options. These changes would not result in any significant cumulative impacts.

4. Biological Resources

Table 5.5 summarizes the cumulative impacts of the proposed action on biological resources in relation to other projects or programs (ongoing or reasonably foreseeable future actions) in the Pecos River basin.

Table 5.5 Cumulative impacts on biological resources

Ongoing or reasonably foreseeable future actions	Impact
Pecos River Compact and U.S. Supreme Court Amended Decree	Past and ongoing actions and projects to ensure that Compact delivery obligations are met generally would have little effect on biological resources. Aquatic ecosystem components in the river reaches between Brantley Reservoir and the State line could be subject to some impacts dependent upon the timing or magnitude of State-line deliveries. Additional, localized impacts to terrestrial and/or aquatic ecosystem components might occur in response to specific projects that would be implemented to meet Compact requirements.
Pecos River Carlsbad Project Settlement Agreement, Reclamation, NMISC	Retirement or long-term fallowing of irrigated lands might have an impact on terrestrial ecosystems. Some organisms dependent upon agricultural crops for food or cover could be affected by this conversion. However, some terrestrial ecosystem components could benefit from the conversion if lands were fallowed and native plants were allowed to recolonize the former agricultural areas.

Table 5.5 Cumulative impacts on biological resources

Ongoing or reasonably foreseeable future actions	Impact
	<p>Construction of the augmentation well field would have temporary impacts on terrestrial ecosystems during construction and operations. The well field likely would affect aquatic ecosystems through changes in riverflows downstream from the point of discharge and could potentially affect reservoir fishes by changing reservoir levels in Brantley Reservoir.</p> <p>Changes in reservoir levels could affect least tern nesting conditions at Brantley Reservoir. Although least tern nests have only been observed during one season, there is some possibility of least terns returning again in areas where there is no vegetative cover and reservoir levels are low.</p>
<p>Long-term Miscellaneous Purposes Contract EIS (MPEIS), Reclamation and NMISC</p>	<p>No significant negative and some negligible beneficial effects are expected to aquatic ecosystem components resulting from the use and delivery of waters under the Long-term Miscellaneous Purposes Contract. NMISC anticipates continuing to lease approximately 3,416 acres each year, but could fallow up to 11,600 acres as needed on a temporary basis.</p>
<p>Pecos River Basin Water Salvage Project, Reclamation</p>	<p>Clearing of land, such as mechanical removal of non-native riparian vegetation or watershed thinning, would directly disturb terrestrial ecosystems and could affect the riparian ecosystem and the organisms that use those habitats.</p>
<p>Carlsbad Project Vegetation Management Program, Reclamation</p>	<p>This program may affect terrestrial and avian species that rely on vegetation that is removed.</p>
<p>Pecos River Restoration Project, U.S. Army Corps of Engineers and Chaves County, New Mexico</p>	<p>Removal of non-native riparian vegetation would directly disturb terrestrial ecosystems and would affect the riparian ecosystem and the organisms that use those habitats. These disturbances would be localized for this project. Long-term river restoration efforts could improve the native riparian ecosystem and improve habitat for aquatic organisms.</p>
<p>Pecos River Restoration at Bitter Lake National Wildlife Refuge, Service</p>	<p>Removal of non-native riparian vegetation would directly disturb terrestrial ecosystems and would affect the riparian ecosystem and the organisms that use those habitats. These disturbances would be localized for this project. River restoration efforts could improve the native riparian ecosystem and improve habitat for aquatic organisms.</p>
<p>Water Resources Conservation Program, NMISC</p>	<p>Retirement of irrigation lands might have an impact on terrestrial ecosystems. Some organisms dependent upon agricultural crops for food or cover could be affected by this conversion. However, some terrestrial ecosystem components could benefit from the conversion if lands were fallowed and native plants were allowed to recolonize the former agricultural areas.</p> <p>Increased riverflows that may occur under this program would likely benefit aquatic ecosystems by improving year-round base inflows.</p>
<p>Agricultural Conservation Reloan Program, NMISC</p>	<p>Modifications to acequias, dams, drains, canals, laterals could affect terrestrial and aquatic ecosystem components during construction or modification projects.</p>
<p>New Mexico Salt Cedar Control Project, NMDA</p>	<p>Removal of non-native riparian vegetation would directly disturb terrestrial ecosystems and would affect the riparian ecosystem and the organisms that use those habitats.</p>
<p>Potash mining activity, Lee and Eddy Counties</p>	<p>Actions could impact biological resources through ground-disturbing activity potential discharge of waters off-site.</p>

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The net cumulative impact on biological resources generally would be positive as most of the listed projects are focused on increasing riverflows for Compact delivery purposes and the Carlsbad Project water supply. Higher and more reliable base inflows would benefit aquatic ecosystems throughout the study area. Current riparian ecosystems and the species dependent upon the habitats provided likely would not benefit from the listed projects. However, long-term benefits might be realized through the removal of non-native phreatophytes that would allow for possible reestablishment of native vegetated communities and associated wildlife species.

5. Regional Economy

Table 5.6 summarizes the cumulative impacts of the proposed action on the regional economy in relation to other projects or programs (ongoing or reasonably foreseeable future actions). Any of the projects and programs included in the cumulative impact analysis that could potentially affect the amount of irrigated acreage, crop yields, or cropping patterns would also potentially affect the regional agricultural economy. In addition, projects that would affect the regional economy through nonagricultural sectors are identified.

Table 5.6 Cumulative impacts on the regional economy

Ongoing or reasonably foreseeable future actions	Impact
Pecos River Compact and U.S. Supreme Court Amended Decree	No cumulative impacts are anticipated. Past actions to meet Compact obligations have had some negative impacts on crop production and the regional economy.
Pecos River Carlsbad Project Settlement Agreement, Reclamation, NMISC	Irrigated land retirement or fallowing would have negative regional economic impacts in the long term in loss of agricultural production. In the short term, the Settlement Agreement would be expected to add value to the economy in the CID, PVACD, and FSID areas through water leasing and other payments.
Long-term Miscellaneous Purposes Contract EIS (MPEIS), Reclamation and NMISC	NMISC would continue to lease and fallow about 3,416 acres. The fallowing of the 164 acres owned by NMISC is not expected to change, resulting in no anticipated cumulative impact to the regional economy.
Pecos River Restoration Project, U.S. Army Corps of Engineers and Chaves County, New Mexico	Slight positive regional economic impacts would be possible to the extent that flood damages are prevented on agricultural land and other land.
Pecos River Restoration at Bitter Lake National Wildlife Refuge, Service	Slight positive regional economic impacts would be possible to the extent that flood damages are prevented on agricultural land and other land.
Water Resources Conservation Program, NMISC	Negative regional economic impacts would be possible because of potential decrease in cropland acreage.

Table 5.6 Cumulative impacts on the regional economy

Ongoing or reasonably foreseeable future actions	Impact
Agricultural Conservation Reloan Program, NMISC	Potential positive regional economic impacts would be associated with yield increases described in the agricultural soil and land resources cumulative impacts section.
Cheese processing facility, Curry County, Glanbia Foods	Potential increase in local demand for alfalfa could lead to increase in alfalfa production. While this could lead to a decrease in acreage of other crops as described in the agricultural soil and land resources cumulative impacts section, alfalfa is a relatively high-value crop. Therefore, positive regional economic impacts are likely.
Potash mining activity, Lee and Eddy Counties	Potential positive regional economic impacts would be associated with the mine. Impacts would not be directly related to agriculture.
Oil and gas exploration and development, multiple counties	Potential positive regional economic impacts would be associated with increased oil and gas activity. Impacts would not be directly related to agriculture.
Closure of Cannon Air Force Base, Clovis	Significant economic impacts would result related to employment and income.

The continuing trend in the region for land fallowing, retirement, and changes to cropping patterns could have a cumulative negative impact to local economies in the long term. In the short term, the Settlement Agreement and other regional activities would be expected to add value to the economy in the CID, PVACD, and FSID areas. Without specific data on which CPWA options would be implemented and the location of options, a cumulative assessment of long-term losses in economic output and employment as crop value loss and job loss is uncertain. Other actions would serve to mitigate any impacts, such as increased oil and gas production, expansion of the dairy industry, and new developments, such as the cheese factory. Other actions, such as the closure of Cannon Air Force Base, could increase the net adverse impact to the regional economy.

6. Recreation

There are no cumulative impacts of the proposed action on recreation in relation to other projects or programs (ongoing or reasonably foreseeable future actions) in the Pecos River basin. Most of these projects affect the use or delivery of water. Water moves through space and time to affect or provide opportunities for recreation. Recreation use at the reservoirs and along the Pecos River is affected by the amount or flow of water at a particular location and many other factors. Less water in the reservoirs and lower flows in the river tend to curtail recreational opportunities and result in lesser amounts of recreation use. A chain of cause-and-effect linking past, present, or ongoing or reasonably foreseeable future actions and the actions of the preferred alternative in an additive or interactive process to generate cumulative impacts has not been identified.

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7. Cultural Resources

Table 5.7 summarizes the cumulative impacts of the proposed action on water resources in relation to other projects or programs (ongoing or reasonably foreseeable future actions) in the Pecos River basin.

Table 5.7 Cumulative impacts on cultural resources

Ongoing or reasonably foreseeable future actions	Impact
Pecos River Compact and U.S. Supreme Court Amended Decree	Actions and projects to ensure that Compact delivery obligations are met generally would have little or no effect on cultural resources.
Pecos River Carlsbad Project Settlement Agreement, Reclamation, NMISC	Long-term fallowing may result indirectly in the abandonment and subsequent deterioration of historic farm structures and features.
Long-term Miscellaneous Purposes Contract (MPEIS), Reclamation and NMISC	The MPEIS anticipates continued fallowing of 3,416 leased acres. Long-term fallowing may result indirectly in the abandonment and subsequent deterioration of historic farm structures and features.
Pecos River Basin Water Salvage Project, Reclamation	Clearing of land, such as mechanical removal of non-native riparian vegetation or watershed thinning, could cause direct disturbance of the integrity of archaeological resources through grading, chaining, equipment use and subsequent erosion. Clearing also could afford greater access to previously undisturbed areas, allowing damage from vehicle use and vandalism.
Carlsbad Project Vegetation Management Program, Reclamation	Clearing of land, such as mechanical removal of non-native riparian vegetation or watershed thinning, could cause direct disturbance of the integrity of archaeological resources through grading, chaining, equipment use, and subsequent erosion. Clearing also could afford greater access to previously undisturbed areas, allowing damage from vehicle use and vandalism.
Pecos River Restoration Project, U.S. Army Corps of Engineers and Chaves County, New Mexico	Clearing of land, such as mechanical removal of non-native riparian vegetation or watershed thinning, could cause direct disturbance of the integrity of archaeological resources through grading, chaining, equipment use, and subsequent erosion. Clearing also could afford greater access to previously undisturbed areas, allowing damage from vehicle use and vandalism.
Pecos River Restoration at Bitter Lake National Wildlife Refuge, Service	Clearing of land, such as mechanical removal of non-native riparian vegetation or watershed thinning, could cause direct disturbance of the integrity of archaeological resources through grading, chaining, equipment use, and subsequent erosion. Clearing also could afford greater access to previously undisturbed areas, allowing damage from vehicle use and vandalism.
State Water Plan, NMOSE and NMISC	This planning effort would have little or no effect on cultural resources, with the exception of affirming the role of traditional water uses and acequias systems.

Table 5.7 Cumulative impacts on cultural resources

Ongoing or reasonably foreseeable future actions	Impact
Regional water plans, NMOSE and NMISC	This planning effort would have little or no effect on cultural resources, with the exception of affirming the role of traditional water uses and acequias systems.
Agricultural Conservation Reloan Program, NMISC	Modifications to acequias, dams, drains, canals, laterals, and other structures could alter the physical integrity of these structures if they are historic. Improvements to water distribution laterals and canals often are not considered to have major impacts on these properties unless they are architecturally significant, because they would still retain integrity of function and location.
New Mexico Salt Cedar Control Project, New Mexico Department of Agriculture	Clearing of land, such as mechanical removal of non-native riparian vegetation or watershed thinning, could cause direct disturbance of the integrity of archaeological resources through grading, chaining, equipment use, and subsequent erosion. Clearing also could afford greater access to previously undisturbed areas, allowing damage from vehicle use and vandalism.
Cascades at Carlsbad, City of Carlsbad Community Development Department	Ground-disturbing and other site preparation actions could affect cultural resources.
Cheese processing facility, Curry County, Glanbia Foods	The facility is being developed outside of the region of influence for cultural resources. Ground-disturbing and other site preparation actions could affect cultural resources.
Active Water Resources Management, NMOSE	Active Water Resources Management is primarily administrative, and no direct or indirect effects on cultural resources are anticipated.
Potash mining activity, Lee and Eddy Counties	Activity could impact cultural resources and landscapes through ground-disturbing activity and alterations to setting; subject to BLM cultural resource review.
Oil and gas exploration and development, multiple counties	Actions could impact cultural resources and landscapes through ground-disturbing activity and alterations to setting; subject to BLM cultural resource review.

Past agricultural, water conveyance, residential, commercial, mining, and energy development and the effects of natural processes in Pecos River basin have resulted in the damage to or the loss of cultural resources. More recent projects, such as Brantley Dam, were constructed in the context of laws that require assessing the significance of cultural resources and minimizing impacts. When resources cannot be avoided, often the adverse effects of the loss of the resource can be partially mitigated by the scientific information gained by research-oriented excavation or other actions.

Although few surveys have been conducted to confirm their presence, it is likely that there are many unrecorded cultural resources that could be impacted by this project or ongoing or reasonably foreseeable future actions. The changes in Carlsbad Project operations (block releases, target flows, reservoir levels) proposed under all of the alternatives would result in negligible effects to cultural resources. Sites in the immediate vicinity of the river or in flood zones have been

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subject to past disturbances that would reduce the likelihood of their intact preservation. Proposed flow levels, flow fluctuations, and changes in reservoir storage would be within the range of normal river and reservoir operations and would not be expected to exacerbate erosion of archaeological resources or exposure of submerged resources.

Implementation of CPWA options could be associated with negligible to major impacts to cultural resources, but the options are not sufficiently developed to define the precise location of the action, whether cultural resources would be present, or the intensity of impact. The water acquisition options would be subject to further consideration under Federal and/or State cultural resource statutes and regulatory protections, which require consultation to avoid or mitigate adverse effect on cultural resources. In general, alternatives that require larger amounts of water acquisition would permit less management flexibility in avoiding options or locations that may cause cultural resource impacts.

The potential for effects to cultural resources resulting from ongoing or reasonably foreseeable future regional water commitments and plans, restoration efforts, land retirement or long-term fallowing, infrastructure improvements, construction, and extractive industries are similar in type, intensity, timeframe and general location to those identified for the water acquisition options. Potential impacts could result from ground-disturbing activities; modifications, removal, or abandonment of historic structures; alterations to visual or audible setting; and greater access to resources, resulting in inadvertent damage or intentional vandalism. The precise location of these actions, their status regarding cultural resource compliance, the presence or absence of cultural resources, and intensity of impact are not known.

For actions on Federal land or actions that are funded, licensed, or permitted by the Federal government, compliance is required with the National Historic Preservation Act and other laws, statutes, and regulations. State agencies must also consult when their activities would involve nominated or listed New Mexico or *National Register of Historic Places* eligible properties, and State law prohibits the use of State funds for projects or programs that would adversely affect eligible properties unless the State agency or local government demonstrates that there is no feasible and prudent alternative. Impacts on cultural resources of many of the regional Federal and State-sponsored or permitted actions could be avoided or partially mitigated through data recovery. Actions that are not protected by Federal or State cultural resource statutes and regulatory protections could impact cultural resources without any consideration or mitigation.

Negligible to major impacts to cultural resources could result from CPWA options and regional actions. Although cultural resource impacts are assessed on a site- and project-specific basis, cumulative impacts can occur if the regional actions would have additive, interactive, or synergistic effects on the resources or

the resource base. Implementation of the water acquisition options and many of the regional actions would be subject to further consideration under Federal and/or State cultural resource statutes and regulatory protections. Some regional actions would not be subject to further cultural resource consideration. The intensity of cumulative impacts is unknown because of uncertainty about water acquisition options and the cultural resource impact, but it is anticipated that cumulative impacts are possible because of the additive effect and the location and timing of other regional actions.

8. Indian Trust and Treaty Assets

No cumulative impacts of the proposed action on Indian trust and treaty assets (ITA) in relation to other projects or programs (ongoing or reasonably foreseeable future actions) in the Pecos River basin would occur. No ITAs have been identified in consultation with tribes and the Bureau of Indian Affairs (BIA). Because resources are not believed to be present, no impacts are anticipated to result from the alternatives or from water acquisition options. Because no impacts to ITAs are anticipated resulting from the alternatives or from water acquisition options, no cumulative impacts are anticipated. Additional consultation will be conducted throughout the EIS process to update tribes and BIA on the progress of the EIS, to provide information on the alternatives under consideration, and to solicit any concerns relative to trust assets or other issues.

9. Environmental Justice

A continuing trend of ongoing and proposed programs to fallow, retire, or change farming practices exists within the Pecos River basin. The exact location where retirement or fallowing would occur cannot be predicted with certainty; however, most is expected to occur within CID and FSID, where a large percentage of the irrigated acreage is located. To the extent that some land retirement could also occur in Guadalupe County, there could be some cumulative impacts that would affect low-income or minority populations.