

# RECLAMATION

*Managing Water in the West*

## Calendar Year 2017 Report to the Pecos River Commission

---

**NEW MEXICO**  
Ray B. Willis

**TEXAS**  
Frederic Tate

---

**FEDERAL CHAIRMAN**  
Vacant



Department of the Interior  
Bureau of Reclamation  
Upper Colorado Region  
Albuquerque, New Mexico

March 2018

## MISSION STATEMENTS

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Information contained in this document regarding commercial products or firms may not be used for advertising or promotional purposes and is not an endorsement of any product or firm by the Bureau of Reclamation.

Cover photo: Avalon Dam and Stilling Basin (Chris Grosso, Reclamation)

## Table of Contents

Table of Contents .....	i
List of Figures .....	ii
List of Tables .....	ii
Introduction .....	1
Carlsbad Project Operations .....	3
Reservoir Storage Entitlements .....	3
Santa Rosa Reservoir Sediment Accumulation .....	4
Lake Sumner Sediment Accumulation .....	4
Brantley Reservoir Sediment Accumulation .....	4
Reservoir Data .....	5
Sumner Dam and Lake .....	5
Sumner Dam Operations .....	5
Sumner Dam Facility Review and Safety of Dams Programs .....	8
Brantley Dam and Reservoir .....	9
Brantley Dam Operations .....	9
Brantley Dam Facility Review and Safety of Dams Programs .....	10
Avalon Dam and Reservoir .....	10
Avalon Dam Operations .....	10
Avalon Dam Facility Review and Safety of Dams Programs .....	11
Carlsbad Project Environmental Compliance .....	13
Current ESA and NEPA Compliance .....	13
Reclamation’s Direct Flow Operations .....	13
Pecos Basin Water Accounting .....	14
Reclamation’s Water Offset Program .....	14
Endangered Species Program .....	15
Pecos Bluntnose Shiner .....	15
Interior Least Tern .....	17
Pecos River Restoration .....	19
Fort Sumner Project .....	20
Operations .....	20
Fort Sumner Irrigation District Review of Operation and Maintenance .....	21
Other Pecos River Activities and Operations .....	22
Carlsbad Irrigation District Water Lease Program .....	22
Pecos River Settlement Implementation .....	22
Pecos River Basin General Stream Adjudication .....	22
WaterSMART .....	23
WaterSMART Grants .....	24
Basin Study Program .....	24
Zebra and Quagga Mussels .....	25

## List of Figures

Figure 1: Map of Reclamation Projects on the Pecos .....	2
Figure 2: Storage and Release for Sumner Dam.....	7
Figure 3: Storage and Release for Brantley Dam .....	9
Figure 4: Storage and Release for Avalon Dam .....	11
Figure 5: Pecos bluntnose shiner density in trimester three, 2000–2017 .....	16
Figure 6: 2017 Pecos Bluntnose Shiner monthly standard length histograms.....	17
Figure 7: Brantley Reservoir elevations during the 2017 Least Tern breeding season .....	18
Figure 8: FSID Main Canal Diversion.....	21

## List of Tables

Table 1: Pecos Reservoir Storage Entitlements for 2017 .....	3
Table 2: Estimated Sediment Accumulation for 2017 Santa Rosa Storage Entitlement .....	4
Table 3: Estimated Sediment Accumulation for 2017 Sumner Storage Entitlement.....	4
Table 4: Estimated Sediment Accumulation for 2017 Brantley Storage Entitlement .....	5
Table 5: Summary of 2017 Interior Least Tern observations at Brantley, New Mexico.....	18
Table 6: 2017 AIS Sampling Results for Reclamation Reservoirs in New Mexico.....	25

## Introduction

The Albuquerque Area Office (AAO) of the Bureau of Reclamation (Reclamation) has oversight responsibilities for three projects on the Pecos River (Pecos). These projects are the *Carlsbad Project*, which includes Sumner, Brantley, and Avalon Dams; the *Pecos River Basin Water Salvage Project*; and the *Fort Sumner Project*, which includes the Fort Sumner Diversion Dam. Figure 1 depicts the general location of the Projects on the Pecos.

Reclamation prepared this Annual Report to the Pecos River Compact Commissioners to convey all required reporting information on the three projects mentioned above. It will also inform the Commission of proposed changes in programs, management activities, and strategies that may affect operations, operating conditions, and/or the Compact, including Endangered Species Act (ESA) issues.

An agreement between Reclamation and Carlsbad Irrigation District (CID), finalized on October 2, 1989, provides for CID to operate and maintain Sumner, Brantley, and Avalon Dams, and the Pecos River Water Salvage Project. Reclamation continues to be responsible for assuring that this work is accomplished in compliance with all applicable agreements, contracts, regulations, compacts, and other related laws.

The Pecos River Water Salvage Project has not been funded since fiscal year (FY) 2012. Funding is not anticipated in the near future. It will not be discussed further in this report.

The gage data used within this report were downloaded from the United States Geological Survey's (USGS) web page, <https://waterdata.usgs.gov/nm/nwis/current/?type=flow>. As of the writing of this report, the USGS has approved all of the gaged flow data for 2017. Reclamation receives provisional reservoir elevation and weather data from CID on a monthly basis.

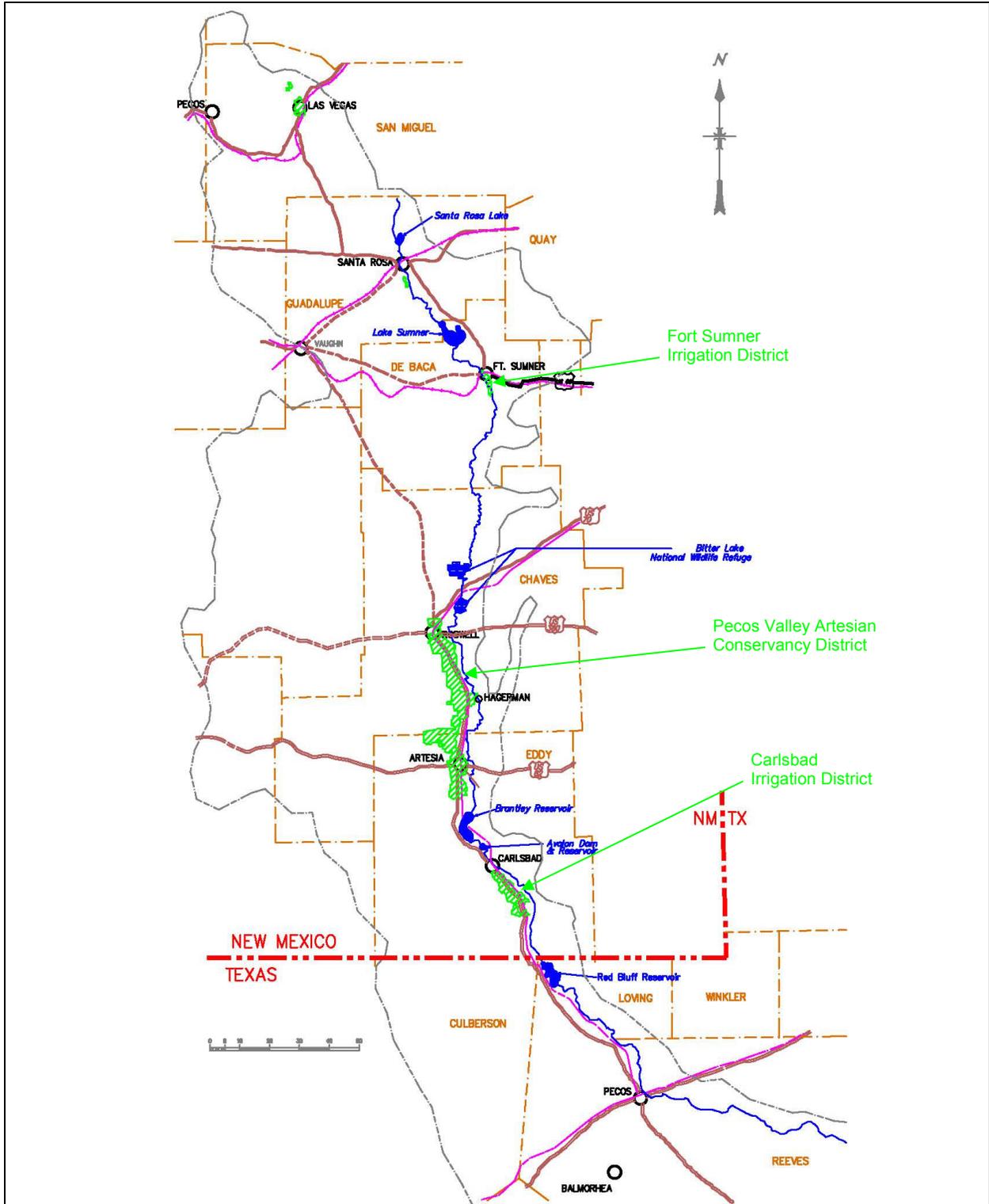


Figure 1: Map of Reclamation Projects on the Pecos

## Carlsbad Project Operations

### Reservoir Storage Entitlements

Reclamation operates all Carlsbad Project (Project) reservoirs in accordance with the requirements of the Pecos River Compact and U.S. Army Corps of Engineers' (Corps) flood control criteria. Figure 1 depicts the location of the Carlsbad Project storage dams on the Pecos River. Operation of the dams on the Pecos River is a joint effort between Reclamation, CID, and the Corps in coordination with the Fort Sumner Irrigation District (FSID) and the State of New Mexico.

Reclamation calculated annual total conservation storage entitlements for the four Pecos River reservoirs within New Mexico (Santa Rosa, Sumner, Brantley, and Avalon). Table 1 presents the calendar year 2017 storage entitlements for these Reservoirs. In this context, entitlement storage refers to the maximum volume of wet water that the Project is entitled to store. Total conservation storage includes estimated sediment and minimum pool, where applicable. Note that Avalon elevations reference a project datum.

Table 1: Pecos Reservoir Storage Entitlements for 2017

Reservoir	Entitlement Storage (af)	Minimum Pool (af)	Total Estimated Sediment Accumulation (af)	Total Conservation Storage (af)	Conservation Elevation (feet)
Santa Rosa	99,763	0	0	99,763	4,749.34 (NAVD 88)
Sumner	32,871	2,500	546	35,917	4,260.88 (NAVD 88)
Brantley	40,000	2,000	374	42,374	3,256.22 (NAVD 88)
Avalon	3,866	600	0	4,466	3,177.40 (USBR)
<b>TOTAL</b>	<b>176,500</b>			<b>182,520</b>	

On January 1, 2017, Carlsbad Project reservoirs on the Pecos River were at 66 percent of full entitlement storage. Santa Rosa, Sumner, Brantley, and Avalon Reservoirs were at approximately 56, 76<sup>1</sup>, 83, and 53 percent, respectively. On December 31, 2017, the total storage in the reservoirs was 64 percent of entitlement. Santa Rosa, Sumner, Brantley, and Avalon Reservoirs were at approximately 95, 109<sup>1</sup>, 95, and 0 percent, respectively. Avalon was drained at the end of irrigation to perform maintenance and inspections.

The National Resource Conservation Service's May 3, 2017, most probable snowmelt runoff forecast predicted 40,000 acre-feet (af) of inflow into Santa Rosa Reservoir, or 71 percent of the

---

<sup>1</sup> During the winter months, Sumner is allowed to store an additional 20,000 af above the entitlement storage as long as the total entitlement storage is not exceeded in for all four reservoirs.

30-year average. The actual March through July inflow to Santa Rosa Reservoir was just below 33,950 af, approximately 61 percent of the 30-year average. There was good monsoon moisture in August and October 2017 that ended the year with total basin storage at 174,107 af of entitlement storage (182,520 af of total conservation storage, which includes sediment accumulation).

**Santa Rosa Reservoir Sediment Accumulation**

The Corps completed a sediment resurvey in 2016, and applied the results on January 1, 2017. The Corps also converted the results of the resurvey to the North American Vertical Datum of 1988 (NAVD88), and from 2017 forward Santa Rosa elevations will be reported in NAVD88.

Because of the new sediment survey, there was no sediment accumulation in Santa Rosa Reservoir in 2016.

Table 2: Estimated Sediment Accumulation for 2017 Santa Rosa Storage Entitlement

<b>Calendar Year</b>	<b>Sediment Accumulation (af)</b>
2016	0
<b>Total</b>	<b>0</b>

**Lake Sumner Sediment Accumulation**

The basis of the estimated sediment accumulation calculations for Lake Sumner is the ratio of total sediment deposition to total inflow during the period between the May 2001 and April 2013 sediment surveys. Inflow to Sumner was measured at the USGS gage, Pecos River near Puerto de Luna, NM (PDL). The total sediment deposition during this period was the difference in the content between the 2001 and 2013 surveys at the top of conservation pool, elevation 4,262.88 feet (NAVD 88 vertical datum, 4261.00 feet referencing project vertical datum). In 2012, Reclamation reduced the maximum conservation pool elevation in Sumner, at the request of the CID, by 2.11 feet to 4260.88 feet (NAVD 88), or 4258.77 feet (NGVD 29).

The total sediment deposition, divided by the total inflow, obtained an average ratio of sediment deposition to inflow during this period. To estimate sediment deposition in a given period, calendar year inflow is multiplied by this ratio. Table 3 shows an annual tabulation of the estimated sediment accumulation since April 2013. The estimated sediment deposition since the last sediment survey was 551 af.

Table 3: Estimated Sediment Accumulation for 2017 Sumner Storage Entitlement

<b>Calendar Year</b>	<b>Inflow (af)</b>	<b>Sediment Accumulation (af)</b>
04/1/2013	74,640	96
2014	121,581	156
2015	108,299	144
2016	128,384	155
<b>Total</b>		<b>551</b>

**Brantley Reservoir Sediment Accumulation**

The basis of the estimated sediment accumulation calculations for Brantley is the ratio of total sediment deposition to total inflow during the period between the May 2001 and March 2013 sediment surveys. Inflow to Brantley is measured at the USGS gage, Pecos River near Lakewood, NM (Kaiser Channel). The total sediment deposition during this period was the

difference in the content between the 2001 and 2013 surveys at the top of the designated conservation pool, elevation 3,272.6 feet (NAVD 88 vertical datum, 3271.00 feet referencing local vertical datum). Total sediment deposition divided by the total inflow yields an average ratio of sediment deposition to inflow during this period.

Annual sediment deposition since the 2013 survey is estimated by multiplying calendar year inflow by this ratio. Table 4 shows estimated inflow and sediment accumulation since April 1, 2013. The estimated sediment deposition since the last sediment survey was 378 af.

Table 4: Estimated Sediment Accumulation for 2017 Brantley Storage Entitlement

<b>Calendar Year</b>	<b>Inflow (af)</b>	<b>Sediment Accumulation (af)</b>
04/1/2013	74,801	57
2014	183,316	139
2015	132,272	104
2016	102,311	78
<b>Total</b>		<b>378</b>

## Reservoir Data

Previously, Reclamation used reservoir data – elevation, storage, weather and evaporation – received from the Carlsbad Irrigation District (CID). Reclamation has transitioned away from using most of CID’s manually collected and entered data, to data transmitted electronically. Use of electronically-collected and transmitted data is standard operating procedure at the majority of Federal reservoirs. All storage and flow data used in this report for all three Reclamation-owned reservoirs are from electronic instrumentation maintained by the USGS.

First of the year elevation and storage are the midnight values on December 31 of the previous year. Unless otherwise specified, other elevations are the daily elevation, recorded at midnight of the date listed, and daily storage values are derived from that end-of-day elevation. Reclamation continues to use weather and pan evaporation data currently only recorded by the CID’s dam tenders, typically at about 8 am daily.

## Sumner Dam and Lake

### Sumner Dam Operations

**Note: All elevations reference the North American Vertical Datum of 1988 (NAVD 88).**

Operations at Sumner Dam (Sumner) store available natural inflow as long as bypass is not required. Bypass may be required either to meet the 35 cubic feet per second (cfs) target at the USGS’ Pecos River below Taiban Creek near Fort Sumner gage, or to maintain continuous flow in the river. A flow of 5 cfs or greater at the Pecos River near Acme gage is considered an indication of continuous river flow. The targeted flows are required by the *Final Biological Opinion for the Carlsbad Project Water Operations and Water Supply Conservation, 2016-2026* (2017 BO; Consultation Number 02WNNM00-2016-F-0506), implemented in December 2017 for the Pecos Bluntnose Shiner (shiner) and the Interior Least Tern (tern).

Natural inflow may be bypassed at any time outside of irrigation season. During irrigation season, it is only available when natural inflow exceeds Fort Sumner Irrigation District's (FSID) maximum direct diversion water right of 100 cfs, The New Mexico Office of the State Engineer (NMOSE) calculates FSID's actual allotment based on natural inflow to Sumner Reservoir in the previous two weeks.

All other inflow into Sumner is considered Carlsbad Project water. Stored Project water is released as a block. The duration of block releases is restricted to a maximum of 15 contiguous days. The cumulative annual duration of all block releases is restricted to a maximum of 65 days, not including flood operations, and scheduled block releases should have a minimum of 14 days between releases. These restrictions are in accordance with the 2017 BO.

When possible, CID schedules block releases in cooperation with Reclamation to alleviate river intermittency. Reclamation directs the CID dam tender on releases, and CID is responsible for all maintenance activities at the dam. This operating procedure does not alter the normal operations of Avalon and Brantley Dams for delivering water to CID.

From November 1 to April 30, under a water right permit granted by the NMOSE, the Carlsbad Project is allowed to store up to 20,000 af above its storage entitlement in Sumner provided that the entitlement storage of all four reservoirs on the Pecos in New Mexico does not exceed 176,500 af.

Sumner began 2017 with 27,161 af (4,256.91 feet) in total storage. Total storage reached a maximum on December 31, 2017, at 39,123 af (4,262.15 feet). Sumner's minimum storage occurred on September 22 at 19,452 af (4,252.58 feet). Figure 2 depicts Sumner's total storage and releases.

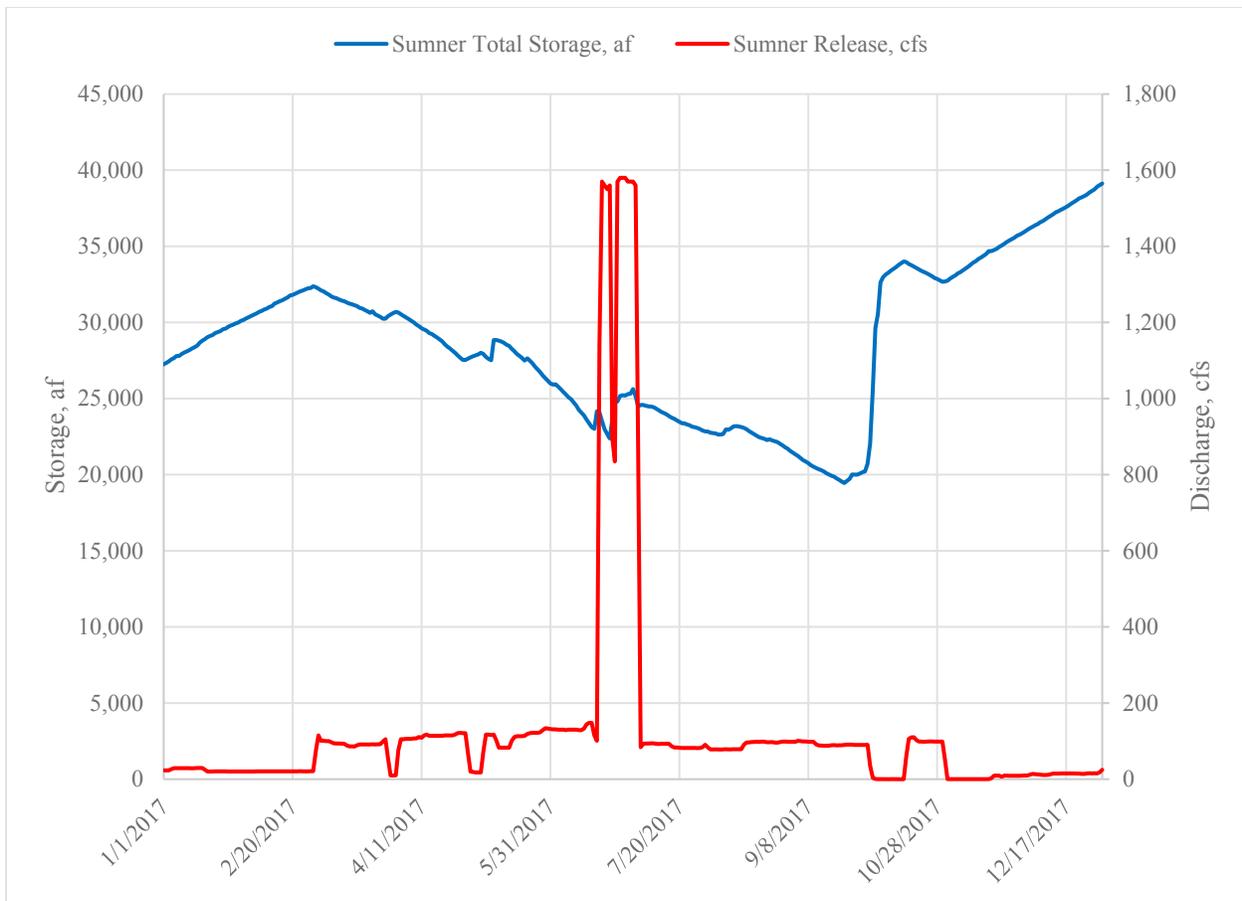


Figure 2: Storage and Release for Sumner Dam

Reclamation began storing the FSID forbearance water on February 13. FSID called for their full allotment on March 1, 2017, after storing 1,925 af of forbearance, temporarily curtailing forbearance storage. The additional 575 af was stored from March 29 to April 2.

There was one block release made this irrigation season. The block release from Sumner began on June 19 and ended on July 4, at an average release rate of 1,314 cfs for CID, for a total CID release of 41,699 af from Sumner to Brantley Reservoir. An additional 3,044 af was released for FSID during this period. The block release was suspended on June 24 through 25 due to a drowning at the FSID Diversion Dam. To allow recovery of the body, the discharge from Sumner was stopped at 14:45 on June 24 and restarted at 10:15 on June 25.

During 2017, Reclamation acquired 2,500 af of forbearance water through a contract between the United States and FSID (Contract No. 08-WC-40-292; FSID Forbearance Agreement Pool). The forbearance is stored in Sumner to provide releases for target flows at the Taiban gage and to avoid river intermittency. This water was stored and released under the Carlsbad Project Water Supply Management Agreement between the United States and CID. Reclamation also pumped 750 af of water into Brantley Reservoir from March 6 through May 25 to acquire the 1,000 af Fish Conservation Pool (FCP) in Sumner. Anticipating insufficient precipitation to maintain river connectivity, an additional 137.1 af was pumped from July 26 to August 10 for a total of 1,183 af FCP water in Sumner.

Releases of forbearance water began on November 18 and ended on December 31, 2017. Forbearance releases were not needed prior to November due to timely and abundant precipitation beginning in the latter part of June. During calendar year 2017, 1,095 af were released and the remaining 1,413 af of forbearance reverted to Project storage.

During the non-irrigation season, 1,988 af was bypassed to meet target flows and to avoid river intermittency. Flow was bypassed between January 1 and February 12, at an average rate of 23 cfs.

An additional 2,898 af of bypass was released at an average rate of 21 cfs from April 10 to June 17, when FSID's allotment was at the maximum of 100 cfs. Reclamation released 954 af of FCP between March 1 and April 9, and July 29 to 31. The remaining 229 af of FCP reverted to Project storage on December 31, 2017. The total supplemental water returned to Project storage in 2017 was 1,642 af.

### **Sumner Dam Facility Review and Safety of Dams Programs**

Eight Category 2 operations and maintenance (O&M) recommendations were completed in FY2017. There are currently fifteen incomplete Category 2 O&M recommendations for Sumner Dam. CID is responsible for completing nine of them. The other six recommendations pertain to updating the Sumner Dam Standard Operating Procedure (SOP) and will be completed by Reclamation.

All three radial gates at Sumner Dam are in need of repair. CID is responsible for the repairs and 68.36% of the repair cost; Reclamation has provided funds for 31.64% (\$1.2 million) of the estimated repair cost. Reclamation helped CID prepare for this project by providing information regarding planning, designs, schedules, cost estimates, and environmental issues. Between 2008 and 2013, CID completed approximately 15% of the radial gate recommendations. Over the last four years, there were no major repairs to the radial gates. From September 2013 through 2017, work was not possible because the gates had water against them. Reclamation plans on contracting the remaining repairs to expedite completion of the project. A plan for completion of the radial gate rehabilitation, to include costs and repayment, will be submitted to the CID board by the end of 2018, with construction tentatively planned for summer of 2019.

The last Periodic Facility Review (PFR) for Sumner Dam was completed in 2014. An Annual Site Inspection (ASI) was completed on February 4, 2017, with no significant O&M issues reported. A Comprehensive Review (CR) took place on February 6, 2018. The next ASI for Sumner Dam is scheduled for FY2019.

The last security reviews for Sumner Dam were an Annual Security Review (ASR) completed on February 2, 2017, and a Security Tailored Assessment Report (STAR), completed on June 26, 2017. Both reported no significant security issues. The next security reviews will be an ASR and a STAR scheduled for FY2018.

Sumner dam tenders received classroom training from Reclamation on March 13, 2017, and received onsite training in February 2018 during the CR.

## Brantley Dam and Reservoir

### Brantley Dam Operations

**Note: All elevations reference the North American Vertical Datum of 1988 (NAVD 88).**

During periods without irrigation releases, approximately 20 cfs is bypassed from Brantley Dam to mitigate reservoir impacts to Major Johnson spring. This year, however, an exception was allowed for downstream maintenance and inspections. Avalon Reservoir was drained at the end of the 2017 irrigation season for repairs and inspections. The Brantley bypass would have refilled Avalon. The bypass was therefore shut off beginning in November 2017, except for small releases to keep the area immediately downstream from the dam wet.

During the irrigation season, releases were made from Brantley to Avalon Reservoir at a rate necessary to support diversion into CID’s Main Canal, generally between 100 and 300 cfs as required by irrigation demand. The highest release of 2017, 296 cfs, was in June during a period of high irrigation demand. Figure 3 depicts Brantley’s total storage and releases.

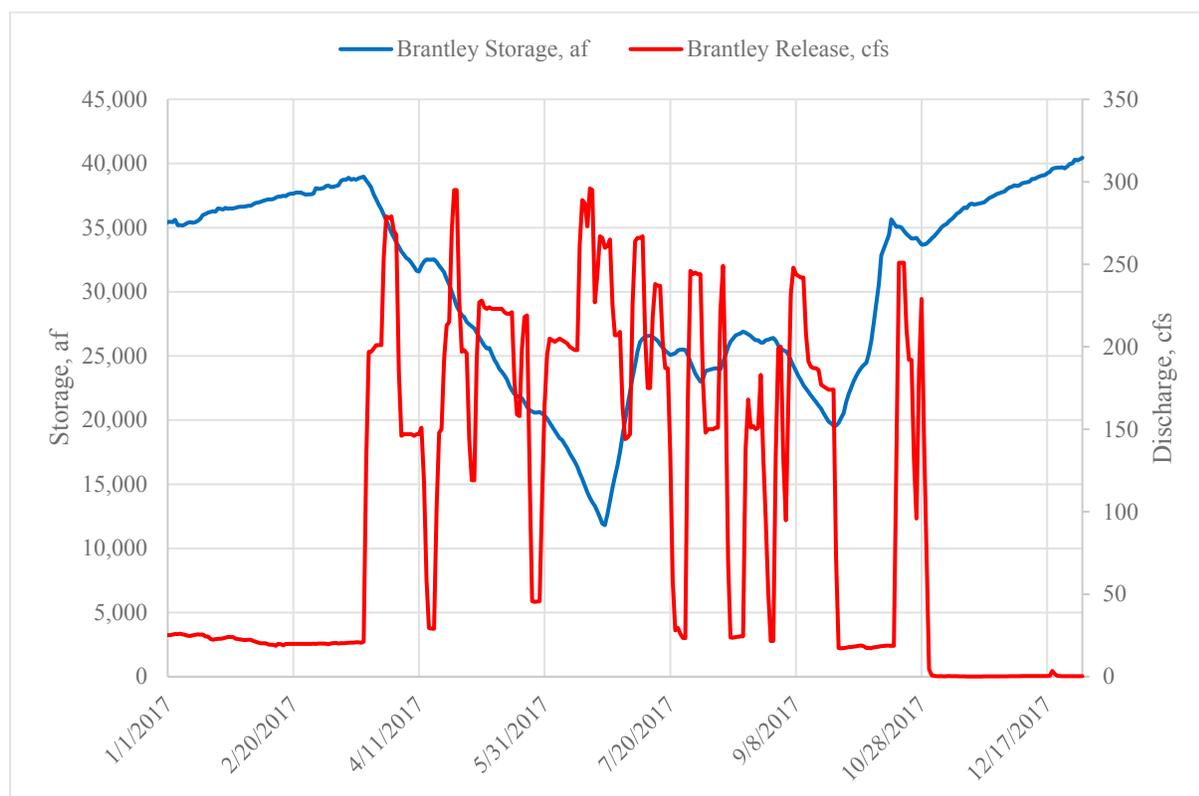


Figure 3: Storage and Release for Brantley Dam

Brantley began the year with a total storage of 35,270 af (3,253.75 feet). On December 31, Brantley was at its maximum storage for 2017, 40,447 af (3,255.59 feet). The lowest total storage in 2017 was 11,813 af (3,241.83 feet) on June 24.

Irrigation releases from Brantley began on March 21. Subsequently, water releases varied to meet demand and conserve water. The final irrigation release from Brantley occurred on October 30. The total released from Brantley in 2017 was 73,342 af, with 71,858 af released for

irrigation, and 1,757 af for mitigation flows and to maintain storage below the maximum entitlement of 176,500 af.

The work at Avalon was completed on February 27, 2018, and releases from Brantley to Avalon began on February 28, 2018. In November 2017, Reclamation requested and received permission to temporarily exceed permitted storage limits set forth under Surface Permit 6, issued by the NMOSE for storage in the four Pecos reservoirs. From January 22 to March 4, Brantley exceeded its permitted total conservation storage of 42,374 af (including estimated sediment). As of March 19, 2018, the four reservoirs had not exceeded their total permitted entitlement storage of 176,500 af.

### **Brantley Dam Facility Review and Safety of Dams Programs**

One Category 2 O&M recommendation was completed in FY2017. There are currently four incomplete Category 2 O&M recommendations for Brantley Dam. CID is responsible for completing one. The other three recommendations pertain to updating the Brantley Dam SOP and will be completed by Reclamation.

There are sinkholes upstream and downstream on the left (southeast) side of Brantley Dam. The sinkholes are monitored visually on a regular basis, and are documented via photographic surveys every eight years. The last survey was in August 2015. The sinkholes appear to be filling in naturally and are more difficult to locate every survey.

The Brantley Dam natural gas emergency generator was removed in 2016, and was replaced with a comparable diesel generator. Reclamation provided the specifications for the new generator and CID installed it. It was installed and became operational in fall of 2017.

The last PFR for Sumner Dam was completed in 2014. An ASI was completed on February 3, 2017, with no significant O&M issues reported. A CR took place on February 7, 2018. The next ASI for Brantley Dam is scheduled for FY2019.

The last security reviews for Brantley Dam were an ASR completed on February 3, 2017, and a STAR, completed on June 26, 2017, both with no significant security issues reported. The next security reviews will be another ASR and a STAR scheduled for FY2018.

Brantley dam tenders received classroom training from Reclamation on March 13, 2017, and received onsite training in February 2018 during the CR.

## **Avalon Dam and Reservoir**

### **Avalon Dam Operations**

**Note: All elevations reference Project Datum. Subtract 16.49 feet to obtain NGVD29 elevation.**

Due to the small reservoir capacity and the location of Brantley Dam 10 miles upstream, Avalon Dam is used primarily as a diversion dam to meet irrigation demand for CID. Water released from Brantley Dam is re-regulated at Avalon, which releases into the CID Main Canal. Avalon Reservoir began the year with 2,363 af (3,174.88 feet) and ended the year with 0.0 af (3,161.52 feet). It reached a maximum storage of 3,215 af (3,175.93 feet) on March 18 in preparation for

2017 irrigation. Diversions into the CID Main Canal began on March 19 and ended on November 3. The total release for irrigation was 70,394 af. Figure 4 depicts Avalon’s total storage and releases.

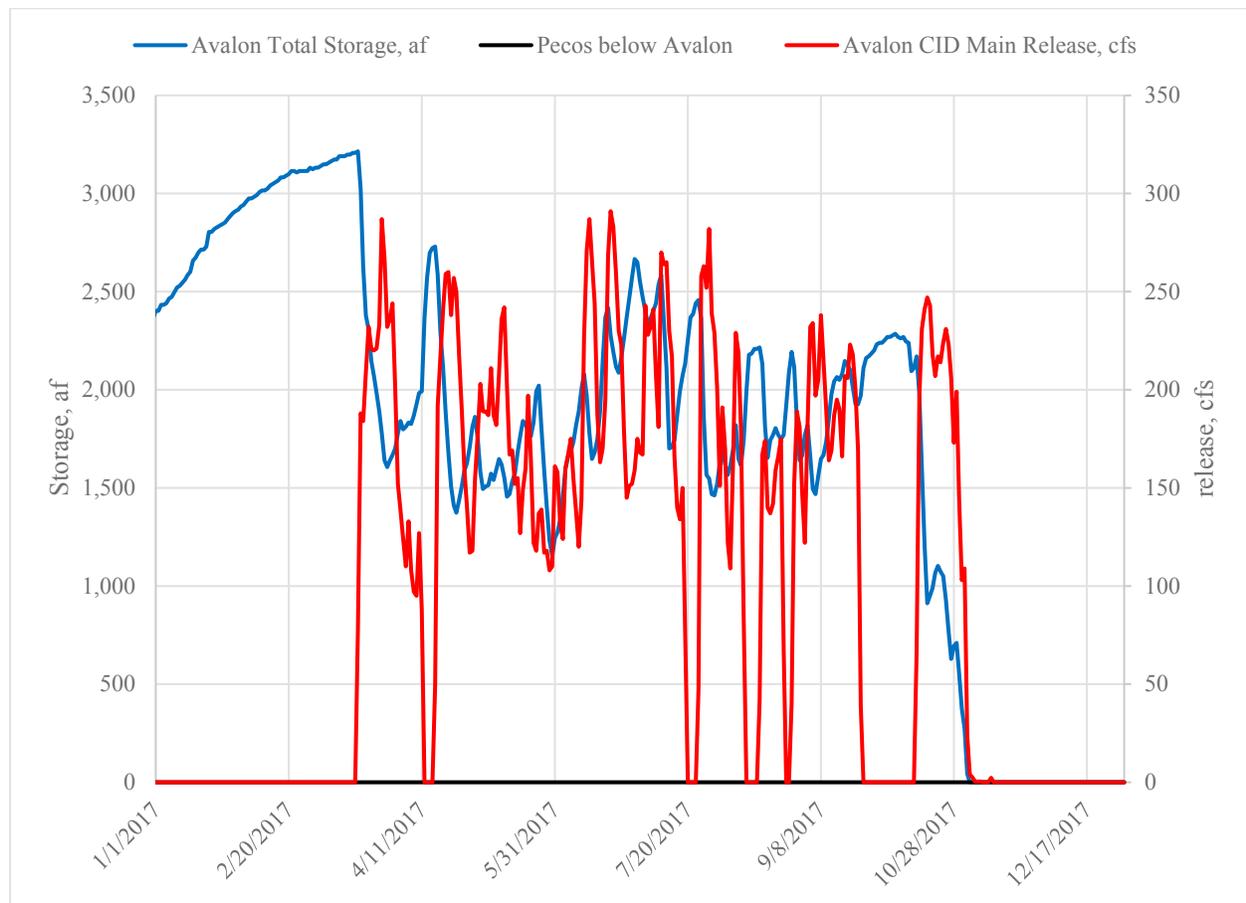


Figure 4: Storage and Release for Avalon Dam

As stated in the Brantley section above, the reservoir was completely drained at the end of irrigation season for maintenance and inspections. By November 3, the reservoir was empty and remained so through the end of the year. Avalon began refilling on February 28, 2018.

**Avalon Dam Facility Review and Safety of Dams Programs**

Four Category 2 O&M recommendations were completed in FY2017. There are currently sixteen incomplete Category 2 O&M recommendations for Avalon Dam. CID is responsible for completing fourteen of them. The other two pertain to updating the Avalon Dam SOP, and will be completed by Reclamation.

The cylinder gates, hoist platform, and walkway are currently in poor structural condition and are in need of repair or replacement. Seven of the incomplete O&M recommendations are related to the condition of the cylinder gates and platform, and date from as far back as 2005. Reclamation is working with CID to complete the Cylinder Gates Project. Reclamation has agreed to: provide data collection; test concrete and paint; conduct a value planning study to further develop alternatives; conduct feasibility studies; provide structural design, risk analysis, and cost estimates of

alternatives; provide final design; and develop all reports/drawings, official transmittal documents, and meetings related to this project. CID is responsible for all construction costs. The first site visit occurred on February 3, 2017, and a more comprehensive examination on February 9, 2018. This examination occurred while Avalon Reservoir and stilling basin were drained.

The last PFR for Avalon Dam was completed in 2014. An ASI was completed on February 4, 2017, with no significant O&M issues reported. A CR took place on February 8, 2018. The next ASI for Avalon Dam is scheduled for FY2019.

The last security reviews for Avalon Dam were an ASR completed on February 2, 2017, and a STAR, completed on June 26, 2017, both with no significant security issues reported. The next security reviews will be another ASR and a STAR scheduled for FY2018.

The Avalon dam tender received classroom training from Reclamation on March 13, 2017, and onsite training on February 8, 2018, during the CR.

## Carlsbad Project Environmental Compliance

### Current ESA and NEPA Compliance

Reclamation submitted a new Biological Assessment (2016 BA) to the U.S. Fish and Wildlife Service (USFWS) on March 22, 2016, requesting consultation with the USFWS under the Endangered Species Act (ESA). On May 24, 2016, Reclamation received a memo from USFWS requesting additional information to start the formal consultation process. Reclamation submitted the additional information to the USFWS on July 7, 2016. The USFWS provided Reclamation, on December 5, 2017, the *Final Biological Opinion for the Carlsbad Project Water Operations and Water Supply Conservation, 2016-2026* (2017 BO; Consultation Number 02WNNM00-2016-F-0506), which provides compliance under ESA for Reclamation's Carlsbad Project actions and effects to ESA-listed species, including the Pecos Bluntnose Shiner and the Interior Least Tern.

Reclamation is preparing a parallel Environmental Assessment (EA) for compliance with the National Environmental Policy Act (NEPA), and which is tiered from the Final Environmental Impact Statement (EIS) for Carlsbad Project Water Operations and Water Supply (June 2006). This EA will analyze the changes from the actions under the 2006 BO to the actions covered by the 2017 BO.

### Reclamation's Direct Flow Operations

Reclamation has a lease agreement with the New Mexico Interstate Stream Commission (NMISC) for groundwater (Vaughan) to be pumped into the Pecos annually. The Vaughan Pipeline (Pipeline) supplements flows on the Pecos to minimize the chance of intermittency between Sumner and Brantley. The outfall structure of the Pipeline is located upstream of the USGS' Taiban gage. Maximum output during 2017 was 9 cfs. The Pipeline provided 1,199 af of the 1,583 af available for 2017.

In addition to the lease agreement described above, Reclamation has established a 1,000 af fish conservation pool (FCP) in Sumner through an exchange of 750 af of water rights it owns at Seven Rivers Wildlife Management Area (Seven Rivers). Water under this water right is pumped into Brantley from wells at Seven Rivers and is exchanged for water stored in Sumner Lake. Reclamation also pumped another 137 af in exchange for 183 ac-ft in Sumner, due to extremely dry weather in May, June, and July that was expected to continue for the rest of irrigation season.

Under a forbearance agreement with FSID, 2,500 af were stored for Reclamation under the Project's storage right at Sumner Lake. The forbearance and FCP water was released as needed to maintain flow in the Pecos below Sumner at the Taiban and Acme gages. Reclamation utilized 954 af of the 1,183 af FCP and 1,095 af of the forbearance water with 1,642 af returned to Project Storage, described further in the Sumner Operations section.

## **Pecos Basin Water Accounting**

Reclamation, the NMISC, and CID developed a 20-year Depletions Agreement for ESA water use (2014-2033). The accounting related to this agreement determines the reduction in Carlsbad Project water supply due to modification of Reclamation's Sumner operations to meet BO obligations, and the amount by which any reductions in Project water supply are offset by Reclamation's water acquisitions.

Historically, a Microsoft Excel® spreadsheet, the Annual Accounting Method (AAM), was used to determine the amount of water depleted from the Pecos River. An accounting model that utilizes RiverWare® software, called the Pecos River Operations Model (PROM\_2017, refinement of the PROM\_2016 model), was developed and, beginning in 2015, its results were compared to those from the AAM. Both the AAM and PROM\_2017 were jointly developed by Reclamation and NMISC with review by CID. For several years, the two methodologies were compared.

Comparisons in past years have shown that the two models have differences, but Reclamation believes that the RiverWare® model is a better representation of physical conditions on the river. This is because RiverWare® more accurately models physical hydrologic processes using current data, whereas the spreadsheet most frequently uses historical averages to represent processes such as channel losses.

The three parties have agreed that the PROM\_2017 will replace the spreadsheet previously used to account for depletions. From 2017 forward, the PROM\_2017 model will be used exclusively to determine depletions.

## **Reclamation's Water Offset Program**

Reclamation leases water rights from willing owners within the Pecos Basin to offset the additional depletions caused by ESA-related operations. Reclamation is entirely dependent on the availability of willing water rights holders and budget constraints to meet the instream flow requirements of the 2016 BO.

From November 1, 2016, through October 31, 2017 (the 2017 water accounting year), Reclamation had water lease agreements with five Pecos river-pumpers to lease 1,126.2 af (consumptive use portion) of surface water rights and 507 af (consumptive use portion) of Hagerman Canal water rights. The land associated with the leased water was fallowed. The Hagerman Canal water was pumped directly into the Pecos River.

In accounting year 2017, Reclamation bypassed 4,886 af and released 2,778 af of forbearance water (includes water released in both 2016 and 2017), creating -582 af of additional depletions in the 2017 water year. A negative depletion means that these operations added water to the river, rather than depleting it.

Carlsbad Project Water Acquisition (CPWA or Offset) amounts of 1,605 af (adjusted for consumptive use, transmission loss, and Brantley evaporation) were provided at Brantley for the

water year to eliminate these additional depletions. This resulted in a Reclamation credit of 2,187 af for the 2017 water year.

The accounting calculations were made using the PROM\_2017 Two Stream Model. Output from the model indicates that for the 2017 water year, Reclamation's CPWA Program put 2,187 af more into the Pecos River than the depletions incurred by the modified operations at Sumner.

## Endangered Species Program

### Pecos Bluntnose Shiner

The threatened Pecos Bluntnose Shiner (*Notropis simus pecosensis*, shiner) is monitored annually to assess population status and determine incidental take for Reclamation's Carlsbad Project. During normal flow conditions, the 2017 BO established take for shiner using the mean 3<sup>rd</sup> trimester density of 12 fish/100m<sup>2</sup> as a surrogate for determining if take has been exceeded during a given water year. The BO states that under normal flow conditions, Pecos Bluntnose Shiner density would be either increasing from the previous year's 3<sup>rd</sup> trimester density or staying above the prescribed mean 3<sup>rd</sup> trimester density of 12 fish/100m<sup>2</sup>. Decreasing densities below 12 fish/100m<sup>2</sup> as a result of the Proposed Action require further consultation with the USFWS.

The 2017 BO also defines a *Critically Dry* condition, which has various measures. Some are the percent of the basin classified as Extreme or Exceptional Drought per the U.S. Drought Monitor, the proportion of the 30-year average of the National Resources Conservation Service's forecast for inflow to Santa Rosa Reservoir, and the percent of time in which bypass is available. Reclamation assesses these factors monthly from January to June. A designation of Critically Dry is an indication that Reclamation may not be able to cover the deficit in the hydrologic system with its available resources. In that case, the Taiban gage target of 35 cfs is removed, and Reclamation focuses on maintaining 5 cfs at the Acme gage. In addition, under Critically Dry conditions, no take from the proposed action occurs providing all water resources at Reclamation's disposal are utilized to minimize drying (USFWS, 2017).

Reclamation funds and receives trip reports from the USFWS for fish sampling from April to October. These data are compiled into an annual report on the status of the shiner. The following shiner data summarizes information provided to Reclamation under the USFWS interagency agreement<sup>2</sup>.

In 2017, fourteen sites were monitored on six separate sampling occasions. A total of 13,792 fish were collected from 24 different species. The cyprinid family (carps and minnows) was the most common group collected, comprising 87.1% of all fish. Red Shiner (*Cyprinella lutrensis*)

---

<sup>2</sup> Davenport, S.R. 2017. Status and trends of Pecos bluntnose shiner *Notropis simus pecosensis* Pecos River, New Mexico 2017. DRAFT report submitted to US Bureau of Reclamation, Albuquerque Area Office.

and Speckled Chub (*Macrhybopsis aestivalis*) were the two most common species, while Pecos Bluntnose Shiner was the fifth most common fish.

Pecos Bluntnose Shiner was collected from all sampled reaches except for the Tailwater Reach. The species has not been collected from the Tailwater Reach since 1999. For all sites combined, a total of 1,145 shiner were collected in 2017.

During 2017’s 3<sup>rd</sup> trimester (September through December), 749 Pecos Bluntnose Shiner were collected. The 2017 mean Pecos Bluntnose Shiner 3<sup>rd</sup> trimester density was  $7.0 \pm 1.0$  fish/100m<sup>2</sup>, while in 2016 the 3<sup>rd</sup> trimester density was  $8.0 \pm 2.1$  fish/100m<sup>2</sup> (Figure 5). Although the nominal value of  $7.0 \pm 1.0$  fish/100m<sup>2</sup> was below the 2016 nominal value of  $8.0 \pm 2.1$  fish/100m<sup>2</sup>, accounting for the overlap in standard error of the means indicates that for all practical purposes the nominal 3<sup>rd</sup> trimester density estimates in 2016 and 2017 are approximately equal and take was not exceeded in 2017.

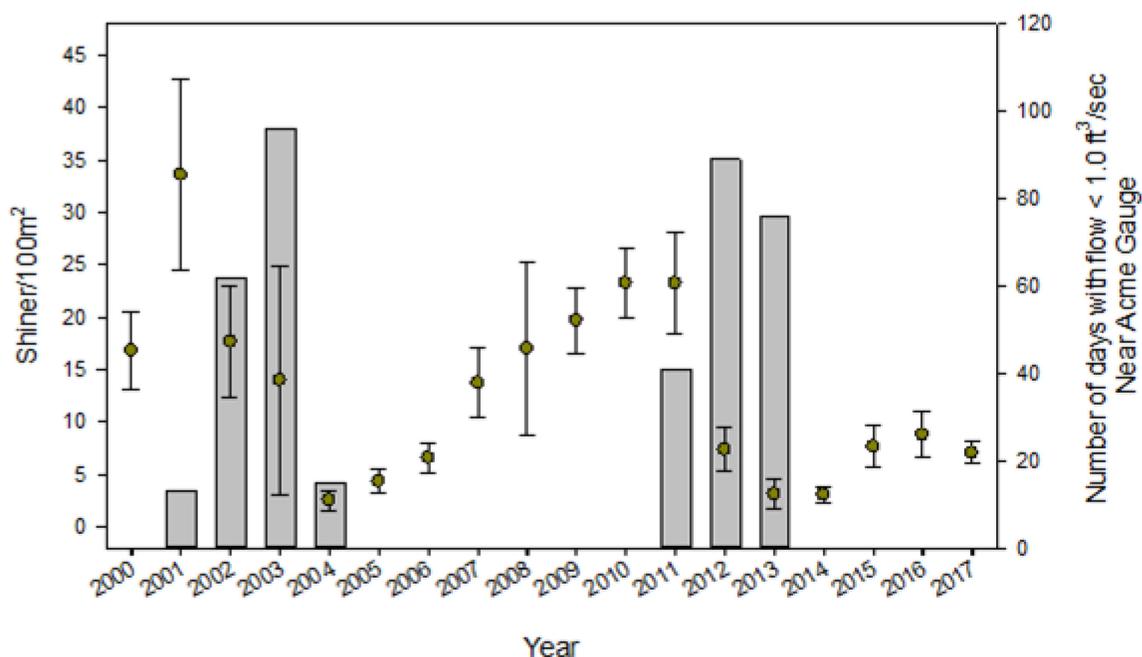


Figure 5: Pecos bluntnose shiner density in trimester three, September- December (scatter plot) ± 1 standard error and days of flow < 1.0 ft<sup>3</sup>/sec (grey bars) at Acme Gauge in the Pecos River, New Mexico, 2000–2017

Despite the slightly lower nominal mean 3<sup>rd</sup> trimester density estimated for 2017 relative to 2016, length frequency for the shiner indicated that the species had successful recruitment in 2017 (Figure 6). In the 3<sup>rd</sup> trimester of 2017, 82.2% of Pecos Bluntnose Shiner were less than 35 mm standard length while at the same time during 2016 only 63.1% were less than 35 mm standard length.

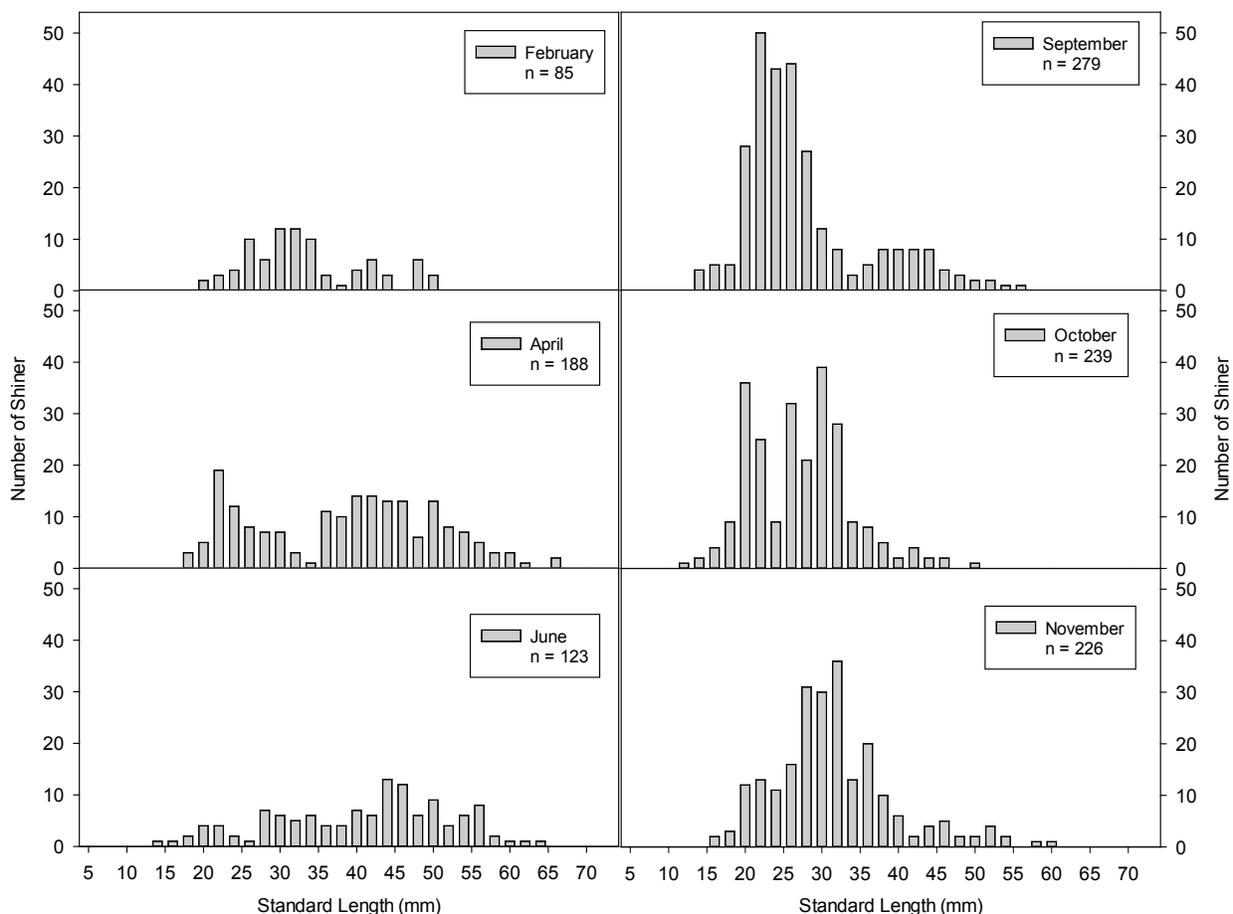


Figure 6: 2017 Pecos Bluntnose Shiner monthly standard length histograms, Pecos River, New Mexico. Standard length data were placed into 2.0 mm length bins

U.S. Fish and Wildlife Service (USFWS). 2016. Biological Opinion for the Bureau of Reclamation's Proposed Carlsbad Project Water Operations and Water Supply Conservation, 2016–2026. New Mexico Ecological Services Field Office, Albuquerque, New Mexico.

### Interior Least Tern

When Brantley reservoir elevations are at or above the full pool elevation of 3,256 feet, the surface area of is approximately 3,034 acres and no suitable nesting shoreline habitat is available to Interior Least Terns (*Sterna antillarum athalassos*, tern). Even when the reservoir elevation is at the normal elevation defined by New Mexico State Parks, 3,250 feet, the surface area of Brantley Reservoir is approximately 2,219 acres, and very little nesting shoreline is typically available to terns.

On May 21, 2017, the reservoir elevation was at 3,247.9 feet (Figure 7), covering approximately 1,915 acres. Although somewhat limited, exposed suitable shoreline was available for arriving terns. Reservoir elevation slowly declined over the next few weeks, reaching the lowest level of the season on June 24, at 3241.8 feet – exposing an additional 600 acres of shoreline. On June 28 when the first nest was discovered, the reservoir elevation was at 3244.5 feet and rising. Reservoir levels continued to increase due to an irrigation block release, reaching a seasonal high of 3250.1 feet on July 14, 2017.

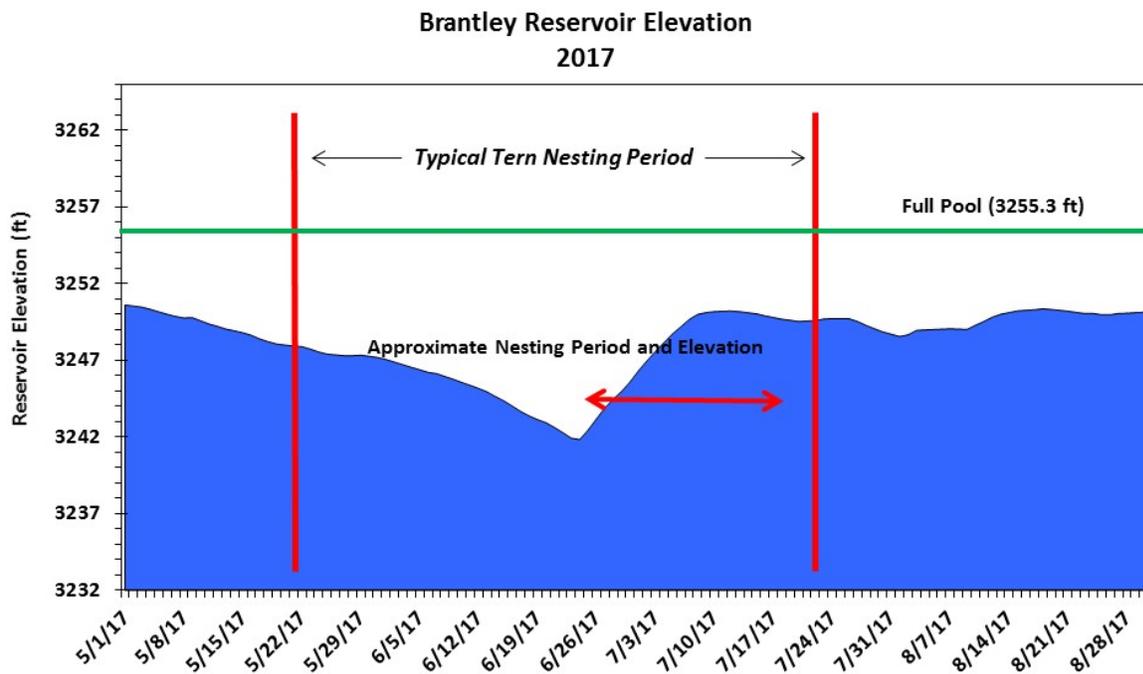


Figure 7: Brantley Reservoir elevations during the 2017 Interior Least Tern breeding season

Survey dates and observation results for Least Terns at Brantley Reservoir during the spring and summer of 2017 are presented in Table 5. Terns were observed from June 27 through July 3, 2017. With concurrence from the USFWS, tern surveys were discontinued after the July 26 visit, as it was past the end of the typical tern nesting season and none had been seen since July 4.

Table 5: Summary of 2017 Interior Least Tern observations at Brantley, New Mexico<sup>3</sup>

Date	Adult	Sub-Adult	Immature	Nests
May 23/24	0	0	0	0
May 30/31	0	0	0	0
June 6/7	0	0	0	0
June 11/12	0	0	0	0
June 20/21	0	0	0	0
June 27/28	2	0	0	0
June 29	2	0	0	0
June 30	4	0	0	1
July 1	4	0	0	2
July 2	4	0	0	1
July 3	4	0	0	1
July 4/5	0	0	0	0
July 11/12	0	0	0	0
July 20/21	0	0	0	0
July 25/26	0	0	0	0
<b>2017 Totals*</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>

<sup>3</sup> D. Ahlers and D. Moore. 2017. Interior Least Tern Monitoring Results 2016. Brantley Reservoir, New Mexico. Bureau of Reclamation, Albuquerque Area Office, NM.

Two pairs of nesting terns were confirmed during the 2017 breeding season. Both pairs constructed nest scrapes and laid one egg each before the eggs were collected and transported to the Desert Willow Wildlife Rehabilitation Center in Carlsbad, NM, for artificial incubation. Both nest scrapes were constructed relatively close to the reservoir pool. The first nest was inundated within two days of discovering the nest and salvaging the egg. Upon discovery of the second nest, the area was cordoned off with T-posts and flagging to restrict vehicle access and reduce human disturbance of the nest site. The T-posts and flagging were removed once all nesting efforts had terminated. All nest monitoring activities were coordinated with the USFWS.

### **Pecos River Restoration**

Under the 2006 BO, Reclamation agreed to “assist in the completion of ongoing habitat improvement projects on the Pecos and to restore 1 to 1.5 miles of quality habitat within the Farmlands reach by 2009, and another 1 to 1.5 miles by 2014.” In 2009, Reclamation funded and completed a channel restoration project that reconnected Oxbow 4 at Bitter Lakes National Wildlife Refuge (BLNWR) to the mainstem of the Pecos. Reclamation has completed the required monitoring for this restoration. Monitoring of this habitat restoration project will continue through 2019 to conclude commitments made under the 2006 Biological Opinion and Clean Water Section 404 permit requirements.

The second habitat improvement project, located at the Bureau of Land Management (BLM) Overflow Wetlands Area of Critical Environmental Concern (ACEC) south of the BLNWR restoration project, was completed in 2014. Lands in the project area are managed by BLM, the NM State Land Office, and private landowners.

According to the 2006 BO, activities that restore and optimize the interaction of river channel and floodplain habitats with available flows will be most successful in mitigating the observed displacement of the shiner eggs and in providing a variety of channel conditions favorable to the different life stages of the shiner. This project included removal of non-native vegetation, lowering and contouring riverbanks, and excavating smaller bank sites. The Pecos River in this reach was a deep channel with very little diversity prior to construction. The cross sectional data collected since 2014 shows areas of varying depth and flows that have improved the habitat for the shiner.

## Fort Sumner Project

### Operations

The irrigation season for FSID typically begins March 1 and ends October 31. FSID can also divert for two, eight-day periods during the winter. This winter allotment has generally been taken just prior to March 1.

FSID began diverting water for irrigation on March 2 and ended irrigation for the year on October 31. During the irrigation season, 75 to 100 cfs was bypassed through Sumner for FSID diversion based on the available water right, less the water for the forbearance described in the Sumner Dam Operations section. FSID diverted 36,356 af into the FSID main canal as recorded by the USGS Fort Sumner Main Canal near Fort Sumner, NM, gage, shown in Figure 8.

The USGS has installed a new discharge gaging system in the FSID Main Canal. The previous system used a stage-discharge relationship to determine discharge. The gage was located near a check structure, however, and the stage-discharge relationship was not consistent. The new equipment records water velocity, and an area-velocity relationship is used to calculate discharge. The gage was also moved approximately a mile downstream to avoid unsteady flow effects at the previous location, immediately adjacent to the FSID diversion dam.

The new equipment was lost after arroyo flooding in October 2017, and was replaced prior to the 2018 irrigation season. The stage-discharge method was used as needed in 2017, but the USGS will transition to using area-velocity once a reliable relationship has been determined with the new velocity meter.

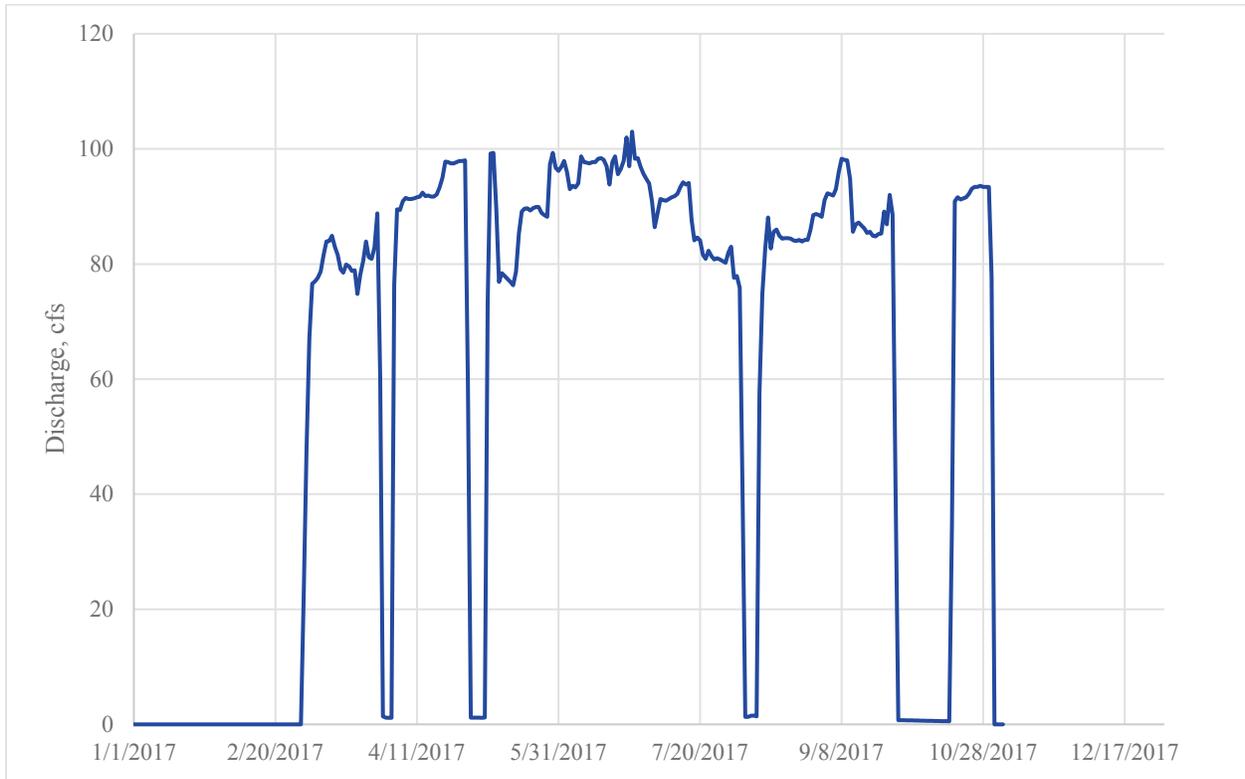


Figure 8: FSID Main Canal Diversion

## Fort Sumner Irrigation District Review of Operation and Maintenance

A Review of O&M examination of the FSID Diversion Dam was completed in 2015. The next examination is scheduled for 2021. There are currently two incomplete recommendations. Four recommendations were completed in 2016, and two were completed in 2017. There are no O&M issues of concern for FSID's irrigation system other than vegetation control along the canals, an ongoing RO&M issue.

## **Other Pecos River Activities and Operations**

### **Carlsbad Irrigation District Water Lease Program**

Reclamation and the NMISC completed an EIS in August 2006, clearing the way for a long term “Miscellaneous Purposes Contract,” which is required to allow Carlsbad Project Water to be released for delivery to the state line. Reclamation and CID entered into a 40-year contract on November 21, 2006, allowing Carlsbad Project water to be used for purposes other than irrigation. This contract allows NMISC and CID to enter into third-party lease agreements for the purposes of leasing water from other CID water users. It also allows NMISC to use water appurtenant to lands it owns within the District for purposes other than irrigation. Such leases must be approved by Reclamation. No third-party agreements have been executed and approved to date.

### **Pecos River Settlement Implementation**

The State of New Mexico, the Pecos Valley Artesian Conservancy District (PVACD), CID, and the United States Government signed the water rights Settlement Agreement (Settlement) on March 25, 2003. The Settlement and its implementation were vital to ensure delivery to Texas under the Pecos River Compact, to provide additional water supplies to CID, and to protect PVACD from a priority call on its junior groundwater rights. The Settlement provides additional water from two sources acquired by the NMISC: surface water from CID farmers, and groundwater from PVACD farmers that is pumped from augmentation well fields operated by the NMISC.

NMISC has not pumped water for CID under the Settlement since September 13, 2013. Climatic conditions since 2013 have kept the Carlsbad Project Supply above the Settlement’s maximum Target Supply.

### **Pecos River Basin General Stream Adjudication**

The Pecos River General Stream Adjudication<sup>4</sup> is ongoing in the fifth Judicial District Court in Chaves County, New Mexico. Reclamation and the U. S. Department of Justice are involved in this case by virtue of U. S. interest in the water rights for the Carlsbad Project. Adjudication of individual CID members’ rights is ongoing.

---

<sup>4</sup> State of New Mexico, ex rel. the Office of the State Engineer and Pecos Valley Artesian Conservancy District v. L. T. Lewis, et al. and the United States of America, Case Nos. 20294 and 22600 (Consolidated).

## WaterSMART

Water is our most precious natural resource and is increasingly stressed by the demands society places on it. Adequate water supplies are an essential element in human survival, ecosystem health, energy production, and economic sustainability. Significant climate change-related impacts on water supplies are well documented in the scientific literature and scientists are forecasting changes in hydrologic cycles.

Congress recognized these issues with the passage of the SECURE Water Act. The law authorizes federal water and science agencies to work together with state and local water managers to plan for climate change and other threats to water supplies, and take action to secure water resources for the communities, economies, and the ecosystems they support.

To implement the SECURE Water Act, and ensure that the Department of the Interior is positioned to meet these challenges, Secretary Salazar established the WaterSMART Program in February 2010. WaterSMART allows all bureaus of the Department to work with States, Tribes, local governments, and non-governmental organizations to pursue a sustainable water supply for the Nation by establishing a framework to provide federal leadership and assistance on the efficient use of water, integrating water and energy policies to support the sustainable use of all natural resources, and coordinating the water conservation activities of the various Interior offices.

As the Department's main water management agency, Reclamation plays a key role in the WaterSMART Program. Reclamation's portion of the WaterSMART Program is focused on improving water conservation, and helping water and resource managers make wise decisions about water use. Goals are achieved through administration of grants, scientific studies, technical assistance, and scientific expertise.

These programs, funded and managed by Reclamation's Office of Policy and Administration in Denver, CO, include:

- WaterSMART Grants
  - Water and Energy Efficiency Grants
  - Small-Scale Water Efficiency Projects
  - Water Marketing Grants
- Water Conservation Field Services Program
- Cooperative Watershed Management Program (Phases I and II)
- Drought Response Program
  - Drought Contingency Planning
  - Drought Resiliency Projects
  - Emergency Response Actions
- Title XVI Water Reclamation and Re-use Program
- Basin Study Program
  - West-Wide Climate Risk Assessment activities
    - Impact Assessments
    - Data, tools, and guidance
    - SECURE Reports to Congress

- Reservoir Operations Pilots
- Basin Studies
- Landscape Conservation Cooperatives
  - Southern Rockies Landscape Conservation Cooperative
  - Desert Landscape Conservation Cooperative

More information about all of these programs, completed project reports, and announcements can be found at <https://www.usbr.gov/watersmart/index.html>.

A new WaterSMART Data Visualization Tool and Progress Report (2010-2016) can be found at <https://usbr.maps.arcgis.com/apps/MapJournal/index.html?appid=043fe91887ac4ddc92a4c0f427e38ab0>.

Specific information on projects awarded to recipients within the jurisdiction of the Albuquerque Area Office (AAO), and therefore administered by the AAO, can be found below.

## **WaterSMART Grants**

### ***Small-Scale Water Efficiency Projects***

As of February 2018, one Small-Scale Water Efficiency Project has been approved but not funded. This is an Acequia Restoration & Conservation Cost Share Project for the Guadalupe Soil & Water Conservation District, near Santa Rosa, NM. The objective of this conservation project is to improve water delivery efficiency by lining acequias or installing pipe in open dirt ditches. Currently, water is delivered in unlined dirt ditches that are inefficient and limit best management practices.

## **Basin Study Program**

Reclamation's Basin Study Program represents a comprehensive approach to identifying and incorporating the best available science into climate-change adaptation planning. Within the Basin Study Program, Reclamation and its partners seek to identify strategies for addressing imbalances in water supply and demand, as authorized in the SECURE Act. The Program includes the West-Wide Climate Risk Assessment (WWCRA) Program, now referred to as Baseline Water Assessments, as well as the Basin Studies themselves.

### ***Pecos Basin Study***

Reclamation has entered partnerships with local water management agencies to perform Basin Studies. Basin Studies in the Upper Rio Grande Basin build on the hydrologic projections developed by Reclamation as part of the Upper Rio Grande Impact Assessment (Llewellyn, et. al., 2013). The projects are managed out of the Upper Colorado Region, and seek to develop adaptation and mitigation strategies for watersheds affected by climate change. Basin studies require a 50% cost share from Reclamation's local water-management partners, and involve considerable cooperation with other members of the water community in a basin.

In 2012, Reclamation entered into a partnership with the NMISC for a Basin Study focusing on the Pecos watershed in eastern New Mexico. This project is evaluating projected changes in water supply and demand in the New Mexico portion of the Pecos Basin, with emphasis on agricultural impacts and adaptation in the three major irrigations districts in the Pecos Basin – FSID, PVACD, and CID. Reclamation has developed projections of the hydrologic impacts of climate change for this basin, with assistance from the Corps. These projections provide the basis

for simulations of the river system using the PROM\_2016 that simulates groundwater/surface water interaction in the Fort Sumner Area, as well as the Roswell Artesian Basin groundwater model, which simulates groundwater/surface water interaction between the Pecos and the Roswell basin aquifers. This study is scheduled for completion in 2018.

Llewellyn, Dagmar, Seshu Vaddey, Jesse Roach, and Ariane Pinson, 2013. Upper Rio Grande Impacts Assessment: An Activity of the West Wide Climate Risk Assessment. Bureau of Reclamation, Albuquerque, New Mexico.

## Zebra and Quagga Mussels

Quagga and zebra mussels (*Dreissena rostriformis bugensis* and *Dreissena polymorpha*) are invasive, freshwater, bivalve mollusks. Originally from Eurasia, zebra mussels were first introduced in the Great Lakes in the mid-1980s and have spread to the Western United States. A single female mussel can produce hundreds of thousands of eggs a year, which, in turn, produce microscopic swimming larvae (veligers). These veligers spread in numerous ways, mainly by floating in the currents of the water body or by hitching a ride on boats or other water vessels used in infested water and then transported to another water body. Once they reach their settling stage, the veligers attach to hard surfaces and continue to grow. They clump onto these hard surfaces, clogging infrastructure and damaging operation and maintenance for water storage, water delivery, and hydropower structures and systems; recreational use; and aquatic ecosystems (<http://www.usbr.gov/research/docs/ks/ks-2015-04.pdf>).

In 2017, none of the seven Reclamation reservoirs sampled in New Mexico tested positive for zebra or quagga mussels via either microscopy or Polymerase Chain Reaction (PCR). Factors that may contribute to a lack of mussel occupation in New Mexico reservoirs include a fast spring run-off coupled with high levels of suspended solids, rapid drawdown of reservoir waters and canals, and ongoing drought (D. Hosler, Personal Communication). Continued vigilance is important, as conditions more suitable to AIS establishment may occur in the future. (Table 6).

Table 6: 2017 AIS Sampling Results for Reclamation Reservoirs in New Mexico

<b>Waterbody</b>	<b>Number sites sampled</b>	<b>Microscopy Results</b>	<b>PCR Results</b>
Navajo Reservoir	33	Negative for all	Negative for all
Heron Reservoir	15	Negative for all	Negative for 11 tested
El Vado Reservoir	17	Negative for all	Negative for all
Elephant Butte Reservoir	17	Negative for all	Negative for all
Caballo Reservoir	16	Negative for all	Not tested
Sumner Reservoir	17	Negative for all	Negative for all
Brantley Reservoir	12	Negative for all	Not tested