

RECLAMATION

Managing Water in the West

Calendar Year 2018 Report to the Rio Grande Compact Commission

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Albuquerque Area Office
Albuquerque, New Mexico

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Cover photo: Looking upstream along the Rio Grande just below the Rio Bravo Blvd. Bridge in Albuquerque, October 8, 2018. Reclamation and its partners worked hard to keep the river in this area continuous in 2018. (Carolyn Donnelly, Reclamation)

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Albuquerque Area Office
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List of Acronyms and Abbreviations

AAO.....	Albuquerque Area Office
ABCWUA.....	Albuquerque Bernalillo County Water Utility Authority
ac-ft	acre-feet
AIS	Aquatic Invasive Species
AM	adaptive management
ANWR	Alamosa National Wildlife Refuge
AOP.....	Annual Operations Plan
ARRC.....	Aquatic Resources and Recovery Center
ASR.....	Aquifer Storage and Recovery
ASI	Annual Site Inspection (Safety of Dams)
AWARDS	Agricultural Water Resources Decision Support
BA	Biological Assessment
BDANWR.....	Bosque del Apache National Wildlife Refuge
BIA.....	Bureau of Indian Affairs
BO	Biological Opinion
BLM.....	Bureau of Land Management
BWHA	Blanca Wildlife Habitat Area
CADSWES	Center for Advanced Decision Support for Water and Environmental Systems
CAS.....	Corrective Action Study
CERRO	Concentrate Enhanced Recovery Reverse Osmosis
cfs.....	Cubic Feet per Second
CMIP5.....	Coupled Model Intercomparison Project Phase 5
Coalition.....	Coalition of the Six Middle Rio Grande Basin Pueblos
CPUE	catch per unit effort
CPW	Colorado Parks and Wildlife
CR	Comprehensive Review

Cuckoo	Western Yellow-billed Cuckoo
CWCD.....	Conejos Water Conservancy District
CWMP	Cooperative Watershed Management Program
CY.....	Calendar Year
DCP.....	Drought Contingency Plan
DOMSAT	Domestic Communications Satellite
DSAT	Dam Sector Analysis Tool
DSIS.....	Dam System Information System
DSS	Data Storage System
EAP	Emergency Action Plan
EBID	Elephant Butte Irrigation District
EDW	Emergency Drought Water
EIS.....	Environmental Impact Statement
EOM.....	End of Month
EPCWID	El Paso County Water Improvement District No. 1
EPWU	El Paso Water Utilities
ESA.....	Endangered Species Act
ET.....	Evapotranspiration
FERC.....	Federal Energy Regulatory Commission
flycatcher.....	Southwestern willow flycatcher
FR.....	Federal Register
FRR.....	Facility Review Rating
FY	Fiscal Year
FW.....	Floodway
HCCRD.....	Hudspeth County Conservation and Reclamation District No. 1
HDB	Bureau of Reclamation's Hydrologic Database
IBWC	International Boundary and Water Commission
ITS.....	Incidental Take Statement
kWhr	kilowatt-hour
LACPP	Los Alamos County Power Plant
LCC.....	Landscape Conservation Cooperative
LFCC.....	Low Flow Conveyance Channel
LFSTP	Longitudinal Fill Stone Toe Protection
LOPP.....	Lease of Power Privilege
MAT.....	Minnow Action Team
MRCOG.....	Mid-Region Council of Governments
MRG	Middle Rio Grande
MRGCD.....	Middle Rio Grande Conservancy District
MRMPO.....	Mid-Region Metropolitan Planning Organization
MR&R.....	Maintenance Rehabilitation and Repair
NEPA	National Environmental Policy Act
NMDGF	New Mexico Department of Game and Fish
NMISC.....	New Mexico Interstate Stream Commission
NMOSE.....	New Mexico Office of the State Engineer
NMSP.....	New Mexico State Parks
NPS	National Park Service

NRCS	Natural Resources Conservation Service
OA	Rio Grande Project Operating Agreement
O&M	Operations and Maintenance
OVIC	Observation Visual Inspection Checklist
PAO	Provo Area Office
PCR	Polymerase Chain Reaction
PFR	Periodic Facility Review
P & P	Prior and Paramount
P.L.	Public Law
PSR	Periodic Security Review
RDLES	Reclamation Detection Laboratory for Exotic Species
Reclamation	Bureau of Reclamation
RGCC	Rio Grande Compact Commission
RGP	Rio Grande Project
RGWCD	Rio Grande Water Conservation District
RIO	River Integrated Operations
RM	River Mile
RWS	Regional Water System
SJ-C	San-Juan Chama
SL	standard length
SLL	San Luis Lake
SLVWCD	San Luis Valley Water Conservation District
SOD	Safety of Dams
SWFL	Southwestern willow flycatcher
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TRT	Technical Response Team
UC	Upper Colorado
URGSiM	Upper Rio Grande Simulation model
URGWOM	Upper Rio Grande Water Operations Model
USACE	U.S. Army Corps of Engineers
USDS	U.S. District Court
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WCFSF	Water Conservation Field Services Program
WEEG	WaterSMART Water and Energy Efficiency Grant
YOY	young of year
ZQM	quagga and zebra mussels

Introduction

The Albuquerque Area Office (AAO) of the Bureau of Reclamation (Reclamation) is responsible for operation, maintenance, and oversight of four projects on the mainstem of the Rio Grande and its upper basin tributaries. These projects are: the *San Luis Valley Project*, the *San Juan – Chama Project*, the *Middle Rio Grande Project*, and the *Rio Grande Project* (Figure 1).

The *San Luis Valley Project* consists of the Conejos and Closed Basin Divisions. The Conejos Division, which includes Platoro Dam and Reservoir, provides water for approximately 86,000 acres within the Conejos Water Conservancy District. The Closed Basin Division is a groundwater salvage project located near Alamosa, Colorado, which pumps water from the shallow unconfined aquifer primarily to assist Colorado in meeting its commitment under the Rio Grande Compact.

The *San Juan – Chama (SJ-C) Project* consists of a system of storage dams, diversion structures, tunnels, and channels for transbasin movement of water from the San Juan River Basin to the Rio Grande Basin as a component of the Colorado River Storage Project. The SJ-C Project provides water for municipal, domestic, industrial, recreation, fish and wildlife purposes, and supplemental water for irrigation. Another component of the project is the Pojoaque Irrigation Unit including Nambé Falls Dam. The Pojoaque Irrigation Unit provides water for approximately 2,800 acres in the Pojoaque Valley.

The *Middle Rio Grande Project* consists of El Vado Dam and Reservoir and irrigation and drainage facilities in the Middle Rio Grande Valley. The project also includes river channel maintenance from Velarde, New Mexico southward to Caballo Reservoir, and the Low Flow Conveyance Channel (LFCC) south of San Acacia, New Mexico. Irrigation water is provided to the Middle Rio Grande Conservancy District (MRGCD) which supplies water to 50,000 to 70,000 acres of land.

The *Rio Grande Project* includes Elephant Butte and Caballo Reservoirs and Percha, Leasburg, and Mesilla Diversion Dams. The Project stretches from the lower Rio Grande Valley of southern New Mexico to just south of El Paso, Texas. The Rio Grande Project provides an agricultural water supply for approximately 178,000 acres of land within the Elephant Butte Irrigation District (EBID) in New Mexico and the El Paso County Water Improvement District No. 1 (EPCWID) in Texas. Water is also provided for diversion to Mexico by the International Boundary and Water Commission (IBWC) - United States Section according to the terms of the Convention of 1906 between the United States and Mexico. Drainage waters from the Rio Grande Project lands provide a supplemental supply for approximately 18,000 acres of land within the Hudspeth County Conservation and Reclamation District No. 1 in Texas. Elephant Butte Dam also generates electrical power that is marketed by the Western Area Power Administration. Reclamation transferred title to the canal and drainage facilities to the districts in a 1996 quit claim deed.

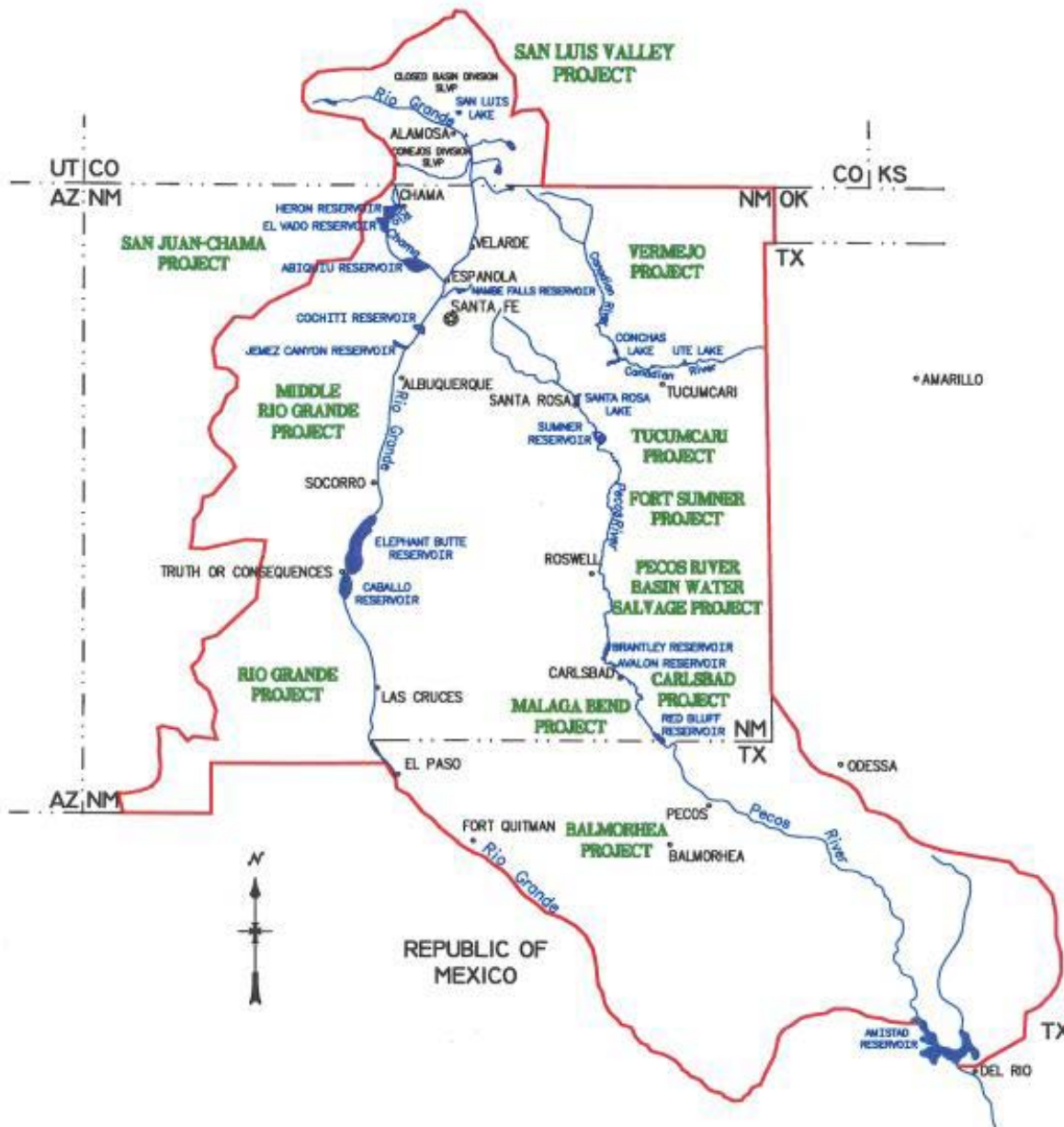


Figure 1: Map of Reclamation's Albuquerque Area Office Projects

San Luis Valley Project, Colorado

Conejos Division, Platoro Reservoir

The Conejos Water Conservancy District (CWCD) operates Platoro Reservoir, which provides storage for approximately 86,000 acres associated with the San Luis Valley Project (Figure 2). The CWCD’s office is located in Manassa, Colorado.

Platoro Reservoir started 2018 with a midnight water surface elevation of 9,988.47 feet, and a storage volume of 23,298 acre-feet (ac-ft), on January 1. The December 31, 2018, reservoir elevation was 9,981.31 feet, with a storage volume of 19,075 ac-ft. The minimum storage during calendar year 2018 occurred on October 1, 2018, at 19,317 ac-ft (9,981.74 feet). Maximum storage was on May 25, 2018, when the reservoir peaked at 25,070 ac-ft (9,991.28 feet). Article VII restrictions were not in effect between January 1 and May 19, 2018. Restrictions came into effect on May 20, 2018, and remained in place through the end of 2018.

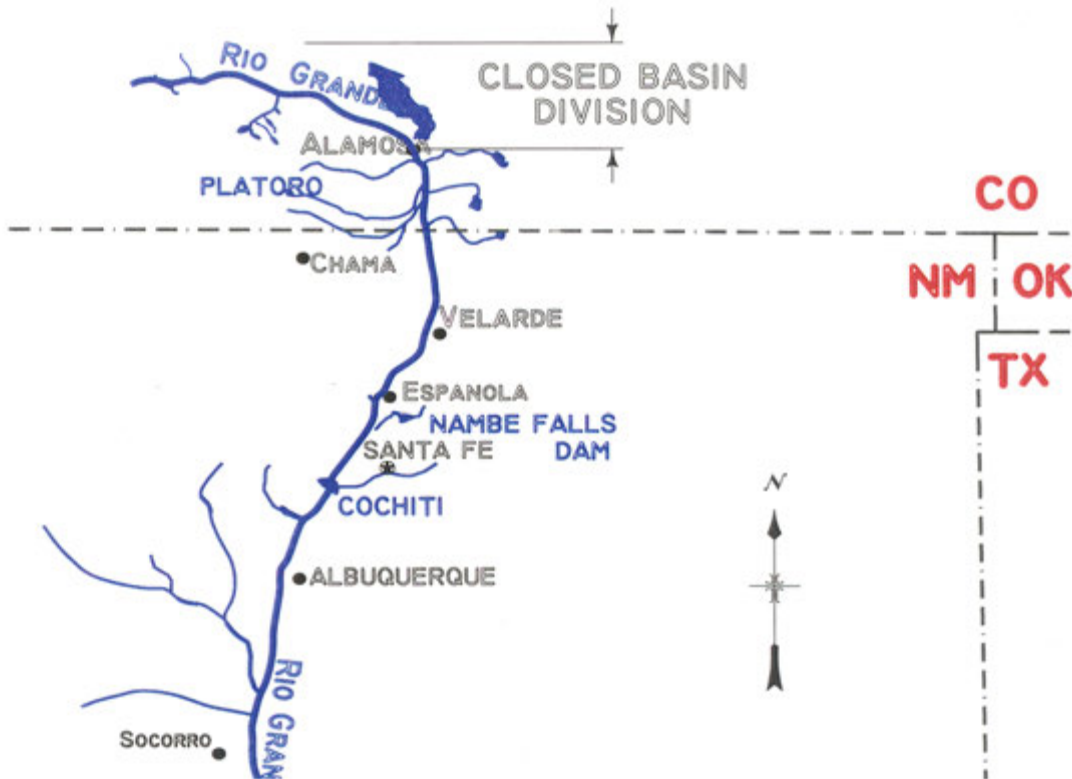


Figure 2: Area Map of San Luis Valley Project

Platoro Dam Facility Review and Safety of Dams Programs

Other than aging infrastructure, there are no significant dam safety-related Operations and Maintenance (O&M) issues associated with Platoro Dam and Dike. Currently there is one incomplete Category 2 O&M recommendation for Platoro Dam.

The Annual Site Inspection (ASI) was completed in August 2018. A Functional Exercise was completed in September 2018, and a new Emergency Action Plan (EAP) is expected as a result. The Facility Review Rating was updated in October 2018. The rating for Platoro Dam decreased from a 95 to a total score of 94, which still results in an overall rating of “Good.”

Closed Basin Division

The Closed Basin Project (CBP) is a water salvage project constructed in the San Luis Valley of Colorado (Figure 2). The purpose of the Project is to salvage unconfined groundwater from the Closed Basin that would otherwise be lost to evaporation and evapotranspiration. The salvaged water is pumped from up to 170 salvage wells and delivered through a conveyance channel to the Rio Grande to assist Colorado in meeting its commitment under the Rio Grande Compact. The project also delivers mitigation water to the Alamosa National Wildlife Refuge and Blanca Wildlife Habitat Area. Reclamation continues to work under the guidance of the Closed Basin Project Operating Committee in management of Project operations and water deliveries. The Rio Grande Water Conservation District (RGWCD) provides civil maintenance on the Project, while Reclamation operates and maintains the Project.

Operations

Deliveries by the Closed Basin Project in Calendar Year (CY) 2018 included deliveries to the Rio Grande, Blanca Wildlife Habitat Area (BWHA), and Alamosa National Wildlife Refuge (ANWR). A total of 10,209 ac-ft of Project water was delivered in CY2018.

Total delivery of Compact water to the Rio Grande for CY2018 was 6,808 ac-ft. This included 6,558 ac-ft delivered at the CBP canal outlet, in addition to 250 ac-ft delivered to the BWHA in an exchange with Colorado Parks and Wildlife (CPW). The Rio Grande Compact specifies that water delivered to the river cannot exceed 350 parts per million total dissolved solids, based on a ten-day average. All water deliveries to the Rio Grande met these water quality standards again in 2018. Table 1 compares total production and Compact deliveries in 2018 to quantities in the five preceding calendar years.

Table 1: Closed Basin Project Deliveries 2012-2018

Year	Total CBP Production (ac-ft)	Delivered to RG @ CBP Canal Outlet (ac-ft)	Delivered to RG by Exchange* (ac-ft)	Total Creditable Delivery to RG (ac-ft)
2018	10,209	6,558	250	6,808
2017	11,789	8,003	378	8,381
2016	12,095	8,469	242	8,711
2015	11,684	8,059	237	8,296
2014	11,213	7,598	228	7,826
2013	11,401	7,979	196	8,175

* CBP water delivered to BWA or San Luis Lakes State Wildlife Area (SWA) in exchange for other water sources delivered upstream to the RG.

Total water deliveries to the Bureau of Land Management's (BLM) BWA were 1,300 ac-ft. This includes 800 ac-ft for annual mitigation, 250 ac-ft from an exchange between BLM and CPW, and a 250 ac-ft donation of mitigation water from the ANWR.

Total water deliveries to the ANWR were 2,351 ac-ft, for project mitigation. This total includes their 2018 mitigation amount of 2,601 ac-ft, minus the 250 ac-ft donation to the BWA. Natural inflows to San Luis Lake (SLL) are measured at the SLL inlet flume and culverts. Inflow to SLL during CY2018 totaled 124 ac-ft. Closed Basin Division water accounting for the 2018 calendar year is summarized in Table 2.

Table 2: San Luis Valley Project - Closed Basin Division Water Accounting (units are acre-feet)

2018 MONTH	BLANCA WILDLIFE HABITAT AREA (BWAH)			PARSHALL FLUME		ALAMOSA NATIONAL WILDLIFE REFUGE (ANWR)				DELIVERY TO THE RIO GRANDE			PROJECT TOTALS
	CH03 STA. 730+00	CH04 STA. 798+60	MONTH TOTALS	Total Passing Flume	Creditable Amount @ Flume	CH01 Chicago Turnout	CH02 Mum Turnout	Pumping Plant	MONTH TOTALS	Total at Flume Minus Delivery to ANWR	Creditable Amt. to RG not used by ANWR	Non - Creditable @ Lobatos	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
JAN	0	0	0	934	934	0	0	0	0	934	934	0	934
FEB	3	3	6	807	807	12	12	0	24	783	783	0	813
MAR	125	121	246	766	766	223	195	0	418	348	348	0	1,012
APR	32	32	64	719	719	0	0	0	0	719	719	0	783
MAY	16	16	32	696	696	0	0	0	0	696	696	0	728
JUN	53	86	139	670	670	0	0	0	0	670	670	0	809
JUL	129	244	373	839	839	250	246	0	496	343	343	0	1,212
AUG	117	188	305	910	910	258	234	0	492	418	418	0	1,215
SEP	73	62	135	996	996	254	235	31	520	476	476	0	1,131
OCT	0	0	0	908	908	195	206	0	401	507	507	0	908
NOV	0	0	0	279	279	0	0	0	0	279	279	0	279
DEC	0	0	0	385	385	0	0	0	0	385	385	0	385
ANNUAL	548	752	1,300	8,909	8,909	1,192	1,128	31	2,351	6,558	6,558	0	10,209

Notes: 1. Delivery to BWAH includes: 250 ac-ft exchange from Colorado Parks and Wildlife (CPW) and 250 ac-ft transfer of mitigation water from ANWR. 2. Total creditable to Rio Grande from delivery and exchange = 6,558+250=6,808 ac-ft

The project continues to provide Priority 1 (Compact) and Priority 2 (mitigation) water deliveries. The San Luis Valley remains in a long-term drought. Since 2002, the water table in the unconfined aquifer has dropped significantly in some areas. Project salvage wells are operated to minimize aquifer impacts outside the Project and to insure sustainability of the closed basin aquifer. Salvage wells turned off at the recommendation of the Project Operating Committee remain off while monitoring nearby water levels.

Project pumping was reduced beginning October 16 at the request of the Operating Committee as Compact delivery obligations were nearing completion for 2018. A minimum canal flow of 5 cfs was delivered from October 16 to December 31 to maintain channel flow beneath the ice cap along the canal and to meet RGWCD Subdistrict #1 well depletion replacement obligations.

Maintenance

Routine preventive maintenance and repair activities continue at all observation and salvage wells, lateral line valves, canal structures, pumping plants, and canal and lateral access roads. Several miles of lateral roadways were upgraded and rehabilitated with additional road base material. All vehicles and heavy equipment were serviced according to their recommended maintenance interval.

Redrilling and rehabilitation of salvage wells is ongoing. In 2018, four salvage wells were redrilled, 24 wells were rehabilitated, and 14 new pumps were installed. Two of the well rehabilitations included replacing existing carbon steel well casing with new stainless steel casing and gravel pack into the existing borehole. In six of the rehabilitations, a PVC liner was installed inside the existing steel well casing because it had lost structural integrity due to corrosion.

All four redrilled wells were constructed using a glass bead filter pack with stainless steel casing. Although this is an expensive design, stainless steel casing will greatly increase the life of the well and the glass beads are intended to increase long term well productivity and reduce the need for frequent well rehabilitation. The performance of these wells will be closely monitored.

Water Quality

Water quality monitoring of Closed Basin Division salvage wells, the Rio Grande, San Luis Lake, Head Lake, and the conveyance channel continued with 1,298 samples collected in 2018.

The Water Quality Laboratory continues to support the Operations and Maintenance groups with their salvage well rehabilitation and bio-fouling mitigation efforts. Currently all salvage wells are monitored for the presence of iron-related bacteria.

The Water Quality Laboratory participated in the spring U.S. Geological Survey (USGS) Evaluation Program for Standard Reference Water Samples. The Laboratory continues to perform commendably on these audits.

Rio Grande Water Conservation District

RGWCD continues to perform civil maintenance on the Project through a cooperative agreement with Reclamation. The task divisions between RGWCD and Reclamation have been officially lifted and both crews are working closer than ever before.

RGWCD continues to assist with salvage well maintenance, rehabilitation, and drilling activities. Other work completed includes blading and mowing all canal berms and lateral access roads, removal of aquatic weeds and sediment from the canal and associated structures, repair and maintenance of right-of-way fences, and repair of erosion along the canal berms. RGWCD also assisted in vehicle and heavy equipment maintenance.

San Juan – Chama Project, Colorado – New Mexico

Water diverted from the San Juan Basin in Colorado through the San Juan – Chama (SJ-C) Project (area map shown in Figure 3) authorized by Congress in 1962 through Public Law (P.L.) 87-483, introduced special circumstances for water use and management in the Middle Rio Grande Valley. Imported SJ-C Project water must be accounted for separately from native Rio Grande flow.

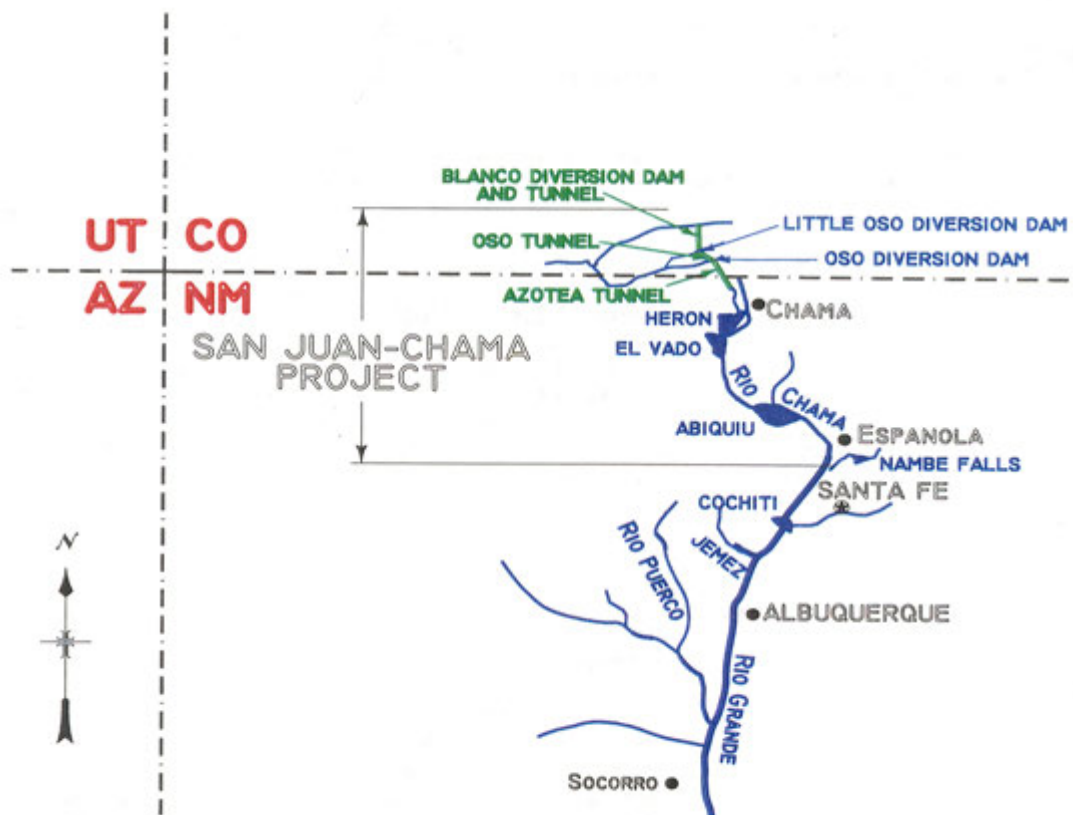


Figure 3: Area Map of the San Juan-Chama Project

San Juan - Chama Project Accounting

Reclamation is responsible for water contracts and accounting for the SJ-C Project. Accounting reports are generated with Crystal Reports®, which mines accounting data from Reclamation's hydrologic database (HDB). HDB is Reclamation's database of record. The data are computed in RiverWare® and sent to HDB via a Data Management Interface. Crystal Reports® has been used since 2013 to generate the SJ-C Project accounting report. SJ-C Project accounting for 2018 is provided in the separate *2018 Water Accounting Report*.

Heron Dam and Reservoir Operations

Diversions into the Azotea Tunnel began on March 9 and continued until November 12, 2018. The total volume diverted through the tunnel was 34,377 ac-ft. The running 10-year average of Azotea Tunnel diversions decreased significantly this year, from 93,347 ac-ft for the period 2008 through 2017, to 82,786 ac-ft for the period 2009 through 2018 (Table 3).

Table 3: SJ-C Project - Diversions through Azotea Tunnel (units are acre-feet)

AZOTEA	YEAR										10 YEAR TOTAL
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
MONTH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
JANUARY	0	0	0	0	0	0	28	109	0	0	137
FEBRUARY	272	0	0	0	0	227	974	1,917	1,488	0	4,878
MARCH	5,938	546	2,008	7,014	1,036	1,984	6,890	6,489	16,839	1,598	50,342
APRIL	19,111	21,908	13,570	18,133	7,068	13,808	8,163	13,687	32,628	12,869	160,945
MAY	51,766	35,368	22,315	17,032	16,844	20,251	24,470	27,940	45,326	15,616	276,928
JUNE	23,544	27,249	42,779	4,037	8,387	18,851	38,438	35,427	46,227	2,636	247,575
JULY	4,392	1,815	8,404	670	511	1,550	8,581	3,535	10,617	152	40,227
AUGUST	232	1,501	1,594	260	3,115	788	889	3,681	4,809	7	16,876
SEPTEMBER	99	712	1,852	76	4,930	902	126	1,271	1,806	0	11,774
OCTOBER	0	251	4,452	0	2,761	1,334	811	253	2,413	1,216	13,491
NOVEMBER	0	53	1,295	0	1,049	335	862	0	279	283	4,156
DECEMBER	0	0	52	0	59	0	334	0	90	0	535
ANNUAL	105,354	89,404	98,321	47,222	45,760	60,030	90,566	94,309	162,522	34,377	827,864

Heron Reservoir began the year at elevation 7,130.75 feet (146,650 ac-ft). The reservoir fell to its lowest elevation of the year, 7,090.60 feet (56,294 ac-ft), on December 23 and remained there until December 30. The next day it rose to 7,090.61 feet (56,308 ac-ft), finishing 2018 at that elevation. It reached a maximum elevation of 7,137.10 feet (168,197 ac-ft) from June 12 to 19, 2018.

An initial allocation to the SJ-C Project contractors of 55,000 ac-ft was made in January 2018. Subsequent allocations were made in April, May, and June, but, due to poor runoff, a full allocation was not made by the end of the year. The 2018 allocation was approximately 89% of a full allocation.

The SJ-C Project contractors' 2018 and waived 2017 annual allocations were delivered as shown in Table 4, for a total delivery of 117,349 ac-ft. The remaining 2018 allocations are being held in Heron according to waivers, which grant an extension of the delivery date into 2019.

Both MRGCD's 2017 and 2018 SJ-C Project allocations were released from Heron in 2018. In 2017, Reclamation issued a waiver to MRGCD allowing them to carryover their 2017 allocation

in Heron into 2018. This was done to help keep El Vado Reservoir below the elevation of 6,875 feet, which triggers additional monitoring.

Table 4: SJ-C Project – Water Releases from Heron Reservoir (units are acre-feet)

SJ-C HERON RELEASE	MARGCD	SANTA FE	SANTA FE COUNTY	COCHITI	CITY OF ALBUQUERQUE	POJOAQUE UNIT	TAOS	COUNTY OF LOS ALAMOS	CITY OF ESPAÑOLA	TAOS SKI VALLEY	VILLAGE OF LOS LUNAS	TOWN OF BERNALILLO	BELEN	RED RIVER	JICARILLA APACHE	OHKAY OWINGEH	RECLAMATION	EL PRADO	TAOS PUEBLO	AAMODT SETTLEMENT	TOTAL
MONTH																					
ALLOCATION	20,900	5,230	375	4,290	48,200	1,030	766	1,200	1,000	15	400	400	500	60	6,500	2,000		40	2,215	1,079	96,200
JANUARY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	534	0	0	0	534
FEBRUARY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,802	0	0	0	5,802
MARCH	149	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,394	0	0	0	1,543
APRIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JUNE	1,426	23	0	0	0	0	0	0	0	0	200	200	200	0	0	0	1,565	0	0	0	3,614
JULY	20,456	0	0	0	5,358	0	0	0	0	0	0	0	0	0	0	0	4,184	0	0	0	29,998
AUGUST	14,969	0	0	0	15,556	0	0	0	0	0	0	0	0	0	0	0	2,380	0	0	0	32,905
SEPTEMBER	3,984	5,107	0	16	24,905	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34,013
OCTOBER	1,726	0	0	2,672	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,398
NOVEMBER	333	0	0	1,150	0	800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,283
DECEMBER	0	0	162	0	0	121	0	0	0	12	0	0	0	0	0	0	1,964	0	0	0	2,259
2018 CY TOTAL	43,043	5,130	162	3,838	45,819	921	0	0	0	12	200	200	200	0	0	0	17,823	0	0	0	117,349

Table 5 presents actual monthly Heron water operations for calendar year 2018.

Table 5: SJ-C Project – Monthly Water Storage in Heron Reservoir (units are acre-feet)

HERON STORAGE	INFLOW		OUTFLOW		SAN JUAN CHAM A LOSS	END-OF-MONTH CONTENT			ELEVATION (FEET)
	RIO GRANDE	SAN JUAN CHAMA	RIO GRANDE	SAN JUAN CHAMA		RIO GRANDE	SAN JUAN CHAMA	TOTAL	
MONTH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DEC. 2017						354	146296	146650	7130.75
JANUARY	87	0	87	534	240	4	145872	145876	7130.51
FEBRUARY	77	0	81	5802	121	0	139949	139949	7128.64
MARCH	84	1598	84	1543	86	0	139918	139918	7128.63
APRIL	84	12843	84	0	448	0	152313	152313	7132.48
MAY	501	15585	93	0	1669	408	166229	166637	7136.66
JUNE	645	2631	92	3614	1820	961	163425	164386	7136.02
JULY	87	152	698	29998	790	350	132789	133139	7126.42
AUGUST	73	7	73	32906	1385	350	98505	98855	7113.68
SEPTEMBER	51	0	51	34013	460	350	64032	64382	7095.98
OCTOBER	40	1216	40	4397	181	350	60670	61020	7093.82
NOVEMBER	36	283	36	2283	390	350	58280	58630	7092.22
DECEMBER	35	0	35	2259	63	350	55958	56308	7090.61
SUB-TOTAL	1,800	34,315	1,454	117,349					
ADJUSTMENT						-350			
ANNUAL		36,115		118,803	7,653	0	56,308	56,308	

Note that 350 ac-ft of native Rio Grande water is annually retained in Heron to cover water use by New Mexico State Parks at their facilities under a water right they hold by exchange.

Heron Dam Facility Review and Safety of Dams Programs

There are no significant dam safety-related operations and maintenance issues associated with Heron Dam and Dike other than aging infrastructure. Currently, there are five incomplete Category 2 Operations and Maintenance recommendations for Heron Dam and Dike.

The Annual Site Inspection was completed in July 2018. The required annual elevator inspections were completed in the fall of 2018.

The Facility Review Rating (FRR) was updated in September 2018. The total score for Heron is 84, which results in an overall rating of “Good.”

Pojoaque Tributary Unit - Nambé Falls Dam and Reservoir

Nambé Falls Reservoir began 2018 with an elevation of 6,825.14 feet (1,649 ac-ft). The reservoir filled and spilled during the year. The maximum elevation for the year was 6,826.64 feet (1,731 ac-ft) on April 7 and 8. The reservoir initially filled in mid-March and remained full

until May 1, when irrigation releases began and reservoir storage and elevation started falling. Releases continued through June 28. The reservoir reached a minimum elevation at 6,801.28 feet (656 ac-ft) shortly thereafter on July 5. The reservoir ended 2018 at elevation 6,821.25 feet (1,447 ac-ft).

Cyclical operations of Nambé Falls Reservoir consist of non-irrigation and irrigation season operations. During non-irrigation season (November through April), all inflow in excess of the bypass requirement of 0.5 cfs is stored until an elevation of 6,825.60 feet is reached. Once that elevation is attained, the outlet gates are regulated weekly to stabilize the reservoir at 6,825.60 feet, or an elevation determined by 100 percent ice cover. An uncontrolled spill begins at elevation 6,826.60 feet, which is the top of the spillway crest. During irrigation season (May through October), water is stored and released on demand to meet downstream requirements.

In 2015, there was an error in the calculation for the net effect of Nambé Falls Reservoir on the Rio Grande. This resulted in a release from Heron Reservoir that was 703 ac-ft less than the depletion. A portion of that 703 ac-ft was made up in 2016. The calculated depletion in 2016 was 1,010 ac-ft, but 1,310 ac-ft was released from Heron. With losses factored in, the 2016 release was 278 ac-ft greater than what was needed, reducing 2015's 703 ac-ft deficit to 425 ac-ft. In 2017, the Otowi depletion added a net deficit of 6 ac-ft making the running deficit 431 ac-ft. The 2018 Otowi depletion was calculated to be 627 ac-ft. The 2018 release was 921 ac-ft making the new running deficit 137 ac-ft.

Table 6 includes a summary of Nambé Falls use above Otowi and the Pojoaque Unit return flow credit used to calculate depletions during 2018 (columns 7 and 8). A summary of 2018 Nambé Falls Reservoir operations is provided in Table 7.

Table 6: San Juan-Chama Project – SJ-C Water at Otowi (units are acre-feet)

SJ-C AT OTOWI	RELEASE FROM HERON	HERON RELEASE STORED IN EL VADO	RELEASE FROM EL VADO	TOTAL BELOW EL VADO	RELEASE FROM OR STORAGE IN ABIQUIU	TRANS LOSSES	NAMBE FALLS USE ABOVE OTOWI	RETURN FLOW CREDIT - POJOAQUE UNIT	SAN JUAN WATER AT OTOWI
MONTH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
JANUARY	534	0	7,039	7,573	-3,934	116	62	21	3,482
FEBRUARY	5,802	446	0	5,355	-3,601	75	16	47	1,711
MARCH	1,543	0	1,696	3,239	-902	57	54	28	2,254
APRIL	0	0	639	639	5,452	62	34	17	6,012
MAY	0	0	2,318	2,318	6,912	109	19	17	9,119
JUNE	3,614	0	4,181	7,795	11,531	260	11	74	19,130
JULY	29,998	0	8,175	38,173	4,661	805	186	95	41,938
AUGUST	32,906	3,223	0	29,683	6,741	654	94	32	35,708
SEPTEMBER	34,013	1,767	0	32,246	-9,293	561	62	27	22,356
OCTOBER	4,397	0	2,399	6,797	7,216	201	124	25	13,713
NOVEMBER	2,283	274	0	2,009	874	48	221	24	2,637
DECEMBER	2,259	1,985	0	274	2,514	28	166	18	2,613
ANNUAL	117,349	7,695	26,447	136,101	28,171	2,976	1,049	425	160,673

Table 7: SJ-C Project – Monthly Water Storage in Nambé Falls Reservoir (units are acre-feet)

NAMBÉ FALLS MONTHLY	INFLO W	OUTFLOW			RESERVOI R LOSSES	TOTAL OUTFLO W + LOSSES	END OF MONTH	
		BYPASSED	STORAGE RELEASE				CONTEN T	ELEVATIO N
MONTH			OPERATIO NAL	IRRIGATIO N				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DEC. 2017							1,649	6,825.14
JANUARY	244	182	0	0	4	186	1,707	6,826.22
FEBRUARY	218	199	27	0	5	232	1,693	3,825.96
MARCH	277	218	9	0	13	241	1,729	6,826.61
APRIL	306	264	0	15	26	306	1,729	6,826.61
MAY	194	155	0	499	29	683	1,240	6,816.93
JUNE	97	71	0	571	20	662	675	6,801.90
JULY	314	128	0	22	2	152	837	6,806.94
AUGUST	209	116	0	0	4	119	927	6,809.43
SEPTEMBER	189	125	0	7	9	141	975	6,810.69
OCTOBER	305	179	0	35	0	215	1,065	6,812.93
NOVEMBER	272	51	0	0	5	56	1,281	6,817.82
DECEMBER	223	57	0	0	0	57	1,447	6,821.25
ANNUAL	2,848	1,745	36	1,149	117	3,050		

Nambé Falls Dam Facility Review and Safety of Dams Programs

There are no significant dam safety-related Operations & Maintenance (O&M) issues associated with Nambé Falls Dam other than aging infrastructure. Currently, there is one incomplete Safety of Dams (SOD) recommendation and four incomplete Category 2 O&M recommendations for the Dam.

Several O&M recommendations were developed during the fiscal year (FY) 2013 Comprehensive Review (CR). The recommendations were intended to improve management of sediment and woody debris entering the reservoir as a result of the 2011 Pacheco Canyon Fire. The 2017 Periodic Facility Review found that these recommendations had been completed.

The Annual Site Inspection was completed in July 2018. A Functional Exercise was completed in September 2018, and a new Emergency Action Plan (EAP) is expected as a result. The Facility Review Rating was updated in September 2018. The rating for Nambé Falls Dam is a 91, which gives the facility an overall rating of “Good”.

2019 San Juan - Chama Project Outlook

On December 31, 2018, Heron Reservoir had 1,514 ac-ft of SJ-C Project storage. This amount is well below the calculated firm yield of 96,200 ac-ft, and is insufficient for a full, or even a partial, initial allocation. Heron Reservoir’s dead pool, which is water that cannot be drained by gravity through the outlet works, is 1,218 ac-ft. Allocations must leave sufficient water in SJ-C Project storage to cover both the dead pool and anticipated reservoir evaporation from January 1

until runoff begins in the spring, usually during March. Therefore, contractors were notified on January 15, 2019, that there would be no initial allocation in 2019.

Water scarcity was contemplated in the SJ-C Project authorization, and all SJ-C Project water contracts state that “when the actual available water supply may be less than the estimated firm yield, [contractors] shall share in the available water supply in the ratio that the above allocation bears to the firm yield.” Subsequent allocations will be made monthly beginning in April. They will continue until December 15, unless a full allocation is made earlier.

Middle Rio Grande Project, New Mexico

The *Middle Rio Grande Project* (Figure 4) is operated out of the AAO, with support provided by the Chama Field Division for operations and maintenance of northern facilities. The Socorro Field Division performs construction throughout the project area.

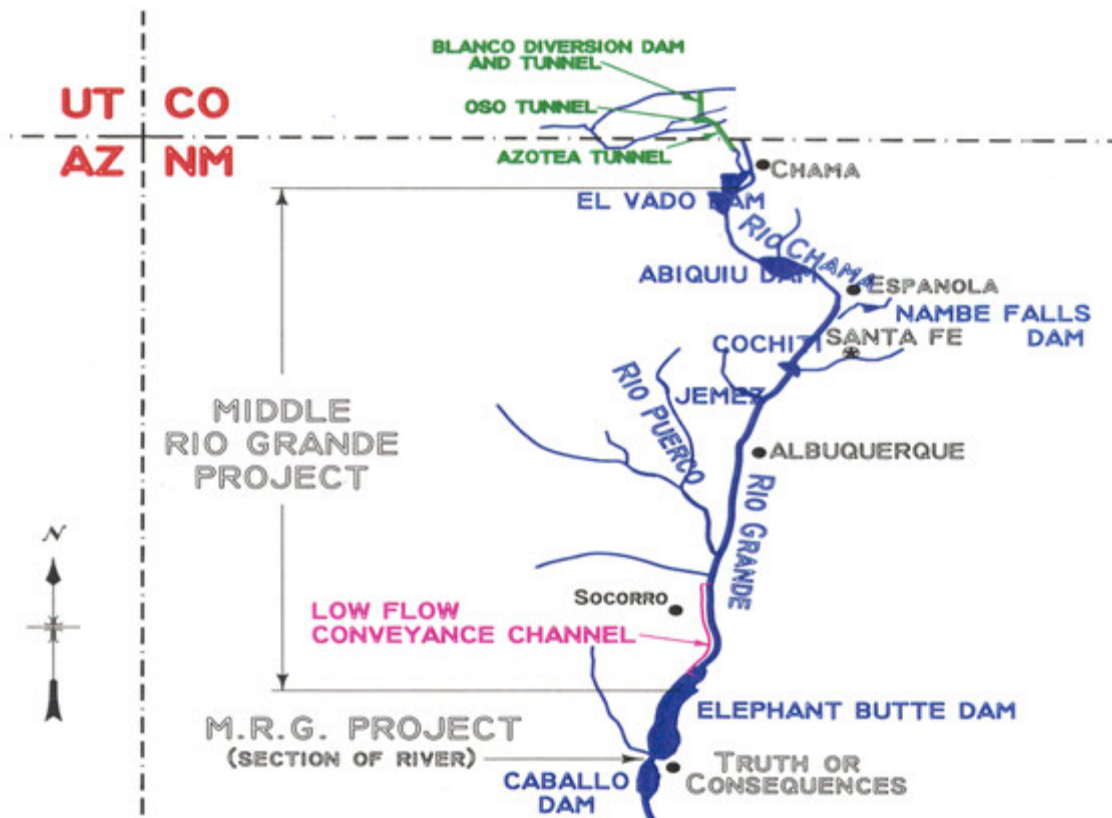


Figure 4: Area Map of the Middle Rio Grande Project

Article VII

Since 2011, the three Rio Grande Compact states have not been able to reach consensus on the appropriate Compact accounting method. Because of that, Compact accounting has not been finalized since that year, and multiple accounting sheets are maintained. From 2011 to 2015, each state maintained its own accounting sheets. Since 2016, only two methods have been published: method 1, advocated by Texas, and method 2, advocated by New Mexico and supported by Colorado.

The Commission determines final Compact accounting, while Reclamation performs daily accounting of SJ-C Project and native Rio Grande water on the Rio Grande in New Mexico, including the composition of water in reservoirs from Heron to Caballo. This accounting is needed to make day-to-day water operations decisions.

To perform this accounting, Reclamation utilizes the interagency Upper Rio Grande Water Operations Model (URGWOM). Methods in URGWOM are consistent with accounting method 1 presented in various addendums to the Commission Reports since 2011.

New Mexico began 2018 with a 6,400 ac-ft credit under accounting method 1, and a 700 ac-ft debit per method 2. Colorado began 2018 with a 300 ac-ft debit under method 1, and a 400 ac-ft debit per accounting method 2.

In the URGWOM, an account with any non-zero value continues to be assessed gains and losses. An account with a negative value could therefore end the year with a greater negative value than it began the year with. This means an account with no wet water would be incorrectly assessed a portion of actual reservoir gains and losses.

Accordingly, Colorado's account in Elephant Butte Reservoir was given a value of zero, rather than a negative value, in the 2018 model. Hence the only credit water accounted for in Elephant Butte was the 6,400 ac-ft of accrued credit with which New Mexico began 2018 per accounting method 1. All numbers following reference accounting method 1 only.

Per the Rio Grande Compact Article I definition, the usable water in Rio Grande Project (RGP) storage (Elephant Butte and Caballo Reservoirs combined) began 2018 at 456,662 ac-ft on January 1, 2018, and ended the year at 136,502 ac-ft. It reached a high for the year on March 14 at 531,110 ac-ft. It fell below 400,000 ac-ft on May 20, 2018.

Article VII of the Rio Grande Compact stipulates that when usable water in RGP storage is below 400,000 ac-ft, no native Rio Grande water will be stored in post-1929 reservoirs upstream of Elephant Butte Reservoir unless accrued credit has been relinquished. Reclamation also stores native water for use on Prior and Paramount (P&P) lands while under Article VII. Storage of native water for relinquishment credit and irrigation of P&P lands began on January 1, 2018, outside of Article VII restrictions.

Between January 1 and May 20, when Article VII restrictions came into effect, 21,493 ac-ft of native Rio Grande water was stored in El Vado Reservoir. MRGCD began 2018 with 65,857 ac-ft of SJ-C Project water and 39,840 ac-ft of native water stored outside of Article VII restrictions in 2017. Because of that supply, and also because of the low runoff volume in 2018, MRGCD did not request that any of its relinquishment credit water allocation be stored in 2018.

Reclamation received the final call for P&P storage of 45,495 ac-ft from the Bureau of Indian Affairs (BIA) in mid May 2018. At that time, only 21,493 ac-ft of native water had been stored in El Vado. On May 19, that water, as well as 24,002 ac-ft of native water stored in 2017, was transferred to the P&P account in El Vado. All of the transferred water was stored outside of Article VII restrictions. Per an agreement between MRGCD and the Coalition of the Six Middle Rio Grande Basin Pueblos (Coalition), the entire volume was subsequently released to MRGCD for general irrigation use, and MRGCD's SJ-C Project water in storage in Heron was reserved for P&P use.

All daily operations decisions were made using provisional data available at the time of the decision. Because of that, reservoir storage in the final accounting model, which uses final approved data, may differ from reservoir storage used to make a daily operational decision. Hence, the dates mentioned above may differ from those determined using final 2018 data.

New Mexico Relinquishment of Rio Grande Compact Credit

On January 1, 2018, neither Reclamation, the New Mexico Interstate Stream Commission (NMISC), nor the MRGCD had any relinquishment credit, or Emergency Drought Water (EDW), in storage in El Vado Reservoir. No EDW was captured in El Vado for the benefit of any party in 2018.

The New Mexico State Engineer allocated 19,000 ac-ft of EDW to Reclamation. Reclamation subsequently reached an agreement with the Albuquerque Bernalillo County Water Utility Authority (ABCWUA), granting them 5,000 ac-ft as repayment for water released during the early 2000s under an Agreed Order. A new multi-party Emergency Drought Water Agreement was established in 2016. In this new agreement, MRGCD agreed to jointly manage the EDW allocated to Reclamation for the sole purpose of Endangered Species Act (ESA) compliance. The balance of EDW available for capture and storage during 2019 or future years is 14,000 ac-ft by Reclamation, 5,000 ac-ft by ABCWUA, 13,000 ac-ft by NMISC, and 53,767 ac-ft by MRGCD.

El Vado Dam and Reservoir Operations

El Vado Reservoir began 2018 at an elevation of 6,854.91 feet (73,693 ac-ft), and ended the year at 6,805.45 feet (13,957 ac-ft). The low point for 2018 was on July 30, at 6,798.50 feet (9,344 ac-ft), and the peak was on April 20 at an elevation of 6,860.85 feet (84,418 ac-ft).

MRGCD began the year with 39,843 ac-ft of native Rio Grande water in storage in El Vado for Middle Valley irrigation, all of which was stored in 2017 while Article VII restrictions were not in place. In 2018, Article VII restrictions went into effect on May 20. Please refer to the *Article VII* section for more details about Article VII timing. Between January 1 and May 19, 2018, 21,493 ac-ft was stored outside of Article VII restrictions.

MRGCD also started 2018 with 29,733 ac-ft of SJ-C Project water in El Vado from previous years' allocations. There was enough Project storage in Heron Reservoir to make a January allocation of 11,949 ac-ft to the MRGCD, but by the end of 2018 the abysmal runoff did not allow for the full allocation of 20,900 ac-ft. The final allocation was 18,867 ac-ft or 90% of a full allocation. In order to maintain a lower reservoir elevation during the high runoff year of 2017, their 2017 allocation had been waived in Heron and was delivered to El Vado by early August 2018.

At the end of 2018, MRGCD had no native storage in El Vado. The reservoir did have 160 ac-ft of incidental storage that was released in the first few days of 2019. MRGCD ended the year

with 1,263 ac-ft of SJ-C Project storage. In 2018, no EDW was stored for MRGCD. In addition, MRGCD had no SJ-C Project water stored in Abiquiu as of December 31.

El Vado was once again used as a re-regulating reservoir for water moving between Heron and Abiquiu in order to simplify operations and have water available for multiple purposes. The City of Santa Fe and the ABCWUA moved some of their 2017 SJ-C Project allocation out of Heron and into El Vado late in the year. That water (5,077 ac-ft and 5,249 ac-ft, respectively, on December 31) will be used to maintain winter flows between El Vado and Abiquiu while allowing native inflows to be captured for P&P storage. A similar action was conducted in 2018, where 4,028 ac-ft of ABCWUA water was used to provide winter flows. The MRGCD also paid back 5,000 ac-ft of SJ-C Project water to the ABCWUA from which it had borrowed water years ago.

A request of 45,495 ac-ft for P&P irrigation was made by the Bureau of Indian Affairs (BIA) in May. Due to the extremely low runoff in 2018, only 21,493 ac-ft of native water stored in 2018 was available. On May 19, that volume as well as 24,002 ac-ft stored in 2017 while out of Article VII restrictions were transferred to the P&P account in El Vado. The Coalition of Six Middle Rio Grande Basin Pueblos and the MRGCD subsequently reached an agreement to allow the release of that native water to MRGCD for general irrigation use, while setting aside the MRGCD's SJ-C water in Heron as a "P&P reserve." As the season progressed and BIA's calculated amount of water needed to insure P&P irrigation decreased, that unneeded water became available for general MRGCD use.

El Vado total storage at the end of the year was 13,957 ac-ft (6,805.45 feet). It was comprised of 1,263 ac-ft of SJ-C Project water held by the MRGCD, 5,249 ac-ft held by ABCWUA, 5,077 ac-ft held by the City of Santa Fe, 162 ac-ft held by the County of Santa Fe, 1,964 ac-ft held by Reclamation, and 82 ac-ft held for Santo Domingo Pueblo. The content also included 160 ac-ft of incidentally stored native Rio Grande. Table 8 provides a summary of monthly operations and water accounting for El Vado Reservoir.

Table 8: Reservoir Operation for El Vado Dam (units are acre-feet)

EL VADO RESERVOIR OPERATION	INFLOW		OUTFLOW		LOSSES		EOM CONTENT		
	RIO GRANDE	SAN JUAN - CHAMA	RIO GRANDE	SAN JUAN - CHAMA	RIO GRANDE	SAN JUAN - CHAMA	RIO GRANDE	SAN JUAN - CHAMA	TOTAL
MONTH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DEC. 2017	4518	0	19965	1812	70	30	39843	33850	73693
JANUARY	2694	534	163	7484	91	23	42284	26788	69072
FEBRUARY	2846	5802	154	5355	123	15	44852	27220	72072
MARCH	5109	1543	1656	3239	184	57	48122	25467	73589
APRIL	38210	0	27419	639	366	118	58547	24710	83257
MAY	17374	0	42556	2318	300	167	33065	22225	55290
JUNE	4234	3614	37348	7795	-49	264	0	17779	17779
JULY	3715	29998	3906	38173	-191	193	0	9411	9411
AUGUST	3168	32906	3408	29683	-239	205	0	12429	12429
SEPTEMBER	3426	34013	3667	32246	-241	218	0	13978	13978
OCTOBER	3451	4397	3021	6797	181	21	249	11558	11807
NOVEMBER	3131	2283	3052	2150	10	42	319	11649	11968
DECEMBER	2572	2259	2651	133	80	-22	160	13797	13957
ANNUAL	89,930	117,349	129,001	136,012	615	1301			

El Vado Dam Facility Review and Safety of Dams Programs

The ongoing El Vado Corrective Action Study (CAS) focuses on potential hydrologic failure modes of the service spillway and embankment. The CAS was originally initiated by recommendation 2009-SOD-A, which focused specifically on the service spillway erosion mode. Recommendation 2009-SOD-A was later deleted and replaced by recommendation 2011-SOD-A, which expanded the CAS scope to include all potential hydrologic failure modes.

A new CAS was initiated in July 2017 with the introduction of recommendation 2017-SOD-A, which will develop a preferred alternative to reduce the risk of failure due to internal erosion. Because of this new recommendation, the final design for the spillway CAS has been delayed until the final internal erosion risk reduction alternative design is chosen.

The Hydrologic Failure CAS began in August 2011. The Internal Erosion CAS began in July 2017. The Draft Hydrologic Failure Corrective Action Study Report was delayed, awaiting a decision on the Internal Erosion CAS.

The CAS, recommended by 2011-SOD-A and 2013-SOD-A to investigate hydrologic and static failure modes at El Vado Dam, continued during FY 2018. Analysis of the data collected for both hydrologic and static failure modes is ongoing.

Below is a list of other activities that occurred in 2018.

- Survey of embankment points
- Archaeological survey using a drone

- Scheduled Annual Site Inspection (ASI) completed
- As part of the CAS:
 - Inspected powerplant to evaluate impacts from sediment releases
 - Determined locations of geomembrane field trial sites
 - Developed list of work to be completed prior to construction
 - Determined planned subsurface investigation locations
- Sediment sampling upstream, downstream, and near dam; sample analysis ongoing
- Geomembrane field trial on left embankment faceplate
- Rope inspection of entire faceplate
- Annual elevator inspections

There are currently three incomplete SOD recommendations and 10 incomplete Category 2 O&M recommendations for El Vado Dam. The Facility Rating Review (FRR) was updated in September 2018. The rating for El Vado increased by nine points, 59 to 68, due to the removal of the SOD CAS MR&R information from the FRR form, which gives the facility an overall rating of “Fair”.

U.S. Army Corps of Engineers’ Related Reservoir Operations

Abiquiu Dam and Reservoir is a U.S. Army Corps of Engineers’ (USACE) facility. P.L. 97-140 authorizes storage of up to 200,000 ac-ft of SJ-C Project water in Abiquiu Reservoir. The volume of SJ-C Project water in storage in 2018 peaked on March 24 and 25 at 126,089 ac-ft (6,203.53 feet). Abiquiu ended 2018 with 78,078 ac-ft (6,187.13 feet) of SJ-C Project water in storage. Table 9 provides a summary of monthly operations and water accounting for Abiquiu Reservoir.

Table 9: Reservoir Operations for Abiquiu Dam (units are acre-feet)

ABIQUIU RESERVOIR OPERATION	INFLOW		OUTFLOW		LOSSES		EOM CONTENT			
	RIO GRANDE	SAN JUAN - CHAMA	RIO GRANDE	SAN JUAN - CHAMA	RIO GRANDE	SAN JUAN - CHAMA	SEDI MENT	RIO GRANDE	SAN JUAN - CHAMA	TOTAL
MONTH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DEC. 2017	22992	1590	22996	12104	-1	290	1188	0	116537	117725
JANUARY	722	7452	1062	3518	0	307	1189	-339	120164	121014
FEBRUARY	1232	5381	511	1780	0	324	1189	382	123440	125011
MARCH	2917	3358	3128	2456	6	751	1189	165	123592	124946
APRIL	27558	632	27742	6084	0	1374	1203	-19	116766	117950
MAY	43594	2293	42578	9205	5	2011	1238	993	107843	110074
JUNE	37031	5206	38025	16737	-1	1598	1269	0	94714	95983
JULY	5100	38768	5105	43429	-4	1653	1302	0	88400	89702
AUGUST	5181	29207	5186	35948	-4	1060	1322	0	80600	81922
SEPTEMBER	1938	31834	1946	22540	-6	1228	1340	-1	88665	90004
OCTOBER	3316	7824	3096	15041	0	418	1342	219	81030	82591
NOVEMBER	3698	1512	2867	2386	1	806	1342	1050	79349	81741
DECEMBER	2519	733	3568	3247	1	99	1342	0	76736	78078
ANNUAL	134,806	134,200	134,814	162,371	-2	11,629				

During 2018 Reclamation had a storage agreement with the ABCWUA to store up to 10,000 ac-ft of supplemental water in the ABCWUA's storage space in Abiquiu Reservoir. In 2018, a total of 35,739 ac-ft of leased SJ-C Project water was released from Abiquiu by Reclamation for endangered species purposes, namely the Rio Grande silvery minnow (silvery minnow).

Cochiti Dam and Reservoir is another USACE facility. It is located downstream of the confluence of the Rio Chama and the Rio Grande. Congress authorized a permanent pool of 1,200 surface acres for recreational purposes (Rec Pool) and fish and wildlife. This pool is composed of SJ-C Project water in Cochiti, and evaporation losses are replaced with additional SJ-C Project water to maintain 1,200 surface acres.

The Rec Pool water may be released from Heron Reservoir and temporarily stored in Abiquiu, where it is then released over the winter to provide flows in the Rio Chama between Abiquiu and the confluence with the Rio Grande. In 2018, 1,552 ac-ft was released from Abiquiu Reservoir and 1,476 ac-ft arrived in Cochiti to maintain flows on the Rio Chama and fill the Rec Pool. In October and November 2018, 3,838 ac-ft was released from Heron and stored in Abiquiu in support of 2019 winter flows. The year ended with a deficit of 4,337 ac-ft in the Cochiti Rec Pool, meaning that volume was needed to reach 1,200 surface acres. Table 10 provides a summary of monthly operations and water accounting for Cochiti Reservoir.

Table 10: Reservoir Operations for Cochiti Dam (units are acre-feet)

Cochiti Del. Req.	EOM SJ-C POOL (AC-FT)	AREA SJ-C POOL (ACRES)	EOM SJ-C POOL LOSSES (AC-FT)	HOLD POOL (SJ-C + SED.) (AC-FT)	EOM WETLANDS ELEVATION (FEET)	EOM WETLANDS AREA (ACRES)	ALLOC. SJ-C POOL AREA (ACRES)	ALLOC. SJ-C POOL CAPACITY (AC-FT)	DEMAND FOR SJ-C POOL (AC-FT)	MONTHLY SJ-C DELIVERY (AC-FT)
MONTH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DEC. 2017	44788	1099	117	46858	5354	0	1200	46860	2072	0
JANUARY	45958	1142	121	48034	5354	0	1200	46860	902	1291
FEBRUARY	45798	1134	160	47879	5354	0	1200	46860	1062	0
MARCH	45479	1122	319	47566	5354	0	1200	46860	1381	0
APRIL	44997	1106	482	47091	5354	0	1200	46860	1863	0
MAY	44451	1088	546	46557	5354	0	1200	46860	2409	0
JUNE	43764	1068	687	45878	5354	0	1200	46860	3096	0
JULY	43332	1058	432	45469	5354	0	1200	46860	3528	0
AUGUST	42904	1046	428	45062	5354	0	1200	46860	3956	0
SEPTEMBER	42557	1031	347	44728	5354	0	1200	46860	4303	0
OCTOBER	42516	1029	41	44691	5354	0	1200	46860	4344	0
NOVEMBER	42350	1022	165	44527	5354	0	1200	46860	4510	0
DECEMBER	42523	1030	12	44704	5354	0	1200	46860	4337	185
ANNUAL			3740							1476

Cooperative Programs with the State of New Mexico

In 2017, a five-year Cooperative Agreement (17-WC-40-678; State Coop) was executed between the NMISC and Reclamation. The Agreement provides funding for joint benefits: water salvage work within the Middle Rio Grande Project and vegetation management on the Rio Grande Project at Elephant Butte and Caballo. This work currently includes Delta Channel maintenance, river maintenance projects, and riverside irrigation drain improvements with water salvage potential.

Delta Channel Maintenance

The term “Delta Channel” refers to the Rio Grande channel that flows into the delta of Elephant Butte Reservoir, previously called the temporary channel. The Delta Channel maintenance is now covered under the 2016 MRG Biological Opinion.

The maintenance work performed along the Delta Channel in 2018 extended from River Mile (RM) 47.5 upstream to approximately RM 52. Reclamation conducted maintenance of the Delta Channel from February through April 2018. Maintenance work included in-channel excavation, sandbar de-vegetation, mowing, and road grading.



Photo 1: Delta Channel Maintenance (Armstrong, March 2018)

Lower San Juan Riverside Drain Vegetation Removal

In 2015 and 2016, Reclamation and the State Coop funded maintenance work on the Lower San Juan Drain that removed vegetation between the edge of the Drain channel and the west side of the spoil berm for a length of 4.5 miles from NM Hwy 60 south to Salas Arroyo. Herbicidal treatment on the project was completed in September 2018. The treatment was performed under a contract, and 2018 was the last year for the herbicidal treatment contract.

Caballo Vegetation Control

Previously cleared sites within the Caballo Reservoir pool floodplain are maintained free of selected vegetation to reduce the non-beneficial consumption of groundwater. This vegetation clearing was conducted in the spring of 2018.

River Maintenance

Reclamation has authorization for maintenance of the Rio Grande from Velarde, NM, south to the headwaters of Caballo Reservoir under the Middle Rio Grande Project. Responsibilities include maintenance of the river channel, floodplain, project drains, and the 55-mile LFCC. Project purposes include improving water delivery and sediment transport, protecting riverside facilities and property, and preventing flooding. River maintenance consists of any work done in the channel and floodplain, including habitat restoration. Reclamation conducts annual river reviews of conditions of sites and reaches after the spring snowmelt runoff and summer monsoon events.

Maintenance needs are prioritized based on these reviews and assessment of geomorphic trends and conditions, public and infrastructure risk, and water delivery effects for the 260-mile reach of the Middle Rio Grande. Project needs listed above are joined by newer considerations to enhance ecological function of the system, within the Project's authorization. Maintenance projects involve planning, construction, and adaptive management. All maintenance projects require adaptive and recurring maintenance over the life cycle of each of the project's intended design life.

River Maintenance Sites

Reclamation is pursuing work at 15 sites and/or reaches along the Middle Rio Grande Project area. Of the active sites, six require an annual review of channel capacity and possible maintenance due to sediment accumulation.

The 2018 spring runoff was extremely low (37% and 11% of median at Otowi and San Marcial, respectively). A three-mile sediment plug developed in the main channel at River Mile (RM) 81 within the Bosque Del Apache National Wildlife Refuge (BDANWR) during the 2017 runoff. The plug was removed in September 2017, and a long-term river realignment project at this location started in January 2018. In collaboration with NMISC, work continues through the Delta Channel to maintain a 20-mile temporary channel into the Elephant Butte reservoir pool for effective water delivery. See the *Cooperative Programs with the State of New Mexico* section of this report for more detail on the Delta Channel Maintenance.

Reclamation's efforts at all maintenance sites include data collection, geomorphic and sediment investigations, design studies, alternative evaluations, design and development of construction drawings, material supply and development, lands access, environmental compliance, project and construction management, construction maintenance, and adaptive maintenance/monitoring.

In the following sections, the terms "new," "existing," and "adaptive" are used to describe the various river maintenance sites and reach status. "New" sites are sites that developed following high flow events on the Rio Grande in the previous year. "Existing" sites are sites in the process of being completed. "Adaptive" sites have been substantially completed and are being monitored for function and performance.

San Felipe (Existing Maintenance Site)

A total of 10 river maintenance sites have been identified on the Pueblo of San Felipe. Seven sites have been completed and three are ready for construction. The remaining three sites are RM 211.3, RM 212.8, and RM 214.4. Construction on longitudinal fill stone toe protection at RM 211.3 began in the fall of 2015 and was partially completed by March 2016. The work was then put on hold by the Pueblo of San Felipe for a review of impacts to vegetation of traditional or medicinal value. All construction work at the remaining sites is currently pending permission by the Pueblo of San Felipe.

Santa Ana River Mile 205.8 (Adaptive Maintenance Site)

This site is within the Pueblo of Santa Ana, on the east bank of the Rio Grande across from the Tamaya Resort special events tent. Nine bendway weirs and a low elevation floodplain were constructed in 2014. The Pueblo of Santa Ana, through a P.L. 93-638 contract, planted vegetation at this site in early 2015. During the spring runoff in 2015, erosion at the site washed away the newly planted vegetation and caused bankline scalloping between some of the weirs immediately after its completion. An interim adaptive maintenance project was completed in January 2016 to provide additional protection of the levee system while a longer-term solution could be investigated. The site experienced additional bank erosion during the 2016 and 2017 runoff, but the existing weir field and temporary controls placed in 2016 minimized the extent of the lateral bank migration.

An investigation to evaluate the specific geomorphic and hydraulic conditions that led to the unexpected bank erosion during the 2015 runoff was completed in October 2018. In the past year, the scalloped sections of this weir field experienced significant infill and formed a shelf that has started to support new vegetation. Reclamation is currently planning adaptive maintenance work at the site as part of a permanent repair project. Reclamation, the Pueblo of Santa Ana, and the University of New Mexico are also in the fourth year of a five-year collaborative research effort at this project site. The research is investigating the effects of bendway weirs on primary producer organisms, specifically targeting those known to be food sources for the silvery minnow.

Angostura to Montañó Reach Planning (Existing Maintenance Reach)

In 2014, Reclamation identified the reach of the Rio Grande from RM 201 to Montañó Bridge for hydraulic and geomorphic assessment and project planning. This reach is transitioning, with river bed incision and migrating bends that have caused problematic erosion, such as at the Sandia Priority Site, the Bernalillo Priority Site, the Corrales Siphon, Corrales River Mile 199, and at private land below the Highway 550 Bridge. The objective of this reach planning is to analyze the current geomorphic and hydraulic trends and identify potential river projects that both minimize the need for river maintenance and improve habitat value. Two hydraulic models of this reach were created using 2015 and 2017 hydrographic data. The hydraulic and geomorphic report is complete and located at the following website:

<https://www.usbr.gov/uc/envdocs/reports/AngosturaDamtoMontanoBridge-GeomorphicanHydraulicAnalysis.pdf>. Reclamation continues to assess river maintenance needs and/or opportunities for habitat restoration in support of the 2016 Biological Opinion (BO).

Sandia Priority Site Bendway Weir Repairs (Adaptive Maintenance Site)

Reclamation constructed the Sandia Priority Site in 2008, in collaboration with the Pueblo of Sandia, because the river was approaching the east levee. After completion of the project, Reclamation considered the Sandia Priority Site to be a completed river maintenance project, and it moved to the adaptive maintenance and monitoring phase. Post project geomorphic monitoring, such as cross section data collection at the project site, aerial flights along the Rio Grande, and longitudinal profile data collection on the Rio Grande, have been performed since 2008 as part of the adaptive maintenance activities.

In January 2016, the Pueblo of Sandia contacted Reclamation regarding new erosion along the east bankline at the site. Reclamation monitored during the 2016 spring runoff and saw 30 to 40 feet of erosion. As a result, Reclamation sought and received approval from the Pueblo's tribal council to strengthen the bankline at the bendway weirs. Reclamation crews performed repair work at this location in March and April 2017.

An investigation to evaluate the specific geomorphic and hydraulic conditions that led to the 2016 spring runoff bank erosion was completed in August 2018. Reclamation is currently planning adaptive maintenance work at the site as part of a longer-term repair project.



Photo 2: View looking downstream at the Sandia Priority Site. The riprap along the bankline was buried in place during the 2017 repairs but exposed through bank erosion during the 2017 spring runoff (8/17/2018)

Corrales Siphon (Adaptive Maintenance Site)

The Corrales Siphon is in Corrales, NM, just north of Albuquerque, at RM 199.7 and about 700 feet downstream of the Arroyo de la Barranca confluence. The siphon was constructed in the early 1930s by the MRGCD to provide irrigation water to the Corrales Main Canal. During river reconnaissance in 2012, Reclamation discovered that degradation in the area had exposed the siphon to the current. MRGCD requested emergency technical assistance and construction support from Reclamation to temporarily protect it during the 2016 runoff.

Reclamation and MRGCD collaborated on a short-term project that placed riprap in the scour hole downstream of the exposed siphon. Approximately 1,800 cubic yards of riprap were placed upstream and downstream of the siphon along the west bankline.

The scour hole and exposed part of the siphon have moved away from the west bank toward the center of the river channel. New developments caused by geomorphic responses to the temporary repair will continue to be monitored by Reclamation. MRGCD will be working on a longer-term solution beyond the 2016 temporary protection of the Siphon location and Reclamation is awaiting further information about their proposed project.



Photo 3: View looking downstream at the Corrales Siphon and the 2016 riprap protection placed downstream of the siphon

River Mile 199 (New Maintenance Site)

In spring 2017 Reclamation identified a new erosion site near RM 199 in the Corrales area. This site is on the west side of the river, and the active bankline is approximately 120 feet from the west levee toe. The reach planning effort between Angostura Diversion Dam to Montañño Bridge provides a detailed geomorphic and hydraulic study of the reach and sub-reaches that will help evaluate erosion at RM 199 in the context of the overall reach needs. In 2019, Reclamation will begin alternative formulation, analysis, and project design to address bank erosion and protect the Corrales levee system. Project goals will include improving ecological function at this site.

Isleta to San Acacia Reach Planning (Existing Maintenance Reach)

In 2014, Reclamation identified the stretch of the Rio Grande from the Isleta Diversion Dam to the San Acacia Diversion Dam for additional investigation to analyze the geomorphic and hydraulic trends within this reach. This investigation is especially relevant given the observed overbank flooding in portions of the reach during the 2017 runoff. Geomorphic and hydraulic analysis reports for this reach were completed in March and December 2018, respectively. These analyses will be used to identify potential projects that minimize the need for river maintenance action and/or have habitat value. Work planned for 2019 involves identifying sites that may need river maintenance and/or offer opportunities to perform habitat restoration in support of the 2016 BO.

Escondida Burn Scar Habitat Restoration

In June 2016, a wildfire burned approximately 524 acres in the bosque near Escondida, NM. Restoration designs for two aquatic habitat restoration sites were completed in 2017, and construction was completed in July 2018. This work helps Reclamation and its partners meet the commitments of the 2016 BO.

The habitat restoration work at the Escondida burn scar involved lowering the Arroyo de la Parida delta and an abandoned side channel. Approximately 1.8 acres of the arroyo delta was lowered to the 300 cfs inundation design level. Cut banks were also sloped to encourage growth of riparian vegetation.

Downstream of the arroyo work, a side channel was also constructed to create a flow-through channel at 2,000 cfs. Three outlets were also added along the side channel which, along with the original inlet and outlet, will function as backwaters at the 300 cfs inundation design water surface level.

This site is currently (2019) undergoing monitoring and adaptive management.



Photo 4: Escondida side channel project at post-monsoonal conditions (7/30/2018)

Rhodes Property Habitat Restoration

A multi-disciplinary design team assessed this site, which is south of Socorro, NM, for opportunities to create aquatic habitat. This work helps Reclamation and its partners meet the commitments of the 2016 BO. Project designs and environmental permitting were completed in December 2018. This project is currently under construction and should be completed in February 2019.

Arroyo de las Cañas Reach Planning (Existing Maintenance Reach)

The Arroyo de las Cañas site is located upstream of the Arroyo de las Cañas confluence, between RM 96 and 95, south of Socorro, NM, and continues downstream to the U.S Hwy 380 Bridge (RM 87) at San Antonio, NM.

Reclamation completed a geomorphic assessment of this area in 2016. Due to current staffing levels and other priority work, Reclamation has not pursued further work on this reach planning effort in 2018. Work intended to identify potential river projects that minimize the need for river maintenance action and/or improve habitat value will likely be reinitiated in 2019.

Bosque del Apache River Realignment (Existing Maintenance Site)

During the 2008 and 2017 spring runoffs, sediment plugs formed in the main channel of the Rio Grande at RM 81, located within the BDANWR. In 2014, a multi-agency project team began to pursue a realignment of the current channel to the east intended to address river maintenance concerns in the area. The project will move two river segments to the east, about 4.5 miles and 2.5 miles in length, and then reconnect them with the current channel.

In 2016, Reclamation decided to construct the southern portion first to learn from the observed channel response of the smaller realignment section before beginning work on the longer northern realignment. The southern realignment portion was termed the BDA Pilot Realignment Project.

Designs were completed on the BDA Pilot Realignment Project in 2017. Mowing began in January 2018. NEPA and Clean Water Act compliance for the entire project is underway and is expected to be received in 2019. Construction will be contingent on field conditions and is planned for completion in 2019 or 2020.

Bosque del Apache, Tiffany, and San Marcial Levee and Delta Channel Capacity Analyses (Adaptive Maintenance Sites)

The hydraulic channel capacity criteria used in the analysis of levee systems is to effectively and safely pass the mean annual peak flow – a 2-year flow of 7,700 cfs. The maintenance design criteria of the Delta Channel used in the analysis was to effectively convey a normal spring runoff peak flow of 4,000 to 5,000 cfs to the Elephant Butte Reservoir pool.

As part of continued analysis, hydrographic data was collected in 2016 and 2017. The hydraulic model for this river reach has been updated with the 2016 cross section survey data. Updated hydraulic model results were reported in an annual summary report on levee and channel monitoring released in March 2017. The model results with the 2017 data were completed in February 2018. The 2018 report found that there were five cross sections within the Bosque del Apache levee system where the levee freeboard elevation would be exceeded, 12 levee freeboard

incursions at cross sections within the Tiffany levee system, and no levee freeboard incursion within the San Marcial levee system. Given the low flows in 2018 and work on other higher priority river needs, hydraulic analysis of the levee systems was not performed in 2018. An update of the hydraulic analysis is planned for 2019.

The BDA Pilot Realignment Project is expected to begin sometime in 2019 and will likely have a significant impact on the channel's hydraulic characteristics through the Bosque del Apache levee system. Reclamation expects that the realignment project will reduce levee freeboard incursions along this portion of the levee system. Channel cross sections within this reach will continue to be surveyed post-construction, and the 2019 annual report should contain results from both the revised channel alignment and channel profiles in the updated hydraulic model.

Reclamation and NMISC staff inspected the Delta Channel in December 2018. Reclamation began maintenance work on the Delta Channel in January 2019. It is expected to continue until bird nesting season begins in April. NMISC is not planning on utilizing a contractor for maintenance work this year.

Fort Craig Bend and River Mile 60 (Existing Maintenance Site)

Historically, the Rio Grande between Fort Craig and RM 60 was a wide, braided, and relatively straight river channel. During recent years, the degree of meandering has increased in several areas as a more sinuous planform developed. This has caused the formation of multiple bends including Fort Craig Bend near RM 64 and the S-curve bend at RM 60. The outside of these bends is near the west edge of the confined floodplain and adjacent to the spoil levee and the LFCC. Continued bank erosion and lateral migration at these locations threatens to breach the spoil levee and cause damage to the LFCC, access road, and Fort Craig pump site. Downstream water delivery and habitat for endangered species are likely to be negatively impacted by a breach. In 2012, a rock windrow on the west bank of the river was placed as a temporary solution to erosion at the toe of the bank near the Fort Craig pump site. Recent observations show that the windrow has not launched into the channel, but the toe of the bank has had additional scour.

A multi-disciplinary project team will develop and evaluate alternatives to reduce maintenance frequency, increase water salvage, and enhance habitat. Reclamation has begun designing a new outfall from the LFCC to the main Rio Grande channel at RM 60 to drain ponded water. The outfall will be closed using a gated control during the fall and winter months to promote wetland habitat for migratory bird species. Design and construction of this project is expected to begin in the next few years.

Truth or Consequences (Existing Maintenance Site)

Reclamation annually excavates sediment from the river channel to maintain the authorized 5,000 cfs capacity in the reach of the Rio Grande between Elephant Butte Dam and Caballo Reservoirs. Maintenance activities are conducted after releases are shut off from Elephant Butte Dam each fall. The primary activity consists of sediment removal at arroyo mouths. Secondary activities include sediment removal in other areas throughout the reach and bank stabilization with riprap at selected sites.

Work identified for the 2018/2019 season involves sediment removal at the mouth of three major tributaries (Mescal, Cuchillo Negro, and Hondo). In addition, during periods of non-release Reclamation installs a dike in the river to increase the alluvial groundwater levels for the benefit of the artesian hot spring bathhouse owners in Truth or Consequences. A new regional 404 permit for another 5-year period was issued in 2018.

Mescal Arroyo Planning (Adaptive Maintenance)

Mescal Arroyo is a tributary to the Rio Grande within the Truth or Consequences reach. Because it is only two miles downstream from Elephant Butte Dam, sediment deposition at the confluence can create channel capacity concerns and influence water operations and hydropower generation. Geomorphic and hydraulic modeling analyses of this tributary led to the formation of a multi-disciplinary team to assess potential options at the Mescal Arroyo and Rio Grande confluence that would minimize future maintenance. The preferred alternative seeks to change sediment management practices that exacerbated the deposition problem at the confluence.

Some of the spoil within the active channel of the Mescal Arroyo was moved beginning in 2017, resulting in a wider channel confluence that will allow deposition to occur before the Rio Grande confluence. Work is planned for April 2019 to continue moving the sediment. The new location for the excavated material would cause less impinging flow conditions on the sediment piles from the arroyo. A grade control structure may also be included to help stabilize the arroyo bed and prevent future head-cutting up the arroyo that would generate additional sediment. Design for these activities is currently underway.

San Acacia Diversion Dam 10-4 Pilot Study

The riprap covered ramp downstream of the San Acacia Diversion Dam just north of Socorro, NM, was rehabilitated by Reclamation in the late 1980s. A multitude of high flow events have progressively displaced much of the ramp downstream. This has resulted in some exposure of the dam's apron and presents challenges to upstream fish movement at the dam when it is unchecked outside of irrigation season. At the request of Reclamation's partner MRGCD, Reclamation is providing design and construction support to rehabilitate the ramp to facilitate future fish passage efforts at this location. This project's goal is to renovate the ramp by providing a 10% design slope comprised of 3 to 4-foot nominal riprap and to see if local fish species can traverse the ramp to the dam's apron while also providing protection to the exposed apron toe. The Socorro Field Division is responsible for the construction of the renovated ramp and this project is being closely coordinated with both the MRGCD and NMISC.



Photo 5: Construction work has begun to rehabilitate the rock ramp below San Acacia Diversion Dam's concrete apron to create a 10% design slope on the ramp as it transitions from the dam's headworks onto the downstream river channel (flow about 500 cfs; January 2019)

Middle Rio Grande River Maintenance Plan

The Middle Rio Grande River Maintenance program has developed a long-term River Maintenance Plan that will assist in accomplishing project purposes in an environmentally and economically sound manner that is consistent with the Middle Rio Grande Project's authorization. A final report is posted at the following web address:

<https://www.usbr.gov/uc/albuq/envdocs/reports/mrgRivMaint/CompPlan/start.pdf>.

This maintenance plan is an engineering and geomorphic review that can be used to readily implement the most cost effective and environmentally sound strategies that reduce Reclamation's long-term commitment of resources. Ongoing work on the "living" long-term comprehensive plan and guide involves evaluating reach-based strategies for feasibility, prioritizing reaches, and evaluating effects of strategy implementation between reaches, upstream and downstream.

Work is also being pursued with respect to reach-based planning and developing ecological criteria for endangered species suitable habitat restoration to complement current water delivery as well as public health and safety factors. Reach-based planning is underway to evaluate the geomorphic reaches from Angostura Diversion Dam to Montaña Bridge, and Isleta downstream to Elephant Butte. This lower reach has been identified as a high priority reach for habitat restoration and meeting ecological goals. A report entitled "Lower Reach Plan" was completed

in 2018. This document provides a strategic overview of reach projects and efforts underway for the river and LFCC from Isleta Diversion Dam to the Elephant Butte Reservoir pool.

Determination of River Maintenance Need at Individual Sites and Reaches

In 2014, Reclamation completed its “Determination of River Maintenance Needs” process, which involved a joint workshop between Reclamation’s Technical Services Center and the AAO River Analysis Group. The workshop followed a newly developed rating system for sites and reaches along the river channel that considers geomorphic trends and conditions, public and infrastructure risk, and water delivery effects for the 260-mile reach of the Middle Rio Grande. All monitored, existing, and completed sites were rated utilizing the new methodology and criteria. A total of 86 sites and 11 reaches were evaluated. Monitoring during the spring runoff and monsoon season in 2018 and work progress were considered in the recently completed 2019 site and reach ratings. These ratings help prioritize project development and implementation.

The technical rating system integrates technical factors for channel instability, bank erosion, and loss of channel capacity with potential for impacts to riverside infrastructure, public health and safety, and water delivery. In addition, five distinct maintenance classes are identified by the assessment. The maintenance class designation helps define the apparent urgency related to addressing any need. The new maintenance class designations are as follows:

- Maintenance Class 1 – Maintenance is required in the short-term (typically before the next high flow event or could be required immediately) because there is a high likelihood of substantial consequences if no action is taken.
- Maintenance Class 2 – Maintenance can be planned, but the consequences of no action could be substantial in the near-term (the next normal spring runoff or within the next few years). This class includes the majority of ongoing or normal river work at existing and new sites.
- Maintenance Class 3a – Maintenance can be planned, and the consequences of no action are less likely to be substantial in the near-term (the next normal spring runoff or within the next few years). Work can be described as preventative maintenance and includes habitat enhancement.
- Maintenance Class 3b – Maintenance can be planned, and the consequences of no action are less likely to be substantial in the near-term (the next normal spring runoff or within the next few years). Data collection and/or analysis are required to determine if preventative or normal maintenance (including habitat enhancement) is needed.
- Maintenance Class 4 – Maintenance is not anticipated to be needed in the near-term (the next normal spring runoff or within the next few years) because changes appear to be occurring at a slow rate. Work can be described as monitoring for potential changes that could accelerate the need for maintenance to the near-term.
- Maintenance Class 5 – Maintenance may be needed but is not within Reclamation’s authority. Responsible parties will be notified if it appears that the consequences of no action could be substantial in the near term.

This approach for the ratings and maintenance class designation complements what is in the long-term River Maintenance Plan and Guide and the 2016 BO for River Maintenance Actions.

Endangered Species

Programmatic Water Operations and River Maintenance Endangered Species Act (ESA), Section 7, Compliance

The USFWS issued a final *Biological and Conference Opinion for Reclamation, BIA, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande* (Consultation Number 02ENNM00-2013-F-0033) on December 2, 2016. The non-jeopardy determination in the Biological Opinion (BO) is based on the mandatory accomplishment of numerous commitments by Reclamation and the BO partners (86 Conservation Measures, 11 Reasonable and Prudent Measures, and 50 Terms and Conditions). The USFWS provided an Incidental Take Statement for the silvery minnow, flycatcher, and cuckoo.

Incidental take of silvery minnows is authorized for the Proposed Action if: October density is greater than or equal to 1.0 fish per 100 m² for 10 of 15 years; October density is less than 1.0 per 100 m² for no more than 5 of 15 years; and October density is less than 0.3 fish per 100 m² for no more than 2 of the 15 years. Incidental take for the silvery minnow will be considered exceeded if these densities and time limits are not met because of the Proposed Action.

Despite starting 2018 with high silvery minnow numbers, minnow density declined in 2018. The 2018 runoff was very low and, despite the many positive actions by the BO partners, resulted in an October density of 0.09 fish per 100 m² at the standard 20 monitoring sites (compared to 21.56 fish per 100 m² in 2017). Incidental take of silvery minnow was not exceeded in 2018.

Incidental take of flycatcher will be considered exceeded if more than 26 flycatcher territories are displaced in any year because of the Proposed Action, or if more than 2,071 acres of suitable flycatcher habitat are impacted because of the Proposed Action over the 15-year BO duration. Incidental take of cuckoos will be considered exceeded if more than 11 cuckoo territories are displaced in any year because of the Proposed Action, or if more than 2,071 acres of suitable cuckoo habitat are impacted as a result of the Proposed Action over the 15-year BO duration. Incidental take of flycatcher or cuckoos was not exceeded in 2018.

In 2018, Reclamation and the BO Partners continued implementing the commitments set forth in the BO. The Minnow Action Team, including Reclamation, the NMISC, MRGCD, and the USFWS, met on February 9 and March 14, 2018, to determine the best use of available water.

This included evaluating options for a managed spring runoff, such as modified reservoir operations and managing summer flows. Extremely low natural flows precluded any additional management actions. During 2018, 35,739 ac-ft of supplemental water was released by Reclamation for endangered species purposes. In cooperation with ABCWUA, MRGCD did several “operational pulses,” where flow is temporarily stored behind a diversion dam then released quickly to increase flow by 100 to 200 cfs. These small pulses are intended to stimulate fish spawning so that eggs may be collected for hatcheries.

The Lower Reach Plan, which was submitted to the USFWS in June 2018, includes summaries and anticipated schedules of the projects planned in the Isleta and San Acacia Reaches. Planning and work on the following projects from the Lower Reach Plan began in 2018.

- Fish passage at San Acacia and Isleta Diversion Dams
- Bosque del Apache Pilot River Realignment
- Escondida Fire Habitat Restoration

The 2018 annual report, due to the Service on April 1, 2019, will provide more information on the implementation of BO requirements and the Proposed Action.

Rio Grande Silvery Minnow

The silvery minnow (*Hybognathus amarus*) was formerly one of the most widespread and abundant species in the Rio Grande Basin of New Mexico, Texas, and Mexico, but is now listed as endangered (USFWS, 1994). Currently, the silvery minnow occupies less than 10 percent of its historic range, and is restricted to the reach of the Rio Grande in central New Mexico from Cochiti Dam to the headwaters of Elephant Butte Reservoir.

Studies of long-term trends of silvery minnow abundance have generally used October catch per unit effort (CPUE) data from the species population monitoring project. Monitoring has occurred annually since 1993, with the exception of 1998 when no monitoring for the species occurred. Survey methods are standardized and the same sites have been consistently monitored since the project began.

CPUE of silvery minnow during October 2018 was substantially lower than October estimates from recent years' monitoring (Dudley and Platania, 2018; Figure 5). During October 2018, a total of 10 silvery minnow were collected from the 20 standard long term monitoring sites. The species was present at four of 20 monitoring sites, and was collected in seven of 309 seine hauls that yielded fish (Dudley and Platania, 2018). All silvery minnow collected in October 2018 were unmarked and presumably naturally spawned fish. In addition, three age classes of silvery minnow were present; however, rather than a majority of the fish being young of year, eight of the 10 fish collected from standard monitoring sites were older age 1+ fish that were presumably spawned in 2017 or 2016. The results from October 2018 monitoring suggest that 2018 spring runoff flows were insufficient for successful silvery minnow spawning and recruitment.

In October 2018, 11 additional sites were sampled and added to the 20 long term monitoring sites to assess how the addition of sites influences silvery minnow CPUE. The addition of the 11 monitoring sites resulted in the capture of 7 additional silvery minnow, for a 31 site total of 17 silvery minnow. Silvery minnow CPUE for the 20 standard long term monitoring sites was 0.09 fish/100m². CPUE for the 20 standard long term monitoring sites plus the 11 additional sites (31 sites total) was 0.10 fish/100m².

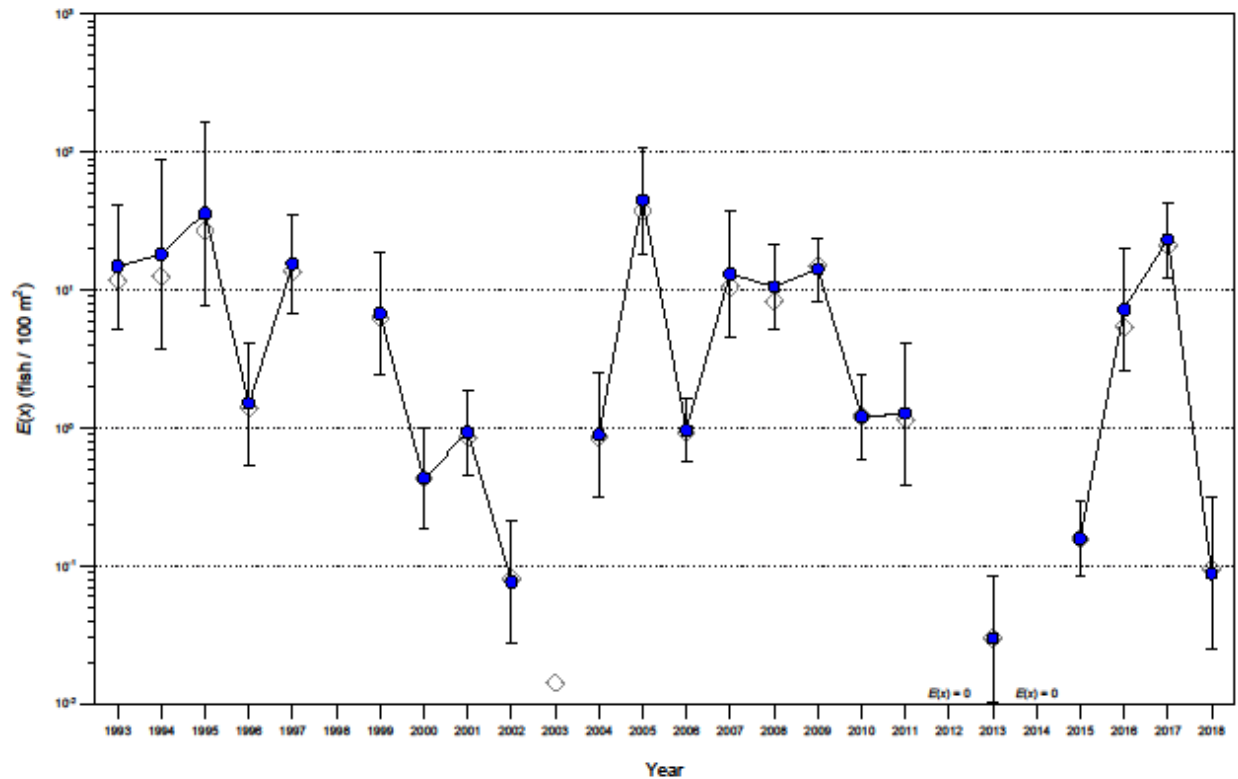


Figure 5: October silvery minnow density estimates ($E(x)$) for 1993–2018 from American Southwest Ichthyological Researchers. Solid circles indicate estimates, hollow circles represent simple estimates using methods of moments, and bars represent 95% confidence intervals.

Reclamation conducted two periods of Rio Grande fish monitoring during 2018 associated with Reclamation projects. The winter electrofishing survey was carried out from February 13 to 23, 2018. Surveys were conducted at sites between Bernalillo and the Delta Channel, below the confluence of the Low Flow Conveyance Channel with the Rio Grande. A total of 293 silvery minnows were captured during that monitoring. Only four of these silvery minnow were marked and the rest presumably were all naturally spawned.

Reclamation's fall surveys were conducted from October 23 to 26, 2018, using seine nets to sample the San Acacia Reach at sites between River Mile 112, near Lemitar, NM, and the current Elephant Butte Reservoir pool level near the Monticello Boat Ramp. During these surveys, 26 silvery minnow were collected. No marked silvery minnow were detected, and the majority collected were age 1+ fish.

Captive silvery minnows are maintained at the following permitted facilities in New Mexico: City of Albuquerque BioPark, Southwestern Native Aquatic Resources and Recovery Center (SNARRC, formerly the Dexter National Fish Hatchery), and the Interstate Stream Commission's Los Lunas Silvery Minnow Refugium. In 2018, 197,800 hatchery silvery minnow were released into the Middle Rio Grande.

The USFWS also annually stocks captively propagated silvery minnows from these facilities into Big Bend National Park, Texas, to maintain the experimental population there. In fall of 2018, 126,227 silvery minnow from the Uvalde National Fish Hatchery, Texas, were stocked at Big Bend National Park. Stocking of silvery minnow at Big Bend National Park was coordinated by the Texas Fish & Wildlife Conservation Office.

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Southwestern Willow Flycatcher

The flycatcher (*Empidonax traillii extimus* – SWFL) was listed as endangered by the USFWS effective March 29, 1995. The 2013 final designation of critical habitat defines two units located along the Rio Grande in the state of New Mexico: the Upper Rio Grande Management Unit and the Middle Rio Grande Management Unit. No Critical Habitat was designated for the Lower Rio Grande Management Unit (Elephant Butte Dam to El Paso, TX).

The Upper Rio Grande Management Unit includes the following segments:

- Taos Junction Bridge to the upstream boundary of Ohkay Owingeh Pueblo, as well as a segment between the southern boundary of Ohkay Owingeh Pueblo to the northern boundary of Santa Clara Pueblo.
- Sarco Canyon downstream to the Arroyo Miranda confluence.
- 2 km (1.2 miles) above Coyote Creek State Park to the second bridge on State Route 518, upstream from Los Cocos.
- A 0.2 mile segment located approximately 2 miles upstream from the Rio Lucero confluence.

The Middle Rio Grande Management Unit includes the following segment:

- The southern boundary of the Pueblo of Isleta to approximately 2 miles north of the Sierra County line.

During the summer of 2018, Reclamation conducted surveys and nest monitoring of the flycatcher in 13 distinct reaches along approximately 450 kilometers (280 miles) of the Rio Grande in New Mexico, mainly between the southern boundary of the Pueblo of Isleta and Elephant Butte Reservoir (Table 10). Other areas surveyed include a 6 mile stretch north of Cochiti Reservoir, as well as reaches between the Caballo Reservoir delta and El Paso, TX. Surveys were performed to contribute to current baseline population data of the flycatcher along the Rio Grande, and to meet Reclamation's ESA compliance commitments.

A total of 780 resident SWFLs were documented in 2018. These SWFLs established 421 territories, of which 359 were pairs. This represents a 14 percent increase in territory numbers

from 2017. As in previous years, the San Marcial Reach was by far the most productive, containing 517 resident flycatchers and 277 territories, of which 240 were pairs – an 8 percent increase in territories from 2017. The biggest increase, however, was documented within the Hatch Reach of the Lower Rio Grande which grew from 57 territories in 2017 to 73 in 2018 – a 28 percent increase.

Table 10: Southwestern Willow Flycatcher territories; 2006-2018 breeding seasons (N/S = not surveyed)

Year/ Location	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006
Frijoles	0	0	0	0	0	1	0	2	N/S	1	1	N/S	N/S
Belen	20	17	20	17	18	23	14	9	6	3	4	10	1
Sevilleta	12	4	5	8	4	4	6	9	13	18	31	14	21
San Acacia	0	0	0	0	0	0	0	0	0	1	2	0	0
Escondida	4	8	5	7	4	8	23	8	4	0	1	0	1
BDANWR	24	16	14	11	23	27	51	49	34	20	5	7	4
Tiffany	0	0	5	1	8	4	1	4	5	5	8	4	9
San Marcial	277	257	302	300	307	266	252	318	298	319	235	197	142
MRG Subtotals	337	302	351	344	364	333	347	399	360	367	287	232	178
Caballo Reservoir	7	8	9	14	15	4	1	N/S	N/S	N/S	N/S	N/S	N/S
Caballo to El Paso, TX	77	60	41	31	26	34	27	3	N/S	5	N/S	N/S	N/S
LRG Subtotals	84	68	50	45	41	38	28	3	N/S	5	N/S	N/S	N/S
Total	421	370	401	389	405	371	375	402	360	372	287	232	178

(This table does not include detections outside of the active floodplain at Bosque del Apache NWR)

In 2018, nest monitoring was conducted at all sites where nesting pairs were detected from the southern boundary of the Pueblo of Isleta to Elephant Butte Reservoir, and in select sites from Elephant Butte Dam to El Paso, TX. A total of 469 nests were discovered and monitored to determine success rates, productivity, and brown-headed cowbird (*Molothrus ater*) parasitism. The San Marcial Reach proved most productive, producing 315 nests.

Other studies which continued in 2018 included: 1) flycatcher nesting hydrology and habitat variable study, 2) river maintenance impact monitoring, 3) photo monitoring of habitat development in the Elephant Butte delta, 4) saltcedar leaf beetle (*Diorhabda* spp.) impact monitoring, and 5) flycatcher habitat modeling. These studies are designed to provide further insight into potential threats to and habitat requirements of flycatcher populations.

At Elephant Butte Reservoir, flycatchers have expanded their occupied habitat farther south, to near Mitchell Point at RM 38. Flycatcher occupied areas in the Elephant Butte Reservoir delta –

RM 60 to 54 – used to consist of mainly dense Goodding’s and coyote willow of various age classes, with water provided by the LFCC outfall. However, with the drought the last few years, this area rarely receives water from the LFCC, and invasive saltcedar is encroaching and becoming dominant. Although this provides refuge habitat for flycatchers, the arrival of the saltcedar leaf beetle may be an issue as they would likely defoliate saltcedar during flycatcher nesting times, providing less foliage cover and making nests more vulnerable to predation, parasitism, and natural elements.

Habitat modeling from 2016 throughout the Middle Rio Grande has shown that there is still suitable habitat that is not occupied, thus indicating that habitat is not a limiting factor for this population. However, the overall quality of the habitat is likely reducing success and productivity. The reason that flycatchers do not expand into all areas of suitable habitat is likely because of their site fidelity and overall population size.

Nest success in the Middle Rio Grande rebounded to 47 percent in 2018 following a study period low of 25 percent observed in 2017 (Figure 6).

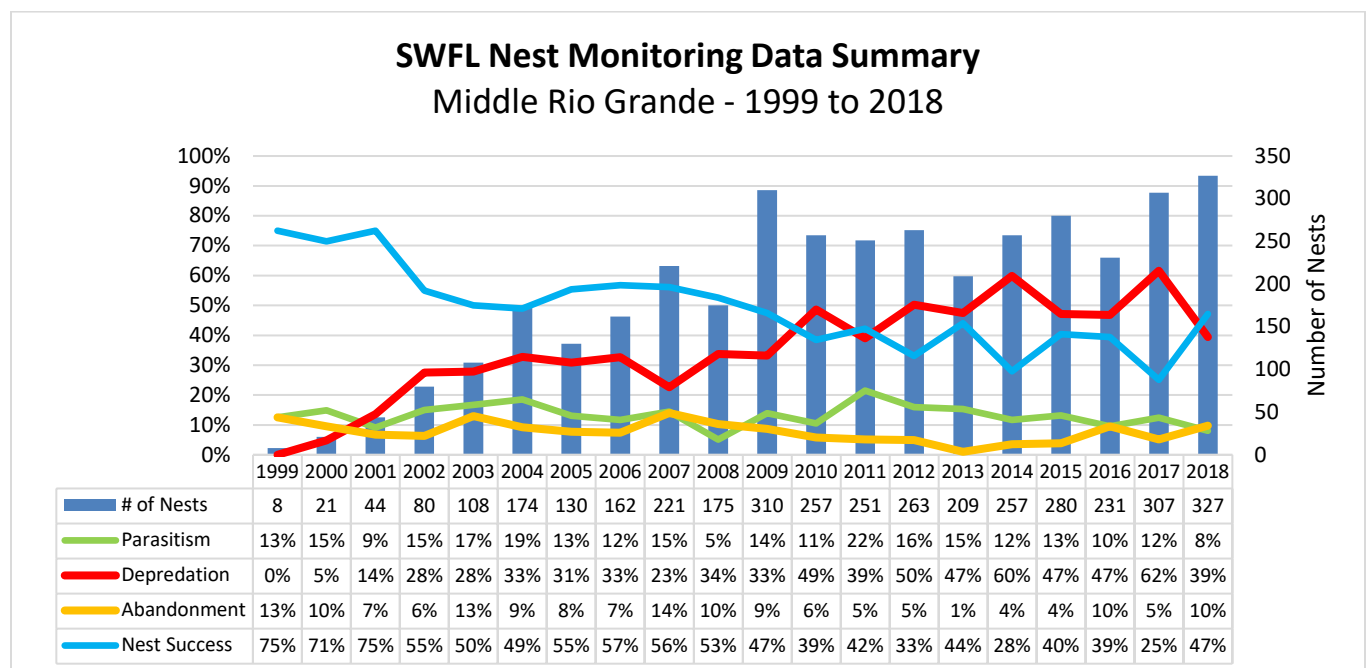


Figure 6: Summary of flycatcher nesting in the Middle Rio Grande from 1999 to 2018

The decline in nest success over the past few years may be related to the decline in habitat suitability and quality in heavily populated areas. Depredation, the biggest source of nest failure, averaged 27 percent from 1999-2011. Since 2012, the depredation rate has nearly doubled, averaging 50 percent. The depredation rate in 2017 was 62 percent, the highest recorded since 1999, but dropped back to 39 percent in 2018. These changes may be attributed to how habitat quality is influenced by hydrology. Drought conditions, which typically result in reduced discharge and groundwater levels, reduce plant vigor and canopy cover. This reduces nest concealment, exposing the nest to predators and the elements. The defoliation of saltcedar by *Diorhabda* spp. has similar affects, and will likely be of greater concern in the near future. Nest

success in the Lower Rio Grande has been much higher the past three years, averaging 60 percent for territories downstream of Caballo Dam, primarily in the Hatch Reach, and 49 percent within the Caballo Reservoir Delta (Figures 7 and 8).

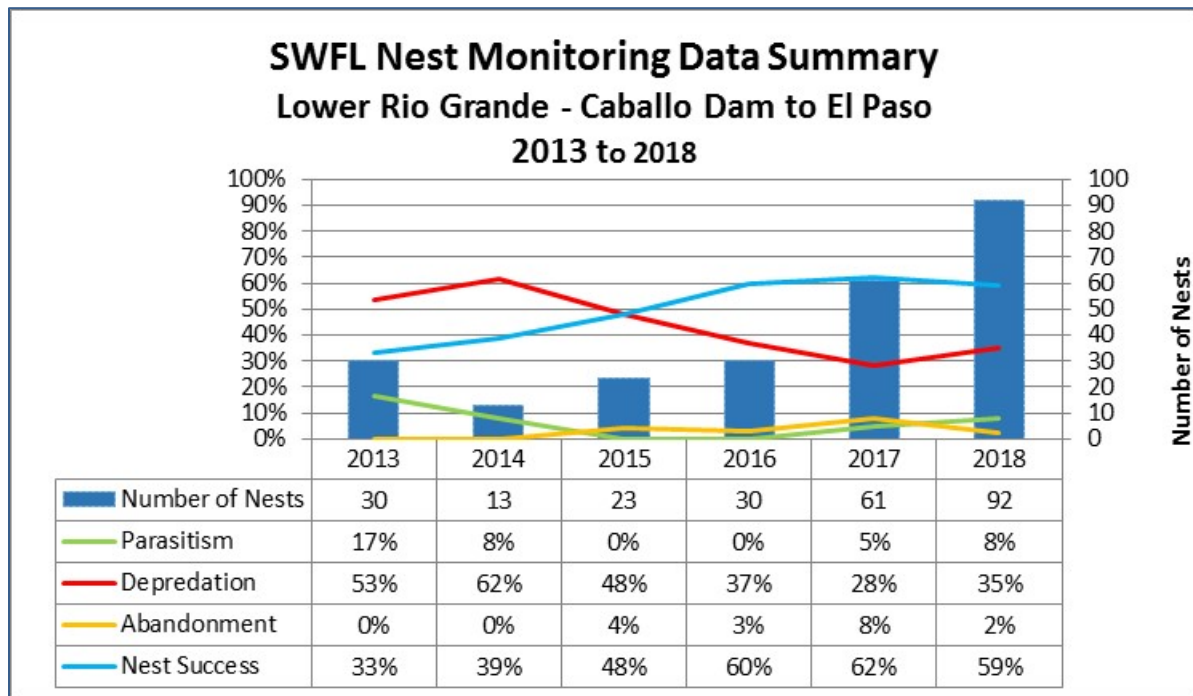


Figure 7: SWFL nest variables, Lower Rio Grande, Hatch - Leasburg Dam, 2013 – 2018

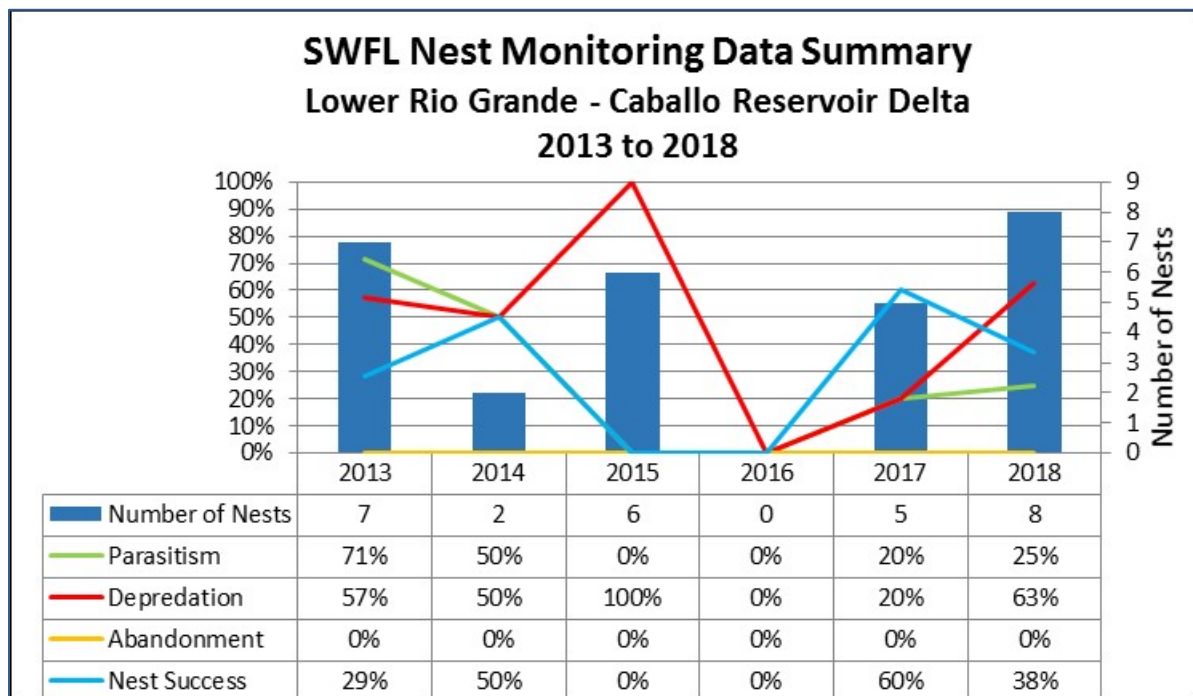


Figure 8: SWFL nest variables, Lower Rio Grande, Caballo Reservoir delta, 2013 to 2018

From 2015 to 2017, the Rio Grande and Low Flow Conveyance Channel both saw higher flows compared to the past several years, resulting in overbank flooding and higher groundwater levels in some areas. This improved plant vigor, structure, density and overall habitat quality. Also, during the summer of 2017, the Tiffany Fire burned 9,200 acres between RM 74 and RM 62. Of that, about 700 acres had vegetation that could accommodate breeding activity for the flycatcher. Despite an extensive effort to save native vegetation by various agencies, 16 flycatcher territories were impacted, seven that were nesting at that time.

Western Yellow-billed Cuckoo

The western distinct vertebrate population segment of the Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) (cuckoo) was listed as a threatened species by the USFWS in October of 2014. The proposed critical habitat posted in the Federal Register in August of 2014 includes eight units in New Mexico.

Along the Rio Grande, this proposed area includes:

- Unit 50, Upper Rio Grande 1, Rio Arriba County: a continuous 10 mile segment of the upper Rio Grande from Ohkay Owingeh Pueblo to near Alcalde in Rio Arriba County (1,830 acres);
- Unit 51, Middle Rio Grande 2, Santa Fe and Rio Arriba Counties: a continuous six mile segment of the Middle Rio Grande starting from the Highway 502 Bridge at the south end of the San Ildefonso Pueblo upstream to a point on the river in Rio Arriba County south of La Mesilla (1,173 acres); and
- Unit 52, Middle Rio Grande 1, Sierra, Socorro, Valencia, Bernalillo, and Sandoval Counties: a continuous 170 mile segment, from river mile 54 within the Elephant Butte Reservoir pool upstream to just below Cochiti Dam. The largest breeding population of western yellow-billed cuckoos north of Mexico is within this reach (61,959 acres).

During the summer of 2018, Reclamation conducted surveys in 12 distinct reaches within sites also surveyed for SWFL, from the south boundary of the Pueblo of Isleta to El Paso, TX (Table 11). Surveys were intended to contribute to current baseline population data of the cuckoo along the Rio Grande and to meet Reclamation's ESA compliance commitments. In 2018, there were an estimated 138 breeding territories (assumed to be pairs) derived from 549 detections. The estimated territories and documented detections were most concentrated in the southern portion of the San Marcial reach (i.e., Elephant Butte Reservoir pool).

Table 11: Yellow-billed Cuckoo Detections/Estimated Territories – Middle Rio Grande Project, 2006 - 2018 Breeding Seasons (N/S = Not Surveyed)

Year/ Location	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006
Belen	41/10	34/4	54/12	39/10	24/5	20/6	44/15	16/ 4	3/0	1/0	N/S	N/S	N/S
Sevilleta	41/10	12/4	32/10	18/5	9/2	19/6	36/12	6/2	1/0	4/2	N/S	N/S	N/S
San Acacia	47/14	50/13	23/8	27/8	15/4	20/5	19/4	6/1	3/0	8/1	N/S	N/S	N/S
Escondida	55/10	44/11	58/16	62/16	27/7	80/23	68/21	15/ 3	6/2	29/ 9	19/ 10	3/2	N/S
BDANWR	46/13	43/10	32/11	40/12	34/12	29/8	36/10	17/ 4	14/ 3	47/ 11	35/ 14	22/ 13	N/S
Tiffany	0	2/0	9/0	2/0	2/0	4/1	10/2	4/1	2/0	10/ 3	7/3	12/ 4	10/ 6
San Marcial	193/ 49	227/ 56	220/ 59	215/ 59	190/ 61	219/ 70	202/ 57	202 / 58	249 / 58	257 / 69	299 / 60	222 / 52	106 / 38
MRG Subtotal	423/ 106	412/ 98	428/ 116	403/ 110	301/ 91	391/ 119	415/ 121	266 / 73	278 / 75	356 / 95	360 / 87	259 / 71	116 / 44
Caballo	58/13	64/16	62/15	48/15	28/8	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
Percha	7/1	8/2	3/1	1/0	0/0	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
Hatch	17/6	11/1	6/2	4/1	0/0	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
Radium Springs	25/7	10/4	16/6	10/4	8/2	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
Las Cruces	10/3	9/3	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
Mesilla	9/2	0	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
LRG Subtotal	126/ 32	93/23	87/24	63/20	36/10	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
TOTAL	549/ 138	505/ 121	515/ 140	466/ 130	337/ 101	391/ 119	415/ 121	266 / 73	278 / 75	356 / 95	360 / 87	259 / 71	116 / 44

Table does not include detections outside of the active floodplain at Bosque del Apache NWR.

New Mexico Meadow Jumping Mouse

The historical distribution of the New Mexico meadow jumping mouse (jumping mouse; *Zapus hudsonius luteus*) likely included riparian areas and wetlands along streams in the Sangre de Cristo and San Juan Mountains from southern Colorado to central New Mexico, including the Jemez and Sacramento Mountains and the Rio Grande Valley from Española to Bosque del Apache National Wildlife Refuge (BDANWR), and into parts of the White Mountains in eastern Arizona. A final rule was published in the June 10, 2014, Federal Register (effective July 10, 2014) to list the jumping mouse as an endangered species under the ESA with proposed critical habitat. The final designation for critical habitat for the species is still being determined, but proposed critical habitat units have been identified for Bernalillo, Colfax, Mora, Otero, Rio Arriba, Sandoval, and Socorro Counties in New Mexico; Las Animas, Archuleta, and La Plata Counties, Colorado; and Greenlee and Apache Counties, Arizona (79 CFR 33119).

In the Middle Rio Grande (MRG) valley, jumping mouse are known to use both natural wetlands and riparian habitats associated with irrigation channels (Frey and Wright, 2012). In either case, tall, dense herbaceous riparian vegetation is a key habitat component. Current distribution of jumping mouse within the MRG is uncertain, but as of the late 1980s (Frey, 2006) the species was confirmed to be present at Ohkay Owingeh Pueblo and the adjacent Rio Chama (Rio Arriba County), Isleta Pueblo (Bernalillo County), near Casa Colorada Wildlife Area (Valencia County), and BDANWR (Socorro County).

Survey efforts have regularly occurred at BDANWR. Surveys in 2014 and 2015 using box traps resulted in the capture of 19 and 6 jumping mice, respectively. The 2016 box trap surveys initially resulted in the capture of three mice. BDANWR changed to camera trapping part way through the trapping season and recorded an additional 27 mice, but it is unclear how many photos were of individual mice or of the same individual. BDANWR has continued camera trapping efforts in 2017 and 2018. With the exception of BDANWR, systematic surveys of jumping mouse and their habitat have not been conducted throughout the riparian corridor of the MRG. Since its listing, surveys for suitable jumping mouse habitat have occurred in selected areas as part of environmental compliance activities for specific projects, such as the Delta Channel river maintenance project (Reclamation, 2014). No additional populations have been identified.

The Delta Channel is located on the southern fringe of the geographic area where jumping mouse could potentially occur. However, during the habitat assessment it was determined that the Delta Channel area does not represent suitable habitat based on the herbaceous vegetation composition and structure, lack of soil moisture, high frequency and long history of disturbance, and lack of regular inundation necessary to support jumping mouse habitat. Based on the habitat assessments within the Delta Channel, it is unlikely that suitable or occupied jumping mouse habitat exists south of BDANWR.

Literature cited:

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U.S. Fish and Wildlife Service. 2013. Endangered and Threatened Wildlife and Plants; Proposed Designation of Critical Habitat for the New Mexico Meadow Jumping Mouse; Listing Determination for the New Mexico Meadow Jumping Mouse; Proposed Rules. Federal Register 78: 37328-37363.

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Supplemental Water Program

Reclamation initiated its Supplemental Water Program in 1996 to support water needs of the ESA-listed species in the Middle Rio Grande. The program originally included water acquisition, reservoir storage, and release of water to support river flows. Since 2001, it also has included operation of a pumping network in the San Acacia Reach to pump water from the LFCC to the river. The Program supports ESA coverage under Section 7(a)(2) and the 2016 BO.

Water Acquisition and Management

In 2018, 35,739 ac-ft of supplemental water was released by Reclamation for endangered species purposes. The volume was entirely composed of leased SJ-C Project water. The release of supplemental water began on April 1 and ended on October 29.

From April 1 to the last day of full MRGCD operations on August 30, 2018, 20,093 ac-ft of water leased in 2017 and 2018 was released. When MRGCD reduced operations to insure irrigation of P&P lands on August 31, Reclamation began release of additional water leased from ABCWUA out of Abiquiu Reservoir under a 2018 contract. On October 28, the Rio Grande reconnected as a result of storm flows, and the supplemental release was stopped the next day. From August 31 to October 29, 15,646 ac-ft of water leased from ABCWUA was released.

Reclamation ended 2018 with a total of 12,225 ac-ft of SJ-C Project water. This was composed of 1,964 ac-ft of 2018 leased SJ-C Project water in storage in El Vado Reservoir, and 5,810 ac-ft of water in Heron, all acquired via short term leases or other water contracts. In addition, 4,451 ac-ft remain from the contract with ABCWUA, which expires in December 2019.

In 2019, Reclamation will have potential leases of approximately 13,000 ac-ft from 2019 SJ-C Project allocations. If there is a SJ-C Project shortage, however, available leased water could be less than half of that amount.

Other Sources of Supplemental Water

In addition to the water released by Reclamation, there were two other sources of water used to support water needs of the ESA-listed species in 2018. As shown in Table 12, this water was released to the river by MRGCD at four wasteway outfalls in the Isleta Reach: Alejandro, Los Chavez, Lower Peralta Drain #2, and Sabinal.

First, Audubon New Mexico acquired a total of 998 ac-ft of SJ-C Project water. They leased 298 ac-ft from The Club at Las Campanas and 100 ac-ft from Bernalillo out of Abiquiu Reservoir, and 200 ac-ft each from Belen, Bernalillo, and Los Lunas leased out of Heron Reservoir.

Conveyance losses from Heron to Abiquiu were 6.6 ac-ft, and evaporation losses while in storage were 29.2 ac-ft. This resulted in a release of 962.2 ac-ft from Abiquiu between July 16 and September 14, with subsequent delivery to the Isleta Reach from July 20 to September 18, 2018.

Second, a total of 293.61 ac-ft of pre-1907 native water rights owned by Reclamation and permitted to be used for offset via the NMISC's Strategic Water Reserve were released from the outfalls from June 21 to 25 and from October 1 to 5.

Table 12: 2018 Isleta Reach Outfall Deliveries

Isleta Reach Outfall Delivery Dates, 2018	Delivered Water Volume, ac-ft	Water Source
June 21 – June 25	154	Native water acquired, permitted, and used for offset
July 16 – September 14	962.2	SJ-C Project (Audubon New Mexico)
October 1 – 5	139.61	Native water acquired, permitted, and used for offset

Low Flow Conveyance Channel (LFCC) Pumping Program

During the irrigation season, flows in the Rio Grande between San Acacia Diversion Dam and the full pool elevation of Elephant Butte Reservoir can drop to low levels that may impact the silvery minnow and flycatcher. The LFCC Pumping Program helps maintain longer sections of continuous river and helps Reclamation maximize the effectiveness of supplemental water releases made for ESA purposes.

The 2003 BO required the use of pumps to manage river recession, maintain river connectivity, and supply water for nesting flycatchers. Requirements under the 2016 BO do not stipulate pumping, and instead focus on using adaptive management and a variety of tools to meet or exceed silvery minnow density thresholds in the Incidental Take Statement (ITS). As an optional tool in support of meeting those thresholds, Reclamation used the south boundary pumps in 2018 to maintain river connectivity from that location to the Elephant Butte Reservoir pool.

Reclamation maintains and operates portable pumps with flow meters at strategic locations along the LFCC. The pumps are used to return water from the LFCC to the Rio Grande. Data for the pumping sites is posted in orange boxes on the MRGCD Gage Schematic page on Reclamation's ET Toolbox web site at:

<https://www.usbr.gov/uc/albuq/water/ETtoolbox/rg/riog/schematic/SCHEMATICsocorrodiv.html>.

The total available pumping capacity for all pump locations is approximately 200 cubic feet per second (cfs). The maximum total pumping rate is limited to 150 cfs by the 2004 permit granted by the New Mexico Office of the State Engineer.

To maintain river connectivity from the south boundary of BDANWR to Elephant Butte Reservoir, pumps at the south boundary site were turned on March 26 at 9 pm. The only pumping in 2018 was at this site. Flow arriving at the south boundary pump site began to decline in late June, and was down to less than 20 cfs by mid July. With the concurrence of

USFWS, and anticipating that flows would get too low to allow pumping, Reclamation began reducing pumping on July 1. The last pump was shut off on the afternoon of July 8.

The pumps remained off until August 3, resulting in two segments of channel drying between the BDANWR south boundary and Elephant Butte Reservoir. Pumping resumed on August 3. Runoff from upstream storms had reconnected the river and also increased flow in the LFCC, LFCC flow looked like it would be consistent. The south boundary pumps were shut off for the season on October 24, after rain storms brought flow at the San Marcial floodway gage above 40 cfs.

The pumps at the south boundary site were the only ones used for pumping supplemental water during the 2018 season. The total volume of supplemental flow provided by the pumping effort in the 2018 season was 19,989 ac-ft.

Isleta Settlement

Isleta Diversion Dam was built by the MRGCD on Pueblo of Isleta land in 1934 and rehabilitated by Reclamation in 1954. The Pueblo of Isleta has maintained that proper easement was never fully granted to the MRGCD or Reclamation. Technical and legal teams comprised of representatives of the Pueblo, Reclamation, and the Middle Rio Grande Conservancy District were formed in May 2015, in response to a request from the Pueblo of Isleta to work on an agreement that could lead to a settlement.

Reclamation, the Pueblo of Isleta, and the MRGCD signed a global settlement on October 21, 2016, resolving trespass issues associated with Isleta Diversion Dam. This global settlement granted the United States easement for the next 100 years. The Pueblo was paid a lump sum of \$5 million for this easement and to redress past and present trespass issues. Additional commitments encompass bosque and riverine restoration, and diversion dam modifications to better manage sediment transport into irrigation canals and provide fish passage through the dam.

In FY 2018, the settlement team achieved major milestones including sediment disposal that exceeded the annual goal, significant progress on a preliminary engineering study for dam modifications, and a draft of the bosque and riverine restoration plan. In addition, the next phase of work for the bosque restoration is in the planning stages, with a draft completed for a P.L. 93-638 contract to the Pueblo of Isleta to fund the environmental compliance, permitting, and initial construction for the first two years of bosque and riverine habitat restoration projects.

The technical team will continue development, review, and implementation of projects to meet the settlement commitments. The commitments are scheduled to be completed by 2026.

Other Ongoing Water Management Related Projects

USGS MRG River Gage Operation and Maintenance

Additional gages along the river and in MRGCD facilities were a high priority in FY 2002 and 2003. Two sets of gages were funded by the Collaborative Program through Reclamation. To

assess how much water was being diverted from and returned to the river, funding allowed MRGCD to establish gages on diversions, wasteways, and important canals. MRGCD subsequently took over operation and maintenance (O&M) of the gages.

Other funding allowed the USGS to install four new river gages, and Reclamation continues to fund the O&M of these gages. The four gages are the Rio Grande near Bosque Farms, NM (08331160); Rio Grande at State Hwy 346 near Bosque, NM (08331510); Rio Grande at bridge near Escondida, NM (08355050); and the Rio Grande above US Hwy 380 near San Antonio, NM (08355490). All of these new gages were a result of the ongoing ESA discussions with the USFWS, and became a requirement in the 2003 BO, to increase the availability of accurate flow data in the Middle Rio Grande.

Data from the river gages helps Middle Rio Grande water management agencies to meet the needs of water users, fulfill the requirements of the Rio Grande Compact, maintain adequate water in the river to support the silvery minnow, and provide information needed to improve the daily management of the river system from Cochiti Dam to Elephant Butte Reservoir. Data from these gages are available to the public at: <http://waterdata.usgs.gov/nm/nwis/current/?type=flow>.

RiverEyes

The RiverEyes program was developed under the 2003 BO to provide current information on river flows and river drying, allowing action agencies to react quickly to changing river conditions to meet 2003 BO flow and intermittency requirements. RiverEyes also facilitates coordination among agencies, helping to prevent unexpected drying, and prepare for and initiate silvery minnow salvage.

The 2016 BO does not set specific flow targets or maximum rates of drying but instead focuses on thresholds of silvery minnow density in October. It is left up to the BO Partners to do what they can to maintain adequate densities and avoid exceeding those thresholds. One of the critical efforts to maintain densities is the coordination of Middle Rio Grande water operations, and the RiverEyes' observations of flows and drying remains an integral part of that coordination.

For the 2018 irrigation season, RiverEyes monitored river conditions along the Rio Grande from Isleta Diversion Dam into the full pool elevation of Elephant Butte Reservoir. Monitoring occurred from March through October. The total maximum extent of river drying during the 2018 RiverEyes monitoring period was 37.5 miles on July 12, all of which was in the San Acacia Reach.

The first occurrence of channel drying was on April 1, and the last occurrence was on October 19, both in the San Acacia Reach. The first occurrence of channel drying in Isleta Reach was on May 31, and that reach reconnected on October 16. Drying in the Isleta Reach was minimized by small releases to the river at various MRGCD wasteways. There were two sections of drying in the Isleta Reach this year. The main area of drying was a six mile section above the Peralta Wasteway. The second section was near the Abeytas Heading which disconnected for 1.5 miles over a two day period in July.

The San Acacia Reach first dried on April 1 at the south boundary of the Bosque del Apache National Wildlife Refuge. Due to the low flow arriving at the south boundary in the Low Flow

Conveyance Channel (LFCC) in July, the pumps that take water from the LFCC to the river channel were shut off. This resulted in two additional sections of drying below the south boundary. In between, there were two short sections that remained wet, most likely due to groundwater upwelling. The reach reconnected in late July due to monsoon-caused flows and pumping was resumed to lessen the burden of monitoring and fish rescue. The maximum drying in this reach occurred on July 12 with the river dry from about two miles above Brown Arroyo to four miles below White Gate, a distance of just over 37.5 miles in three sections. Flows from monsoon rains reconnected the river approximately five times over the course of the summer. These periods of re-wetting lasted between one and nine days.

Middle Rio Grande Endangered Species Collaborative Program

The USFWS listed the Rio Grande Silvery Minnow as endangered in 1994, issued a recovery plan in 1999, and released a revised critical habitat designation in 2003¹. The silvery minnow recovery plan² was updated in 2010. The southwestern willow flycatcher was added to the endangered species list in 1995 and a final recovery plan³ was issued in 2002. The designation for flycatcher critical habitat was revised in January 2013⁴.

In response to ESA species listings in the Middle Rio Grande, ESA-related litigation, and the 2003 BO, the Middle Rio Grande Endangered Species Collaborative Program (Collaborative Program) was formed, bringing various groups together to support ESA compliance for the silvery minnow and flycatcher, and address environmental issues along the Middle Rio Grande (MRG). The Collaborative Program consists of stakeholders representing diverse interests including federal, state, and local government entities; Indian tribes and pueblos; and non-governmental organizations working to protect and improve the status of listed species along the MRG while protecting existing and future regional water uses and complying with applicable state and federal laws, including Rio Grande Compact delivery obligations. The Collaborative Program was a partner in implementing the 2003 Biological Opinion.

On December 2, 2016, the USFWS issued a final *Biological and Conference Opinion for Reclamation, BIA, and Non-Federal Water Management and Maintenance Activities on the Middle Rio Grande* (Consultation Number 02ENNM00-2013-F-0033) to Reclamation and its Biological Opinion partners (Bureau of Indian Affairs [BIA], State of New Mexico, and Middle Rio Grande Conservancy District), specifying ESA compliance requirements for water management and river maintenance activities on the MRG. Reclamation and partners are responsible for implementing the 2016 Biological Opinion (86 Conservation Measures, 11 Reasonable and Prudent measures, and 50 Terms and Conditions).

¹http://www.fws.gov/southwest/es/Documents/R2ES/FINAL_CH_EIS_Rio_Grande_Silvery_Minnow_no_appendices_Feb_2003.pdf

²http://www.fws.gov/southwest/es/Documents/R2ES/Rio_Grande_Silvery_Minnow_Recovery_Plan_First_Revision.pdf

³http://www.fws.gov/southwest/es/arizona/Documents/SpeciesDocs/SWWF/Final%20Recovery%20Plan/ExecSummary_Contents.pdf

⁴<http://www.gpo.gov/fdsys/pkg/FR-2013-01-03/pdf/2012-30634.pdf>

The Collaborative Program is not included in the 2016 Biological Opinion and does not have responsibility or authority for meeting the requirements. However, Reclamation does work with the Collaborative Program to provide science recommendations in support of adaptive management. The Collaborative Program is developing a new organizational framework that focuses on science and adaptive management to better assist signatories in meeting their regulatory requirements.

Currently, Reclamation provides some of the funding for the Collaborative Program in support of 3rd party management and studies related to species' needs, as authorized by the Omnibus Appropriations Act of 2009 (P.L. 111-8). In FY 2018, Reclamation provided \$3,433,733 for Collaborative Program-related activities. Fiscal Year 2018 accomplishments include:

- Captive propagation of silvery minnow at the Southwestern Native Aquatic Resources and Recovery Center⁵, the City of Albuquerque's BioPark Aquatic Conservation Facility⁶, and the New Mexico Interstate Stream Commission's Los Lunas Silvery Minnow Refugium⁷;
- Annual monitoring of silvery minnow population;
- Genetics study of silvery minnow;
- Development of high throughput markers to allow for an enhanced and rapid assessment of RGSM genetic diversity;
- Silvery minnow rescue and salvage efforts during river drying and reproductive monitoring;
- Annual monitoring of southwestern willow flycatcher population and nests;
- Program management, assessment, reporting, and outreach activities.

⁵ <http://www.fws.gov/southwest/fisheries/dexter/>

⁶ <http://www.cabq.gov/culturalservices/biopark/news/success-for-abq-bioparks-silvery-minnow-program>

⁷ <http://www.ose.state.nm.us/LLSMR/index.php>

Rio Grande Project, New Mexico - Texas

Reclamation's El Paso Field Office and Elephant Butte Field Division are jointly responsible for the operations of the Rio Grande Project (Figure 9). Elephant Butte Field Division operates and maintains Elephant Butte and Caballo Dams and Elephant Butte powerplant. Releases from Elephant Butte and Caballo Reservoirs are scheduled to meet irrigation demand, with concomitant power production, at the canal headings of the Elephant Butte Irrigation District (EBID), El Paso County Water Improvement District No. 1 (EPCWID), and Mexico (under the 1906 International Treaty). EBID operates and maintains Reclamation's diversion dams on the Rio Grande, including Percha Diversion Dam, Leasburg Diversion Dam, and Mesilla Diversion Dam in New Mexico, under a contract with Reclamation. In September 2003, Reclamation completed work to remove Riverside Diversion Dam and the adjacent Coffey Dam, both in Texas. Riverside Diversion Dam had been inoperable since 1987, when flooding on the Rio Grande caused the structure to fail.

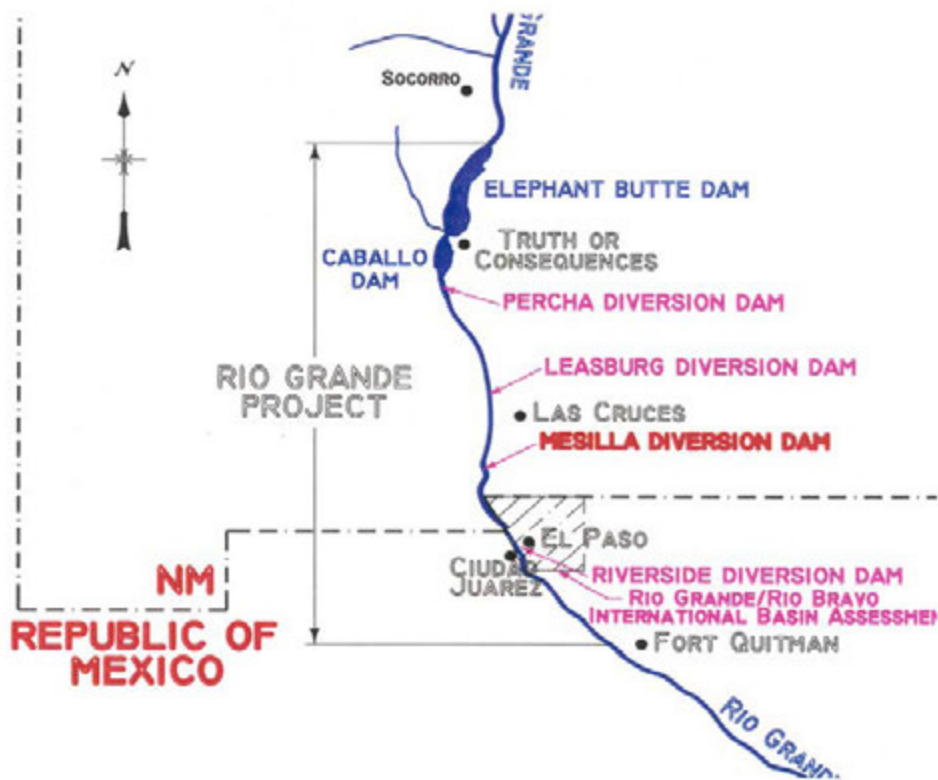


Figure 9: Area Map of the Rio Grande Project

Water Supply Conditions

Preliminary inflow data into Elephant Butte Reservoir during 2018, measured as the sum of the Rio Grande floodway and the Low Flow Conveyance Channel at San Marcial, was 213,998 ac-ft. The provisional flow record for the 2018 spring runoff (March - July), measured at San Marcial, was 54,298 ac-ft, or approximately 10% of the 30-year average.

From 1998 to 2018, average spring runoff at the San Marcial gaging station was below the 30-year average used by the NRCS, which is for the period of 1981 to 2010. From 1998 to 2018, average inflow was 273,542 ac-ft, and only three years – 2005, 2008, and 2017 – exceeded the 30-year average of 510,000 ac-ft.

Releases from Elephant Butte Reservoir began on February 23 and continued through September 25, 2018. During this period, a total release of 493,254 ac-ft was recorded by the USGS. This flow data has been approved by the USGS.

During the 2018 irrigation season (March 16 to September 29), 491,305 ac-ft of water was released from Caballo Reservoir for delivery to Rio Grande Project water users. The water released is combined with drain and arroyo inflows downstream of Caballo Dam for use by the Project beneficiaries.

Combined total storage for Elephant Butte and Caballo Reservoirs was 141,607 ac-ft on December 31, 2018, or 6% of their total capacity. The available storage for both reservoirs during the winter months, October 1 to March 31, is equal to the capacity of Elephant Butte Reservoir, 2,024,586 ac-ft, minus 25,000 ac-ft that Reclamation reserves for winter operational flood control space (50,000 ac-ft during the summer), plus the capacity of Caballo Reservoir, 324,934 ac-ft, minus 100,000 ac-ft for flood control space, for a total of 2,224,520 ac-ft during the winter and 2,199,520 ac-ft during the summer.

Per the Rio Grande Compact Article I definition, the usable water in Project storage (Elephant Butte and Caballo Reservoirs combined) was above 400,000 ac-ft from January 1 to May 20, 2018. It fell below 400,000 ac-ft on May 20 and remained below that level to the end of 2018 and into 2019.

With the combined Project storage and runoff, Reclamation allotted 475,505 ac-ft, 60% of a full supply, to Rio Grande Project water users in 2018. The available storage was not sufficient to start releases in late February, as has occurred in the past. Reclamation coordinated with the IBWC, Mexico, EBID, and EPCWID to schedule a timely and organized irrigation release. Release from Caballo Reservoir began on March 16, 2018, and the irrigation season continued through September 29, 2018.

On January 31, 2019, combined storage in Elephant Butte and Caballo Reservoirs was 170,824 ac-ft. Water available to the Project water users was 164,725 ac-ft. Due to the government shutdown, the Natural Resources Conservation Service spring runoff forecast at the San Marcial gaging station was not available for January 2019. Using the National Weather Service predictions for the El Niño Southern Oscillation activity and present hydrologic conditions, Reclamation does not anticipate a full irrigation supply for the Rio Grande Project during 2019.

Project Irrigation and Drainage Systems

Upon completion of title transfer in 1996, the irrigation and drainage system of the Rio Grande Project has been owned, operated, and maintained by EBID in New Mexico and EPCWID in Texas. Reclamation owns and administers the lands and rights-of-way activities of the reservoirs

and diversion dam areas, including Percha, Leasburg, and Mesilla. Reclamation also retains the title and O&M responsibilities for Elephant Butte and Caballo Dams and Reservoirs and the Elephant Butte Powerplant.

The districts performed flow measurements at canal headings, river stations, and lateral headings during 2018. Reclamation performed flow measurements at the Rio Grande below Caballo gaging station, and coordinated and maintained central control of releases, river operations, and water accounting. To accomplish the water allotment accounting, the districts collect field flow measurements and coordinate data from all water user entities. Utilizing the summarized flow data submitted by the districts for their areas of responsibility, Reclamation calculated and summarized the monthly and end-of-year Project water supply use and accounting for 2018.

The IBWC owns, operates, and maintains the American Diversion Dam and the American Canal in accordance with the International Treaties with Mexico (1906 and 1933). In addition, the IBWC operates the International Diversion Dam, which diverts irrigation waters into the Acequia Madre head gates operated by Mexico.

Drainage waters from the Rio Grande Project lands provide supplemental irrigation water for approximately 18,342 acres of the Hudspeth County Conservation and Reclamation District No. 1 (HCCRD). Total flows out of the Project to HCCRD are measured at three gaging stations near the Hudspeth County line: the Hudspeth Feeder Canal, the Tornillo Canal at Alamo Alto, and the Tornillo Drain. Under the Warren Act contracts, HCCRD is charged for drainage water from the Project between March 1 and September 30. Provisional data show that 39,603 ac-ft was diverted in 2018.

Elephant Butte Reservoir and Powerplant

In 2018, Elephant Butte Reservoir reached a daily minimum storage of 58,240 ac-ft (elevation 4285.66 feet) on September 25, and a daily maximum storage of 483,692 ac-ft (elevation 4339.41 feet) on February 27.

The total gross power generation for 2018 was 40,100,990 kilowatt-hours (KWhr). Net power generation was 39,524,264 KWhr, which is 102 percent of the 9-year average (2010 through 2018) of 39,424,370.44 KWhr. The Elephant Butte powerplant record showed releases of 408,031 ac-ft to meet downstream irrigation demand and manage Caballo Reservoir storage levels. Note that Elephant Butte operators consistently record a lower flow than the USGS.

Elephant Butte Dam Facility Review and Safety of Dams Program

There are no significant dam safety-related O&M issues associated with Elephant Butte Dam, other than aging infrastructure. There are currently two incomplete Safety of Dams recommendations and two incomplete Category 2 O&M recommendations for Elephant Butte Dam.

The outstanding Category 1 recommendation related to the generating unit penstock operating system for the powerplant was completed in April 2018. A rehabilitation of the balance valve gate system began in September 2018 and is scheduled for completion in March 2019. An Annual Examination was completed in September 2018. The inspection did not find any new issues. The Facility Review Rating was also updated in September 2018. The rating for Elephant Butte increased from a total score of 82 to 89, giving the facility an overall rating of “Good”.

Caballo Dam and Reservoir

Caballo Reservoir started 2018 at 37,029 ac-ft (4,142.79 feet), and ended the year at 26,735 ac-ft (4,139.18 feet). During 2018, the maximum storage was 65,917 ac-ft (4,150.07 feet) on March 15. The minimum storage occurred on September 29, at 23,824 ac-ft (elevation 4,138.00 feet).

The irrigation release period extended from March 16 through September 29, 2018. During that period, Reclamation operated Caballo Reservoir to maintain storage levels adequate to respond to irrigation calls.

Reclamation communicated with stakeholders to provide information and projections of reservoir elevations throughout the irrigation season. Overall, 491,560 ac-ft was recorded at the Caballo gage from January 1 to December 31, 2018.

Discussion is ongoing between EBID, EPCWID, and Mexico about the start date for the 2019 irrigation season. The parties are coordinating release schedules to avoid isolated releases. Reclamation will finalize a reservoir operating plan in the spring of 2019.

Caballo Dam Facility Review and Safety of Dams Program

There are no significant dam safety-related O&M issues associated with Caballo Dam other than aging infrastructure. There are currently two incomplete Category 2 O&M recommendations for Caballo Dam. No O&M recommendations were completed during FY 2018.

An Annual Examination was completed in September 2018, and the Facility Review Rating was also updated. The rating for Caballo remained the same at a total score of 94, giving the facility an overall rating of “Good”.

Active Rio Grande Project Litigation

United States of America v. Elephant Butte Irrigation District

The United States filed the case United States of America v. Elephant Butte Irrigation District (EBID), et al Civ. No. 97-0803 JP/RLP/WWD (Quiet Title to the Waters for the Rio Grande Project) on June 12, 1997, requesting the Court to grant quiet legal title to the waters of the Rio Grande Project in its name. The U.S. District Court (USDC) for the District of New Mexico dismissed the case in August 2000. On May 7, 2002, the U.S. Court of Appeals (10th Circuit)

vacated the USDC's August 2000 decision and remanded the case back to District Court for further proceedings. Chief Judge James A. Parker issued an order to stay the case and close for administrative purposes on August 15, 2002. He further ordered that, if it becomes necessary or desirable during the pendency of the water adjudications in New Mexico and Texas, any party may initiate proceedings as though the case had not been closed for administrative purposes.

Since 2010, interested parties have been proceeding with Stream System Issue No. 104, which involves the United States' water interests in the Lower Rio Grande in New Mexico. In 2012, the Court determined that the United States did not have a groundwater right associated with the Rio Grande Project. However, the Court did not rule on whether the various groundwater inflows into the Rio Grande are considered "project water," which would mean the United States still has a right to such inflows once they become surface water again.

On October 26, 2018, the Court found that good cause exists to continue suspension of proceedings in SS-97-104 and SS-97-107, which involve pre-Project interests for the purpose of allowing the parties to continue to make progress in their negotiations. By March 8, 2019, the parties shall report in writing on the status of their negotiations and shall propose new scheduling orders for SS-97-107 and SS-97-104, if appropriate.

State of New Mexico v. United States

On August 8, 2011, the New Mexico Attorney General filed a lawsuit against the United States Bureau of Reclamation (State of New Mexico v. United States, et al. U.S. Dist. Ct. 11-cv-691) regarding the Rio Grande Project 2008 Operating Agreement and a purported change in accounting of the water to be delivered to Texas from the Rio Grande. The case is stayed pending ruling by the Supreme Court on Texas v. New Mexico.

Texas v. New Mexico

In January 2013, Texas filed a motion in the U.S. Supreme Court to: receive a declaration of the rights of the State of Texas to the waters of the Rio Grande pursuant to and consistent with the Rio Grande Compact and the Rio Grande Project Act; issue its decree commanding the State of New Mexico to deliver the waters of the Rio Grande in accordance with the provisions of the Rio Grande Compact and the Rio Grande Project Act; and, award damages and other relief for the injury suffered by the State of Texas.

On January 27, 2014, the U.S. Supreme Court ruled that Texas can proceed to the next step in its lawsuit against New Mexico and invited New Mexico to file a motion to dismiss the action. On February 27, 2014, the United States filed a motion to intervene as a plaintiff, asserting much of the same claims as Texas. On November 3, 2014, the U.S. Supreme Court appointed Gregory Grimsal of New Orleans, LA, as the Lower Rio Grande Adjudication Special Master. The Special Master held hearings on August 19 and 20, 2015, on New Mexico's motion to dismiss, and the motions filed by EBID in New Mexico and EPCWID in Texas for leave to intervene, but did not rule from the bench.

On February 13, 2017, the parties received the final report of the Special Master regarding the motions of New Mexico to dismiss the complaints of Texas and the United States as well as the motions of the two districts to intervene. The Special Master recommended to the court that the Texas complaint be maintained under the U.S. Supreme Court's jurisdiction as a matter of right,

that the United States' complaint in intervention be retained as a matter of the Court's discretionary authority, and that the motions to intervene by EBID and EPCWID be denied. Exceptions (appeals) to the Special Master's report were taken to the U.S. Supreme Court.

On January 8, 2018, the U.S. Supreme Court heard oral argument on the exception to the Special Master's report by the United States and Colorado. The arguments were related to the United States' motion to intervene to protect unique sovereign interests in the Reclamation Rio Grande Project, where the Special Master had argued that the claims of the United States under the Rio Grande Compact be dismissed, but that jurisdiction be extended for the other claims made under the federal government's treaty powers and under Reclamation law. On March 5, 2018, the U.S. Supreme Court delivered a unanimous opinion that sustained the United States' exception, overruled all other exceptions, and remanded the case. On April 2, 2018, the Special Master was discharged, and a new Special Master, the Honorable Michael J. Melloy, was appointed. In May 2018, the Answer of New Mexico to the Texas Complaint and to the United States Complaint was filed with the Special Master along with Counterclaims. In July 2018, the Answer of Texas and the Answer of the United States to New Mexico's counterclaims were filed.

Rio Grande Project Operating Agreement

In 2018, the Rio Grande Project continued to be operated under the 2008 Rio Grande Project Operating Agreement (OA) and Manual. The OA and its Manual provide detailed procedures for operating the Rio Grande Project, allocating the water supply to EBID, EPCWID, and Mexico, and accounting for use by the parties while recognizing and fulfilling the terms of the 1906 Convention with Mexico.

The 2018 irrigation season for the Rio Grande Project began on March 16 for EPCWID, with their initial diversion on March 19. Mexico began diverting a day later, on March 20. EBID began the irrigation season in two phases, with the Rincon Valley beginning irrigation May 1 and the Mesilla Valley on May 30. The Project released 491,305 ac-ft from Rio Grande Project storage for irrigation. EBID, EPCWID, and Mexico were charged for 444,433 ac-ft of delivered water. The calculated diversion ratio, a quantitative measure of delivery performance, was 0.90 for 2018. EBID ended the 2018 irrigation season with -6,037 ac-ft in their allocation account that carries over into 2019, and EPCWID ended with 33,889 ac-ft. Table 13 summarizes the 2018 Rio Grande Project Accounting.

Table 13: Summary of Rio 2018 Grande Project Accounting Charges

	Final Allocation, ac-ft	Total Allocation Charges, ac-ft	Release from Caballo Dam, ac-ft	Calculated Diversion Ratio	Allocation based on Release, ac-ft	Account Balance, ac-ft	Conservation Credit, ac-ft	Mexico Allocation Adjustment, ac-ft	Carryover Account Balance, ac-ft
EBID	123,315	127,487				-4,172		-1,865	-6,037
EP1	314,520	279,211				35,309		-1,420	33,889
Mexico	37,670	37,735			34,450	-3,285			
Total	475,504	444,433	491,305	0.90					

Based on current storage in Elephant Butte and Caballo and the current forecast, it appears that water users will receive less than a full allocation in 2019. Since 2008, the calculated diversion ratios have been less than one, demonstrating that the Project has been operating in an extreme drought scenario.

Elephant Butte and Caballo Reservoir Vegetation Management Cooperative Agreement

Under the previous Vegetation Management Agreement with the State of New Mexico, Reclamation performed maintenance of previously managed vegetation at Caballo Reservoir, primarily by mowing to limit the non-beneficial consumption of water by woody phreatophytes such as saltcedar (Tamarix).

During FY 2018, Reclamation and the NMISC created a new Service Agreement to replace the previous Cooperative Agreement. The new agreement also allows work in the Elephant Butte Reservoir pool. A Task Order was issued to begin the work in April 2018. Approximately 794 acres of phreatophytic vegetation at Caballo was managed utilizing mowers and mulchers during FY 2018.

Other Reclamation Programs

Native American Affairs Programs

Reclamation has numerous projects underway with Pueblos and Tribes. These projects fall under several categories including the Native American Affairs Program, planning, water rights settlements, cooperative ventures with other federal agencies, and special projects funded through Congressional legislation.

As part of Reclamation's Native American and other programs, assistance was given to various Pueblos to evaluate and improve irrigation system efficiency. Some of the projects included planning and design services for future upgrades and construction including concrete lining of farm ditches, land leveling, and replacement of check structures, pipes, culverts, and turnouts. Reclamation is working with the BIA on irrigation system improvements for Middle Rio Grande Conservancy District facilities on lands of the six Middle Rio Grande Pueblos.

The Omnibus Public Land Management Act of 2009, P.L. 111-11, authorized up to \$4 million in federal appropriations to conduct a study of the 18 Rio Grande Pueblos' irrigation infrastructure, and up to \$6 million per year for construction through 2019. Contracts for irrigation surveys for the Pueblos of Nambé and Santa Clara were initiated in 2018 with FY 2018 funding. In addition, the Study Report progressed to the Office of Management and Budget, the final review step before submittal to Congress.

Indian Water Rights Settlements

The Claims Resolution Act of 2010 was signed into law on December 8, 2010, authorizing the settlement of two long-running New Mexico Indian water rights cases. Title V, the Taos Pueblo Indian Water Rights Settlement Act, authorizes implementation of the Abeyta (Taos Pueblo) settlement. Title VI, the Aamodt Litigation Settlement Act, authorizes implementation of the Aamodt (Pojoaque, Nambé, Tesuque, and San Ildefonso Pueblos) settlement. Reclamation is working with BIA, the Pueblos, the State of New Mexico, and other involved parties to implement the provisions of these settlements.

Taos Pueblo Indian Water Rights Settlement

Pursuant to Title V of the Claims Resolution Act, Reclamation is working on implementing their responsibilities under the Taos Pueblo Indian Water Rights Settlement. Under the terms of the Settlement, Taos Pueblo has a recognized right to 11,927.71 ac-ft per year of depletion, of which 7,249.05 ac-ft per year would be available for immediate use. The Pueblo has agreed to forbear using 4,678.66 ac-ft per year in order to allow non-Indian water uses to continue. Over time, the Pueblo would reduce the amount of the forborne water rights through purchase of surface water rights from willing sellers. Reclamation entered into contracts for San Juan – Chama Project water with the Pueblo for 2,215 ac-ft per year, the Town of Taos for 366 ac-ft per year, and El Prado Water and Sanitation District for 40 ac-ft per year.

The Secretary's statement of finding that all conditions precedent have been fulfilled was published in the Federal Register on October 7, 2016, and the Settlement Agreement is final and enforceable. Implementation of the Settlement is currently in the final, on-the-ground phase, and Reclamation is awarding grants to project entities as they move forward with their projects. The United States District Court for the State of New Mexico issued "Partial Final Decree on the Water Rights of Taos Pueblo" on February 11, 2016, which described and decreed water right to the Taos Pueblo. The mutual-benefit projects will minimize adverse effects on the Pueblo's water resources by moving future non-Indian ground water pumping away from the Pueblo's Buffalo Pasture, a culturally sensitive wetland.

Aamodt Settlement

The Aamodt Settlement Agreement provides for settlement of water rights claims in the Pojoaque Basin including claims of the Pueblos of Nambé, Pojoaque, San Ildefonso, and Tesuque; Santa Fe County; and the City of Santa Fe. The Secretary and all other governmental parties signed the Settlement Agreement and Cost Sharing and System Integration Agreement on March 14, 2013.

The Aamodt Litigation Settlement Act authorized Reclamation to plan, design, and construct a Regional Water System (RWS). The RWS would consist of a water diversion, raw water transmission pipeline, and water treatment facility at San Ildefonso Pueblo on the Rio Grande, as well as storage tanks and transmission and distribution pipelines that would supply up to 4,000 ac-ft of water annually to Pueblo and non-Pueblo customers within the Pojoaque Basin.

The Final EIS was published in the Federal Register (FR) in January 2018. A Record of Decision will be signed by April 2019. Reclamation has completed designs at the 90 percent level on Phase 1 that include intake, water treatment plant, storage tanks, and pipelines on the northern end of the project area in San Ildefonso and northern Pojoaque Pueblos. Phase 2 60 percent designs are also complete, and include conveyance of treated water to existing and proposed distribution tanks within the Nambe, southern Pojoaque, and Tesuque Pueblos, and Bishops Lodge in Santa Fe County. Designs at the 30 percent level for Phase 3 are complete and include distribution piping for the Pueblos of San Ildefonso, Pojoaque, Nambe, and Tesuque and Santa Fe County. Associated cost estimates are well above the amount authorized for the project. In accordance with the Act, the Secretary has initiated negotiations with the parties for an agreement regarding non-federal contributions to ensure the RWS can be constructed.

No diversions of Rio Grande water occurred in 2018, but instream river sampling and water quality analysis was conducted from June to November 2018. This was recommended by the U.S. Environmental Protection Agency and the New Mexico Environment Department to obtain more current data. Previously, the most recent data available was from 2012.

Upper Rio Grande Water Operations Model

URGWOM is a computational model developed through an interagency effort. It is used to simulate processes and operations in the Rio Grande Basin from the headwaters in Colorado to Fort Quitman, Texas, as well track the delivery of water allocated to specific users within New Mexico. URGWOM operates on a RiverWare software platform. RiverWare was developed at the Center for Advanced Decision Support for Water and Environmental Systems (CADSWES).

The primary purpose of URGWOM is to facilitate more efficient and effective accounting, forecasting, flood risk management operations, and management of water in the Upper Rio Grande Basin. URGWOM is used for water accounting of SJ-C Project water and forecasting to simulate daily storage and delivery operations in the Rio Grande Basin. The model is used to simulate operations for Annual Operations Plans (AOP) that forecast the remainder of the year, and for long-term forecasts for planning studies.

The Technical Team meets approximately monthly, while the Executive Committee meets less frequently but at least annually. The URGWOM Advisory Committee has not met in several years because attendees in recent years were the same as those at the Technical Team meetings. The URGWOM website is updated with details on recent activities, postings of the latest documentation, and meeting notes. It can be accessed at <http://www.spa.usace.army.mil/Missions/CivilWorks/URGWOM.aspx>.

In 2018, work to improve the Lower Rio Grande segment of URGWOM continued. This included fine tuning the rules governing Elephant Butte and Caballo operations. Enhancement of the URGWOM salinity model and groundwater modeling also continued. The team investigated using Reclamation's ET Toolbox to compute reference and crop evapotranspiration to replace the previous method, which used a spreadsheet outside of the URGWOM. The Technical Team continues to review and test a monthly time step model.

Water Accounting Reports Projects

2018 San Juan – Chama Project Water Accounting

The 2018 San Juan – Chama Project water accounting was accomplished using version 7.3 of the RiverWare modeling system software and version 7.3 of the URGWOM accounting module. All accounting data and information is stored directly in the final version of the 2018 accounting model. Data are also sent to Reclamation's HDB via a data management interface (DMI). Reclamation consulted with representatives of the NMISC and the USACE, Albuquerque District, to verify accounting data throughout the year. This ongoing discussion minimized year-end data quality and accounting concerns.

Oracle® Hydrologic Database (HDB)

HDB is a specialized relational database for storing and recovering hydrologic data used by Reclamation in the management of river and reservoir systems. A generalized version of HDB was specifically developed for Reclamation use with RiverWare® models. HDB is an Oracle® relational database application, and includes connections to data sources such as Reclamation's Hydromet, DOMSAT, DSS, and modeling software such as RiverWare. HDB was originally developed at the University of Colorado's CADSWES. The HDB instance housing URGWOM data is located in the Upper Colorado Regional office, and is maintained by Reclamation's Upper Colorado Regional Office as well as through contract with Precision Water Resources Engineering. HDB has been customized by Reclamation consultants and offices for specific office and model requirements. The AAO and the El Paso Field Office depend on HDB installations for data storage and retrieval.

Development of water accounting and reporting functionalities for the Upper Colorado HDB installation continued during 2018. Water accounting data is directly transferred from the RiverWare URGWOM Accounting Model to HDB, and from HDB to URGWOM, via an HDB/RiverWare Data Management Interface (DMI). OpenDCS 6.5 and HDB-POET 3.6.9 were also released in 2018. OpenDCS is an application that allows automated computations and data manipulation. HDB-POET is an interface for data viewing and analyses.

Planned work for 2019 includes continued maintenance of HDB and continuing to back-populate historical data for both the Middle Rio Grande and Rio Grande Projects into HDB. Reclamation is also working on moving HDB to a new server using Linux version 7 and Oracle version 12. Additional Crystal Reports (version 2016) accounting table reports for internal use and external reporting may be developed, and work to ensure that data posted to the internet are current and correct will continue.

RiverWare®

Numerous improvements to RiverWare® were accomplished during 2018 through multiple contracts (Reclamation and USACE) with CADSWES at the University of Colorado. Work included completing enhancements to the RiverWare workspace, groundwater modeling, plotting, salinity modeling, the geospatial view, and the completion of the Scenario Manager for use by stakeholders. An annual report produced by CADSWES summarizes the 2018 improvements to URGWOM and RiverWare. The report is distributed to the user community at their annual meeting.

Evapotranspiration (ET) Toolbox

ET Toolbox is an extension of Reclamation's Agricultural Water Resources Decision Support (AWARDS) system that provides internet access to high-resolution rainfall and daily crop water use estimates for improving the efficiency of water management and irrigation scheduling. Its coverage extends from Cochiti Dam to Elephant Butte Reservoir. ET currently accounts for an estimated 67 percent of the water depletions over this reach of the Rio Grande, including riparian vegetation, irrigated crops, and open water/wet sand evaporation.

ET Toolbox was intended to make accurate, real-time ET predictions available to URGWOM for daily water operations model runs. This connection was not initially developed, but ET Toolbox has nonetheless proven to be a useful tool for water managers within and outside of Reclamation, supplying accurate, real-time ET predictions via a dedicated website, and providing a real-time ET dataset (estimates of daily riparian and crop water use, open water evaporation, and rainfall).

Initially, the ET Toolbox model processes and predictions used primarily local farm weather station data feeds. Many of these stations are no longer functional, however, and other remote forms of data acquisition currently feed hourly weather data to ET Toolbox. Weather forecasts are now used for all Toolbox calculations.

ET Toolbox can be accessed at <https://www.usbr.gov/uc/albuq/water/ETtoolbox/riogrande.html>. In 2018, the following general tasks were performed on ET Toolbox: general development and maintenance, updates to cropping patterns, improvements and simplifications to the data

acquisition workflow, evaluation of new MRGCD weather stations, and updates to documentation.

The URGWOM Technical Team decided that ET Toolbox will provide ET data used in the model. To transition to ET Toolbox, a new method to calculate effective precipitation was developed and deployed in ET Toolbox. Reclamation also began using URGWOM's crop curves in ET Toolbox. The ET Toolbox calculation area expanded into the Mesilla Valley.

In 2019, Reclamation plans to continue to update cropping pattern information and develop data connections between URGWOM, HDB, and ET Toolbox. Work to allow ET Toolbox to be used as the source for ET data in URGWOM will continue.

Quagga and Zebra Mussel Update

Quagga and zebra mussels (*Dreissena rostriformis bugensis* and *Dreissena polymorpha*) (ZQM) are invasive, freshwater, bivalve mollusks. Originally from Eurasia, zebra mussels were first introduced in the Great Lakes in the mid 1980s and have spread to the western United States. A single female mussel can produce hundreds of thousands of eggs a year, which produce microscopic, swimming larvae called veligers. Veligers spread within a waterbody in numerous ways, mainly by floating within the water column. Transport to neighboring waterbodies occurs via standing water in, or adult mussel attachment on, a water vessel that was used in infested water and then transported to another water body. Eventually, veligers mature and begin to attach to hard surfaces, and will continue to grow into reproducing adults. Clumped onto these hard surfaces, ZQM clog infrastructure, restricting operation and maintenance of water storage, water delivery, and hydropower structures and systems. They also impair recreational use and aquatic ecosystems (<http://www.usbr.gov/research/docs/ks/ks-2015-04.pdf>).

Because Reclamation believes that preventing the spread of mussels is the least costly option for protecting water bodies and Reclamation infrastructure, it is assisting with, providing resources for, or directly engaged in the following.

Outreach: Reclamation has engaged in public outreach efforts since 2009, printing 41,000 'Zap the Zebra' brochures and 1,000 mussel posters. These brochures and posters have been dispersed throughout New Mexico at New Mexico State Parks (NMSP) facilities, convenience and sporting goods shops, and libraries. Permanent signs with the "Stop Aquatic Hitchhikers!" message have been installed at boating docks and other key locations at both Elephant Butte and Navajo Reservoirs. Information is distributed to the public at New Mexico reservoirs where ZQM inspections occur. Western States Boat Inspection Information rack cards, New Mexico Department of Game and Fish (NMDGF) Aquatic Invasive Species (AIS) post cards, NMDGF AIS alien stickers, and 'Zap the Zebra' rack cards are just a few of the items that are distributed.

Watercraft Inspections and Decontamination: Reclamation does not have a direct role in conducting watercraft inspections and decontamination in New Mexico. However, Reclamation supports these activities primarily by providing equipment and contractual support. Reclamation utilizes up to five mobile decontamination units for AIS inspections. Two are permanently assigned to Elephant Butte Reservoir (generally stationed near Marina del Sur). At Navajo

Reservoir, there are two mobile units on the Colorado side (large and small) and one mobile unit on the New Mexico side. There is one permanent decontamination station at Navajo State Park, Colorado, and one unimproved decontamination station at Navajo Lake State Park, New Mexico (Pine River Recreation Area). Seven additional mussel decontamination station locations have been designated at the following reservoir locations: Heron, El Vado, Elephant Butte Main Entry, Elephant Butte Hot Springs, Sumner, and two sites at Brantley. Funding will determine if any of these facilities are built.

In general, AIS watercraft inspection efforts have increased in New Mexico since 2013. NMDGF, Reclamation, and other partners have increased the number of watercraft inspection locations. The number of watercraft inspections statewide has increased from 9,346 in 2013 to 40,834 in 2018 (J. Dominguez, personal communication; Table 14). NMDGF, Pyramid Enterprises (a contractor working with Reclamation, see below), and the City of Farmington are the agencies currently conducting inspections. At many locations, NMSP is providing law enforcement support, location support, and other logistics when needed.

Table 14: 2018 AIS Inspection Data (compiled by NMDGF and Reclamation). Inspections totals include incoming and outgoing vessels

Location	Inspections	Decontaminations
Brantley Reservoir	20	1
Clayton Lake	1	1
Conchas Reservoir	1,819	3
Eagle Nest Lake	4	2
Elephant Butte Reservoir	16,346	42
Farmington Lake	1282	0
Navajo Reservoir	17,629	86
NMDGF ABQ Office	14	4
NMDGF Las Cruces Office	1	0
NMDGF Raton Office	3	0
NMDGF Santa Fe Office	1	0
Other Locations	2	1
Storrie Lake	3	0
Sumner Reservoir	2	0
Ute Lake	3,707	19
Total	40,834	159

Reclamation has a contract for AIS monitoring for up to five years for the following:

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

There were over 16,346 inspections at Elephant Butte Reservoir, and 17,629 inspections at Navajo Reservoir in 2018 (Table 14).

Reclamation Reservoir Monitoring: Since 2008, Reclamation has been sampling seven of its New Mexico reservoir bodies (Navajo, Heron, El Vado, Elephant Butte, Caballo, Sumner, and Brantley) for mussels, and processing these water samples through Reclamation’s research lab

(Reclamation Detection Laboratory for Exotic Species or RDLES) in Denver, CO. RDLES performs microscopy on all water samples to visually identify the presence of these mussel species.

Polymerase Chain Reaction (PCR) testing (Johnson 1995, Reclamation 2013) is performed on samples from all water bodies that have had positive microscopy. All positive PCR results are sent for gene sequencing to verify species (quagga or zebra) using deoxyribonucleic acid (DNA). RDLES provides remaining bulk water samples for independent lab testing, which most states, including New Mexico, require prior to water body re-classification. RDLES positive results may be confirmed by:

- Microscopic photos (using high resolution fluorescent or scanning electron microscopes) taken and verified by dreissenid mussel experts in independent labs,
- Positive microscopic results verified with positive PCR results, and/or
- Positive microscopic results with positive PCR results verified with gene sequencing.

State Aquatic Invasive Species coordinators routinely request independent lab verification of RDLES test results, which may or may not confirm Reclamation test results, as follows:

- Microscopy results agreed upon/not agreed upon,
- PCR results replicated/not replicated,
- If PCR results replicated, then gene sequencing replicated/not replicated.

Each state has its own definition of what constitutes a positive water body, and the action it takes to manage the water body is dependent upon its definition. In New Mexico, the NMDGF is responsible for designating a water body's status for invasive mussels using waterbody designations created by western states AIS coordinators, including: status unknown, undetected/negative, inconclusive, suspect, and positive (USFWS 2013).

Reclamation does not make waterbody designations. However, it does make notifications of all positive test results for a water body. All of RDLES confirmed test results are posted to the Reclamation Mussel SharePoint Database and that data is available to designated State and Reclamation employees. Reclamation follows standard operating procedures and quality control and assurance practices, which are documented and available on the Reclamation Mussel internet site at: <http://www.usbr.gov/mussels/index.html>.

Reclamation continues to sample seven of its New Mexico reservoirs under RDLES' direction. The table below shows the reservoir, total number of tests sites, the total number of months over which the tests were conducted, associated PCR test results and microscopy test results for 2018 (S. Pucherelli, personal communication; Table 15).

Table 15: 2018 AIS sampling results for seven Reclamation reservoirs in New Mexico

Water body	Number of samples	Microscopy results	PCR results
Navajo Reservoir	23	Negative for all	Negative for all
Heron Reservoir	11	Negative for all	Negative for all
El Vado Reservoir	6	Negative for all	Negative for all
Elephant Butte Reservoir	9	Negative for all	Not tested
Caballo Reservoir	8	Negative for all	Not tested
Sumner Reservoir	14	Negative for all	Negative for all
Brantley Reservoir	14	Negative for all	Not tested

In 2018, none of the seven Reclamation reservoirs sampled in New Mexico tested positive for ZQM via either microscopy or PCR.

Factors that may contribute to a lack of mussel occupation in New Mexico reservoirs include a fast spring runoff coupled with high levels of suspended solids, rapid drawdown of reservoir waters and canals, and ongoing drought (D. Hosler, Personal Communication). Continued vigilance is important, as future conditions may be more suitable to AIS establishment.

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WaterSMART Program

Water is our most precious natural resource. Adequate water supplies are essential to human survival, ecosystem health, energy production, and economic sustainability. However, water supplies are increasingly stressed by the demands society places on them, as well as by the

impacts of steadily increasing temperatures, and changing weather patterns. Significant climate-change-related impacts on water supplies are well documented in the scientific literature and scientists are forecasting significant further changes in hydrologic cycles.

Congress recognized these issues 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, and take action to secure water resources for the communities, economies, and the ecosystems they support.

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

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

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

- WaterSMART Grants
 - Water and Energy Efficiency Grants
 - Small-Scale Water Efficiency Projects
 - Water Marketing 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 Re-use Program
 - Funding for planning, design, and construction of water recycling and re-use projects
 - Funding for development of new Title XVI feasibility studies
 - Funding for Title XVI water reuse research
 - Funding for planning, design, and construction of brackish groundwater and ocean desalination projects
- Basin Study Program
 - Baseline Water Assessments
 - Data, tools, and guidance

- SECURE Reports to Congress
- Reservoir Operations Pilots
- Basin Studies (previously funded studies – no new Basin Studies were funded in 2018)
- 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 Albuquerque Area Office (AAO) in the Upper Rio Grande Basin are listed in Table 16 at the end of this section.

WaterSMART Grants

Water and Energy Efficiency Grants

WaterSMART Water and Energy Efficiency Grants (WEEG) provide funding for projects that result in quantifiable water savings and support broader water reliability benefits. These projects conserve and use water more efficiently, increase the production of hydropower, mitigate the risk of conflict in areas at a high risk of future water conflict, and accomplish other benefits that contribute to water supply reliability and have environmental benefits in the western United States.

Small-Scale Water Efficiency Projects

Small-scale water efficiency projects (SWEP) provide funding for small-scale water-management projects that have been identified through previous planning efforts. Benefits are similar to those described for Water and Energy Efficiency Grants, but on a smaller scale.

Water Marketing Strategy Grants

Through the WaterSMART Water Marketing Strategy Grants, Reclamation provides assistance to states, 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. These grants support entities in exploring actions that can be taken to develop or facilitate water marketing that could provide a mechanism for willing participants to buy, sell, lease, or exchange water.

Water Conservation Field Services Program

Through the Water Conservation Field Services Program (WCFSP), Reclamation provides funding and technical assistance to several water management entities in New Mexico and west

Texas. The WCFSP seeks to promote water use efficiency through support of outreach efforts, research projects, and technical assistance to water users.

Cooperative Watershed Management Program

The Cooperative Watershed Management Program (CWMP) contributes to the WaterSMART Program strategy by providing funding to watershed groups to encourage diverse stakeholders to form local solutions to address their water management needs. The purpose of the CWMP is to improve water quality and ecological resilience, conserve water, and reduce conflicts over water through collaborative conservation efforts in the management of local watersheds. Phase I of this program supports the initial establishment of watershed groups and restoration planning by those groups. Phase II supports the completion of watershed management projects that were recommended in the restoration planning process under Phase I.

Drought Response Program

Reclamation's Drought Response Program supports a proactive approach to drought by funding projects that build long-term resilience to drought and reduce the need for emergency response actions. The Drought Response Program provides assistance for three sub-programs: Drought Contingency Planning, which provides assistance to water users for drought contingency planning, including consideration of ways that climate change is affecting water supply reliability; Drought Resiliency Projects, which support actions that will build long-term resiliency to drought; and Emergency Response Actions, which seek to minimize losses and damages resulting from drought, relying on the authorities in Title I of the Drought Act.

Drought Contingency Planning

Reclamation provides 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 the three following 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 build long-term resiliency to drought.

Drought Resiliency Projects

“Drought Resiliency” is defined as the capacity of a community to cope with and respond to drought. Under this element of the program, Reclamation will fund drought resiliency 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. Projects must meet one of the following goals:

- Increase the reliability of water supply and sustainability;

- Improve water management and increase operational flexibility;
- Implement systems to facilitate voluntary sale, transfer or exchange of water;
- Provide benefits for fish and wildlife and the environment;
- Mitigate poor water quality caused by drought.

Emergency Response Actions

Reclamation will continue 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.

Title XVI Water Reclamation and Re-use Projects

Title XVI of P.L. 102-575, as amended (Title XVI), provides authority for Reclamation's water reclamation and re-use program. Through the Title XVI Program, Reclamation identifies and investigates opportunities to reclaim and reuse wastewater and naturally 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 re-use projects in partnership with local government entities. In 2018, the following Title XVI projects were underway with El Paso Water Utilities.

- Feasibility of Water Recovery from Filter Backwashing and Rewashing Operations – in close-out phase;
- Aquifer Storage and Recovery Using Reclaimed Water – in close-out phase;
- Fred Hervey Purple Pipe Project – requested an extension.

Basin Study Program

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

Baseline Water Assessments

Baseline Water Assessment activities focus on development of projections of future water supply and demand for Western river basins, and evaluation of impacts of the projected changes to water/reservoir operations, water quality, hydropower generation, endangered species, fish and wildlife, flow- and water-dependent ecological resiliency, and recreation. Program activities include development of guidance for analysis of potential impacts of changes to water supply and demand on Reclamation projects.

The Baseline Water Assessment Program includes the Reservoir Operations Pilot Projects. Reclamation has initiated an analysis of water operations on the Rio Chama, in northwestern New Mexico, under this program. This project seeks to evaluate the legal constraints to river and reservoir operations on the Rio Chama, evaluate the economic implications of reservoir operations and potential changes to reservoir operations, and compile existing data and information on the impact of reservoir operations on the ecology, geomorphology, hydropower generation, and recreation potential of the designated Wild and Scenic reach of the Rio Chama.

Basin Studies

Reclamation has entered partnerships with local water management agencies to perform Basin studies. Basin studies in the Upper Rio Grande Basin build on the hydrologic projections developed by Reclamation as part of the Upper Rio Grande Impact Assessment (Llewellyn, et. al., 2013). The 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.

Reclamation and its partners completed the Santa Fe Basin Study in 2015, and were funded in 2017 to perform an update to that study.

Reclamation and the New Mexico Interstate Stream Commission are scheduled to complete a Pecos Basin Study in 2018 (please see Reclamation's Report to the Pecos River Commission for more information). In addition, Reclamation is now in partnership with the MRGCD along with a large number of basin stakeholders to perform a Basin Study for the portion of the Rio Grande under New Mexico's jurisdiction per the Rio Grande Compact. This study follows from the Middle Rio Grande Basin Study – Plan of Study, and is called the Rio Grande – New Mexico Basin Study.

Santa Fe Basin Study

In 2015, Reclamation's AAO, in partnership with the City of Santa Fe and Santa Fe County, released the *Santa Fe Basin Study: Adaptations to Projected Changes in Water Supply and Demand* (Llewellyn et. al, 2015). This study evaluates projected impacts of climate change, population growth, and other stressors on the Santa Fe watershed and water supplies for the combined municipal water system of the City and County.

Based on the conclusions of this Basin Study, Santa Fe proposed and received funding from Reclamation for a Title XVI Feasibility Study, which was completed in 2017. The completed feasibility study describes alternatives for implementation of a water reuse project for Santa Fe.

In 2016, Santa Fe was also awarded funding from Reclamation for a Basin Study Update. In this ongoing project, Reclamation and Santa Fe are working together to determine the likely timeline for projected impacts of climate change on Santa Fe's water supply over the coming century, so that the Santa Fe water utility can plan for implementation of the remainder of its adaptation portfolio.

Middle Rio Grande Basin Study: Plan of Study and Rio Grande – New Mexico Basin Study

In 2015, Reclamation entered into a partnership with the MRGCD, Audubon, The Nature Conservancy, Sandia Pueblo, and the Middle Rio Grande Water Assembly to develop a Plan of Study for a comprehensive Middle Rio Grande Basin Study. This Plan of Study was completed in 2017, and provided the basis for a successful proposal to Reclamation for a comprehensive, multi-stakeholder Basin Study. The scope of the Basin Study has been expanded to include the entire portion of the Rio Grande Basin under New Mexico's jurisdiction per the Rio Grande Compact, and is called the Rio Grande – New Mexico Basin Study. The Basin Study, like the Plan of Study, is being funded as a 50/50 cost split between Reclamation and all the other partners combined.

Science & Technology Program

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 part of Reclamation's Science and Technology Program. It initiates and participates in research to improve the services that Reclamation provides to its stakeholders. S&T Program projects underway in 2018 include:

- Completed (FY 2015 Award): Postdocs Applying Climate Expertise (PACE) Fellowship for Improving Seasonal Forecasting to Support Operational Decision-Making within Reclamation Service Areas (AAO partnership with National Center for Atmospheric Research (NCAR), Boulder, CO)
- Ongoing (FY 2016): Field deployment of a continuous sediment load surrogate. (AAO partnership with USGS and University of Mississippi)
- Ongoing (FY-2017 Award): Detecting, Interpreting, and Modeling Hydrologic Extremes to Support Flexible Water Management and Planning (AAO partnership with NCAR, Boulder, CO)
- FY 2018 Award: Collison Floating Evaporation Pan (AAO Partnership with University of New Mexico to improve monitoring of reservoir evaporation)
- FY 2018 Award: Improving the Robustness of Southwestern US Water Supply Forecasting in the Face of Climate Trends and Variability (AAO partnership with NCAR, Boulder, CO)
- FY 2019 Award: 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)
- FY 2019 Award: Software Tool Development to Generate Stochastic Hydraulic Simulations using HEC-RAS (AAO partnership with the USACE and the Hydrologic Research Center of San Diego, CA)

In addition, through Reclamation's Power Resources Office, AAO is partnering with the National Renewable Energy Laboratory on a project to evaluate the feasibility of, and obstacles

to, the installation of floating solar panels, or “floatovoltaics,” on federal reservoirs to generate electricity and reduce reservoir evaporation losses.

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Table 16: Active WaterSMART Projects in the Rio Grande Basin Managed by the Albuquerque Area Office as of February 13, 2019

Agreement Number	Program*	Completion Date	Recipient Name	Project Title	Federal Total Obligation Amount	Non-Federal Total Estimated Amount	GOTR**
R18AP00116	CWMP		Save our Bosque Task Force	Updating and Expanding the Restoration Plan for New Mexico's Middle Rio Grande through Socorro County	\$100,000	\$0	Dagmar Llewellyn
R18AP00117	CWMP		Colorado Rio Grande Restoration Foundation	Rio Grande, Conejos River, and Saguache Creek Stream Management Plan	\$35,000	\$238,030	Dave Park
R18AP00119	CWMP		National Audubon Society, Inc.	Isleta Reach Watershed Restoration Group, Middle Rio Grande Basin Watershed Group Development and Restoration Plan	\$99,964	\$0	Dagmar Llewellyn
R18AP00120	CWMP		Northern Arizona University	Developing a Watershed Restoration Strategy for the Eastern Jemez	\$97,673	\$0	Dave Park
R16AC00108	DROUGHT PLANNING	6/30/2019	Middle Rio Grande Conservancy District	Create a drought contingency plan to identify and prioritize actions to ensure a dependable water supply to its customers while reducing exposure and vulnerability to prolonged water shortages	\$200,000	\$229,886	Dagmar Llewellyn
R16AP00145	DROUGHT PROJECT	9/20/2019	Middle Rio Grande Conservancy District	Socorro Main Canal South Distribution Hub	\$300,000	\$676,101	Ann Demint
R18AC00122	DROUGHT PROJECT		Elephant Butte Irrigation District	Watershed Scale Stormwater Monitoring and Capture	\$180,670	\$181,784	Michelle Estrada-Lopez

Agreement Number	Program*	Completion Date	Recipient Name	Project Title	Federal Total Obligation Amount	Non-Federal Total Estimated Amount	GOTR**
R18AP00193	WEEG		El Paso County Water Improvement District No 1.	Riverside Canal Lining Project	\$1,000,000	\$1,000,000	Woody Irving
R18AP00197	WEEG		Elephant Butte Irrigation District	Picacho WHEN Project	\$998,182	\$1,030,212	Woody Irving
R17AP00215	SWEP	9/30/2020	City of Rio Rancho, NM	Water Efficiency Rebates	\$30,000	\$47,110	David Park
R17AP00220	SWEP	3/31/2019	City of Elephant Butte, NM	Water Meter Upgrades	\$75,000	\$93,367	Woody Irving
R17AP00222	SWEP	12/31/2019	Village of Los Lunas	Effluent Reuse for Construction Water	\$74,681	\$77,090	David Park
R17AP00223	SWEP	9/30/2019	City of El Paso, TX	Water Conservation in El Paso Parks	\$75,000	\$75,000	Woody Irving
R18AP00255	SWEP		City of Rio Rancho	Ultrasonic Water Meter Replacement	\$70,000	\$86,403	David Park
R18AP00258	SWEP		City of Las Cruces	Smart Irrigation Technology Water Supply Reliability Project	\$75,000	\$75,000	Woody Irving
R18AP00261	SWEP		El Paso County Water Improvement District No. 1	Ysla Lateral Concrete Lining Project	\$75,000	\$124,845	Woody Irving
R16AP00069	WCFSP	09/30/2018	City of Rio Rancho	Water Use Audits	\$50,000	\$88,915	David Park
R17AP00022	WCFSP	06/30/2019	Middle Rio Grande Conservancy District	Demonstrating Conservation Project Technologies	\$49,989	\$95,558	David Park

Agreement Number	Program*	Completion Date	Recipient Name	Project Title	Federal Total Obligation Amount	Non-Federal Total Estimated Amount	GOTR**
R18 pending	WCFSP		El Paso County Water Improvement District No. 1	Designing Improvements to Franklin Canal and Franklin Feeder Canal	\$75,000	\$75,000	Woody Irving

*Program:

CWMP = Cooperative Watershed Management Program

WEEG = Water and Energy Efficiency Grant

SWEP = Small-Scale Water Efficiency Project

WCFSP = Water Conservation Field Services Program

**Grant Officers Technical Representative (local AAO point of contact)

Title XVI awards are not included in this table