BUREAU OF RECLAMATION

Calendar Year 2020 Report to the Pecos River Commission

Interior Region 7: Upper Colorado Basin

U.S. Department of the Interior

March 2021

Mission Statements

The Department of the Interior (DOI) conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

The mission of the Bureau of Reclamation (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 2020 Report to the Pecos River Commission

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Cover Photo: Aerial photo of Avalon Dam and Lake Avalon looking upstream (Reclamation photo)

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List of Acronyms and Abbreviations

AAM	Annual Accounting Method
AAO	Albuquerque Area Office
af	acre-feet
ADVM	acoustic doppler velocity meter
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
CWMP	Cooperative Watershed Management Program
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
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
NREL	National Renewable Energy Laboratory
O&M	Operation and Maintenance
PROM	Pecos River Operations Model
PVACD	Pecos Valley Artesian Conservancy District
RAB	Roswell Artesian Basin
Reclamation	Bureau of Reclamation
RO&M	Review of Operations and Maintenance
Santa Rosa	Santa Rosa Dam and Reservoir
S&T	Science and Technology
shiner	Pecos Bluntnose Shiner
SOP	Standing Operating Procedures
STAR	Security Tailored Assessment Report
Sumner	Sumner Dam and Lake
SWEP	Small-Scale Water Efficiency Projects
tern	Interior Least Tern
USACE	U.S. Army Corp of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VCP	Vaughan Conservation Pipeline
WCFSP	Water Conservation Field Services Program
WEEG	WaterSMART Water and Energy Efficiency Grants
WWRA	West-Wide Risk Assessment

Introduction

The Bureau of Reclamation (Reclamation) has had 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 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 (CID). 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 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 gage data used within this report were downloaded from the U.S. Geological Survey's (USGS) web page at: https://waterdata.usgs.gov/nm/nwis/current/?type=flow.

All 2020 data presented or used in this report have been approved and should be considered final.

Figure 1: Map of Reclamation Projects in the Pecos Basin

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 Carlsbad Irrigation District (CID) 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. 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 these facilities follows:

- Santa Rosa Dam and Lake (hereafter Santa Rosa), the northernmost facility on the Pecos River, is a USACE flood control facility. Construction of this facility was completed in 1980, and Santa Rosa stores a portion of the Carlsbad Project water. The conservation storage, which is space set aside to meet the Project purpose of irrigation, for this facility is about 100,000 acre-feet (af).

- 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 conservation storage for Sumner is about 33,000 af.

- 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 conservation 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 conservation storage for this facility is about 3,900 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 2020 storage entitlements for these Reservoirs.

Table 1: Pecos River Reservoir Storage Entitlements for 2020

Reservoir	Entitlement Storage (af)	Minimum Pool (af)	Total Estimated Sediment Accumulation (af)	Total Conservation Storage (af)	Conservation Elevation (feet) NAVD 88
Santa Rosa	100,198	0	885	101,083	4,749.69
Sumner	32,436	2,500	981	35,917	4,260.88
Brantley	40,000	2,000	602	42,602	3,256.29
Avalon	3,866	600	0	4,466	3,117.40*
Total	176,500	-	1,875	184,068	-

*Note that Avalon elevation references Project Datum

Carlsbad Project conservation storage in the Pecos River reservoirs began the year on January 1, 2020, at 49 percent of entitlement. Santa Rosa, Sumner, Brantley, and Avalon Reservoirs were at approximately 26, 60, 99, and 0 percent, respectively. On December 31, 2020, the total storage in the reservoirs was 15 percent of entitlement. Santa Rosa, Sumner, Brantley, and Avalon Reservoirs were at approximately 4, 38, 22, and 40 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. All releases from Santa Rosa in 2020 were for Carlsbad Project operations. These operations are described in detail in the USACE report to the Pecos River Compact Commission.

The Natural Resources Conservation Service's (NRCS) May 1, 2020, most probable streamflow forecast for March through July, predicted 37,000 af of inflow into Santa Rosa, or 66% of the 30-year average of 56,000 af. Observed March through July inflow to Santa Rosa was 23,495 af, or 42% of average, as measured at the USGS Above Santa Rosa gage.

Sumner Operations

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

The Carlsbad Project stored all-natural inflow to Sumner in 2020 only if inflows were greater than the bypass needed for:

(1) FSID direct flow diversion right[2]

(2) a downstream ESA target flow of 35 cubic feet per second (cfs) 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 USGS Pecos River near Acme gage is used by Reclamation to indicate continuous river flow.

[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.

Bypass for downstream ESA target flows occurred between January 1 and February 4 and February 21 and February 29 during the non-irrigation season at an average rate of 18 cfs (630 af total). During the irrigation season, there were 56 days that Sumner natural inflow was greater than FSID's direct flow diversion right and Reclamation bypassed a total of 2,029 af for downstream ESA target flows.

Reclamation stored 9,499 af of supplemental water[1] in Sumner during 2020. Reclamation exchanged 5,999 af with CID for water delivered to Brantley in 2019. Through an agreement with FSID, Reclamation stored 3,500 af of forbearance from February 5 to 21 and March 1 to 4. 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.

There were two block releases during the 2020 irrigation season:

- The first block release was initiated from Santa Rosa on June 1. The release from Sumner began on June 3 and ended on June 18. The average release rate from Santa Rosa was 1,280 cfs and 1,285 cfs from Sumner. The total volume for the block release from Santa Rosa was 37,978 af. The volume bypassed through and released from Sumner was 40,785 af, 3,050 af diverted by FSID and 37,735 af for delivery to Brantley for use by CID.

- The second block release was from Santa Rosa between September 28 and October 2. It was delivered to Sumner to maintain operational storage minimums and water quality for FSID. The release from Santa Rosa was at an average release rate of 409 cfs and no water was released for delivery to Brantley.

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 19 cfs during this time. On December 31, 2020, 262 af of supplemental water remained in Sumner storage and reverted to Carlsbad Project for future irrigation releases per the 2009 Agreement.

Sumner began 2020 with 21,531 af (4,253.84 ft) in storage. Total storage reached a maximum on March 4, 2020, at 27,882 af (4,257.27 ft). Sumner's minimum storage occurred on September 28 at 4,808 af (4,237.66 ft). On December 31, 2020, Sumner had 13,564 af (3,239.60 ft) in storage. Figure 2 depicts Sumner's total storage and release.

[1] See Supplemental Water Section of this report.

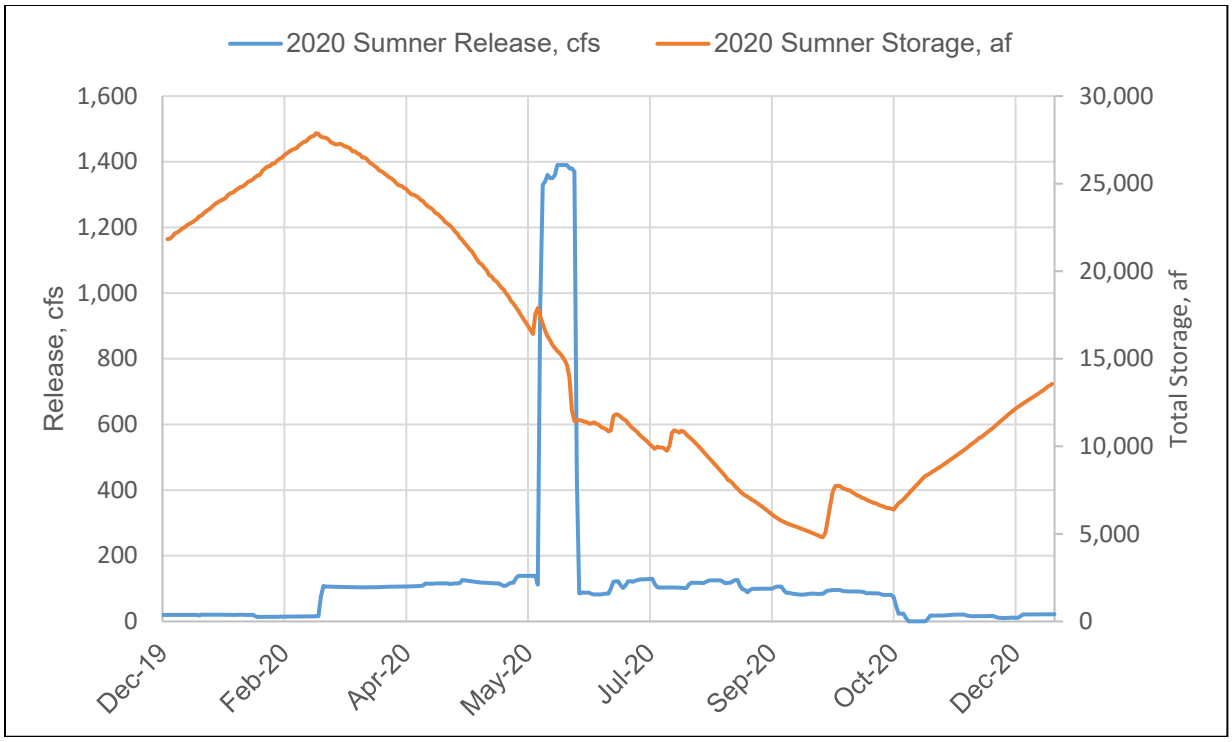

Figure 2: 2020 Sumner Dam Storage and Release

Brantley Operations

All inflows to Brantley in 2020 were stored for the Carlsbad Project. Reclamation agreed to a continuous minimum release of 20 cfs[1] to mitigate for impacts 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 from October 29, 2019, to January 28, 2020, to maintain Avalon Reservoir at zero storage in preparation for a sediment survey. It was resumed on January 28 when it was clear that the survey would not occur this season. Additionally, Reclamation requested and received approval to temporarily store the Avalon conservation storage volume in Brantley above the normal maximum.

The Brantley release to refill Avalon began on January 28 and ended on February 1. Due to a rain event in late January and after refilling Avalon, Brantley storage was still above the Brantley only conservation storage and releases from Brantley continued through February and into March to decrease Brantley storage below the maximum Brantley only conservation storage. Releases for irrigation season began on March 11 and varied at a rate necessary to support diversion into CID's Main Canal, generally between 150 and 250 cfs as required by irrigation demand through October 31. The highest average daily release of 2020 was 350 cfs on June 14 to meet the high irrigation demand. The total released from Brantley in 2020 was 85,476 af, with 6,691 af released for refilling

[1] 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.

Avalon and decreasing Brantley storage, 75,371 af released for irrigation demands and 3,413 af for mitigation flows.

Brantley began the year with a total storage of 42,110 af (3,256.14 ft). On January 27, Brantley reached its maximum storage for 2020, 44,439 af (3,256.85 feet). The lowest total storage in 2020 was 4,177 af (3,232.84 feet) on October 30. On December 31, 2020, Brantley had 9,258 af (3,239.6 ft) in storage. Figure 3 depicts Brantley's total storage and release.

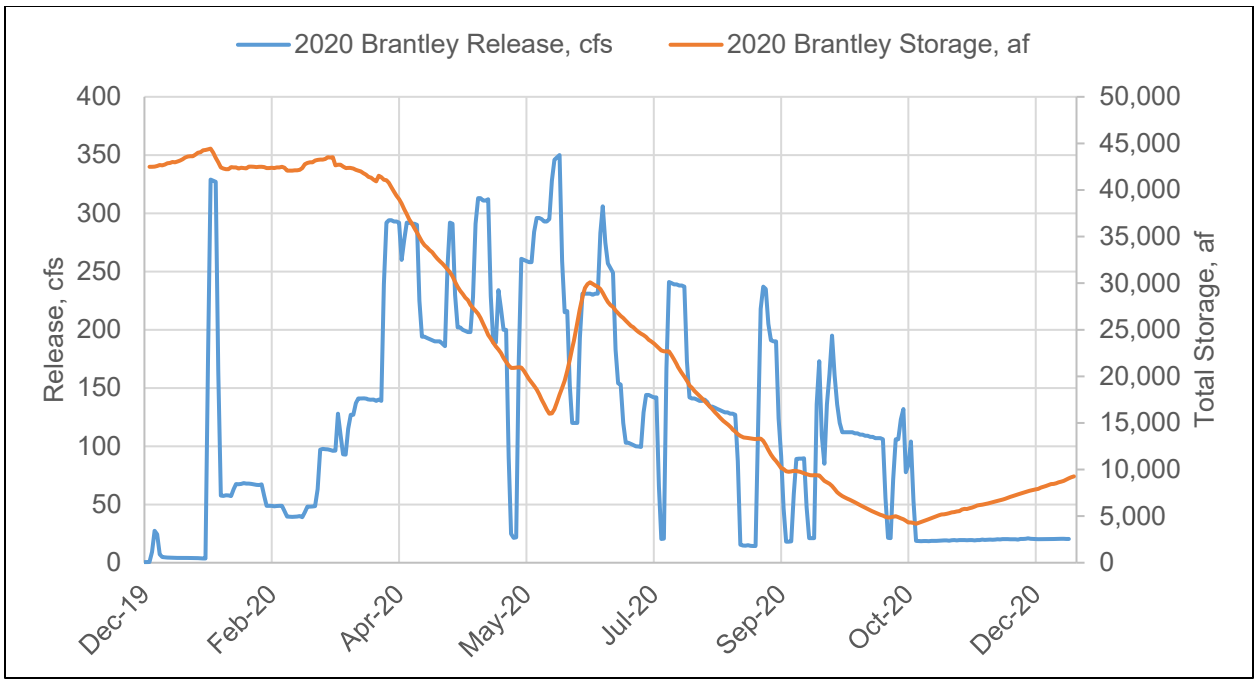

Figure 3: Brantley Dam Storage and Release

Avalon Operations

Due to the small reservoir capacity and the location of Brantley 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 empty, zero af (3,164 feet), to allow for a LiDAR flight to develop new Area Capacity tables. This was also the minimum elevation and storage in 2020, from January 1 to 28. Brantley releases refilled Avalon starting on February 1. It reached a maximum storage of 3,177.53 af (4,638 feet) on March 18. There was 89 af released March 18 through March 21 to the Pecos River in 2020 when both Brantley and Avalon reached maximum allowable conservation storage. Reclamation worked with NMISC and NMOSE to slowly reduce Brantley and Avalon to the maximum conservation storages to keep water out of the Pecos River because Lake Carlsbad was drained in the winter for maintenance on Tansil Dam downstream of Avalon Dam. On December 31, 2020, Avalon had 1,791 af (3,174.11 ft) in storage. Diversions into the CID Main Canal began on March 19 and ended on October 31. The total release for irrigation was 67,813 af. Figure 4 depicts Avalon's total storage and release.

The LiDAR drone flight that was scheduled for the 2019/2020 winter did not happen due to changes in Reclamation policy on drone flights. It is uncertain when aerial drone flights will be allowed again, and the project has not been rescheduled.

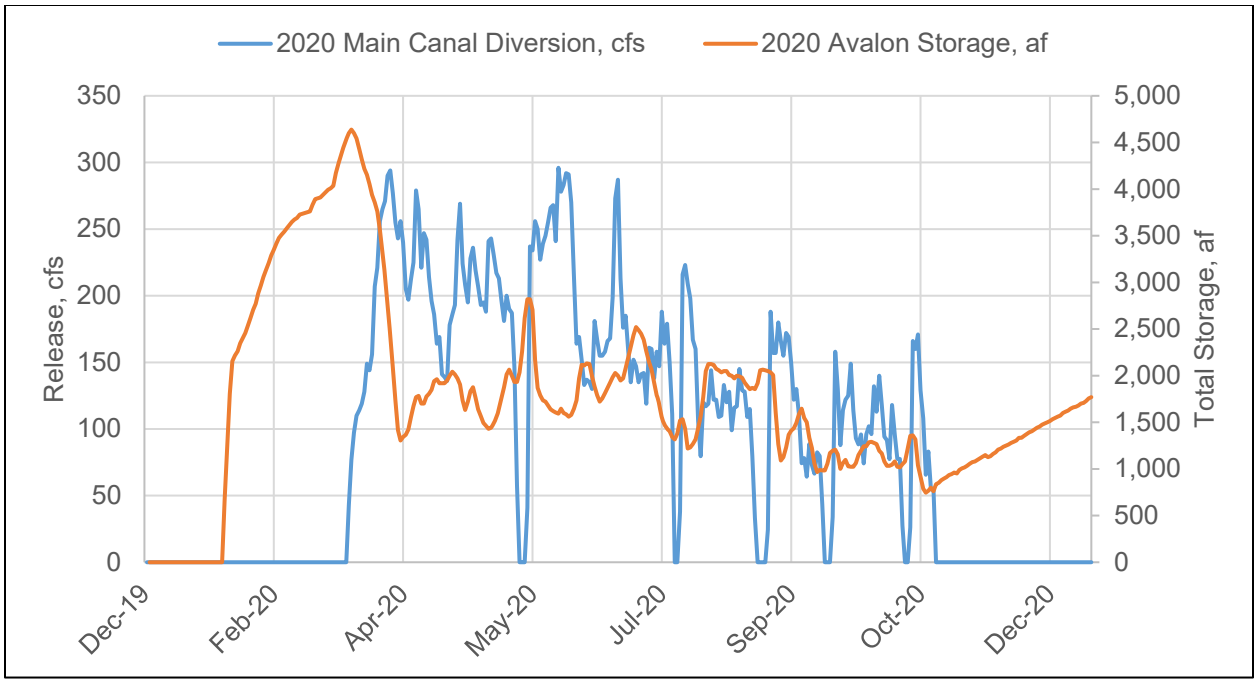

Figure 4: Storage and Release for Avalon Dam

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 2-year period. The parties to the agreement are 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 and 2013)
- 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. The 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 did not pump the augmentation well fields for the 2020 irrigation season for CID. In September of 2020, NMISC convened the Settlement parties to discuss turning on the pumps over the winter for the 2021 irrigation season. NMISC began pumping at their Seven Rivers wellfield on October 29 and their Lake Arthur wellfield on November 6. This water will increase CID's supply prior to the 2021 irrigation season but will not be enough to bring them up to the March 1 Settlement Target Supply of 50,000 af.

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 are dependent in part on New Mexico's cumulative Compact credit.

The Carlsbad Project did not deliver water to the New Mexico-Texas state line in 2020.

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, 4 Reasonable and Prudent Measures, and 4 Terms and Conditions). The USFWS provided an Incidental Take Statement (ITS) for the threatened Pecos Bluntnose Shiner (*Notropis simus pecosensis*, shiner) and Interior Least Tern (*Sterna antillarum athalassos*, tern).

Threatened and Endangered Species

Pecos Bluntnose Shiner

The shiner is monitored annually to assess population status in the Pecos River and determine the incidental take attributable to Reclamation's Carlsbad Project. During normal flow conditions, the 2017 BO established 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 flow conditions, if the 3rd trimester shiner density increases from the

previous year's 3rd trimester density or stays above 12 fish/100m^2, then incidental take due to the Carlsbad Project is authorized. If the 3rd trimester shiner density decreases or is below a density of 12 fish per 100m^2, then further consultation with the USFWS is necessary to determine if the change in population status is due to the Project.

The 2017 BO also defines a *Critically Dry* condition, which is determined in by various hydrologic conditions. These include 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 NRCS' forecast for inflow to Santa Rosa, and the percent of time in which bypass at Sumner is available. Reclamation assesses these factors monthly from January to June. A designation of *Critically Dry* is an indication 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 relevant, 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, provided that all water resources (see Supplemental Water section below) at Reclamation's disposal are used to minimize drying, no take from the Carlsbad Project occurs.

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 is a summary[1] of data on the status of shiner.

In 2020, 13 sites were monitored on four separate sampling trips. No monitoring was conducted during trimester one because of the COVID-19 Pandemic. A total of 15,618 fish were collected from 22 different species. More fish were collected in 2020 than in 2019. The most abundant fish species was Red Shiner (*Cyprinella lutrensis*). Pecos bluntnose shiner was the third most abundant fish species, with a total of 1,779 collected during 2020. Small-bodied minnows dominated the fish collections: Red Shiner; Plains Minnow (*Hybognathus placitus*); Speckled Chub (*Macrhybopsis aestivalis*); Rio Grande Shiner (*Notropis jemezanus*). Pecos Bluntnose Shiner accounted for 8.7% of all fish collected.

During the 3rd trimester of 2020 (August through December), 1,052 shiner were collected from the Pecos River, comprising a mean percent of total that was 8.7 $\pm$ 1.2% of all species collected. The 2020 mean Pecos Bluntnose Shiner 3rd trimester density was 15.3 $\pm$ 1.9 fish per 100m^2, which was higher than the 2019 3rd trimester density of 14.1 $\pm$ 1.8 fish per 100m^2 (Table 2). The 2020 3rd trimester density was above the prescribed mean 3rd trimester density of 12 fish per 100m^2. Therefore, incidental take attributable to the Carlsbad Project was not exceeded in 2020. In 2020, the shiner density abundance was higher than the average overall shiner density for years 2000 – 2019 (Table 2) and all sites sampled were occupied.

[1] Davenport, S.R. 2021. 2020 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**

Interior Least Tern

When the elevation of Brantley Reservoir is at or above the full pool elevation of 3,256 feet (NAVD 88), the surface area is 3,034 acres or greater and no suitable nesting shoreline habitat is available to the Interior Least Tern (*Sterna antillarum athalassos*, tern). Even when the reservoir elevation is at what New Mexico State Parks defines as the normal elevation of 3,250 feet with a surface area approximately 2,219 acres, very little nesting shoreline is typically available to the tern.

During the 2020 breeding season, reservoir elevations reached a low of approximately 3,244.8 feet on June 9 (Figure 6), following the typical onset of tern breeding at Brantley Reservoir. The reservoir rose to a seasonal high of 3,251.6 feet on June 24, then fell continuously for the remainder of the season. Suitable tern nesting habitat was limited for most of the breeding season.

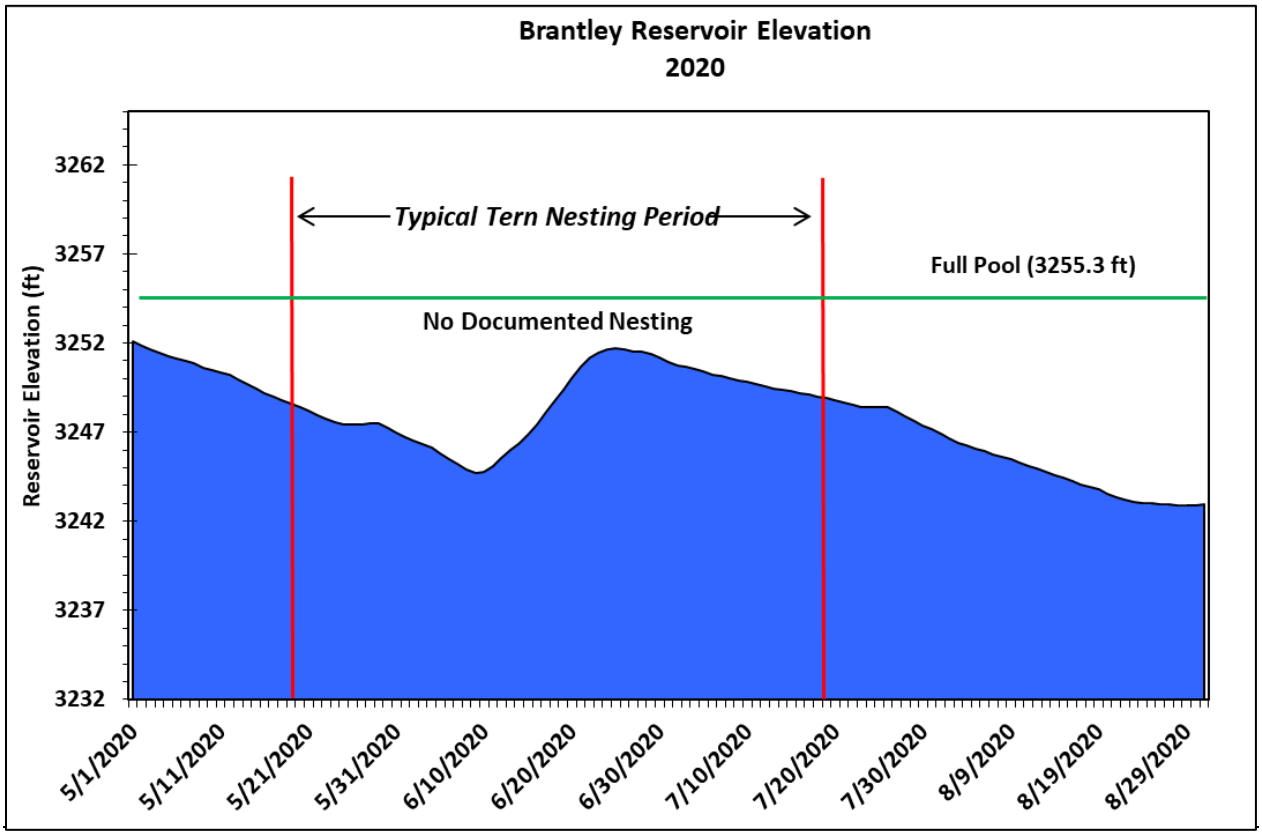

Figure 5: Brantley Reservoir 2020 Interior Least Tern Breeding Season

Survey dates and observation results for terns at Brantley Reservoir during the spring and summer of 2020 are presented in Table 3. Six terns were observed during the evening of June 11. They were never observed altogether but instead in groups of two or three at most. A presumed pair was observed during the following three visits, however no nest or nesting behavior was documented. With concurrence from the USFWS, tern surveys were discontinued after July 29, as it was past the end of the typical tern nesting season and limited shoreline habitat was available due to reservoir elevation.

Table 3. Summary of 2020 Interior Least Tern Observations at Brantley, New Mexico[1]

Date	Adult	Sub-Adult	Immature	Nests
May 24/25	0	0	0	0
June 3/4	0	0	0	0
June 11	6	0	0	0
June 12	2	0	0	0
June 17	2	0	0	0
June 18	2	0	0	0
June 24/25	0	0	0	0
June 30	0	0	0	0
July 1	0	0	0	0
July 8/9	0	0	0	0
July 15/16	0	0	0	0
July 22/23	0	0	0	0
July 28/29	0	0	0	0
2020 Totals	**12**	**0**	**0**	**0**

The two terns observed in mid-June were often seen loafing and flying together. One bird was observed carrying a small fish and appeared to display courtship behavior toward the other tern. However, this was only observed once. The pair did not seem focused on a particular area and covered much of the western side of the reservoir. They never acted defensively or made a nest scrape.

Similar to previous years, Brantley water levels fluctuated drastically over the course of the breeding season as a result of block releases from upstream reservoirs and releases for irrigation from Brantley. The arrival of the block release in mid-June essentially removed all potential tern nesting habitat. By the time receding of the reservoir exposed shoreline habitat in mid-July, it was likely too late for initiation of nesting efforts.

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 to avoid or minimize river intermittency and to acquire additional water for the Carlsbad Project to

[1] T. Barron and D. Moore. 2021 (in press). Interior Least Tern Monitoring Results 2020. Brantley Reservoir, New Mexico. Bureau of Reclamation, Albuquerque Area Office, NM.

offset reductions in Project water supply relative to historic operations caused by Reclamation's bypass and storage operations for ESA compliance.

Reclamation's Direct Flow Supplemental Water

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

In 2020, Reclamation stored 3,500 af of water (referred to as Forbearance) through a lease agreement with FSID, 5,000 af of water (referred to as Negotiated Credit), and 999 af of water (referred to as 2019 Credit) in Sumner Lake 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 the Negotiated Credit and 2019 Credit and 3,238 af of Forbearance water was released through Sumner Dam at the direction of Reclamation. The remaining 262 af of Forbearance water was given to the Carlsbad Project as described in the Sumner Dam Operations section above.

Reclamation has acquired groundwater through agreements with NMISC for the direct flow supplemental water. In 2020, NMISC, at Reclamation's direction, delivered 2,205 af of groundwater from the Fort Sumner Groundwater Basin to the Pecos River near the Taiban Gage via the Vaughan Conservation Pipeline (VCP). The maximum output from the VCP in 2020 was 9.62 cfs. The VCP delivered water from May 2 through May 29 and July 1 through October 23.

Due to the hydrologic conditions and to the other direct flow supplemental water acquired in 2020, Reclamation did not operate its Seven Rivers Wildlife Management Area wells for delivery to Brantley Reservoir in exchange for water in Sumner Lake (referred to as the Fish Conservation Pool or FCP).

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, NM, and Lake Arthur, NM. These 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 2020, Reclamation leased 1,197.9 af of surface water (referred to as River Pumper water), of which 507 af is from the Hagerman 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 in support of ESA compliance. The 2019 Agreement replaces multiple, sequential prior agreements that date back to 2008.

The Annual Accounting Methodology (AAM) used for Accounting Year 2020 was the Pecos River Operational Model, 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.

In Accounting Year 2020, Reclamation's operations in support of the 2017 BO resulted in a Net Credit of 1,619 af. The results for the AAM are summarized in Table 4 below.

Table 4: Annual Depletions and Offsets Accounting

Accounting Year	Depletions af	Credits af	Net Depletion (-) or Net Credit (+) af
2019	-259	+4,488	+4,228
2020	-1,327	+2,946	+1,619

With the 2020 Net Credit amount greater than 1,000 af and as agreed in Section 6(b) of the 2019 Agreement, Reclamation has requested CID's approval to transfer of 1,619 af to Santa Rosa or Sumer Reservoir for Reclamation's supplemental water use on May 1, 2021, or earlier. If Reclamation has not released the full 1,619 af by October 31, 2021, the remaining volume will revert to Carlsbad Project storage for use by CID.

Figure 5 below shows the cumulative depletions and credits of the supplemental water Reclamation adds to the Pecos River as directed by the 2017 BO. The labels on the graph indicate which supplemental water or modified Sumner operation dominates at a particular time of the Accounting year. Storage of Forbearance and bypass depleted Carlsbad Project supply. Carlsbad Project water supply was increased by Reclamation's nearly continuous release of Forbearance, Negotiated Credit, and 2019 Credit from Sumner, as well as by groundwater delivered through the VCP and the lack of pumping by the River Pumpers.

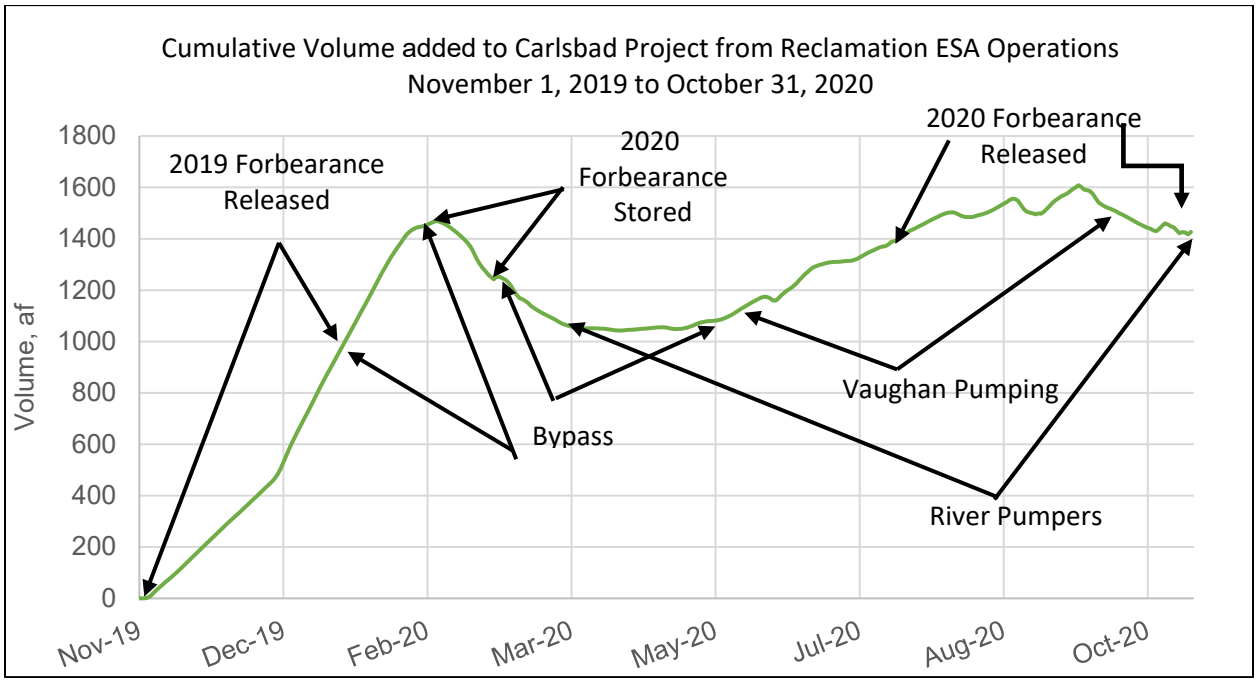

Figure 6: Cumulative Volume added to Carlsbad Project for Accounting Year 2020

Facility Review and Safety of Dams Programs

Reclamation reviews and examines the Carlsbad Project facilities following the Reclamation Manual Directives and Standards (FAC 01-07). The review/examination program for all high and significant hazard potential dams consists of annual site inspections (ASIs), periodic facility reviews (PFRs), comprehensive reviews (CRs), examinations of normally inaccessible features, and special examinations.

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 made for sound and beneficial suggestions to improve or enhance the O&M of the project or facility.

Sumner Dam

At the beginning of 2020, Sumner Dam had one incomplete Category 1 O&M recommendation related to the rehabilitation of the three radial gates and 18 incomplete Category 2 O&M recommendations. There was one new Category 2 O&M recommendation issued in 2020 from the ASI.

The Category 1 O&M recommendation will be addressed by replacing the Sumner Dam radial gates. From November 1 to April 30, the Carlsbad Project is normally authorized to store up to 20,000 af (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, pending current maintenance issues, Sumner storage is restricted to a maximum of 35,917 af until the Category 1 O&M recommendation has been completed. CID and Reclamation are developing a plan and will fund the work through a cost-share agreement. Reclamation is evaluating options to replace the gates and may solicit a contractor to perform the work. The radial gate replacement plan including costs and repayment by CID will be presented publicly and submitted to the CID Board of Directors in 2021, with the start of construction anticipated for 2023 or 2024.

In 2020, CID completed five Category 2 O&M recommendations. Of the 14 remaining incomplete Category 2 O&M recommendations, two are scheduled to be completed by CID in 2021, and four, related to the replacement or repair of the radial gates and associated concrete, are scheduled for completion in 2023. The remaining eight are contingent on an update to the Sumner Dam Standing Operating Procedures (SOP) which is scheduled for completion in 2023.

There were no significant security issues from the 2019 Security Tailored Assessment Reports (STAR). There were no significant security issues identified during the Annual Security Equipment Inventory (ASEI) in 2020.

Table 4. Sumner Dam Facility Reviews and Exams Dates

Review/Exam	Date of Last Review/Exam	Year of Next Scheduled Review/Exam
CR	2/6/2018	2026
PFR	4/1/2014	2022
STAR	9/8/2019	2024
ASI	8/10/2020	2021
ASEI	8/10/2020	2021

Brantley Dam

At the beginning of 2020, Brantley Dam had no incomplete Category 1 O&M recommendations and five incomplete Category 2 O&M recommendations. There were two new Category 2 O&M recommendations issued in 2020 from the ASI.

In 2020, CID completed three Category 2 O&M recommendations. Of the four remaining incomplete Category 2 O&M recommendations, two are scheduled to be completed by CID in 2021 and two are related to updating the Brantley Dam SOP, completed in 2020 with a 2021 publication date.

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 sinkhole survey was conducted in August 2015. The sinkholes appear to be filling in naturally and are more difficult to find during every survey.

There were no significant security issues from the 2019 STAR. There were no significant security issues identified during the 2020 ASEI.

Table 5. Brantley Dam Facility Reviews and Exams Dates

Review/Exam	Date of Last Review/Exam	Year of Next Scheduled Review/Exam
CR	2/7/2018	2026
PFR	4/2/2014	2022
STAR	9/9/2019	2024
Sinkhole Survey	8/2015	2023
ASI	8/9/2020	2021
ASEI	8/9/2020	2021

Avalon Dam

At the beginning of 2020, Avalon Dam had no incomplete Category 1 O&M recommendations and 12 incomplete Category 2 O&M recommendations. There were no new Category 1 or Category 2 O&M recommendations issued from the 2020 ASI.

In 2020, CID did not complete any O&M recommendations. Of the 12 incomplete Category 2 O&M recommendations, eight are related to the replacement or repair of the Avalon Dam river outlet works and the other four are related to updating the Avalon Dam SOP, scheduled for 2023.

The Avalon Dam river outlet works consist of two-cylinder gates, a hoist platform, and a walkway, which are 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. 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 glory holes and continue to use Brantley Dam to regulate the release of water to the Pecos River.

There were no significant security issues from the 2019 STAR. There were no significant security issues identified during the 2020 ASEI.

Table 6. Avalon Dam Facility Reviews and Exams Dates

Review/Exam	Date of Last Review/Exam	Year of Next Scheduled Review/Exam
CR	2/8/2018	2026
PFR	4/3/2014	2022
STAR	9/10/2019	2024
ASI	8/10/2020	2021
ASEI	8/10/2020	2021

Fort Sumner Project

The Fort Sumner Project includes one federal facility. Fort Sumner Diversion Dam (hereafter FSDD) is a Reclamation-owned dam, completed in 1951. This facility is about 14 river miles downstream of Sumner Dam, and diverts the FSID 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 United States 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 can 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 or 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 allotment 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 allotment has historically been diverted just prior to March 1.

In 2020, FSID began diverting water for irrigation on March 6 and ended on October 31. During the irrigation season, 0 to 100 cfs was bypassed through Sumner for FSID diversion based on the available water right and per their call. FSID diverted 44,024 af into the FSID main canal as recorded by the USGS Fort Sumner Main Canal gage near Fort Sumner, NM (USGS gage number 08385000, shown in Figure 7.) This year, FSID diverted flows less than 105 cfs arriving at their dam, and then released Reclamation's supplemental water call back to the river at the Sand Gate Diversion (USGS gage number 08385503). A total of 3,291 af were released back to the river at the Sand Gate. Of that, 74% was Reclamation's supplemental water and 26% was unused irrigation release.

FSID's total calculated allotment in 2020 was 48,927 af, including the winter allotment. Of that, 87% was called for and diverted, 7% was forborne under the lease agreement with Reclamation, and 6% was not called for and stored in Sumner for the Carlsbad Project.

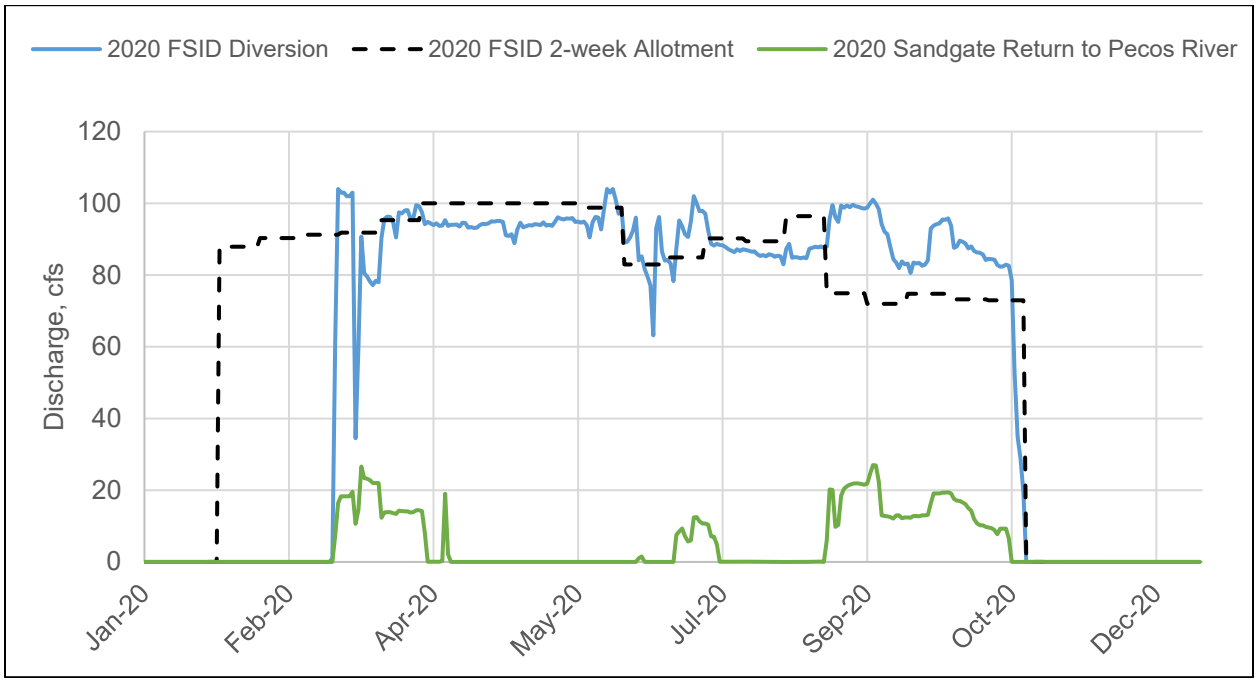

Figure 7: FSID Operations

In 2019, the USGS replaced the Sand Gate gaging station, moving it to a location with better hydraulic control approximately 250 feet downstream from the diversion inlet. Because the new location and gaging station are further away from the inlet structure, the turbulent flow at that location should no longer impact the gage reading.

Before the irrigation season began, the USGS reinstalled an acoustic doppler velocity meter (ADVM) gaging system on a track at the FSID Main Canal gaging station. This should raise the

ADVM above the level at which sediment accumulates. The track allows it to be removed for cleaning and maintenance. During the 2020 irrigation season, both a water stage recorder and the ADVM were recording flow in the Main Canal while a rating for the ADVM was established.

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 high and significant hazard potential dams described earlier in this report.

The 2015 RO&M examination of the FSDD 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 types of 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 will be published in 2021.

Related Reclamation Programs

Aquatic Invasive Species- Zebra and Quagga Mussels

Dreissenid mussels, including zebra mussel (*Dreissena polymorpha*)and quagga mussel (*Dreissena rostriformis bugensis*), are invasive, freshwater, bivalve mollusks. These aquatic invasive species (AIS) impair water infrastructure and are extremely costly to remove or to prevent attachment to surfaces. Dreissenid mussels proliferate, attach onto hard surfaces like dams, water intakes, pipes, and canals, and restrict the operation and maintenance of water storage, water delivery, irrigation, and hydropower infrastructure. 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 by 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 a direct role in the inspection and decontamination of watercraft. Reclamation manages invasive species through its Integrated Pest Management Program as well as various other authorities including the Fish and Wildlife Coordination Act of 1934. 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." In

New Mexico, Reclamation supports these AIS prevention activities by furnishing equipment and contractual support to the New Mexico Department of Game and Fish (NMDGF).

Reclamation has contracted AIS monitoring for the following:

- Decontamination of watercraft considered "high risk" as defined by the NMDGF
- Coordination with law enforcement for issuance and removal of red warning tags

In general, AIS watercraft inspection efforts have increased in New Mexico since 2013, with the total number of watercraft inspections statewide increasing from 9,346 in 2013 to 42,929 in 2020. Table 8 provides the number of watercraft inspections and decontaminations conducted in 2020 in coordination with the NMDGF at waterbodies in New Mexico.

Table 7. 2020 AIS Inspection Data (compiled by NMDGF and Reclamation)

Waterbody	Inspections	Decontaminations
Conchas Reservoir	2,371	4
Eagle Nest Lake	27	0
Elephant Butte Reservoir	18,188	44
Lake Farmington	2,990	1
Navajo Reservoir	14,554	99
NMDGF Office-ABQ	1	0
NMDGF Office-Santa Fe	5	1
Other Locations	2	0
Sumner Reservoir	164	0
Ute Lake	4,627	6
Totals	**42,929**	**155**

In 2008, Reclamation established an early detection and monitoring program and regularly conducts research to develop methods to monitor, control, and predict invasive mussel spread. Reclamation follows standard operating procedures and quality control and assurance practices, which are documented and available on the Reclamation website at: https://www.usbr.gov/mussels/index.html.

In 2020, Reclamation collected 48 water samples from seven of its New Mexico reservoirs (Navajo, Heron, El Vado, Elephant Butte, Caballo, Sumner, and Brantley). These samples were analyzed by microscopy and molecular methods, providing early detection, and can be used to trigger immediate containment action. In 2020, there were NO detections of invasive mussels or their markers 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 SECURE Water Act in 2009. 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 DOI is positioned to meet these challenges, the WaterSMART Program was established in February 2010. The Program's framework allows all

bureaus of the DOI 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 establishing a framework to provide 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 DOI's many offices.

As the DOI's primary 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 prudent water use decisions. Goals are achieved through administration of grants, scientific studies, technical assistance, and shared 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.

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 Strategy 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 Reuse Program
- Basin Study Program
    - West-Wide Risk Assessment activities
    - Baseline Assessments (previously called Impact Assessments)
    - Basin Studies
    - Reservoir Operations Pilots
    - Water Management Options Pilots
    - Applied Science Grants
    - Applied Science Tools

More information about all of 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. Ongoing or newly funded projects within the jurisdiction of the AAO in the Pecos Basin are listed in Table 9 at the end of this section.

WaterSMART Grants

Water and Energy Efficiency Grants

Through Water and Energy Efficiency Grants (WEEG, formerly Challenge 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 or automation in a specific part of a water delivery system, lining of 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.

Water Conservation Field Services Program

The Water Conservation Field Services Program (WCFSP) was established by Reclamation in 1996 to proactively encourage water operations conservation by recipients of 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 area and regional office levels, as well 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.

Cooperative Watershed Management Program

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

Watershed Group Development and Watershed Restoration Planning

In 2012, Reclamation began providing funding for watershed group development, restoration planning, and 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 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 $50,000 per year for a period of up to two years with no non-Federal cost-share requirement.

Implementation of Watershed Management Projects

In 2017, Reclamation began providing cost-shared financial assistance to watershed groups to implement watershed management projects (Phase II). 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 awards up to $100,000 per project over a two-year period. For Phase II projects, applicants must contribute at least 50% of the total project costs.

Drought Response Program

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

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 fundamental 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 is structured to help planners answer these questions and to encourage 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 provides funding for projects that will help communities better prepare and respond in times of water shortage. 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.

In 2020, an estimated 7,268 af of water was recycled through Title XVI projects in the AAO service area.

Basin Study Program

Reclamation's Basin Study Program represents a comprehensive approach to identifying and incorporating the best available science into adaptation planning for the growing gap between water supply and demand due to climate change and other factors. 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 Water Act. The Program includes: the West-Wide Risk Assessment (WWRA) Program (now referred to as Baseline Water Assessments), as well as the Basin Studies themselves, Basin Study updates, Water Management Option Pilots, Reservoir Operations Pilots, Applied Science Grants (to outside parties) and Applied Science Tools (internal Reclamation applied science projects). Further information about each of these sub-programs is provided below.

Baseline Assessments (formerly West-Wide Risk Assessments)

Reclamation conducts Baseline Water Assessments to develop water supply and demand projections for the Western U.S., with emphasis on Reclamation's service areas, as well as 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. In 2020, new projections of future conditions, as well as paleoclimate analyses to refine those projections, were developed by Reclamation, and will be published in the spring of 2021 on Reclamation's SECURE Water Act 2021 Report website. A summary report, which includes an overview of these projections, has been delivered to Congress and is currently available at: https://www.usbr.gov/climate/secure/

Basin Studies

Reclamation has entered partnerships with local water management agencies to perform basin studies. The studies seek to develop adaptation and mitigation strategies for watersheds affected by climate change. Basin studies require a 50% cost share by Reclamation's local water-management partners and involve considerable cooperation with other members of the water community in a basin.

Pecos River Basin Study – New Mexico

Reclamation and NMISC have completed the *Pecos River Basin Study – New Mexico*, currently in review in Reclamation's Washington D.C. Office pending public release. 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.

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/.

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 underway in 2020 related to the Pecos Basin include:

- 2018 Award – ongoing: *Improving the Robustness of Southwestern US Water Supply Forecasting in the Face of Climate Trends and Variability* (AAO partnership with National Center for Atmospheric Research [NCAR], Boulder, CO). The project seeks to improve forecasting for spring snowmelt runoff using a new model that provides ensembles of streamflow prediction based on current snowpack along with climate and weather drivers. Forecasts used to this point have been based only on snowpack and resulting streamflow in similar past years. This forecasting work, which will be tested in the Annual Operating Plan (AOP) for the Upper Rio Grande in 2021, has the potential to provide significant improvement to water supply and operational forecasts in the Pecos Basin.

- 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. The project uses a process called "weather typing" and statistical analyses to develop forecasts for summer monsoons in New Mexico, and will be tested in 2021. Although the anticipated results will not predict specific monsoon events, they will provide information on the likely strength of the monsoon season to support improved water supply planning.

In addition, through Reclamation's Power Resources Office, the AAO is partnering with the Department of Energy's National Renewable Energy Laboratory (NREL) on a project to evaluate the feasibility of, and considerations for, the installation of floating solar panels, or "floatovoltaics," on federal reservoirs to generate "green" electricity and reduce reservoir evaporation losses.

Table 8. Active WaterSMART Projects in the Pecos Basin Managed by the AAO[1]

Agreement No.	Program[2]	Completion Date	Recipient Name	Project Title	Federal Total Obligation Amount	Non-Federal Total Est Amount
R19AP00290	ASG	12/31/23	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
R17AP00217	SWEP	3/31/21	Guadalupe Soil & Water Conservation District	Acequia Restoration and Conservation Project	$67,500	$119,392
R19AP00221	SWEP	6/30/2021 tentative	Fort Sumner Irrigation District (Pecos River Basin)	Canal Flow Telemetry and Automatic Head Gate Project	$24,972	$24,971

[1] As of January 22, 2021
[2] ASG = Applied Science Grants
SWEP = Small-Scale Water Efficiency Project
Applied Science Grants = Part of Basin Study Program yet to be awarded