

Chapter 4: Environmental Consequences

Water Resources

The following indicators were used to evaluate water resources for the alternatives. A detailed definition of these indicators is provided in Appendix A.

- Flow duration or frequency at the Near Acme gage, or the amount of time that a certain flow has occurred at the Near Acme gage; and intermittency, which is the amount of time that zero flow has occurred at the Near Acme gage
- Additional water need (AWN), or the amount of additional water required to satisfy the target demand of 35 cfs at the Taiban gage or a continuous river, which is defined as 2 cfs at the Acme gage in summer months
- Carlsbad Project water supply, which is measured as the shortfall amount due to the project as a consequence of the proposed action, sometimes referred to as the net depletion to the Carlsbad Project water supply
- Pecos River flows at the New Mexico-Texas State Line, which is measured as the change in the amount of flow at the State line
- Changes to Pecos River Compact (Compact) delivery obligation due to alternative operations affecting Sumner Reservoir outflows
- Ground water withdrawals, increases or decreases in ground water withdrawals due to water leasing actions
- Water quality impacts, qualitative impacts to the Pecos River and reservoirs considering water leasing agreements and changes in operations

Hydrological modeling was conducted to evaluate these indicators. Appendix A provides an overview of the modeling methods. In summary, the model assessed a prior to 1991 (pre-91) baseline condition, no action condition, and the proposed action. For the proposed action, two operational scenarios were developed to assess how the river might respond to different applications of the rate of pumping ground water.

No Action

Modeling results for the No Action alternative are presented in this section. Flow duration and intermittency are presented along with remaining additional water needs (AWN), Carlsbad Project water supply, State-line flows, compact obligations, ground water withdrawals, and water quality.

No Action Flow Duration and Intermittency

Flow duration modeling results for flows at the Near Acme gage are presented in Figure 4.1. Intermittency results (occurrence of zero flow) are presented in Figure 4.2

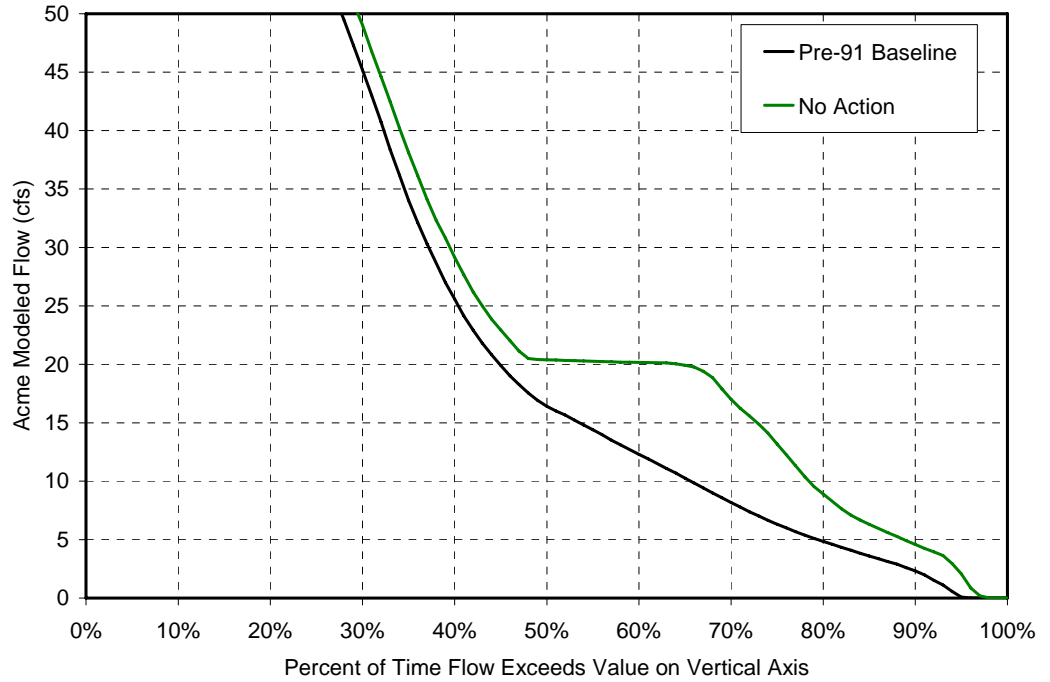


Figure 4. 1 Modeled flow duration at the Near Acme Gage showing pre-91 baseline and No Action results.

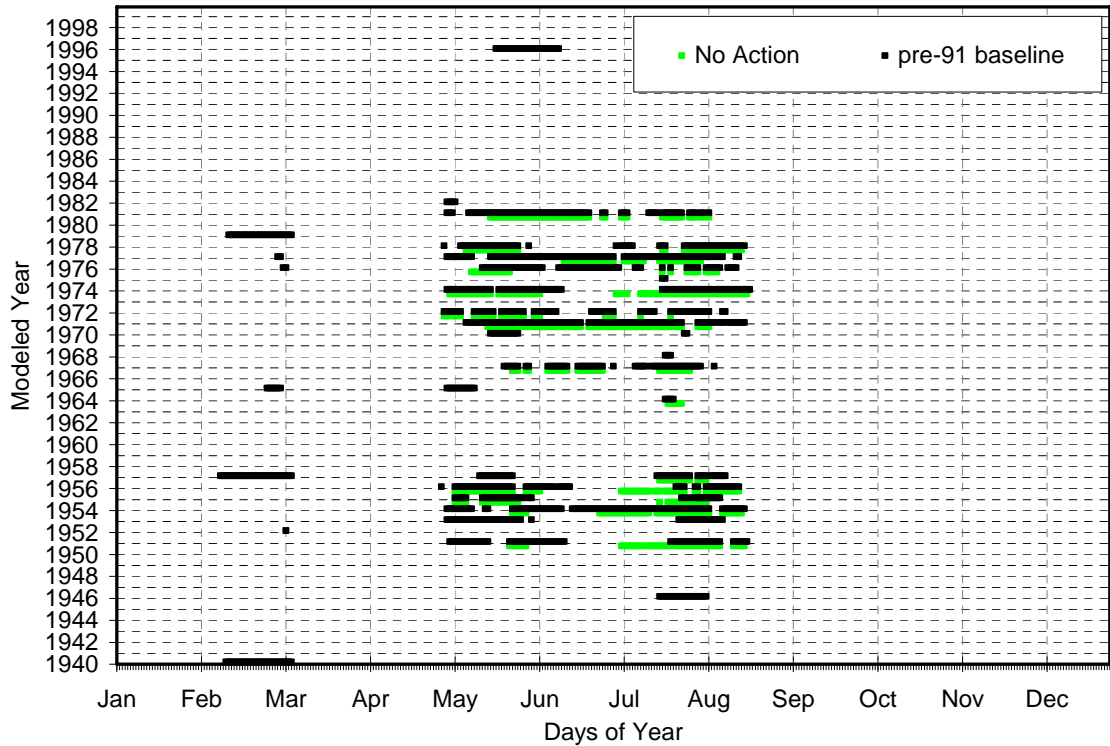


Figure 4. 2 Modeled intermittency at the Near Acme Gage showing pre-91 baseline and No Action results (bars denote times when intermittency occurred).

From Figure 4.1, it is apparent that winter bypassing for a constant target of 35 cfs at the Taiban gage makes a large benefit at the Near Acme gage (note plateau at 20 cfs). Also note from the plot, that the 500 acre-foot per year FCP in conjunction with bypassing makes a difference in the amount of intermittency, an improvement from 7% to 5%. The days of modeled intermittency depicted in Figure 4.2 indicate that winter bypassing eliminated all of the intermittency occurring in the non-irrigation season and the FCP reduced some intermittency during the summer months.

No Action Remaining Additional Water Needs (AWN)

Table 4.1 indicates the original and remaining Awn for meeting the constant target of 35 cfs at Taiban. These Awn values also include the amount of water to keep the Pecos River flow continuous at a discharge of 2 cfs at the Near Acme gage in the summer months. Awn is the amount of water that is needed to meet all of the target flow demands after available bypass amounts are consumed. Total water needed is the sum of available bypass and Awn.

Table 4.1 No Action (remaining) Additional Water Needs

Alternative	60-year annual averages			Maximum and minimum additional water needed			
	Total water needed (acre-feet per year)	Available water bypassed (acre-feet per year)	AWN (acre-feet per year)	Maximum Awn (acre-feet)	Maximum occurs in modeled year	Minimum Awn (acre-feet)	Minimum occurs in modeled year(s)
Bypass Only	4300	2500	1800	6900	'56	0	'42
No Action	4000	2300	1200	5900	'56	0	'41, '42, '49, '58, '86, '87, '91, '93, '95, '97, '99

From the table it is apparent that the FCP helps to reduce the additional water need required after bypassing is applied to river operations. For example, the average Awn was reduced from 1,800 acre-feet per year to 1,200 acre-feet per year. In the modeled year for 1956, the maximum annual Awn was reduced from 6,900 acre-feet to 5,900 acre-feet.

No Action Water Supplies

Water supplies for the No Action alternative are measured in comparison to the pre-91 baseline. Carlsbad Project total net depletions, changes to flows at the New Mexico-Texas Stateline, and changes in Compact delivery obligation are water supply resource indicators. Table 4.2 summarizes impacts to these indicators.

Table 4.2 Average (60-year) Changes in Water Supply Indicators for the No Action Alternative

Alternative	Total Net Depletion to Carlsbad Project Water Supply (acre-feet per year)	Increased CID Diversions (acre-feet per year)	Project water lost to additional conservation spills (acre-feet per year)	Estimated increase in flows at the Stateline (acre-feet per year)	Additional Compact Obligation (acre-feet per year)
No Action	-600	500	1000	1250	-300

In reading the table, the second column represents the total net depletion to diversions and project storage to the Carlsbad Project water supply for the No Action alternative. In other words, compared to the pre-91 baseline, an average of 600 acre-feet per year more water was made available to the Carlsbad Project for the No Action alternative. The third column represents increases in CID diversions from project water supplies, an average of 500 acre-feet per year. The fourth column shows how much water spilled from the Project due to the No Action alternative, 1,000 acre-feet per year. The fifth column estimates the additional State-line flow as a result of water spilled from the project and additional CID diversions, which assumes a 50% return flow component for CID diversions (EIS modeling indicated Carlsbad area ground water gains at 75% of CID diversions, but 50% is used here to be conservative in the absence of modeling these ground water gains) (Reclamation, 2006a). The sixth column shows the estimated relative change in Compact obligation due to increases (or decreases) in Sumner outflow.

No Action Ground Water Withdrawals

Ground water withdrawals for the No Action model simulation only includes exchange of 375 acre-feet per year of Seven Rivers ground water rights pumped into Brantley reservoir (Carlsbad Project storage) for the 500 acre-feet per year FCP stored in Sumner or Santa Rosa reservoirs. Well records indicate historic withdrawals in 2002 and 2003 of 790 and 870 acre-feet per year, respectively, for these water rights before FCP exchanges started. The full diversion amount for these rights is 1,800 acre-feet per year and the consumptive irrigation requirement associated with the water right is 1,260 AF/year. Pumping 375 acre-feet per year for the exchange is less than the historic diversion for 2002 and 2003, but the water rights are essentially only being used partially. If Reclamation continues pumping at the 2002-2003 level for previous uses under the No Action alternative in addition to pumping 375 acre-feet per year for the FCP exchange, ground water withdrawals will be approximately 1,200 AF/year in this location.

No Action Water Quality

The Carlsbad Project Environmental Impact Statement (EIS) models show small increases in electrical conductivity (EC) at Artesia and Below Brantley Dam as a result of bypassing (Reclamation 2006a). EC is an indirect measurement of total dissolved solids (TDS), sometimes referred to as salinity. Stratification of high salinity water is historically a problem in Brantley reservoir and is managed by using block releases to “turn over” the stratified layer and mix the reservoirs contents,

subsequently diluting the stratified high-EC layer with fresh water from a block release. Bypassing actions included in the No Action alternative will not impact water quality of flows at Artesia or Below Brantley anymore than was already identified in the EIS.

Proposed Action

Alternative impacts for the two simulated scenarios of the proposed action are presented in this section. Operational scenario definitions for the Proposed Action are shown in Appendix A. Operational Scenario A includes a lease of roughly 1100 acre-feet per year of ground water rights in the Ft. Sumner area to augment Pecos River flows. Operational Scenario B includes a lease of roughly 1600 acre-feet per year of ground water rights in the Ft. Sumner area to augment Pecos River flows. Operational Scenario A would pump these Ft. Sumner area ground water rights to the river at a maximum rate of 10 cfs and Operational Scenario B would pump at a maximum rate of 15 cfs (refer to Table A.1 in Appendix A).

The following table (Table 4.3) shows qualitative measurements of the water resources indicators used in this chapter for both of the Proposed Action operational scenarios. In sum, operational scenario B shows the most relative improvement. Operational Scenario A showed the least improvement from the No Action alternative. Quantification of these resource indicators is discussed below.

Table 4.3 Qualitative Summary of Resource Indicators

Alternative	Relative change from No Action Alternative				
	Flow frequency and intermittency Near Acme	Additional Water Needs	Project Water Supply, State-line Flow, and Compact	Volume of Ground Water Withdrawals	Water Quality
Action Operational Scenario A	large improvement	large reduction	no improvement to slight improvement	large decrease near Ft. Sumner	No change to slight reduction at Brantley and Pecos River near Taiban Creek
Action Operational Scenario B	large improvement	large reduction	no improvement to slight improvement	large decrease near Ft. Sumner	No change to slight reduction at Brantley and Pecos River near Taiban Creek

Proposed Action Flow Duration and Intermittency

Modeled flow durations at the Near Acme gage for the action alternative operational scenarios A and B are shown in Figures 4.3 and 4.4, respectively. Depictions of intermittency from the modeled results for flow at the Near Acme gage for operational scenarios A and B are shown in Figures 4.5 and 4.6, respectively. All of the operational scenarios in the Figures are compared to the No Action alternative.

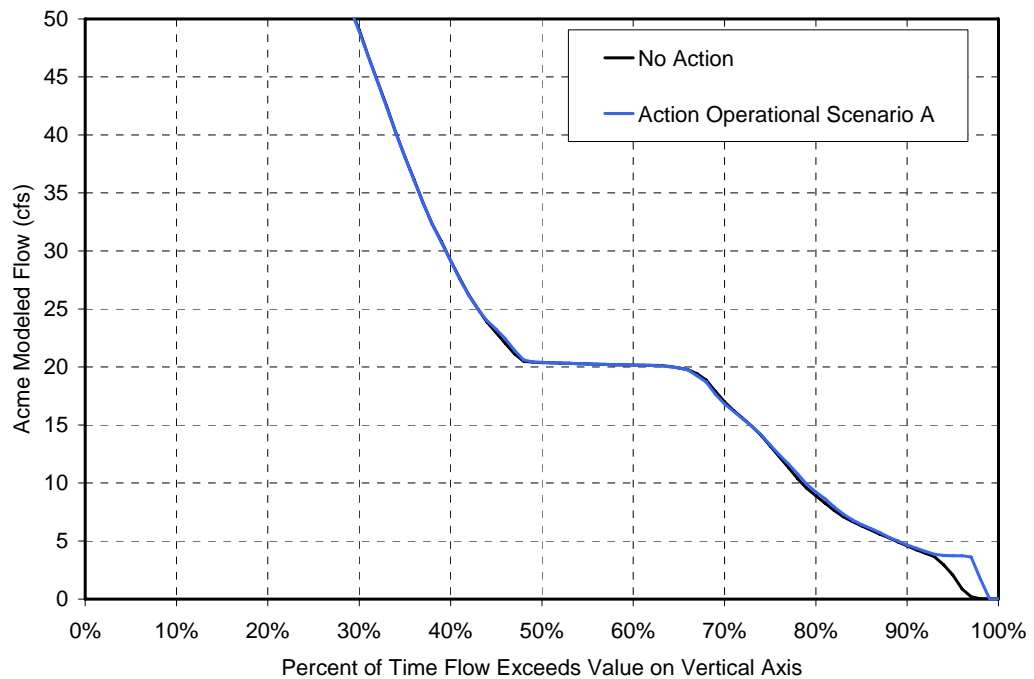


Figure 4.3 Modeled flow duration at the Near Acme gage for Operational Scenario A as compared to No Action.

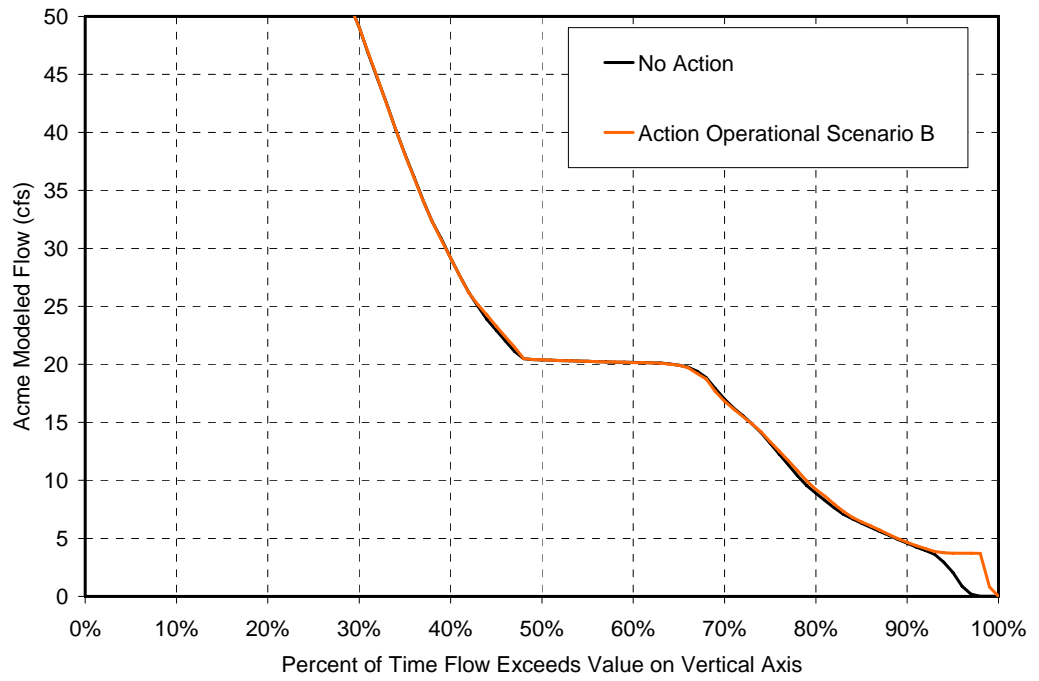


Figure 4.4 Modeled flow duration at the Near Acme gage for Operational Scenario B as compared to No Action.

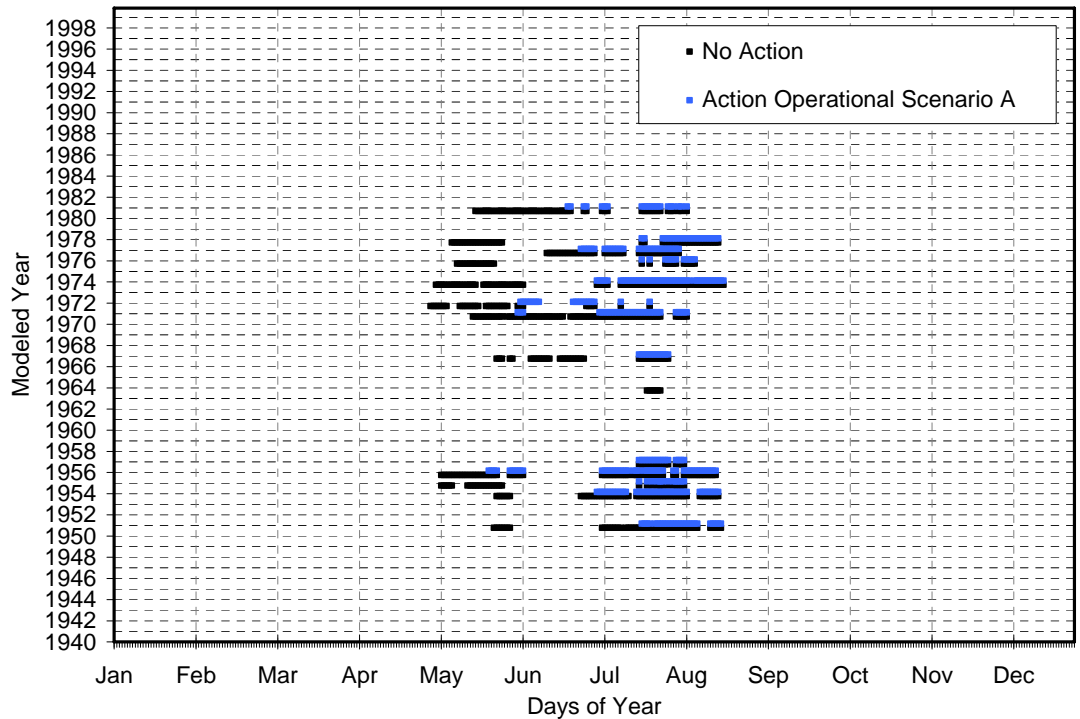


Figure 4.5 Modeled intermittency at the Near Acme gage for Operational Scenario A as compared to No Action.

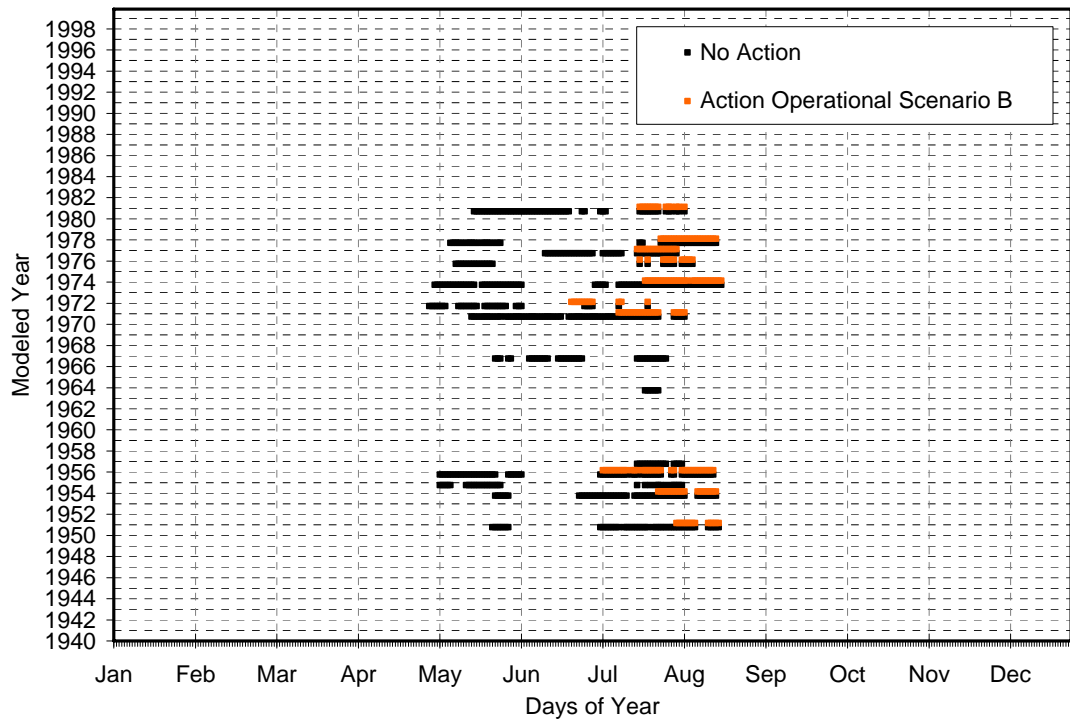


Figure 4.6 Modeled intermittency at the Near Acme gage for Operational Scenario B as compared to No Action.

The flow duration plots vary from a medium improvement in the 0-5 cfs range of the plot (Operational Scenario A) to a large improvement in the 0-5 cfs range of the plot (Operational Scenario B). Note that the plateau in these graphs begins to extend around 4 cfs, which is due to the 2 cfs target for keeping the river wet plus the additional constant 2.5 cfs from ground water leasing and subsequent pumping through the Gary Lynch Pipelines (see Figure 1) upstream of the Near Acme gage. Note that the proposed ground water leasing in the Ft. Sumner area helps to augment the effectiveness of the current leasing upstream of the Near Acme gage.

Pumping of ground water rights of approximately 1100 acre-feet per year (at a maximum delivery rate of 10 cfs per day) in the Ft. Sumner area makes a large contribution to eliminating intermittency (as shown in Figure 4.5). Figure 4.6 demonstrates that an even larger lease of ground water rights in the Ft. Sumner area of approximately 1600 acre-feet per year (at a maximum delivery rate of 15 cfs per day) reduces intermittency by nearly 70% from the No Action alternative. Table 4.4 tabulates intermittency statistics for the pre-91 baseline, No Action alternative, and the two Action alternative operational scenarios.

Table 4.4 Modeled Intermittency Statistics at the Near Acme gage

Alternative / Baseline	Total intermittency		Number of occurrences over 60 years - for single or consecutive days of intermittency					
	Percent of time	Number of days (out of 60 years)	1 day	2 to 5 days	6 to 10 days	11 to 20 days	21 to 30 days	Greater than 30 days
pre-91 baseline	4.9%	1064	13	32	20	18	13	5
No Action	2.8%	606	9	20	15	16	4	3
Operational Scenario A	1.5%	335	9	19	8	9	3	0
Operational Scenario B	0.3%	194	4	9	6	6	1	0

Proposed Action Remaining Additional Water Needs

The remaining amounts of AWN for the two operational scenarios are shown in Table 4.5. Also shown in the table are the original (bypass only) AWN amounts and the No Action AWN amounts. As stated previously, AWN is a sum of all the target demand to achieve 35 cfs at Taiban (or 2 cfs at Acme in the summer months) remaining after bypassing available supplies.

Table 4.5 Action and No Action (remaining) Additional Water Needs

Alternative	60-year annual averages			Maximum and minimum additional water needed			
	Total water needed (acre-feet per year)	Available water bypassed (acre-feet per year)	AWN (acre-feet per year)	Maximum AWN (acre-feet)	Maximum occurs in modeled year	Minimum AWN (acre-feet)	Minimum(s) occur(s) in modeled year(s)
Bypass Only	4200	2500	1800	6900	'56	0	'42
No Action	4000	2300	1200	5900	'56	0	'41, '42, '49, '58, '86, '87, '91, '93, '95, '97, '99
Operational Scenario A	3500	2100	500	4000	'56	0	'41, '42, '49, '58, '86, '87, '91, '93, '95, '97, '99
Operational Scenario B	3400	2100	300	3100	'56	0	'41, '42, '49, '57, '58, '86, '87, '91, '93, '95, '97, '99

It is apparent from the table that AWN decreases considerably as a result of the Action alternative scenarios. AWN follows the same trend as intermittency in that reductions due to ground water leasing in the Ft. Sumner area are fairly significant (Operational Scenarios A and B). Total water need decreases somewhat from only using bypass supplies due to timing of block releases, an average reduction of 200 acre-feet per year. Leasing of ground water in the Ft. Sumner area reduces total water need by another 500 to 600 acre-feet per year on the average because the water is added to the system downstream of Sumner Dam, closer to the Near Acme gage location; subsequently, some of the loss incurred as Sumner Dam release is eliminated by applying the water that is needed closer to the Near Acme gage location. It is also apparent from the table that the worst year for AWN is the modeled year 1956; however, reductions in this maximum are fairly significant for the Proposed Action operational scenarios (Operational Scenarios A and B).

Proposed Action Water Supplies

Action water supplies are measured against the pre-91 baseline to determine the amounts of net depletion incurred as a result of augmenting flows for the shiner. Table 4.6 summarizes impacts to the three water supply indicators including net depletions to Carlsbad Project supplies, changes to flows at the New Mexico-Texas Stateline, and changes in Compact delivery obligation.

Table 4.6 Average (60-Year) Changes in Water Supply Indicators for the Operational Scenarios Compared to the No Action Alternative

Alternative	Total Net Depletion to Carlsbad Project Water Supply (acre-feet per year)	Increased CID diversions (acre-feet per year)	Project water lost to additional conservation spills (acre-feet per year)	Estimated increase in flows at the Stateline (acre-feet per year)	Estimated Additional Compact Obligation (acre-feet per year)
No Action	-600	500	1000	1250	-300
Operational Scenario A	-800	600	1100	1400	-300
Operational Scenario B	-800	700	1100	1450	-300

The table illustrates that additional water acquisition (AWA) shows little benefit to Carlsbad Project water supplies or flows at the New Mexico-Texas Stateline. Since most of the water added to the system for the operational scenarios is closer to Sumner Reservoir than Brantley Reservoir (with the exception of the augmented Brantley exchange pumping), most of the water leasing or FCP release is consumed before it reaches Brantley and is mostly ineffective at augmenting Carlsbad Project water supplies. Note for all the alternatives shown in the table 4215 acre-feet per year of river pumper retirement was modeled as Carlsbad Project Water Acquisition to eliminate the net depletions caused by bypassing. It is this retirement that makes

the most difference in keeping the Carlsbad Project whole in lieu of all the river flow augmentation activities (bypassing and water leasing for augmenting river flows).

Proposed Action Ground Water Withdrawals

Modeled ground water withdrawals for the operational scenarios entail pumping ground water leases in the Ft. Sumner area to the Pecos River (Operational Scenarios A and B) are shown in Figure 4.7. Estimates from energy usage by the ISC indicate that for the years 1976-1983 and 1996-2005 irrigation well pumping for the same wells being considered under the lease agreement averaged 2,450 acre-feet per year, with a more recent average of 4,000 acre-feet per year for the latter period of record (1996-2005) (2006). Average modeled pumping rates for Operational Scenarios A and B were 500 and 600 acre-feet per year, respectively. The chart shows that in many years the full amount of the lease will be needed to augment Pecos River flows, but in many years the pumping is barely used. Table 4.7 summarizes modeled and historic ground water withdrawals near the Ft. Sumner area. It is apparent from the table and the figures that ground water withdrawals on a year-to-year basis (short term) and over the 60-year period (long term 60-year averages) for the same water rights will be greatly reduced from the recent historic average of 4,000 AF/year or the longer historic average of 2,450 AF/year since the maximum pumped under either Proposed Action operational scenario is 1,580 AF/year in any given year. Subsequently, this reduction in ground water withdrawals will lead to large improvements to base inflow contributions from this local Ft. Sumner area aquifer over the short-term and the long-term since the wells will be pumped at most, less than half of the recent historic usage (1,580 AF/year maximum in any year for the Proposed Action vs. 4,000 AF/year historic average), and over the long-term the wells will be pumped nearly a full order of magnitude less than the recent historic average (average of 500 to 600 AF/year for the Proposed Action versus 4,000 AF/year recent historical average).

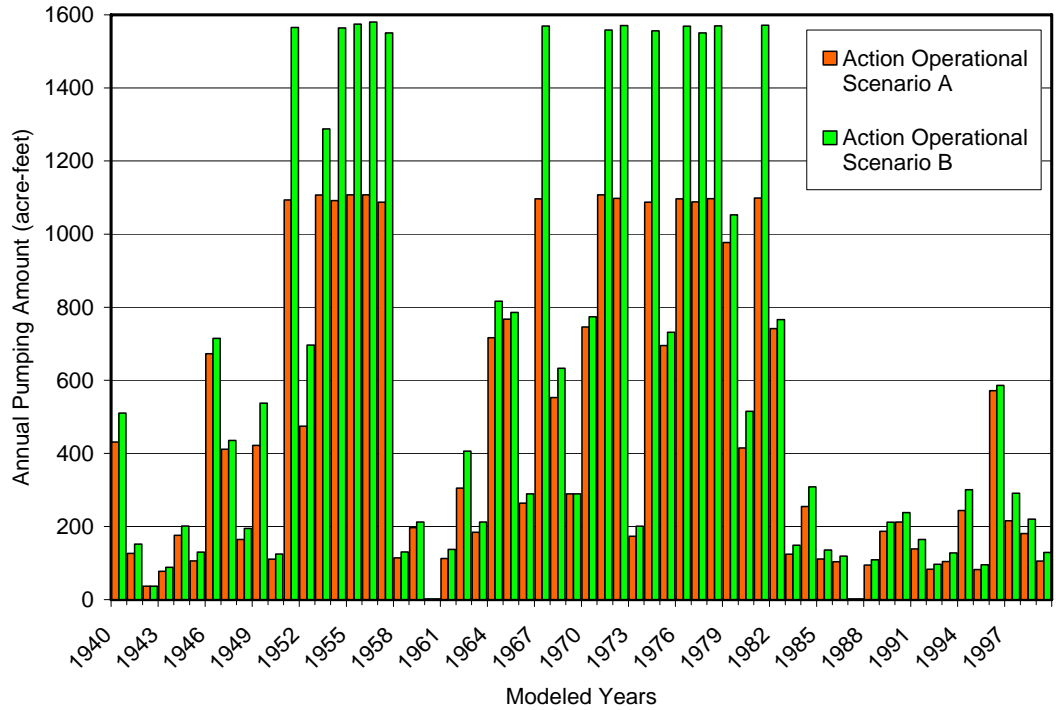


Figure 4.7 Modeled pumping of ground water lease to augment Pecos River flows for Operational Scenarios A and B.

Table 4.7 Current and proposed (modeled) ground water use in the Ft. Sumner area.

Alternative	Consumptive Irrigation Requirement (acre-feet per year)	Full Diversion Right (acre-feet per year)	Recent Average Historical Diversion (acre-feet per year)	Proposed Average Diversion (60-year modeled average, acre-feet per year)
No Action	1108	1794	4000	N/A
Proposed Action Operational Scenario A (pumping at 10 cfs)	1108	1794	N/A	500
Proposed Action Operational Scenario B (pumping at 15 cfs)	1580	2560	N/A	600

Proposed Action Water Quality

The action alternative operational scenarios will not have negative impacts on water quality in the study area any more than the No Action alternative. The lease of ground water rights and subsequent pumping of those rights to the Pecos River in the Ft. Sumner area will serve to improve water quality in this reach of the river since a large portion of farm acreage will no longer be irrigated with the leased water. Irrigation of lands, and subsequent return flows, serves to increase salinity in rivers

from leaching salts from the irrigated lands. This leaching process increases the TDS in the water, where as just pumping the water into the Pecos River will not cause an increase in TDS from the source well water quality.

Biological Resources

The following indicators were selected to evaluate potential impacts on biological resources:

- Increased potential for overbank flows or inundation of habitats used by nesting shorebirds, terrestrial wildlife species, and wetland aquatic species.
- Changes in frequency, extent, duration of intermittency or extreme low flows that would cause direct mortality of aquatic organisms and loss of aquatic habitat.
- Change in frequency, magnitude, or duration of managed or natural peak flows that could impact aquatic habitat or spawning activities.

No Action Alternative

Under the no action alternative, there would be no change from current trends or conditions. Reclamation would not enter into a long-term agreement with ISC to lease and deliver water at this location for the benefit of the shiner. In order to avoid jeopardy, Reclamation would still be obligated to meet the conditions of the Biological Opinion and would continue to acquire other supplemental sources of water or pursue other measures to meet the flow target and keep the river continuous.

The no action alternative would have no effect on the potential for overbank flows, inundation of habitat, potential for intermittency, or extreme low or peak flows.

Proposed Action

If the proposed action is implemented, Reclamation would have an additional tool available in the 2007 irrigation season to meet the flow target and keep the river continuous which would be beneficial to the threatened shiner. The discharge point for the Vaughan pipeline is located near the top of the upper critical habitat and three miles north of the Taiban gage where flows are monitored. Reclamation would be able to quickly and efficiently add water to the river if base flows drop and reduce the possibility and duration of intermittency or extreme low flows. The availability of water upstream on a more continuous basis during summer months should have a positive effect on terrestrial, riverine and floodplain habitats and the species that use them.

Because the flow rate of water pumped to the river is small, the proposed action is not expected to have much effect on the potential for overbank flows or inundation of habitats. Most overbank flows and habitat inundations are the result of much larger natural events and large block releases. The use of pumped water and smaller block releases may reduce the need for larger block releases that can sweep eggs and larvae into the reservoirs and but can cue spawning.

Recreation

The following indicators were selected to evaluate potential impacts on recreation:

- Water levels and their effects on recreation along the Pecos River.

No Action Alternative

Under the no action alternative, there would be no change from current recreational conditions or trends at recreational sites along the Pecos River. The availability of recreational opportunities along the Pecos would continue fluctuate widely based on flows and location. The no action alternative would have no effect on instream water levels and therefore no effect on recreation.

Proposed Action

If the proposed action is implemented, Reclamation would have the flexibility to pump ground water into the river. The proposed action is expected to have negligible to minor positive impacts on recreation. More water flowing in the Pecos River during the summer could mean greater opportunities for water-oriented outdoor recreation, but fluctuations in weather, timing, supply, location and irrigation demand would be far more influential in determining recreational opportunity and use than the proposed action.

Cultural Resources

The following indicators are used to evaluate changes to cultural resources:

- The known presence or potential for cultural resources that may be eligible for listing on the National Register of Historic Places (NRHP) or locations that are important to Native American or other traditional communities in areas affected by the action.
- River flow levels and fluctuation resulting from the action where there is a potential for directly disturbing resources, increasing access to resources, or exposing submerged resources.

Impact analysis for cultural resources incorporates the National Historic Preservation Act, Section 106 process. In the Section 106 process, the Federal lead agency determines an Area of Potential Effect (APE) for each undertaking or project. The APE is the physical area where the action may affect cultural resources and specifically those that are listed or meet the criteria for listing (36 CFR 60.4) on the National Register of Historic Places (NRHP). The APE for cultural resources includes the existing water channels or active flood zones of the Pecos River corridor.

Impacts on cultural resources are assessed by applying the criteria of adverse effect as defined in 36 CFR 800.5a. "An adverse effect is found when an action may alter the characteristics of a historic property that qualify it for inclusion in the NRHP in a

manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the action that may occur later in time, be farther removed in distance, or be cumulative." The criteria of adverse effect provide a general framework for identifying and determining the context and intensity of potential impacts on other categories of cultural resources, as well, if these are present. Assessment of effects involving Native American or other traditional community, cultural or religious practices, or resources also requires focused consultation with the affected group.

No Action Alternative

The no action alternative is unlikely to affect cultural resources. Potential impacts would be limited geographically to known and unknown cultural resources in the existing water channels and active flood zones of the Pecos River corridor.

Ongoing impacts on cultural resources resulting from river operations include the potential for direct disturbance of the integrity of archaeological sites through erosion, wave action, and cycles of inundation and drawdown, and the potential for vandalism of formerly submerged archaeological resources. The potential for these kinds of impacts, including impacts on resources that may be eligible for listing on the NRHP or may be of traditional importance, is greater from natural drought cycles and flood events. Future actions to acquire and develop additional water or to conserve the shiner would be expected to continue and may require further consideration of the effects on cultural resources.

Proposed Action

The proposed action is unlikely to affect cultural resources. No additional construction, ground disturbance, changes in water, control, storage and delivery infrastructure, or new land abandonment is proposed. The action of leasing water and releasing it into the river at a slow rate at this location would be a negligible change from current operations and similar in nature to other existing actions. Sites in the immediate vicinity of the river or in flood zones have been subject to past disturbances, reducing the likelihood of their intact preservation. Proposed flow levels and flow fluctuations would be within the range of normal river operations and would not be expected to exacerbate erosion of archaeological resources or exposure of submerged resources. Future actions to acquire and develop additional water and to conserve the shiner would be expected to continue and may require further consideration of the effects on cultural resources.

Indian Trust Assets

The following resource indicator is used to evaluate impacts on Indian trust assets:

- The potential for the action to affect Indian real property, physical assets, or intangible property rights. Actions which would adversely affect the value, use, or enjoyment of an ITA would be considered an impact.

As part of the preparation of the Carlsbad EIS (Reclamation 2006a), Reclamation contacted representatives of tribal groups with historic ties to the Pecos River basin or tribal groups who had expressed interest in Reclamation activities to identify any tribal trust interests. In addition, Reclamation contacted various representatives and offices of BIA, informing them of the consultation and requesting any feedback that the agency might have including the potential of Reclamation's actions to affect ITAs. 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 ITAs or ITA issues have been identified to date. If present, impacts on ITAs include any actions that affect Indian real property, physical assets, or intangible property rights. In some cases, the measure of impact significance on ITAs may be estimated based on the monetary value of the assets to the Indian tribe, but ITAs may also have social and cultural values that will need to be considered in addition to their economic value.

No Action Alternative and Proposed Action

No ITAs have been identified in the Pecos River Basin in consultation with tribes and the Bureau of Indian Affairs (BIA). There are no reservations or ceded lands present. Because resources are not believed to be present, no impacts are anticipated to result from the no action alternative or the proposed action.

Environmental Justice

The following resource indicator is used to evaluate environmental justice:

- The potential for the action to cause a disproportionate share of high and adverse human health and/or environmental impacts on low income and/or minority communities.

As discussed in chapter 3, U.S. Census Bureau data indicate that the distribution of population by race and Hispanic origin is similar for each of the four study area counties, with the exception of Guadalupe County. The percentage of total population that is Hispanic in Guadalupe County is nearly double the percentage for the entire area. Income data indicate that the per capita income for all four study area counties is lower than the average for all of New Mexico. Data also show Guadalupe County has much lower per capita income than the rest of the study area.

No Action Alternative

Under the no action alternative, there would be no change from current conditions and trends. The no action alternative would have no effect on ongoing socioeconomic and environmental trends affecting minority and low income populations. Other actions would be required to acquire and develop additional water sources. These actions may result in potential environmental justice issues if they involve minority and low income populations.

Proposed Action

The action of leasing and delivering water through the ISC infrastructure would have no effect on environmental justice. Negligible or no environmental impacts are anticipated for other resources. Since the water required 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.

Irretrievable Commitment of Resources

The implementation of the proposed action would result in the commitment of resources such as power to run pumps. Use of ground water sources may represent an irretrievable impact if pumping exceeds recharge rates. Federal funds will be expended on a long-term basis to lease and deliver water.

Cumulative Impacts

According to the Council on Environmental Quality's regulations for implementing NEPA (50 CFR §1508.7), a "cumulative impact" is an 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 what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. It focuses on whether the proposed action, considered together with any known or reasonable foreseeable actions by Reclamation, other Federal or state agencies, or some other entity combined to cause an effect.

There are ongoing efforts, primarily by the ISC, to acquire land with water rights in the Pecos River Basin to ensure compliance with the Pecos River Compact and meet obligations under the Settlement Agreement. Reclamation has executed a long-term contract with the Carlsbad Irrigation District (CID) to allow ISC to use water up to 50,000 acre-feet for purposes other than irrigation. The result of these actions is that land is being taken out of agricultural production, land ownership is being shifted from private to public ownership, prices for land with water rights have increased, there is additional economic incentive to sell, there is additional short-term economic

input into the region, and a long-term loss to agriculturally-related segments of the regional economy. The ISC and Reclamation recently completed the Seven Rivers Pipeline Environmental Assessment which analyzed the construction and operation of the water delivery pipeline from the Seven Rivers Augmentation Well field to Brantley Reservoir for use as Carlsbad Project water as partial fulfillment of the Settlement Agreement and to help maintain Compact compliance. No significant impacts were found.

On a more limited scale, Reclamation is continuing its efforts through leases to acquire and transfer water to support the 2006-2016 Biological Opinion. The Pecos Supplemental Water and Exchange EA is being prepared concurrently with this EA but on a longer time frame. The Bureau of Reclamation would like to obtain supplemental water to provide the operational ability to release approximately 2,500 acre-feet of water out of Santa Rosa Reservoir or Sumner Lake per year to keep the river continuous, while also ensuring that there is enough water at Brantley Reservoir to meet the contracted irrigation needs of the Carlsbad Project. Reclamation has obtained a permit to operate a 1000 acre-foot fish conservation pool using existing water rights. A variety of supplemental water sources are being considered to meet these goals. Scoping for this project was completed November 2006, and a draft EA will be available later this year.

Additional efforts by federal state and local agencies in the Pecos River Basin are focused on salt cedar removal and river habitat restoration. Many thousands of acres have been treated to reduce the adverse effects of invasive plant species. Reclamation is currently partnering with the Service in an EA on Pecos River restoration at Bitter Lake National Wildlife Refuge (NWR). The purpose of the Pecos River restoration is to improve riparian and in-channel habitat, extending the reach of connected good quality habitat for the benefit of native aquatic and riparian plant and animal communities. The 2006-2016 Biological Opinion requires Reclamation to restore two reaches totaling 3 miles of the river and to cooperate with other agencies in restoration efforts. Reclamation is assisting the Service with NEPA compliance and plans to restore flows into one oxbow. The proposed restoration actions at Bitter Lake NWR would correct or improve degraded ecological conditions caused by the excavation of straight channels that begun in the 1930s and encroaching nonnative vegetation, and would restore parts of the river to more natural flow conditions within the context of the modern hydrological regime, including reconnecting the river to the floodplain.

Under the 2006-2016 Biological Opinion Reclamation has created 56.6 acres of nesting and brood-rearing habitat for Interior Least Terns on the western shoreline of Brantley Reservoir, at and above the Lake's conservation storage pool elevation. Reclamation will create a third, 28-acre site for nesting and brood-rearing in winter 2007, prior to the species' arrival in May. This total of 84+ acres of nesting and brood-rearing habitat will be maintained through regular vegetation removal for the next 10 years. In addition, Reclamation will monitor for possible tern nesting activity throughout this period of time.

Reclamation has determined that the proposed action would not have a significant adverse cumulative effect on any resources. The water proposed for leasing by Reclamation in the vicinity of the Taiban gage would not result in any additional loss or fallowing of agricultural land. This land was previously purchased and fallowed by the ISC who are also constructing the delivery infrastructure to meet their independent needs. The contribution of the proposed action to cumulative effects would likely be beneficial for most resources.

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