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RECLAMATION

Calendar Year 2022 Report to the Pecos River Compact Commission

Interior Region 7: Upper Colorado Basin



Mission Statements

The U.S. 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.

Calendar Year 2022 Report to the Pecos River Compact Commission

Interior Region 7: Upper Colorado Basin

prepared by Bureau of Reclamation, Albuquerque Area Office, Albuquerque, New Mexico

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Cover Photo: Pecos River near Acme Gage, August 31, 2022. (USGS/Hwy 70 Acme webcam)

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Acronyms

AAO.....	Albuquerque Area Office
af.....	acre-feet
ASEI	Annual Security Equipment Inventory
ASI	Annual Site Inspection
Avalon.....	Avalon Dam and Lake
Brantley.....	Brantley Dam and Reservoir
BO.....	Biological Opinion
cfs	cubic feet per second
CID	Carlsbad Irrigation District
CPWA.....	Carlsbad Project Water Acquisition
CR.....	Comprehensive Review
DOI.....	U.S. Department of the Interior
ESA	Endangered Species Act
FCP	Fish Conservation Pool
FSDD	Fort Sumner Diversion Dam
FSID	Fort Sumner Irrigation District
FY.....	fiscal year
NAVD 88.....	North American Vertical Datum of 1988
NCAR.....	National Center for Atmospheric Research
NMISC	New Mexico Interstate Stream Commission
NMOSE	New Mexico Office of the State Engineer
NRCS.....	Natural Resources Conservation Service
O&M.....	Operation and Maintenance
P.L.	Public Law
PFR	Periodic Facility Review
PVACD	Pecos Valley Artesian Conservancy District
RAB.....	Roswell Artesian Basin
Reclamation	Bureau of Reclamation
RO&M.....	Review of Operation and Maintenance
S&T	Science and Technology
Santa Rosa.....	Santa Rosa Dam and Reservoir
SECURE	Science and Engineering to Comprehensively Understand and Responsibly Enhance Water Act
shiner	Pecos Bluntnose Shiner
SOP	Standing Operating Procedures
STAR	Security Tailored Assessment Report
Sumner.....	Sumner Dam and Lake
SWEP	Small-Scale Water Efficiency Projects
USACE.....	U.S. Army Corp of Engineers
USFWS.....	U.S. Fish and Wildlife Service
USGS.....	U.S. Geological Survey
VCP.....	Vaughan Conservation Pipeline
WaterSMART	Secure and Manage America’s Resources for Tomorrow
WIIN	Water Infrastructure Improvements for the Nation

Introduction

The Bureau of Reclamation (Reclamation) has numerous authorized Projects on the Pecos River. This report will limit discussion to the Carlsbad and Fort Sumner Projects. The Carlsbad Project was one of Reclamation's earliest projects, and Reclamation holds title to three of the four dams within the Project as well as jointly holding the water storage permit with the Carlsbad Irrigation District (CID). The Fort Sumner Diversion Dam was constructed by private interests beginning in the late 19th century and was reconstructed and rehabilitated by Reclamation in the early 1950s. Reclamation holds title to the dam and also inspects the dam and certain other facilities within the Fort Sumner Irrigation District (FSID).

Reclamation's Albuquerque Area Office (AAO) has oversight responsibilities for these Projects. Figure 1 depicts locations of major dams, partner irrigation districts, and important gages in the Pecos River Basin.

Reclamation's Annual Report to the Pecos River Compact Commissioners conveys all required reporting information on the Projects mentioned above. It also informs 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.

Data

Prior to 2016, Reclamation used reservoir data – elevation, storage, weather, and pan evaporation – received from the Carlsbad Irrigation District. Reclamation no longer uses some of this manually collected and recorded data, and instead primarily relies on data collected and transmitted electronically. Use of data collected and transmitted electronically is standard operating procedure at most Federal reservoirs. All storage and flow data used in this report for the three Reclamation-owned reservoirs are from electronic instrumentation managed by the U.S. Geological Survey (USGS) and available at https://www.usbr.gov/uc/water/hydrodata/reservoir_data/site_map.html. Unless otherwise specified, reservoir elevations are the daily elevation recorded at midnight of the date listed, and daily storage values correspond to that end-of-day elevation. Reservoir elevations are reported in the North American Vertical Datum of 1988 (NAVD 88), except for Avalon Reservoir elevations which are reported in the Project Datum.

Reclamation continues to use weather and pan evaporation data collected and recorded by CID's dam tenders, typically at about 8:00 a.m. daily. Weather and evaporation data used by Reclamation is available upon request to AAO.

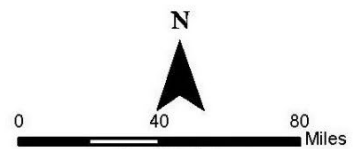
The stream gage data used within this report were downloaded from the USGS web page at: <https://waterdata.usgs.gov/nm/nwis/current/?type=flow>.



Data Attribution: USBR, DWR, NHD, USGS, CDEW, and Fort Bascom

Map Notes: Sensitive Information, Only Major Facilities Included

- Pecos River Basin
- Gaging Station
- Dam
- Irrigation/Conservancy District
- Waterbody



Coordinate System:
NAD 1983 UTM Zone 13N

Bureau of Reclamation, Upper Colorado Basin, Albuquerque Area Office

Figure 1: Map of the Pecos River Basin focused on Reclamation's projects

Carlsbad Project

The Carlsbad Project includes four federal facilities (dams) on the Pecos River in New Mexico: Santa Rosa Dam (formerly Los Esteros), Sumner Dam (formerly Alamogordo), Brantley Dam, and Avalon Dam. Reclamation and the Carlsbad Irrigation District jointly hold the storage permit for the four reservoirs. There are three Carlsbad Project facilities owned by Reclamation and operated by CID that are used to divert water to storage and release water for beneficial use by CID: Sumner, Brantley, and Avalon Dams. The U.S. Army Corps of Engineers (USACE) owns and operates Santa Rosa Dam and Lake, which contains the majority of Carlsbad Project storage when the system is full. CID is in southeastern New Mexico, near the City of Carlsbad. The Carlsbad Project authorizes irrigation on up to 25,055 acres from just below Avalon Dam to the Black River area. A brief description of the federal facilities follows:

- Santa Rosa Dam and Lake (hereafter Santa Rosa), the northernmost Project facility on the Pecos River, is a USACE-owned flood control facility. Construction of this facility was completed in 1980, and Santa Rosa stores a portion of the Carlsbad Project water. The entitlement storage, which is space set aside to meet the Project purpose of irrigation, for this facility was 100,355 acre-feet (af) in 2022.
- Sumner Dam and Lake Sumner (hereafter Sumner), a Reclamation-owned dam, was completed in 1938, and was the primary storage facility on the Pecos River for the Carlsbad Project until Santa Rosa was completed. The entitlement storage for Sumner was 32,230 af in 2022.
- Brantley Dam and Reservoir (hereafter Brantley) is a Reclamation-owned dam, completed in 1989 to replace McMillan Dam and Reservoir which was immediately upstream. This facility is about 225 river miles downstream from Sumner. The entitlement storage for this facility is 40,000 af.
- Avalon Dam and Lake (hereafter Avalon) is a Reclamation-owned dam, which Reclamation rebuilt in 1907 as part of the Carlsbad Project. The entitlement storage for this facility is 3,915 af.

Operations

Total Conservation Storage

Annually, Reclamation adjusts the conservation storage entitlements for the four Pecos River reservoirs in New Mexico (Santa Rosa, Sumner, Brantley, and Avalon) based on estimated sediment accumulation while keeping the total conservation storage entitlement at 176,500 af. Table 1 shows the 2022 storage entitlements for these Reservoirs.

Table 1: 2022 Pecos River Reservoir Storage Entitlements

Reservoir	Entitlement Storage (af)	Minimum Pool (af)	Total Estimated Sediment Accumulation (af)	Total Conservation Storage (af)	Conservation Elevation (feet) NAVD 88*
Santa Rosa	100,355	0	1,105	101,460	4,749.79
Sumner	32,230	2,500	1,187	35,917	4,260.88
Brantley	40,000	2,000	708	42,708	3,256.32
Avalon	3,915	600	0	4,515	3,177.40
Total	176,500		3,000	184,600	

*Note that Avalon elevation references Project Datum

Conservation storage in the Carlsbad Project reservoirs began the year at 32 percent of entitlement on January 1, 2022. Santa Rosa, Sumner, Brantley, and Avalon Reservoirs were at approximately 18, 33, 63, and 50 percent, respectively. On December 31, 2022, the total storage in the reservoirs was 37 percent of entitlement. Santa Rosa, Sumner, Brantley, and Avalon Reservoirs were at approximately 16, 45, 84, and 0 percent, respectively.

Santa Rosa Operations

The USACE Carlsbad Project storage and releases were directed by Reclamation in coordination with CID and USACE. All inflow into Santa Rosa was stored for the Carlsbad Project. There were two releases from Santa Rosa in 2022 for Carlsbad Project operations. Santa Rosa operations are described in detail in the USACE report to the Pecos River Compact Commission.

The Natural Resources Conservation Service’s (NRCS) May 1, 2022, most probable streamflow forecast for March through July, predicted 8,300 af of inflow into Santa Rosa, or 20 percent of the 30-year median of 41,000 af. Observed March through July inflow to Santa Rosa was 14,831 af, or 36 percent of median, as measured at the USGS Above Santa Rosa gage (this total may differ from USACE calculated inflow).

Sumner Operations

Reclamation directs the CID dam tender on storage and releases from Sumner to maintain its water rights and ESA compliance.¹

All the natural inflow to Sumner is stored for the Carlsbad Project only if inflows are greater than the bypass needed for:

- (1) FSID’s direct flow diversion right,² and
- (2) a downstream ESA target flow of 5 cubic feet per second (cfs) at the USGS Pecos River near Acme to maintain continuous flow in the river, as amended by FWS. A flow of 5 cfs or

¹ See Water Operations and Water Supply Conservation ESA Compliance section of this document for additional information on Reclamation’s ESA commitments and requirements.

² See Fort Sumner Project section of this report.

greater at the USGS Pecos River near Acme gage is used by Reclamation to indicate continuous river flow.

During the non-irrigation season, bypass to meet ESA target flows occurred from January 1 to February 12 at an average rate of 15 cfs. A total of 1,301 af was released in that period. During the irrigation season, Sumner natural inflow was greater than FSID's direct flow diversion right of 100 cfs on 64 days, and Reclamation bypassed a total of 670 af for downstream ESA target flows between July 19 and 31.

Reclamation stored 5,443 af of supplemental water³ in Sumner during 2022. Reclamation exchanged 1,158 af with CID for water pumped into Brantley (Fish Conservation Pool or FCP) and received 785 af for a credit from operations in 2021. Through an agreement with FSID, Reclamation stored 3,500 af of water, referred to as Forbearance, from February 13 to 21 and March 9 to April 10. The supplemental water was stored under the Carlsbad Project storage permit and released to meet ESA flow targets under the 2009 Carlsbad Project Water Management Agreement (2009 Agreement) between Reclamation and CID.

Stored Carlsbad Project water in Santa Rosa and Sumner is released as a block at CID's discretion and in consultation with Reclamation. ESA requirements restrict the duration of block releases from Sumner to a maximum of 15 contiguous days and a cumulative annual duration of 65 days with a minimum of 14 days between releases. Block releases during the six weeks bracketing August 1 are avoided and, when possible, are scheduled to alleviate river intermittency. These block release restrictions are not enforced during flood operations. Reclamation's totals for block releases may differ from the USACE as Reclamation uses USGS data and USACE uses their own data.

There were two block releases during the 2022 irrigation season from Santa Rosa and Sumner. The first block release started from Santa Rosa on June 22 and ended on June 30. The average release rate from Santa Rosa was 759 cfs due to the low reservoir level. Total volume for the release from Santa Rosa was 13,548 af (USGS data). The first block release from Sumner started on June 25 and ended on July 4. The average release from Sumner was 916 cfs. The total volume for the block release from Sumner was 18,161 af. Of that, 1,362 af was diverted by FSID leaving in the Pecos River 16,802 af for delivery to Brantley for use by CID.

The second block release from Santa Rosa began on August 11 and ended on August 21. The average release was 1,006 cfs with a total release of 21,943 af. The second block release from Sumner started on August 15 and was curtailed on August 21 due to flooding downstream. The average release from Sumner was 1,248 cfs. The total volume for the block release from Sumner was 17,322 af. FSID diverted 1,243 af of that, leaving 16,122 af for delivery to Brantley for use by CID. In both block releases, FSID returned a small amount of their diversion to the river as measured at the Sand Gate Diversion gage.

Releases of Reclamation's supplemental water occurred intermittently throughout the year when bypass through Sumner to meet ESA flow targets was unavailable. To avoid river intermittency, the supplemental water was released at an average rate of 18 cfs during this time. On December 31,

³ See Supplemental Water section of this report.

2022, 787 af of supplemental water remained in storage in Sumner and reverted to Carlsbad Project for future irrigation releases per the 2019 Agreement.

Sumner began 2022 with 11,874 af (4,246.91 ft) in storage. Total storage reached a maximum on February 20, 2022, at 16,993 af (4,250.97 ft). Sumner’s minimum storage occurred on August 8 at 3,166 af (4,234.10 ft). On December 31, 2022, Sumner had 16,209 af (4,250.42 ft) in storage. Figure 2 depicts Sumner’s total storage and release.

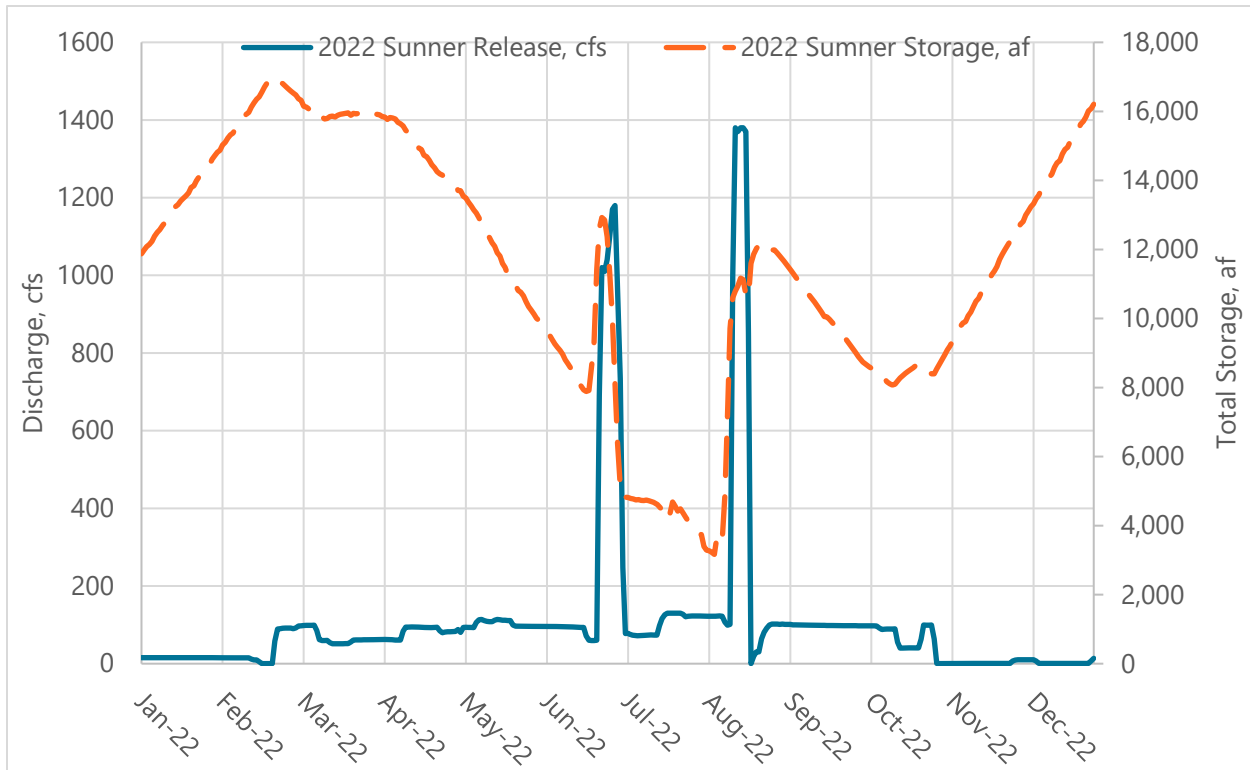


Figure 2: Sumner Dam Storage and Release

Brantley Operations

All inflows to Brantley in 2022 were stored for the Carlsbad Project. Brantley was operated normally during irrigation season (March 1 through October 31). Normal operations release water to maintain a sufficient volume in Avalon to deliver water to CID for irrigation. When not releasing to Avalon 20 cfs is released.

Reclamation agreed to a continuous minimum release of 20 cfs⁴ to mitigate for impacts of Brantley Dam to Major Johnson Springs, except as follows. Releases may be terminated (1) to facilitate emergency type repairs at the outlet structures for Avalon; (2) during periods when the water in storage in Brantley is reduced to the minimum pool of 2,000 af; (3) during periods of spill from Avalon; and (4) when prudent use of irrigation water would prevent such releases, or when water is not available. The minimum release was shut off in August, October, November, and December of 2022. In August and October, when no irrigation release was called, the release was not a “prudent

⁴ This minimum release is documented in letters with the New Mexico Department of Game and Fish in 1982, and the Environmental Commitments of the Final Environmental Statement for the Brantley Project, New Mexico, and its final supplement filed with the Environmental Protection Agency in 1982.

use of irrigation water” due to the extremely low supply. In November and December, the release was stopped to limit inflow to Avalon to empty the reservoir for a sediment survey (see Avalon Operations section).

Releases for irrigation began on March 31 and varied at a rate necessary to support diversion into CID’s Main Canal, generally between 150 and 250 cfs, through October 31. The highest average daily release of 2022 was 299 cfs on May 18. The total released from Brantley in 2022 was 56,617 af composed of 51,137 af for irrigation demand and 5,480 af of mitigation flows.

Brantley began the year with a total storage of 26,873 af (3,250.34 ft). On December 31, 2022, Brantley had 36,090 af (3,254.06 ft) in storage, which was also the maximum storage for the year. Minimum storage occurred on August 16 at 7,877 af (3,238.20 ft). Figure 3 depicts Brantley storage and release.

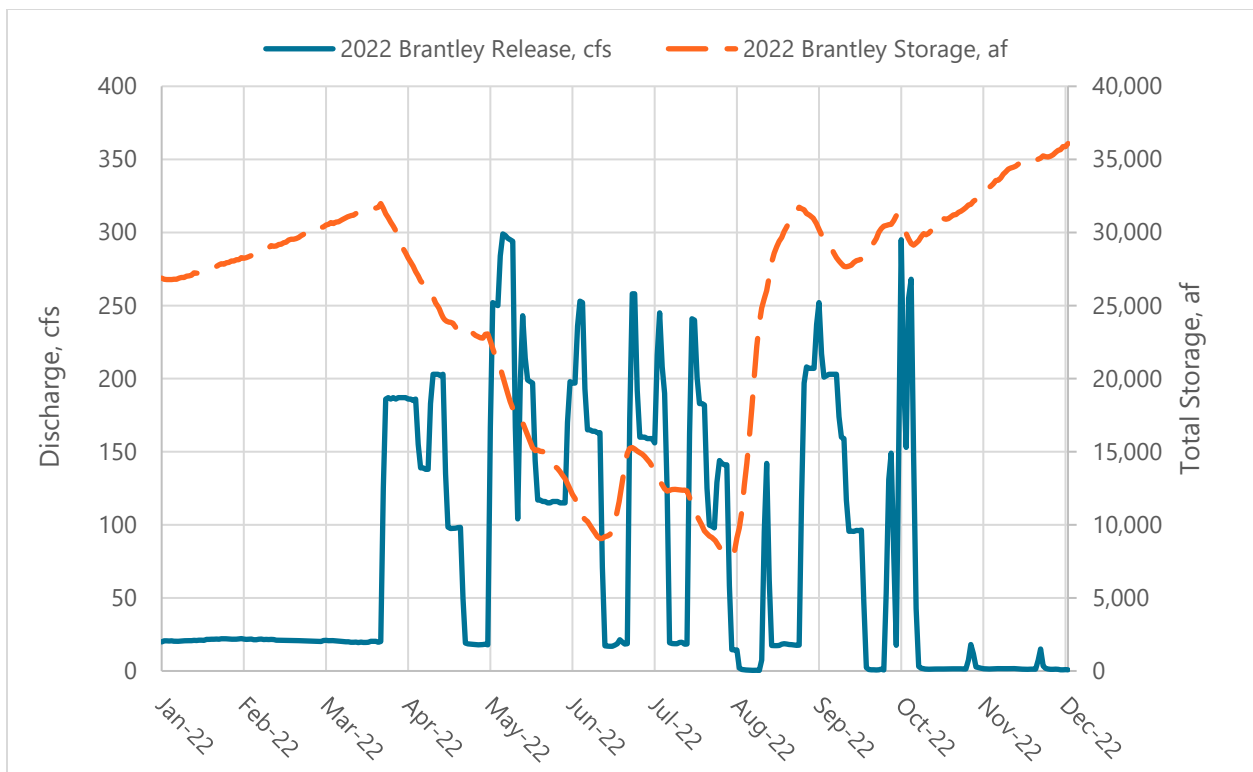


Figure 3: Brantley Dam Storage and Release

Avalon Operations

Due to the small reservoir capacity and the location of Brantley Dam approximately 10 miles upstream, Avalon is used primarily as a diversion dam to meet irrigation demand for CID. Water released from Brantley is re-regulated at Avalon, which releases into the CID Main Canal.

Avalon began the year at 2,246 af (3,174.73 ft; project datum). On November 2, 2022, Avalon was drained for a sediment survey that took place in February 2023. The minimum elevation and storage were therefore zero af (3,159.29 ft) from November 2 to 23 and December 2 to 31. A storm caused incidental storage from November 24 to December 1. Avalon ended the year at elevation 3,159.29 ft

with a storage of 0 af. Avalon’s maximum storage was on March 24 prior to the start of irrigation releases with storage of 3,008 af (3,175.68 ft).

A total of 53,392 af was released to the Carlsbad Main Canal in 2022. The maximum irrigation release into the canal was 275 cfs on May 14. Figure 4 depicts Avalon storage and release.

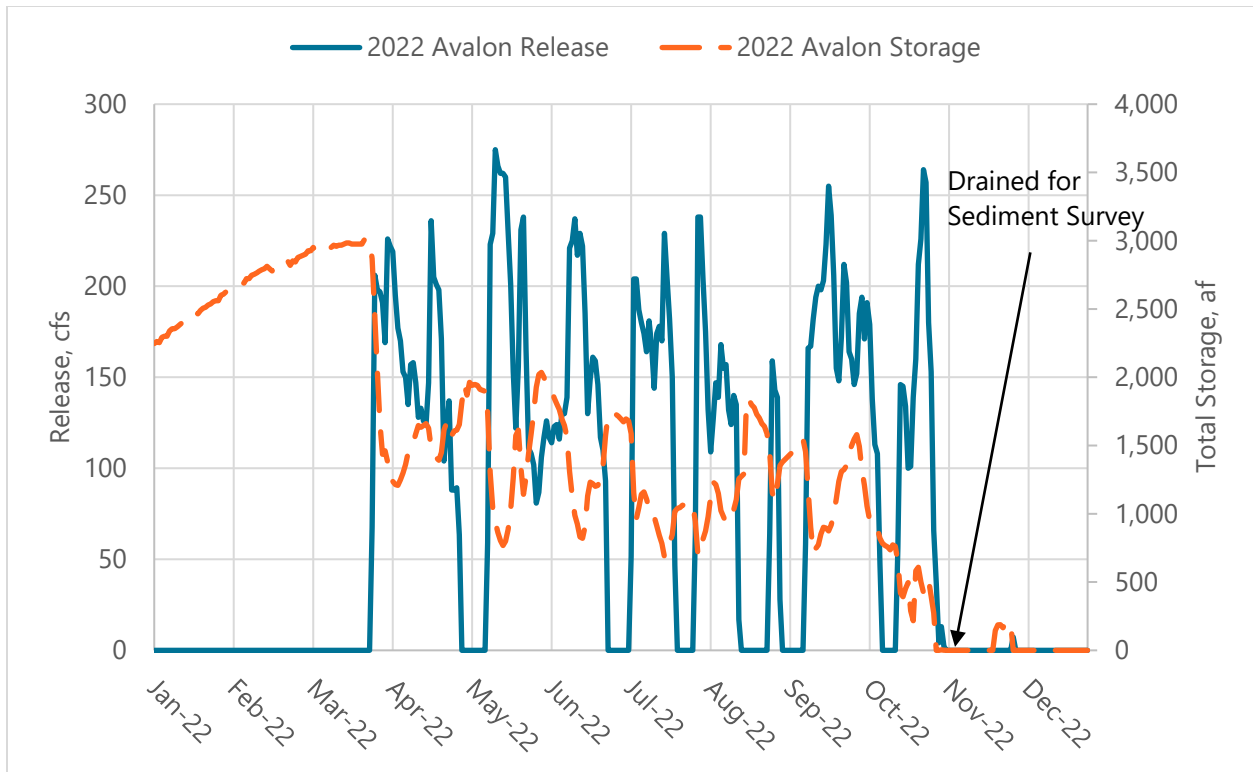


Figure 4: Avalon Dam Storage and Release

Pecos River Settlement Implementation

The 2003 Pecos Settlement Agreement (Settlement) is a landmark agreement reached between New Mexico’s principal Pecos River Basin water management and irrigation entities. Its primary objective is to ensure permanent compliance with the 1948 Pecos River Compact and in particular the 1988 U.S. Supreme Court Amended Decree in *Texas v. New Mexico*. In addition, it aims to help resolve intrastate disputes between Pecos Basin water-right owners, primarily over priority administration. The Settlement is the outcome of what was known as the Pecos Consensus Plan, conceived and refined by a broad spectrum of Pecos Basin stakeholders over a roughly two year period. The parties to the agreement are the New Mexico Office of the State Engineer (NMOSE), New Mexico Interstate Stream Commission (NMISC), Reclamation, CID, and the Pecos Valley Artesian Conservancy District (PVACD). Objectives of the Settlement include:

- Permanent compliance with the Pecos River Compact and 1988 Amended Decree in *Texas v. New Mexico*.
- An increased and more stable water supply for CID.

- A reduced likelihood of a priority call by CID against junior groundwater pumpers, primarily PVACD (calls were made in 1976, 2013, and 2021).
- Decreased consumptive water use resulting in an improved hydrologic balance in the Pecos Basin.

The Settlement combines several different elements to achieve its objectives.

Water Rights Purchases: The Settlement required the NMISC to purchase and retire, or place in state water conservation programs, irrigation water rights to reduce depletions in the Pecos Basin and increase river flows. State purchases to date include approximately 4,500 acres in CID and 7,500 acres in the Roswell Artesian Basin (RAB). Under specific conditions, state-purchased CID water rights can be used for delivery to Texas, and state-purchased RAB water rights can be used in augmentation well fields to increase supplies for CID or for delivery to the state line.

Augmentation Well Fields: The Settlement also required the NMISC to construct two river augmentation well fields with a combined minimum capacity of 15,750 af per year. NMISC's primary well field, called Seven Rivers, is located adjacent to Brantley. A complementary well field is located near Lake Arthur. All NMISC augmentation wells have been, or are in the process of being, added as additional points of diversion for state-purchased RAB artesian water rights. The Settlement prescribes specific conditions under which augmentation pumping is required either for augmentation of CID's irrigation supply or Compact compliance.

NMISC pumped 11,656 af from the augmentation well fields for the 2022 irrigation season for CID. The NMISC's November 1, 2021, projection estimated that the March 1, 2022, target of 50,000 would easily be reached and NMISC pumps were turned off by November 3. Following an unusually dry November and December, this projection no longer appeared valid, and NMISC opened their Lake Arthur artesian wells and began pumping at their Seven Rivers wellfield on January 7, 2022. This water increased CID's supply by about 2,000 af prior to the 2022 irrigation season, enough to bring the supply up to the March 1 Settlement Target of 50,000 af.

NMISC continued pumping from the augmentation well fields for CID throughout the 2022 irrigation season, attempting to meet later project supply targets. Due to poor snowmelt runoff in April and May of 2022, augmentation was not enough to keep supplies above 50,000 for the entire irrigation season. In large part due to improved inflows during the monsoon season, NMISC augmentation pumping was finally able to bring the project supply up to the final September 1 target supply of 90,000 af by late October, and all pumps were turned off by October 24, 2022. (NMISC, February 28, 2023).

Delivery of Water to the State Line: Compact compliance before the Settlement was challenging due to the impoundment of Pecos River flows in Carlsbad Project reservoirs. Settlement algorithms determine an annual delivery of state-purchased CID water rights to Texas. These formulas depend in part on New Mexico's cumulative Compact credit.

The Carlsbad Project did not deliver water to the New Mexico-Texas state line in 2022.

Water Operations and Water Supply Conservation ESA Compliance

The U.S. Fish and Wildlife Service (USFWS) issued a *Final Biological Opinion for the Carlsbad Project Water Operations and Water Supply Conservation, 2016-2026* (2017 BO; Consultation Number 02WNNM00-2016-F-0506) in 2017. The non-jeopardy determination in the 2017 BO is based on the mandatory accomplishment of numerous commitments by Reclamation (12 Conservation Measures, four Reasonable and Prudent Measures, and four Terms and Conditions). The USFWS provided an Incidental Take Statement for the threatened Pecos Bluntnose Shiner (*Notropis simus pecosensis*, shiner) and Interior Least Tern (*Sterna antillarum atbalassos*). The Interior Least Tern was removed from the Endangered Species List in 2021 and will therefore no longer be monitored at Brantley Reservoir and Reclamation will no longer provide updates in the report.

Term and condition 1 of the 2017 BO stipulates that Reclamation should work with the USACE to allow storage of Reclamation's supplemental water at Santa Rosa Reservoir within a 5-years of issuance of the BO. This additional storage could help reduce the effects of river drying on the shiner. If the goal of increased storage at Santa Rosa Reservoir is reached within the proposed timeframe, the 2017 BO would be extended for an additional 5-years through 2032.

Reclamation has made significant progress towards meeting this goal but requested a 2-year extension from the USFWS to ensure that the progress made towards term and condition 1 was not lost. In 2022, the USFWS agreed that Reclamation has made significant progress towards term and condition 1 and issued a 2-year extension to meet the goal, which would then extend ESA coverage under the BO to 15 years. In addition, the USFWS also agreed that the 35 cfs target flow at the Taiban gage would no longer apply from November 1 through March 1 annually, as long as the river is kept continuous as shown by an Acme gage flow of 5 cfs or greater.

Pecos Bluntnose Shiner

The 2017 BO defines two types of hydrologic conditions for a given year, Normal and Critically Dry. Normal conditions mean a better hydrologic outlook and do not meet the criteria established for Critically Dry conditions. Each month from January to June, Reclamation assesses various hydrologic measures until a final determination is made in June. Depending on the month, the hydrologic condition is determined by the percent of the Pecos basin in New Mexico classified as Extreme or Exceptional Drought per the U.S. Drought Monitor, the proportion of the 30-year average of the NRCS' forecast for inflow to Santa Rosa Reservoir, or the percent of time in which bypass at Sumner is available during irrigation season.

During Normal hydrologic conditions, the 2017 BO establishes a surrogate for quantifying incidental take of the shiner using the mean 3rd trimester density to determine if the incidental take attributable to the Carlsbad Project has been exceeded. Under Normal hydrologic conditions, if the 3rd trimester shiner density increases from the previous year's 3rd trimester density or stays at or above 12 fish per 100 m², then incidental take due to the Carlsbad Project is not exceeded. If under Normal hydrologic conditions, the 3rd trimester shiner density is decreasing and falls below a density of 12 fish per 100 m², then take is exceeded and further consultation with the USFWS is necessary to determine if the change in population status is due to the Project.

A designation of Critically Dry indicates that Reclamation may be unable to cover the deficit in the hydrologic system with its available supplemental water resources. In that case, the Taiban gage target flow of 35 cfs is no longer applied, and Reclamation instead focuses on maintaining 5 cfs at the Acme gage, which helps ensure that the Sumner to Brantley reach is continuous and conserves the shiner. Additionally, under Critically Dry conditions and provided that all water resources at Reclamation's disposal are used to minimize drying (see Supplemental Water section below), no take from the Carlsbad Project occurs.

The shiner is monitored annually to assess population status in the Pecos River and determine the incidental take attributable to Reclamation's Carlsbad Project. Reclamation funds USFWS for fish sampling from April to October and receives their trip reports. These data are compiled into an annual report on the status of the shiner. The following is a summary of data on the status of the shiner.⁵

In 2022, 13 sites were monitored on seven separate sampling trips. The Pecos River fish community was monitored in March, May, June, July, September, October, and November 2022. A total of 22,407 fish were collected from 22 different species. Less fish were collected in 2022 than in 2021. Similar to 2021, the most abundant fish species was Red Shiner (*Cyprinella lutrensis*). The Pecos Bluntnose Shiner was the fourth most abundant fish species in 2022, with a total of 1,967 collected. Pecos Bluntnose Shiner accounted for 7.0 percent of all fish collected.

During the 3rd trimester of 2022 (August–December), 770 shiner were collected from the Pecos River, comprising a mean percent of total that was $7.8 \pm 1.7\%$ of all species collected (Table 3). The 2022 mean Pecos Bluntnose Shiner 3rd trimester density was 10.8 ± 3.0 fish per 100 m², which was lower than the 3rd trimester density in 2021 of 25.4 ± 3.2 fish per 100 m². The 2021 3rd trimester density was above the prescribed mean 3rd trimester density of 12 fish per 100 m². Since 2022 was designated as a Critically Dry year, incidental take was not attributable to the Carlsbad Project.

Since 2017, shiner density has either increased from the previous year's abundance or been above the 12 fish per 100 m² prescribed mean 3rd trimester density. If 2023 is not designated as critically dry, then shiner density will need to increase from the 10.8 fish per 100 m² observed in 2022 for take to not be exceeded in 2023.

⁵ Davenport, S.R. 2023. 2022 Pecos River Basin Fisheries Update Summary Report. DRAFT report submitted to US Bureau of Reclamation, Albuquerque Area Office.

Table 2: Presence and Abundance of Pecos Bluntnose Shiner in Trimester 3 Only

Calendar Year	Total Site Visits	Occupied Sites	Percent of Sites Occupied	Total # of Shiner	Total # of Fish (all species)	Shiner Percent of Total	Total Area Sampled (m ²)	CPUE (Shiner/100 m ²)
2017	31	31	100	749	6,250	14.1	10,788.5	7.1
2018	33	33	100	2,419	10,499	22.0	7,659	33.3
2019	36	36	100	1,313	8,091	17.1	9,247.5	14.1
2020	35	35	100	1,052	13,667	8.7	9,415	15.3
2021	36	36	100	1,888	12,690	15.1	7,937.5	25.4
2022	35	33	94.3	770	12,487	7.8	7,491	10.8

Supplemental Water

As part of the 2017 BO conservation measures, Reclamation has established a supplemental water acquisition program to augment Pecos River flows between Sumner Dam and Brantley Dam. It is intended to avoid or minimize river intermittency and to acquire additional water for the Carlsbad Project to offset reductions in Project water supply caused by Reclamation’s bypass and storage operations for ESA compliance, relative to historic operations.

In an October 5, 2022, letter, Reclamation asked FWS to lift the Taiban target of 35 cfs from November to February. FWS responded on October 26, 2022, and amended the BO as follows: *Under “non-Critically Dry” conditions, and given a continuous river, Reclamation may operate “without” the target flow of 1 m³/s (35 cfs) at the Taiban gage from November 1 to February 28. The Pecos River is considered continuous when the Acme gage is at minimum of 0.14 m³/s (5 cfs). This operational standard allows for a judicious use of limited water resources while maintaining a continuous river.*

Reclamation’s Direct Flow Supplemental Water

Reclamation’s direct flow supplemental water supplies are used only to avoid river intermittency and are not used to meet other river flow targets.

In 2022, Reclamation stored 3,500 af of Forbearance through an agreement with FSID, 1,158 af of Fish Conservation Pool (FCP) water for which Reclamation pumped 869 af from the Seven Rivers well field directly into Brantley in exchange, and 785 af from the 2021 depletions accounting credit, referred to as 2021 Credit, in Lake Sumner for supplemental use as negotiated through an agreement with NMISC and CID. See the Depletions and Offsets Accounting section below for more information. All of Forbearance, 1,156 af of the FCP, and none of the 785 of 2021 Credit water was released through Sumner Dam at the direction of Reclamation. The remaining 2 af of FCP and all the 2021 Credit water was returned to the Carlsbad Project as described in the Sumner Dam Operations section above.

Reclamation has acquired groundwater through agreements with NMISC for augmenting flow to the Pecos River. In 2022, at Reclamation’s direction, NMISC delivered 3,400 af of groundwater from the Fort Sumner Groundwater Basin to the Pecos River near the Taiban Gage via the Vaughan Conservation Pipeline (VCP). Of the VCP water delivered, 1,649 af were from the Vaughan lease and 1,751 af were from the VP Bar lease. The maximum output from the VCP in 2022 was 10.93

cfs. The VCP delivered water from February 11 to June 21, July 12 to August 13, September 16 to October 17, and November 23 to December 9.

In 2022, Reclamation operated its Seven Rivers Wildlife Management Area wells for delivery to Brantley Reservoir in exchange for water in Sumner Lake (FCP). The north well began pumping on February 4 and the south well on February 22. The full volume of 750 af was delivered on May 25 at an average rate of 6.83 af per day, less than the average rate of 9 af per day in the past. Because of the dry conditions prior to the start of summer rains, Reclamation asked CID if they could pump additional water for exchange. Another 119 af was pumped directly into Brantley for 158 af of additional FCP water in Sumner Lake from the north well September 6 to 29 and from the south well September 16 to 29.

Reclamation's Offset Supplemental Water

Reclamation leases water from willing water rights owners within the Pecos Basin for delivery to the Carlsbad Project in Brantley Reservoir to offset the depletions caused by ESA-related operations. These leases are from farms near Hageman and Lake Arthur, NM. The farms are fallowed, and their water is either left in the Pecos River or delivered to the Pecos River and used by CID for irrigation. In 2022, Reclamation leased 1,198 af of surface water from farmers who previously pumped water directly from the river (referred to as River Pumper water), of which 507 af is from the Hageman Canal and is pumped directly into the Pecos River.

Depletions and Offsets Accounting

Reclamation, NMISC, and CID entered into a 10-year Pecos River Depletions Accounting and Offsets Agreement on October 24, 2019 (2019 Agreement). The 2019 Agreement established terms and methodologies to account for reductions and increases in Carlsbad Project water supply due to modification of Reclamation's Sumner Dam operations and supplemental water released in support of ESA compliance. The 2019 Agreement replaces multiple, sequential prior agreements that date back to 2008.

Reclamation's 2021 Report to the Pecos River Commission reported a net Credit of 705 af. Later in 2022, that volume was revised by agreement to a Net Credit of 785 af.

The Annual Accounting Methodology used for Accounting Year 2022 is the Pecos River Operational Model, specifically the Two-Stream Depletions Module, developed through the Pecos Hydrology Workgroup, a multi-agency work group that includes NMISC, CID, USACE, PVACD, and others, as agreed to in Section 5 of the 2019 Agreement.

As of the date of this report, Reclamation was still reviewing and calculating the Net Credit for Accounting Year 2022. The Net Credit will be published in the 2023 Report to the Pecos Compact Commission. If the 2022 Net Credit amount is greater than 1,000 af, Section 6(b) of the 2019 Agreement states that the volume, will be transferred to Reclamation's supplemental water supply in Santa Rosa or Sumner Reservoir as soon as the accounting is finalized by Reclamation, NMISC, and CID. The agreement states that accounting shall be finalized no later than 60 days after the determination is provided to NMISC and CID. If any of the Net Credit volume remains in storage on December 31, 2022, it will be returned to Carlsbad Project storage for use by CID.

Facility Review and Safety of Dams Programs

Reclamation reviews and examines the Carlsbad Project facilities following the Reclamation Manual Directives and Standards (Project Planning and Facility Operation, Maintenance, and Rehabilitation Program (FAC) 01-07). For all dams classified as having either high or significant hazard potential, the review and examination program consists of annual site inspections (ASIs), periodic facility reviews (PFRs), comprehensive reviews (CRs), examinations of normally inaccessible features, and special examinations and surveys.

Operation and maintenance (O&M) recommendations are determined and categorized through this program. Category 1 O&M recommendations are made for the correction of severe deficiencies where immediate and responsive action is required to ensure structural safety and operational integrity of a facility. Category 2 O&M recommendations are made for a wide range of important matters where action is needed to prevent or reduce further damage or preclude possible operational failure of the facility. Category 3 O&M recommendations are sound and beneficial suggestions to improve or enhance the O&M of the project or facility.

Sumner Dam

At the beginning of 2022, Sumner Dam had one incomplete Category 1 O&M recommendation, related to the rehabilitation of the three radial gates, and eleven incomplete Category 2 O&M recommendations. Three new Category 2 O&M recommendations were issued because of the 2022 PFR, and one recommendation was completed, leaving a total of thirteen incomplete Category 2 O&M recommendations at the end of FY 2022.

The Category 1 O&M recommendation will be completed after the Sumner Dam radial gates are replaced. From November 1 to April 30, the Carlsbad Project is normally authorized to store up to 20,000 af, called winter storage, above its storage entitlement in Sumner, provided the total entitlement storage does not exceed 176,500 af. Winter storage must be evacuated by May 1.

However, until rehabilitation of the radial gates is completed, Sumner storage is restricted to a maximum of 35,917 af. CID and Reclamation are in discussions on how to fund the work. Reclamation is developing a design to replace the gates and in 2022 it progressed from a 30% to 90% design. Reclamation will also solicit a contractor for construction. Reclamation will continue to coordinate with CID about the radial gate replacement project costs, including design, construction, and repayment obligations, throughout 2023. Design should be completed in 2023 and National Environmental Policy Act (NEPA) and other environmental compliance started, with the goal of award of a construction contract in late 2023. Construction should begin in 2024.

In 2022, AAO completed one Category 2 O&M recommendation. Of the thirteen remaining incomplete Category 2 O&M recommendations, three are scheduled to be completed by CID in 2023, and three recommendations, related to the replacement or repair of the radial gates and associated concrete, are scheduled for completion in 2024. The remaining seven recommendations are contingent on an update to the Sumner Dam Standing Operating Procedures (SOP), scheduled for 2024 or after the replacement of the Sumner dam radial gates.

There were no significant security issues identified during the Annual Security Equipment Inventory (ASEI) in 2022.

Table 3: Sumner Dam Facility Reviews and Exams Dates

Review/Exam	Date of Last Review/Exam	Year of Next Scheduled Review/Exam
ASI	6/29/2021	2023
PFR	2/15/2022	2030
CR	2/6/2018	2026
ASEI	2/15/2022	2023
STAR	8/10/2020	2024
Sediment Survey	3/2013	2024

Brantley Dam

At the beginning of 2022, Brantley Dam had no incomplete Category 1 O&M recommendations and three incomplete Category 2 O&M recommendations. Two new Category 2 O&M recommendations were issued as a result of the 2022 PFR.

In 2022, CID completed two Category 2 O&M recommendations. The remaining three recommendations are expected to be completed by CID in 2023.

There are sinkholes upstream and downstream on the left (southeast) side of Brantley Dam. The sinkholes are monitored visually on a regular basis and documented via photographic surveys every eight years. The last sinkhole survey was conducted in August 2019. The sinkholes appear to be filling in naturally and are more difficult to find during every survey.

There were no significant security issues identified during the 2022 ASEI.

Table 4: Brantley Dam Facility Reviews and Exams Dates

Review/Exam	Date of Last Review/Exam	Year of Next Scheduled Review/Exam
ASI	6/30/2021	2023
PFR	2/16/2022	2030
CR	2/7/2018	2026
ASEI	2/16/2022	2023
STAR	8/10/2020	2024
Sinkhole Survey	09/2019	2025 (6 months before CR)
Embankment Survey	12/2022	2030
Sediment Survey	03/2013	2024

Avalon Dam

Avalon Dam has 14 incomplete Category 2 O&M recommendations. No O&M recommendations were completed in FY 2022. Eight recommendations are related to the replacement or repair of Avalon Dam’s river outlet works. Three are related to updating the Avalon Dam SOP, scheduled to be updated upon completion the river outlet works, expected in FY 2024. The remaining three recommendations are regular O&M maintenance recommendations and are scheduled to be completed by CID in FY 2023.

Avalon Dam’s river outlet works consist of two cylinder gates, a hoist platform, and a walkway, all in poor structural condition and in need of repair or replacement. CID is responsible for all Avalon Dam costs including construction costs for the river outlet works rehabilitation. Reclamation is

working with CID to plan and design the river outlet works rehabilitation. CID’s current plan is to convert the cylinder gate system into morning glory spillways. Reclamation has provided a letter of support for CID in seeking funding for this project.

There were no significant security issues identified during the 2021 ASEI.

A sediment survey was conducted in late 2022. The report and new area-capacity tables are expected in 2023.

Table 5: Avalon Dam Facility Reviews and Exams Dates

Review/Exam	Date of Last Review/Exam	Year of Next Scheduled Review/Exam
ASI	6/29/2021	2023
PFR	2/17/2022	2030
CR	2/8/2018	2026
ASEI	2/17/2022	2023
STAR	8/10/2020	2024
Sediment Survey	3/2006	2023

Fort Sumner Project

The Fort Sumner Project includes the Fort Sumner Diversion Dam (FSDD), a Reclamation-owned dam, reconstructed by Reclamation in 1951. This facility is about 15 river miles downstream of Sumner Dam and diverts FSID's senior direct flow diversion water right into their canal. This facility replaced an earlier, privately-owned dam, and is operated and maintained by FSID. FSID includes 8,035 acres, of which 6,500 are classified as irrigable. The U.S. Army first irrigated some of these lands in 1863. Most of the area has been irrigated continuously since 1907.

Reclamation owns FSDD and the first few miles of the main canal. FSID operates and maintains these facilities through a contract. Reclamation does not pay any of the operation and maintenance costs of the facilities. FSID is contractually responsible to Reclamation for full repayment of the construction costs for the Fort Sumner Project. Full repayment on this contract is scheduled to occur by 2023, after which the title to the FSDD and other property may be turned over to FSID through legislation.

FSID has a direct flow diversion right with a priority date of March 18, 1903. FSID's right to divert up to 100 cfs of the Pecos River's natural flow is senior to the Carlsbad Project's right to storage at Santa Rosa and Sumner. Therefore, Reclamation must not divert to storage at Sumner or Santa Rosa water necessary to meet FSID's senior diversion water right of up to 100 cfs of natural flow. FSID's water right was determined prior to Reclamation's involvement with FSID. The water right was never transferred to the United States. NMOSE calculates a two-week entitlement for FSID's direct diversion right using estimated natural inflow to Sumner and Santa Rosa over the previous two weeks.

Operations

The irrigation season for FSID typically begins March 1 and ends October 31. FSID is also permitted to divert for two, eight-day periods during the winter. This winter entitlement has historically been diverted just prior to March 1.

In 2022, FSID began diverting water for irrigation on February 22 and stopped on October 31. During the irrigation season, 0 to 100 cfs was bypassed through Sumner Dam for FSID based on their available water right and call. FSID diverted 38,165 af into the FSID main canal as recorded by the USGS Fort Sumner Main Canal gage near Fort Sumner, NM (USGS gage number 08385000). This year, FSID diverted flows less than 105 cfs arriving at their diversion and released Reclamation's supplemental water back to the river at the Sand Gate Diversion (USGS gage number 08385503). A total of 1,640 af were released back to the river at the Sand Gate.

FSID's total calculated entitlement in 2022 was 44,517 af, including the winter entitlement. Of that, 81.5% was called for and diverted, 7.5% was forborne under the forbearance agreement with Reclamation, and 11.6% was not called for and stored in Sumner for the Carlsbad Project.

Facility Review of Operation and Maintenance

Reclamation reviews and examines the Fort Sumner Project facilities following the Reclamation Manual Directives and Standards (FAC 01-04). The Review of Operation and Maintenance (RO&M) Program results in categorized O&M recommendations for associated facilities. The categories are the same as those for high and significant hazard potential dams described earlier in this report.

The 2015 RO&M examination of the FSID and canal system resulted in six Category 2 O&M recommendations. At the beginning of 2020, three of the recommendations had been completed. All three remaining recommendations are ongoing O&M recommendations, such as vegetation control and concrete repairs. These recommendations are each approximately 80% complete and are scheduled to be completed by FSID in 2022. An RO&M exam was completed on February 22, 2021, and the associated report was published in May 2021. No new recommendations were made because of the exam.

Related Reclamation Programs

Aquatic Invasive Species- Zebra and Quagga Mussels

Dreissenid mussels, including the zebra mussel (*Dreissena polymorpha*) and quagga mussel (*Dreissena rostriformis bugensis*), are invasive, freshwater, bivalve mollusks. These aquatic invasive species (AIS) impair water infrastructure, and it is extremely costly to remove them or prevent their attachment to infrastructure. Dreissenid mussels proliferate; attach to infrastructure surfaces like dams, water intakes, pipes, and canals; and impact water storage, water delivery, irrigation, and hydropower. Dreissenid mussels can also impair recreational use and aquatic ecosystems by destroying watercraft motors, becoming a beach nuisance, altering aquatic food webs, and fostering harmful algal blooms. A single mussel can produce hundreds of thousands of eggs, which hatch into microscopic larvae called veligers. Veligers spread within a waterbody in numerous ways, mainly by floating within the water column, and can be taken up by outboard motors, pumps, or other water intake and storage on watercraft. Transport of dreissenid mussels can occur when watercraft used in an infested waterbody transport or discharge water containing veligers or adult mussels into non-infested reservoirs.

Reclamation does not have authority to manage the importation, interstate transport, exclusion, control, or eradication of aquatic invasive species in New Mexico. In New Mexico, Reclamation supports AIS prevention activities by furnishing equipment and contractual support to the New Mexico Department of Game and Fish (NMDGF). Reclamation regularly collects water samples and analyzes them by microscopy and molecular methods, providing early detection that can be used to trigger immediate containment action. The Fish and Wildlife Coordination Act, as amended by section 7001 of Public Law 116-9, provides authority for Reclamation to “enter into any contract or cooperative agreement with another Federal agency, an eligible State, a Federally recognized Indian tribe, a political subdivision of an eligible State, or a private individual or entity to assist with the control and management of an invasive species.”

Reclamation has contracted AIS monitoring for the following:

- Inspections for watercraft entering Navajo and Elephant Butte Reservoirs,
- Decontamination of watercraft considered “high risk” as defined by the NMDGF,
- Coordination with law enforcement for issuance and removal of red warning tags.

Reclamation’s AIS watercraft inspection and decontamination (WID) efforts have increased over time from 9,346 watercraft in 2013 to 17,931 in 2022, as have the contractual costs. With limited funding, Reclamation has prioritized AIS WID services at two marinas in Elephant Butte because of this reservoir’s extensive recreation, fishing, irrigation, power, and water infrastructure. In 2022, 30 percent of incoming watercraft were high risk inspections (were not drained and dried, etc.), and 0.1 percent of those were infested and decontaminated. In 2022, there were no detections of invasive mussels or their genetic markers in water samples collected from Elephant Butte by Reclamation’s Ecological Research Laboratory.

WaterSMART Program

Congress recognized the increasing stresses on water supplies in the Western U.S. with the passage of the Science and Engineering to Comprehensively Understand and Responsibly Enhance (SECURE) Water Act in 2009 (P.L. 111-11). The law authorizes Federal water and science agencies to work together with state and local water managers to plan for threats to water supplies, as well as take action to secure water resources for the communities, economies, and ecosystems they support.

To implement the SECURE Water Act and ensure the Department of the Interior is positioned to meet these challenges, the WaterSMART Program (Sustain and Manage America's Resources for Tomorrow) was established in February 2010. The Program's framework allows all bureaus of the Department to work with States, Pueblos and Tribes, local governments, and non-governmental organizations to pursue a sustainable water supply for the Nation. This is accomplished by providing Federal leadership and assistance on the efficient use of water, integrating water and energy policies to support the maintainable use of all natural resources, and coordinating the water conservation activities of the Department's many 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 resource managers make wise decisions about water use. Goals are achieved through administration of grants, scientific studies, technical assistance, and sharing scientific expertise. Reclamation will continue to work cooperatively with States, Pueblos and Tribes, and local entities as they plan for and implement actions to increase water supply through investments to modernize existing infrastructure and give attention to local water conflicts.

Bipartisan Infrastructure Law

The Bipartisan Infrastructure Law (Infrastructure Law) provides a total of \$8.3 billion under Title IX (Western Water Infrastructure) to the Bureau of Reclamation for authorized programs and activities. Funding is provided as emergency funding and is available for obligation until expended. In FY 2022 and FY 2023, establishing the exact allocation of the initial \$1.66 billion by project will take shape over the coming months. Additional information can be found at: <https://www.usbr.gov/bil/2022-spendplan.html>.

Programs funded and managed by Reclamation's Office of Policy and Administration include:

- WaterSMART Grants
 - Water and Energy Efficiency Grants
 - Small-Scale Water Efficiency Projects
 - Water Marketing Strategy Grants
 - Environmental Water Resources Projects
 - Aquatic Ecosystem Restoration Program
 - Cooperative Watershed Management Program
 - Water Conservation Field Services Program
- Drought Response Program
 - Drought Contingency Planning
 - Drought Resiliency Projects

- Emergency Response Actions
- Title XVI Water Recycling and Reuse Program
 - Authorized Title XVI Projects
 - WIIN Eligible Projects
- Large-Scale Water Recycling Program
- Desalination Projects (WIIN Act)
- Basin Studies
- Baseline Assessments and Pilots
- Reservoir Operations Pilots
- Applied Science Grants
 - Internal Applied Science Tools
- 2021 SECURE Water Act Report to Congress

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

A WaterSMART Data Visualization Tool showing project locations can be found at: <https://usbr.maps.arcgis.com/apps/MapJournal/index.html?appid=043fe91887ac4ddc92a4c0f427e38ab0>.

General information about Reclamation’s WaterSMART Program is provided below. Not all programs have funding opportunities each year, so there may not be currently active projects under all programs. Ongoing, newly funded, and recently completed projects within the jurisdiction of the AAO in the Pecos River Basin are listed in Table 6 at the end of this section.

WaterSMART Grants

Water and Energy Efficiency Grants

Through Water and Energy Efficiency Grants, Reclamation provides 50/50 cost-share funding to irrigation and water districts, Pueblos and Tribes, States, and other entities with water or power delivery authority. Projects conserve and use water more efficiently, increase the production of hydropower, mitigate conflict in areas at a high risk of future water conflict, and accomplish other benefits that contribute to water supply reliability in the Western United States. Projects are selected through a competitive process and the focus is on projects that can be completed within two or three years.

Small-Scale Water Efficiency Projects

Through the Small-Scale Water Efficiency Projects (SWEP), Reclamation provides 50/50 cost-share funding to irrigation and water districts, Pueblos and Tribes, States, and other entities with water or power delivery authority for small water efficiency improvements that have been identified through previous planning efforts. Projects eligible for funding include installation of flow measurement devices or automation in a specific part of a water delivery system, lining a section of a canal to address seepage, or other similar projects that are limited in scope.

Water Marketing Strategy Grants

Through the Water Marketing Strategy Grants, Reclamation provides assistance to States, Pueblos and Tribes, and local governments to conduct planning activities to develop water marketing strategies that establish or expand water markets or water marketing activities between willing participants in compliance with State and Federal laws.

Environmental Water Resources Projects

WaterSMART Environmental Water Resources Projects is a category of funding to support projects focused on environmental benefits that have been developed as part of a collaborative process to help carry out an established strategy to increase the reliability of water resources.

Unlike other WaterSMART programs, Environmental Water Resources Projects require only 25 percent cost share. Applicants are invited to leverage their money and resources by cost sharing with Reclamation on water conservation and efficiency projects that result in quantifiable and sustained water savings and benefit ecological values or watershed health; water management or infrastructure improvements to benefit ecological values or watershed health; and watershed restoration projects benefitting ecological values or watershed health that have a nexus to water resources or water resources management.

New for FY 2023: Section 40907 of the Bipartisan Infrastructure Law (BIL), P.L. 117-58, signed in late 2021, includes additional authority for Reclamation to provide funding for multi-benefit projects that improve watershed health. Section 40907 is being implemented through WaterSMART Environmental Water Resources Projects, and additional details will be contained in the funding opportunity anticipated for early 2023.

Aquatic Ecosystem Restoration Program

The new WaterSMART Aquatic Ecosystem Restoration Program will provide cost shared funding to States, Pueblos and Tribes, and other entities as they study, design, and construct aquatic ecosystem restoration projects that are collaboratively developed, have widespread regional benefits, and result in the improvement of the health of fisheries, wildlife, and aquatic habitat.

Eligible restoration activities include, but are not limited to

- Removal or modification of barriers to fish passage
- Restoration of connectivity
- Restoration of aquatic habitat
- Improvement of water availability, quality, and temperature.
- Other related activities

Cooperative Watershed Management Program

The Cooperative Watershed Management Program contributes to the WaterSMART strategy by providing funding to watershed groups to encourage diverse stakeholders to form local solutions to address their water management needs. Funding is provided on a competitive basis for the following.

- **Watershed Group Development and Watershed Restoration Planning** In 2012, Reclamation began providing funding for watershed group development, watershed restoration planning, and watershed management project design (Phase I). A watershed

group is a self-sustaining, non-regulatory, consensus-based group that is composed of a diverse array of stakeholders, which may include, but is not limited to, private property owners; non-profit organizations; Federal, State, or local agencies; and Pueblos and Tribes. As part of Phase I activities, applicants may use funding to develop bylaws, a mission statement, perform stakeholder outreach, develop a watershed restoration plan, and design a watershed management project. For Phase I projects, Reclamation awards a successful applicant up to \$100,000 per year for a period of up to two years with no non-Federal cost-share required.

- **Implementation of Watershed Management Projects** In 2017, Reclamation started to provide cost-shared financial assistance to watershed groups to implement watershed management projects. These on-the-ground projects, collaboratively developed by members of a watershed group, address critical water supply needs and water quality concerns, helping water users meet competing demands and avoid conflicts over water. Reclamation currently provides funding to watershed groups for the implementation of watershed management projects through the Environmental Water Resources Projects funding opportunity.

Water Conservation Field Services Program

The Water Conservation Field Services Program was established by Reclamation in 1996 to proactively encourage water conservation in the operations of recipients of water from Federal water projects and to assist agricultural and urban water districts in preparing and implementing water conservation plans in accordance with the Reclamation Reform Act of 1982. Funding is used to make cost-shared financial assistance available on a competitive basis at Reclamation's area and regional office levels, as well as for technical assistance from Reclamation staff. Funding may be used to develop water conservation plans, identify water management improvements through System Optimization Reviews, design water management improvements, and improve application of water conservation technologies through demonstration activities.

Drought Response Program

Reclamation's Drought Response Program supports a proactive approach to drought by assisting water managers to develop and update comprehensive drought plans and implement projects that will build long-term resiliency to drought. Program areas are described below.

Drought Contingency Planning

Reclamation will provide financial assistance on a competitive basis for applicants to develop a drought contingency plan or to update an existing plan to meet the required elements described in the Drought Response Framework. Most drought contingency planning processes are structured to address three questions:

- How will we recognize the next drought in its early stages?
- How will drought affect us?
- How can we protect ourselves from the next drought?

The planning process helps planners answer these three questions and encourages an open and inclusive planning effort that employs a proactive approach to building long-term resiliency to drought.

Drought Resiliency Projects

Drought Resiliency can be defined as the capacity of a community to cope with and respond to drought. Under this element of the program, Reclamation will provide funding for projects that will help communities prepare for and respond to drought. Typically, these types of projects are referred to as "mitigation actions" in a drought contingency plan. Reclamation funds projects that build resiliency to drought by:

- Increasing the reliability of water supplies
- Improving water management
- Providing benefits for fish and wildlife and the environment

Emergency Response Actions

Reclamation continues to undertake emergency response actions under the Drought Response Program to minimize losses and damages resulting from drought, relying on the authorities in Title I of the Drought Act. Emergency response actions are crisis-driven actions in response to unanticipated circumstances. Eligible emergency response actions are limited to temporary construction activities and other actions authorized under Title I that do not involve construction of permanent facilities, including water purchases and use of Reclamation facilities to convey and store water.

Title XVI Water Reclamation and Reuse Projects

Title XVI of P.L. 102-575, as amended (Title XVI), provides authority for Reclamation's water recycling and reuse program. Through the Title XVI Program, Reclamation identifies and investigates opportunities to reclaim and reuse wastewaters and impaired ground and surface water in the 17 Western States and Hawaii. Title XVI includes funding for the planning, design, and construction of water recycling and reuse projects in partnership with local government entities.

Authorized Title XVI Projects

Projects authorized under this authority are listed at:

<https://www.usbr.gov/watersmart/title/authorized.html>.

WIIN Eligible Projects

Projects eligible to compete for Title XVI Program funding under section 4009(c) of the Water Infrastructure Improvements for the Nation (WIIN) Act are listed at:

<https://www.usbr.gov/watersmart/title/wiin.html>.

Large-Scale Water Recycling Program

Section 40905 of the BIL provides authority for Reclamation's Large-Scale Water Recycling Program. The program provides \$450 million over five years to projects in Reclamation states that have a total project cost greater than or equal to \$500,000,000, at 25% Federal cost share, with no per-project maximum. Large-scale recycled water projects will play an important role in helping communities develop local, drought-resistant sources of water supply by turning currently unusable water sources into a new source of water supply that is less vulnerable to drought and climate change.

Projects will become eligible to compete for funding under the Large-Scale Water Recycling Program once Reclamation has reviewed a feasibility study submitted by the non-Federal project sponsor and has informed Congress that the project meets Reclamation's requirements. Temporary guidelines for the preparation of feasibility studies are established by Temporary Reclamation Manual Release WTR TRMR-128, https://www.usbr.gov/recman/temporary_releases/wtrtrmr-128.pdf.

WTR-TRMR-128 communicates to project sponsors the additional information they must provide to Reclamation, beyond existing Title XVI Program requirements. The additional requirements are available as a TRMR so that potential project sponsors can begin working on feasibility studies. Over the next year, this TRMR will be incorporated as permanent revisions to the existing Reclamation Manual Directive and Standards "Title XVI Water Reclamation and Reuse Program and Desalination Construction Program Feasibility Study Review Process" (WTR 11-01). There will be an opportunity for public comment during the permanent revision process.

Desalination Projects

The WIIN Act provides new authority to Reclamation to develop a desalination construction program that will provide a path for ocean or brackish water desalination projects to receive Federal funding. Eligible projects are listed at: <https://www.usbr.gov/watersmart/desalination/eligible.html>.

In 2021, the AAO supported the development and implementation of three WIIN eligible Title XVI projects and one WIIN Act Desalination project.

Basin Studies

Basin Studies are collaborative studies, cost-shared with non-Federal partners, to evaluate water supply and demand and help ensure reliable water supplies by identifying strategies to address imbalances in water supply and demand. Each study includes four key elements:

- State-of-the-art projections of future supply and demand by river basin,
- An analysis of how the basin's existing water and power operations and infrastructure will perform in the face of changing water realities,
- Development of strategies to meet current and future water demands,
- A trade-off analysis of strategies identified.

Pecos River Basin Study – New Mexico

Reclamation and NMISC completed the *Pecos River Basin Study – New Mexico*, available at <https://www.usbr.gov/watersmart/bsp/docs/finalreport/Pecos/PRNMB-final-9-20-2021.pdf>. The study focuses on potential impacts of climate change to agricultural water use in the Pecos Basin in New Mexico, including impacts to water storage and availability through the 21st century.

Baseline Assessments and Pilots

Reclamation conducts Baseline Water Assessments to develop water supply and demand information, guidance, and tools needed to conduct planning activities across Reclamation's mission areas. Baseline Water Assessments support reservoir operations planning, appraisal and feasibility studies, basin studies, drought contingency planning and environmental analyses. Examples of ongoing activities include:

- Conducting Impact Assessments to develop key data on west-wide risks and impacts to water supply and demand that inform Reclamation operations and planning studies and provide a foundation for project specific applications.
- Conducting Site-Specific Pilots to support the application of information developed through Basin Assessments in specific locations. Reclamation initiated the Site-Specific Pilots in 2015 to identify possible improvements to western reservoir operations using forecasting and other ways to enhance operations flexibility. Outcomes from the Pilots will be used to develop guidance for optimizing reservoir operations west-wide.
- Collaborating with other Federal agencies to develop tools with shared benefits. For example, Reclamation and the USGS are working together to expand application of the USGS National Brackish Groundwater Assessment database to develop a web-based data viewer and decision support tool for planners to evaluate the potential use of brackish groundwater supplies.

New projections of future conditions, and paleoclimate analyses to refine those projections, were developed by Reclamation and published on Reclamation’s SECURE Water Act 2021 Report website: <https://www.usbr.gov/climate/secure/>.

Reservoir Operations Pilots

Through the Reservoir Operations Pilot Initiative, Reclamation uses modeling and forecasting tools to identify ways to increase flexibility in reservoir operations to support optimal water management.

Reclamation completed an analysis of water operations on the Rio Chama, located in northwestern New Mexico, as a Reservoir Operations Pilot project. This project evaluated the legal constraints to river and reservoir operations on the Rio Chama, and the economic implications of reservoir operations and potential changes to them. Existing data and information on the effects of reservoir operations on the ecology, geomorphology, hydropower generation, and recreation potential of the designated Wild and Scenic reach of the Rio Chama was compiled. The report can be found at <https://www.usbr.gov/watersmart/pilots/docs/riochama/Rio-Chama-Transmittal-Report.pdf>.

Applied Science Grants

Through Applied Science Grants, Reclamation provides funding to external non-Federal entities and internal project teams for the development of tools and information to support water management for multiple uses. Eligible projects include the development of modeling and forecasting tools, hydrologic data platforms, and new data sets. Under the Applied Science Grants Program, Reclamation is funding the following project:

- *New Mexico Water Data Initiative and Regional Pilot Project for Improved Data Management and Decision Support Tool in the Lower Pecos Valley* – Reclamation has awarded a grant to the New Mexico Institute of Mining and Technology, Bureau of Geology, for a project to develop a pilot water data decision support toolset that will link to a statewide water data service. The goal of this project is to enhance short- and long-term water management for irrigation, river flow for endangered species, interstate compact compliance, and other potential water management benefits in the lower Pecos Valley. The Water Data Act project website is available at: <https://newmexicowaterdata.org/>.

Applied Science Tools

Reclamation's Water Resources and Planning Office provides funding to Reclamation staff on a competitive basis for the development of improved modeling and forecasting tools, improved hydrologic information, GIS products, and data management, and other decision support tools.

Using applied science information and tools allows Reclamation, partners, and stakeholders to rely on the best available science to address uncertainty in decision making to improve water management. Reclamation also relies on applied science to carry out activities that are central to our mission and are in cooperation with our stakeholders and partners.

All proposed projects must have a nexus to Reclamation’s mission, priorities, and activities, including fulfilling water supply contracts, operating reservoirs for multiple purposes, and complying with environmental requirements.

2021 SECURE Water Act Report to Congress

In 2021, the Bureau of Reclamation released final technical reports supporting the Water Reliability in the West - 2021 SECURE Water Act Report. Reclamation's 2021 West-Wide Climate and Hydrology Assessment

(<https://www.usbr.gov/climate/secure/docs/2021secure/2021SECUREReport.pdf>) and seven individual basin reports provide detailed information on climate change impacts and adaptation strategies to increase water supply reliability in the West. A new 2021 SECURE Report Web Portal (<https://experience.arcgis.com/experience/7461ca68b2da4620863ff27d65b8cf14/>) is also available to provide a user-friendly, web-based format for delivery of information in the reports. The next report to Congress will be completed in 2026.

Table 6: Active WaterSMART Projects in the Pecos Basin Managed by the AAO⁶

Agreement No.	Program ⁷	Completion Date	Recipient Name	Project Title	Federal Total Obligation Amount	Non-Federal Total Est Amount
R19AP00290	ASG	12/31/2023	NM Institute of Mining and Technology	New Mexico Water Data Initiative and Regional Pilot Project for Improved Data Management and Decision Support Tool in the Lower Pecos Valley	\$300,000	\$300,000

⁶ As of February 3, 2023

⁷ ASG = Applied Science Grants

DROUGHT = Contingency Planning, Resiliency Projects, or Emergency Response Actions

SWEP = Small-Scale Water Efficiency Project

Applied Science Grants = Part of Basin Study Program yet to be awarded

Agreement No.	Program ⁷	Completion Date	Recipient Name	Project Title	Federal Total Obligation Amount	Non-Federal Total Est Amount
	ASG	TBD	Southwest Research Institute	Application of a geochemical framework for water resource management in a semi-arid landscape: Trans Pecos Texas, USA	\$200,000	\$119,998
	DROUGHT	TBD	City of Roswell	City of Roswell, Drought Contingency Plan	\$200,000	\$200,000
R17AP00217	SWEP	3/31/2022 (Complete)	Guadalupe Soil & Water Conservation District	Acequia Restoration and Conservation Project	\$67,500	\$119,392
Total Funding					\$767,500	\$739,390

Science & Technology Program and Other Research Projects

Reclamation's Science and Technology (S&T) Program is a Reclamation-wide, competitive, merit-based applied research and development program. The program focuses on innovative solutions for water and power challenges in the Western United States for Reclamation water and facility managers and the stakeholders they serve. The program has contributed many of the tools and capabilities Reclamation and Western water managers use today.

The AAO is an active participant in Reclamation's S&T Program, and initiates and participates in research to improve the services that Reclamation provides to its stakeholders. S&T Program projects related to the Pecos Basin that are ongoing or were completed in 2022 are listed below.

- FY 2020 Award – ongoing, *Characterizing the Predictability and Sensitivity of Streamflow to Monsoon Season Precipitation* (AAO partnership with NCAR, Boulder, CO). This project builds on a previous S&T Program project characterizing extreme events in New Mexico <https://www.usbr.gov/research/projects/detail.cfm?id=1782>. It uses a process called "weather typing," along with statistical analyses, to begin to develop forecasts for summer monsoons in New Mexico, and in Arizona under a parallel project. The initial results show forecasts starting in May provided more accuracy than climatology. This process was tested in 2021 and 2022 and provides a qualitative measure that can guide Reclamation's streamflow forecasts after May. Although this work will not predict specific monsoon events, it will provide information on the likely strength of the monsoon season, allowing for better water supply planning than was previously possible.
- FY 2019 Award – ongoing, *Using Remote Sensing and Ground Measurement to Improve Evaporation Estimation and Reservoir Management* (AAO and Elephant Butte Field Office partnership with New Mexico State University). This project aims to improve reservoir evaporation

monitoring and reservoir management through the comparison of evaporation estimates from in situ and remotely sensed measurements. In situ evaporation estimates for this project are measured through eddy covariance towers at Elephant Butte and Caballo Reservoirs. Results will also be compared with those from the Collison Floating Evaporation Pans. Remotely sensed evaporation estimates are developed from Landsat-8 images. Project is on track to be completed by September 30, 2023.

Reclamation is funding the recalibration of hydrologic models used by the National Oceanic and Atmospheric Administration's West Gulf River Forecast Center, which is responsible for development of streamflow forecasts for the Rio Grande and Pecos basins. These hydrologic models support the development of Ensemble Streamflow Prediction forecasts, similar to those available in the Colorado River Basin, which will supplement the volumetric forecasts available from the NRCS.

Research continues on the Collison Floating Evaporation Pan through funding from the Regional Office. While this project is in the Rio Grande watershed, results and technology improvements may ultimately improve water management throughout the Southwest. It aims to improve estimates of reservoir evaporation through the development and calibration of an in situ floating evaporation pan. S&T Program-funded work at Cochiti and Lake Powell was completed in 2021 and the report can be viewed at <https://www.usbr.gov/research/projects/detail.cfm?id=8119>. Evaporation monitoring results are being integrated and compared with those generated by the S&T-funded New Mexico State University project discussed above. Data collection is scheduled for completion by September 30, 2023, at Lake Powell, and at Elephant Butte and Caballo Reservoirs. Project close-out is expected by the end of 2023.

In addition to the S&T Program, Reclamation's Research and Development Office initiated a series of projects in 2022 aimed at developing a snow monitoring program that takes advantage of new monitoring technologies. AAO is participating in development of this snow monitoring program through two funded projects:

- *A Testbed for Harnessing and Benchmarking Snow Data Observations and Watershed Modeling for Water Supply Prediction* (AAO in partnership with Reclamation's TSC and NCAR) – ongoing. Modeling study to test snow monitoring technologies using data from other Reclamation snow studies.
- *Assessing the Utility of New Satellites to Advance State of the Art Snow Forecasting Capabilities* (AAO in partnership with the University of New Mexico, University of Washington, University of Wyoming, and USGS Water Science Center) – ongoing. Study involves remote sensing paired with field monitoring in the headwaters of the San Juan-Chama Project.