BUREAU OF RECLAMATION

Calendar Year 2020 Report to the Rio Grande Compact Commission

Interior Region 7: Upper Colorado Basin

U.S. Department of the Interior

March 2021

Mission Statements

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

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

Calendar Year 2020 Report to the Rio Grande Compact Commission

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Cover Photo: Sunrise view downstream end of the Pilot Channel near Bosque del Apache, New Mexico facing downstream (credit: Tyler Mobraten, Geosystems Analysis)

Contents

Introduction **1**
San Luis Valley Project, Colorado **3**
Conejos Division, Platoro Reservoir 3
Platoro Dam Facility Review and Safety of Dams Program 3
Closed Basin Division 5
San Juan-Chama Project, Colorado – New Mexico **8**
San Juan-Chama Project Accounting 8
Heron Dam and Reservoir Operations 8
Pojoaque Tributary Unit – Nambé Falls Dam and Reservoir 13
2021 San Juan-Chama Project Outlook 15
Facility Review and Safety of Dams Program 16
Middle Rio Grande Project, New Mexico **17**
El Vado Dam and Reservoir Operations 17
2021 Middle Rio Grande Project Outlook 20
Facility Review and Safety of Dams Program – El Vado Dam 20
Related Reservoir Operations 21
MRG River Gage Operation and Maintenance 24
River Maintenance 24
Delta Channel Maintenance with the State of New Mexico 36
Programmatic Water Operations and River Maintenance ESA Compliance 366
Other ESA-Related MRG Projects 49
Rio Grande Project, New Mexico – Texas **51**
Rio Grande Project Operations 53
Rio Grande Project Water Accounting 55
2021 Rio Grande Project Outlook 57
RGP River Gage Operation and Maintenance 57
Facility Review and Safety of Dams Program 58
Reservoir Vegetation Management 58
ESA Compliance for Operating Agreement and Storage of SJ-C Water 59
Active Rio Grande Project Litigation 59
Related Reclamation Programs **61**
Native American Affairs Programs 61
Isleta Settlement 61
Indian Water Rights Settlements 62
Hydrologic Models 63
Water Accounting Reports Projects 66
Evapotranspiration (ET) Toolbox 67
Aquatic Invasive Species- Zebra and Quagga Mussels 68
WaterSMART Program 69
Science & Technology Program and Other Research Projects 75

List of Figures

Figure 1: Map of Reclamation's Albuquerque Area Office Projects 2
Figure 2: Area Map of San Luis Valley Project 4
Figure 3: Area Map of the San Juan-Chama Project 9

Figure 4: Area Map of the Middle Rio Grande Project....18
Figure 5: Rio Grande Silvery Minnow estimated densities....41
Figure 6: Summary of Flycatcher nesting in the Middle Rio Grande from 1999 to 2019....44
Figure 7: Flycatcher nest variables, Caballo Dam to El Paso, 2013 to 2019....45
Figure 8: Flycatcher nest variables, Caballo Reservoir delta, 2013 to 2019....45
Figure 9: Area Map of the Rio Grande Project....52

List of Tables

Table 1: CBD Deliveries 2015-2020....5
Table 2: San Luis Valley Project - CBD Water Accounting....6
Table 3: SJ-C Diversions through Azotea Tunnel....10
Table 4: SJ-C Water 2020 Releases from Heron Reservoir....11
Table 5: SJ-C Monthly Water Operations in Heron Reservoir....12
Table 6: SJ-C Water at Otowi....14
Table 7: SJ-C Monthly Water Operations at Nambé Falls Reservoir....15
Table 8: Reservoir Operation for El Vado Dam....19
Table 9: Reservoir Operations for Abiquiu Dam....22
Table 10: Reservoir Operations for Cochiti Dam....23
Table 11: 2020 Isleta Reach Outfall Deliveries....38
Table 12: Southwestern Willow Flycatcher Territories 2013-2020....43
Table 13: Cuckoo Detections/Estimated Territories 2013- 2020....47
Table 14: 2018 Revised Rio Grande Project Water Accounting....55
Table 15: 2019 Revised Rio Grande Project Water Accounting....55
Table 16: 2020 Rio Grande Project Water Accounting....57
Table 17: 2020 AIS Inspection Data (compiled by NMDGF and Reclamation)....69
Table 18: Active WaterSMART Projects in the Rio Grande Basin Managed by the AAO....77

List of Photos

Photo 1: Looking downstream at Santa Ana River Mile 205.8....26
Photo 2: Construction of a new side channel Sandia Priority Site....28
Photo 3: Looking east at the Corrales Siphon....29
Photo 4: New erosion in the RM 199 project area....30
Photo 5: Escondida side channel project....31
Photo 6: View of realigned Rio Grande channel on the BDANWR....33

List of Acronyms and Abbreviations

AAO	Albuquerque Area Office
ABCWUA	Albuquerque Bernalillo County Water Utility Authority
ac-ft	acre-feet
AIS	Aquatic Invasive Species
ANWR	Alamosa National Wildlife Refuge
AOP	Annual Operating Plan
ASI	Annual Site Inspection
AWARDS	Agricultural Water Resources Decision Support
BCM	Basin Characterization Model

BDANWR ..... Bosque del Apache National Wildlife Refuge
BIA ..... Bureau of Indian Affairs
BLM ..... Bureau of Land Management
BO ..... Biological Opinion
BWHA ..... Blanca Wildlife Habitat Area
CADSWES ..... Center for Advanced Decision Support for Water and Environmental Systems
CAS ..... Corrective Action Study
CBD ..... Closed Basin Division
CFA ..... Contributed Funds Agreements
cfs ..... cubic feet per second
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
FRDCP ..... Drought Contingency Plan
DMI ..... Data Management Interface
DOI ..... U. S. Department of the Interior
DOMSAT ..... Domestic Communications Satellite
DSS ..... Data Storage System
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
ESA ..... Endangered Species Act
ET ..... Evapotranspiration
flycatcher ..... Southwestern willow flycatcher
FR ..... Federal Register
FRR ..... Facility Reliability Rating
HCCRD ..... Hudspeth County Conservation and Reclamation District No. 1
HDB ..... Bureau of Reclamation's Hydrologic Database
HEC-RAS ..... Hydrologic Engineering Center River Analysis System
IBWC ..... International Boundary and Water Commission
ITS ..... Incidental Take Statement
JPL ..... NASA's Jet Propulsion Laboratory
kWhr ..... kilowatt-hour
LFCC ..... Low Flow Conveyance Channel
MAT ..... Minnow Action Team
MF-OWHM ..... MODFLOW One-Water Hydrologic Flow Model
MODFLOW ..... Modular Three-Dimensional Finite-Difference Groundwater Flow Model
MODIS ..... Moderate Resolution Imaging Spectroradiometer
MRG ..... Middle Rio Grande
MRGCD ..... Middle Rio Grande Conservancy District
MRGV ..... Middle Rio Grande Valley
NASA ..... National Aeronautics and Space Administration

NCAR.....National Center for Atmospheric Research
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
NMWSC.....New Mexico Water Science Center
NRCS.....Natural Resources Conservation Service
NREL.....National Renewable Energy Laboratory
OA.....Rio Grande Project Operating Agreement
O&M.....Operations and Maintenance
P&P.....Prior and Paramount
P.L.....Public Law
PEST.....Parameter ESTimation
Reclamation.....Bureau of Reclamation
RGCC.....Rio Grande Compact Commission
RGP.....Rio Grande Project
RGSM.....Rio Grande silvery minnow
RGTIHM.....Rio Grande Transboundary Integrated Hydrologic Model
RGWCD.....Rio Grande Water Conservation District
RM.....River Mile
ROV.....Remote Operated Vehicle
RWS.....Regional Water System
S&T.....Science and Technology Program
SADD.....San Acacia Diversion Dam
Secretary.....Secretary of the U.S. Department of the Interior
SIR.....Scientific Investigations Report
SJ-C.....San Juan-Chama
SLVWCD.....San Luis Valley Water Conservation District
SOD.....Safety of Dams
T&M.....Techniques and Methods
TCEQ.....Texas Commission on Environmental Quality
TDS.....Total Dissolved Solids
Title XVI.....Title XVI of Public Law 102-575
TRG.....Transboundary Rio Grande
TRGWM.....Transboundary Rio Grande Watershed Model
TSC.....Technical Service Center
UCB.....Upper Colorado Basin
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
WCFSP.....Water Conservation Field Services Program
WEEG.....WaterSMART Water and Energy Efficiency Grant

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 (Figure 1) 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.

The San Luis Valley Project consists of the Conejos and Closed Basin Divisions. The Conejos Division, which includes Platoro Dam and Reservoir, supplies water for approximately 86,000 acres within the Conejos Water Conservancy District (CWCD). The Closed Basin Division (CBD) 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 (Compact).

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

The Middle Rio Grande Project (MRG) 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 – 70,000 acres of land.

The Rio Grande Project (RGP) 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 Fort Quitman 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 supplied 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 (HCCRD) in Texas. Elephant Butte Dam also generates hydroelectric power that is marketed by the Western Area Power Administration.

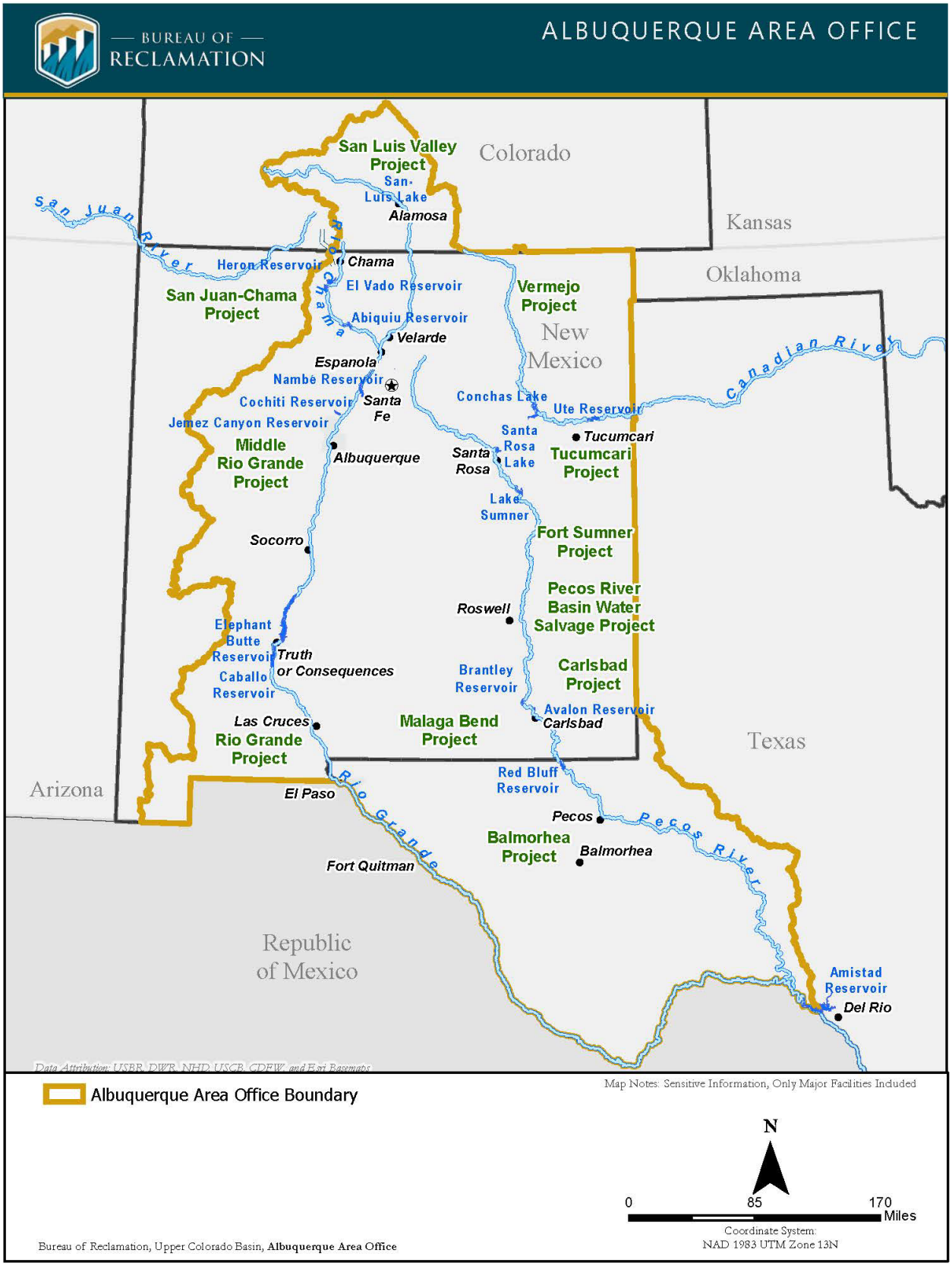


Figure 1: Map of Reclamation's Albuquerque Area Office Projects

San Luis Valley Project, Colorado

Conejos Division, Platoro Reservoir

The CWCD operates Platoro Reservoir, which provides storage for approximately 86,000 acres associated with the San Luis Valley Project (Figure 2).

Operations

Platoro Reservoir started 2020 with a midnight water surface elevation of 9,980.46 feet, and a storage volume of 18,599 acre-feet (ac-ft). The December 31 reservoir elevation was 9,972.07 feet, with a storage volume of 14,231 ac-ft. The minimum storage during 2020 was on November 4 with 13,686 ac-ft (9970.95 feet). The maximum storage was on June 8 when the reservoir peaked at 21,035 ac-ft (9,984.72 feet). Article VII[1] Compact restrictions on storage in Platoro began on June 19 and remained in effect for the rest of 2020.

2021 Platoro Reservoir Outlook

The March Natural Resources Conservation Service (NRCS) median forecast for the Platoro Reservoir Inflow is for 47,000 ac-ft or 84% of the 30-year average. With Article VII Compact restrictions on storage in Platoro projected for the entirty of 2021 no storage is expected and inflows will be bypassed through the facility, as practicable.

Platoro Dam Facility Review and Safety of Dams Program

There are no significant dam safety related Operations and Maintenance (O&M) issues associated with Platoro Dam and Dike.

The scheduled embankment point survey and the dive inspections were completed in 2020. After the 2020 irrigation season, the dam tender planned to recoat the conduit pipe at two locations next to the conduit pipe bifurcation where parts of the coating are peeling because of high velocity discharges. The coating surface defects were first seen in 2017. Repairs should be completed before the next peak discharge season to prevent further damage.

Currently there is one incomplete Category 2 O&M recommendation for Platoro Dam. The Annual Site Inspection (ASI) was completed on August 11, 2020. The Facility Reliability Rating (FRR) was completed in September 2020. The FRR score was 97, resulting in an overall rating of "Good."

[1] See the Article VII section under Rio Grande Project

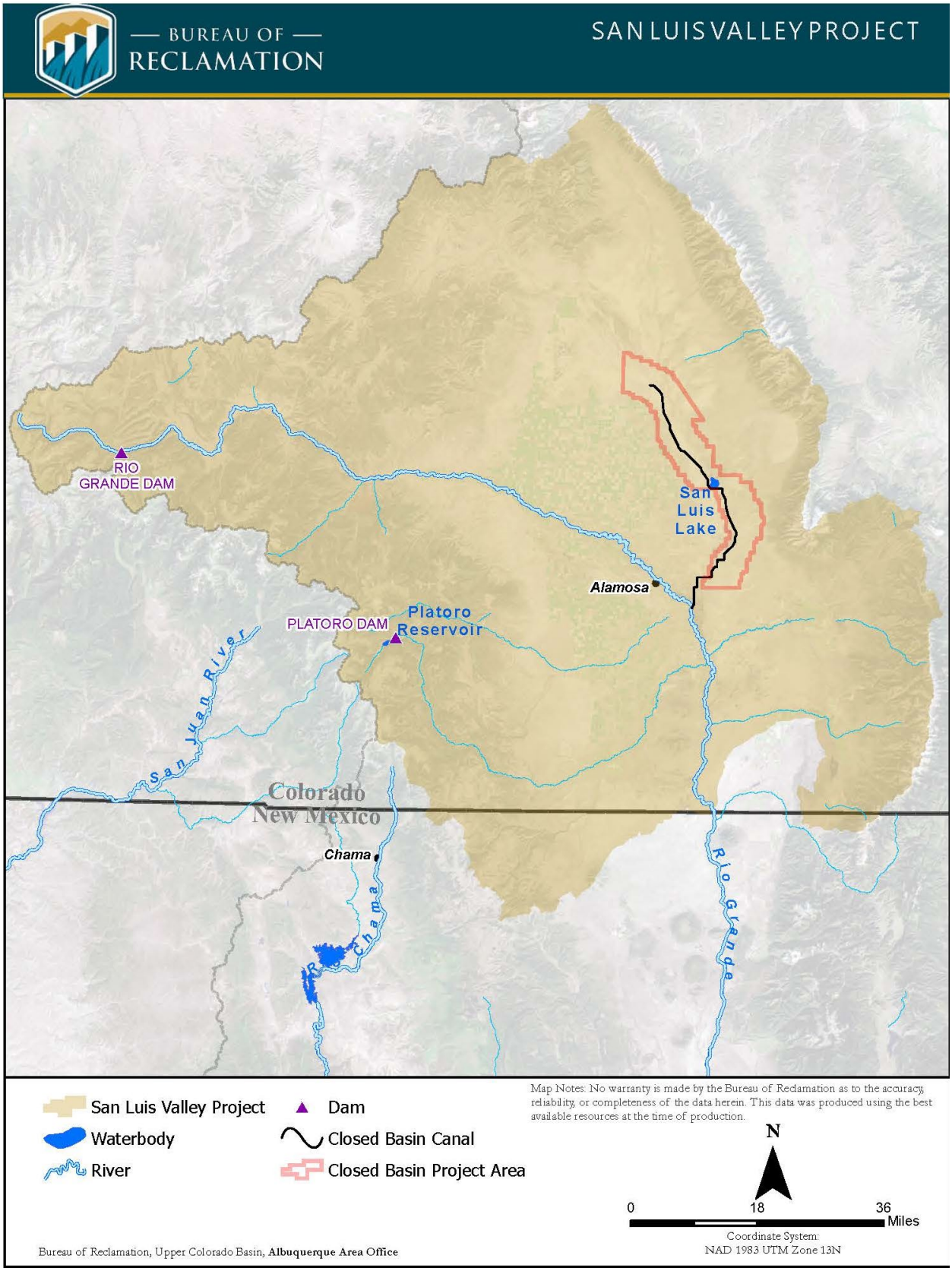


Figure 2: Area Map of San Luis Valley Project

Closed Basin Division

The Closed Basin Division (CBD) is a water salvage project in the San Luis Valley of Colorado (Figure 2). The CBD purpose 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 scheduled delivery under the Rio Grande Compact. The CBD also delivers mitigation water to the Alamosa National Wildlife Refuge (ANWR) and Blanca Wildlife Habitat Area (BWHA). Reclamation operates the CBD under the guidance of the CBD Operating Committee.

Operations

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

Deliveries by the CBD in 2020 included deliveries to the Rio Grande, BWHA, ANWR and San Luis Lakes State Wildlife Area (SWA). CBD pumping was reduced beginning in July at the request of the CBD Operating Committee as Compact delivery obligations were nearing completion for 2020. A minimum canal flow of 5 cubic feet per second (cfs) was delivered from November 4 to December 31 to maintain channel flow beneath the ice cap.

In 2020, the CBD Project delivered 9,911 ac-ft. Of that, total creditable Compact water delivered to the Rio Grande was 6,498 ac-ft. This included 6,188 ac-ft delivered at the CBD canal outlet, plus 250 ac-ft delivered to the BWHA and 60 ac-ft delivered to the San Luis Lakes SWA in exchanges with Colorado Parks and Wildlife (CPW). The Compact specifies that creditable water delivered to the river cannot exceed 350 parts per million total dissolved solids (TDS) based on a ten-day average. All water deliveries to the Rio Grande met these water quality standards in 2020. Table 1 compares total production and Compact deliveries in 2020 to the five preceding calendar years.

Table 1: CBD Deliveries 2015-2020[1]

Year	Total CBD Production	Delivered to RG @ CBD Canal Outlet	Delivered to RG by Exchange[2]	Total Creditable Delivery to RG
2020	9,911	6,188	310	6,498
2019	12,334	8,567	400	8,967
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

[1] Units are ac-ft

[2] CBD water delivered to BWHA or San Luis Lakes State Wildlife Area (SWA) in exchange for other water sources delivered upstream to the RG.

Table 2 shows total water deliveries to the Bureau of Land Management's (BLM) BWHA were 1,300 ac-ft, composed of 800 ac-ft for annual mitigation, 250 ac-ft from an exchange with BLM, and 250 ac-ft transfer from the ANWR. Deliveries to ANWR were 2,363 ac-ft for CBD Project mitigation, 2,613 ac-ft less the 250 ac-ft transfer to the BWHA.

Table 2: San Luis Valley Project - CBD Water Accounting[1]

San Luis Valley - Closed Basin Division	BWHA CH03 STA. 730 + 00	BWHA CH04 STA. 798 + 60	BWHA Month Totals[2]	Parshall Flume Total Passing Flume	Parshall Flume Creditable Amount at Flume	ANWR CH01 Chicago Turn-Out	ANWR CH02 Mum. Turn-Out	ANWR Pumping Plant	ANWR Month Totals	Delivery to the Rio Grande Total at Flume Minus Del. @ ANWR	Delivery to the Rio Grande Credit Amt. Del. to R.G. & not used by ANWR[3]	Delivery to the Rio Grande Non-Creditable at Lobatos	CBD Totals
January	0	0	0	932	932	0	0	0	0	932	932	0	932
February	0	19	19	996	996	14	17	0	31	965	965	0	1,015
March	85	157	242	982	982	264	272	0	536	446	446	0	1,224
April	56	15	71	829	829	14	17	0	31	798	798	0	900
May	20	18	38	857	857	0	0	0	0	857	857	0	895
June	34	35	69	793	793	0	0	0	0	793	793	0	862
July	163	225	388	452	452	0	0	0	0	452	452	0	840
August	149	170	319	511	511	264	226	0	490	21	21	0	830
September	74	80	154	595	595	232	264	0	496	99	99	0	749
October	0	0	0	779	779	346	353	0	699	80	80	0	779
November	0	0	0	345	345	48	32	0	80	265	265	0	345
December	0	0	0	480	480	0	0	0	0	480	480	0	480
Annual	581	719	1,300	8,551	8,551	1,182	1,181	0	2,363	6,188	6,188[4]	0	9,851[5]

[1] Units are ac-ft

[2] Delivery to BWHA includes: 250 ac-ft transferred via exchange by the BLM and 250 ac-ft transfer of mitigation water from the ANWR to the BWHA

[3] The San Luis Lakes SWA received 60 ac-ft which was delivered to the North Head Lake Playa in an exchange with CPW

[4] Total creditable to Rio Grande from delivery and exchange = 6,188 + 60 + 250 = 6,498 ac-ft

[5] Total CBD production for 2020 was 9,851 + 60 = 9,911 ac-ft

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 added road base material. All vehicles and heavy equipment were serviced according to their recommended maintenance schedule.

Redrilling and rehabilitation of salvage wells is ongoing. In 2020, four salvage wells were redrilled, 12 wells were rehabilitated, and 7 new pumps were installed.

All four redrilled wells were constructed using a glass bead filter pack with stainless steel casing. Stainless steel casing will greatly increase the life of the well while the glass beads are intended to increase long term well productivity and reduce the need for frequent well rehabilitation, in part due to biofouling. The performance of these wells will be monitored closely.

Water Quality

Reclamation continues to monitor the water quality of CBD salvage wells, the Rio Grande, San Luis Lake, Head Lake, and the conveyance channel with 1,429 samples collected during 2020.

Reclamation's Water Quality Laboratory continues to support the O&M groups with their salvage well rehabilitation and bio-fouling mitigation efforts. Currently all salvage wells are monitored for the presence of iron-related bacteria.

Rio Grande Water Conservation District

The Rio Grande Water Conservation District (RGWCD) assists Reclamation with CBD maintenance through a cooperative agreement. RGWCD assisted with salvage well maintenance, rehabilitation, and drilling activities. Other work included blading and mowing of 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 River Basin in Colorado through the San Juan-Chama Project (SJ-C) (Figure 3), authorized by Congress in 1962 through Public Law (P.L.) 87-483, introduces special circumstances for water use and management in the Middle Rio Grande Valley. Imported SJ-C water must be accounted for separately from native Rio Grande flow.

San Juan-Chama Project Accounting

Reclamation is responsible for water contracts and water accounting for the SJ-C. 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 (DMI). Crystal Reports® has been used since 2013 to generate the SJ-C accounting report. SJ-C accounting for 2020 is provided in the separate *2020 Water Accounting Report.*

Heron Dam and Reservoir Operations

Diversions into the Azotea Tunnel began on February 22 and continued until September 17 during 2020. The total volume diverted was 48,214 ac-ft. The running 10-year average of Azotea Tunnel diversions decreased slightly this year, from 87,078 ac-ft for the period 2010 through 2019, to 82,959 ac-ft for the period 2011 through 2020 (Table 3).

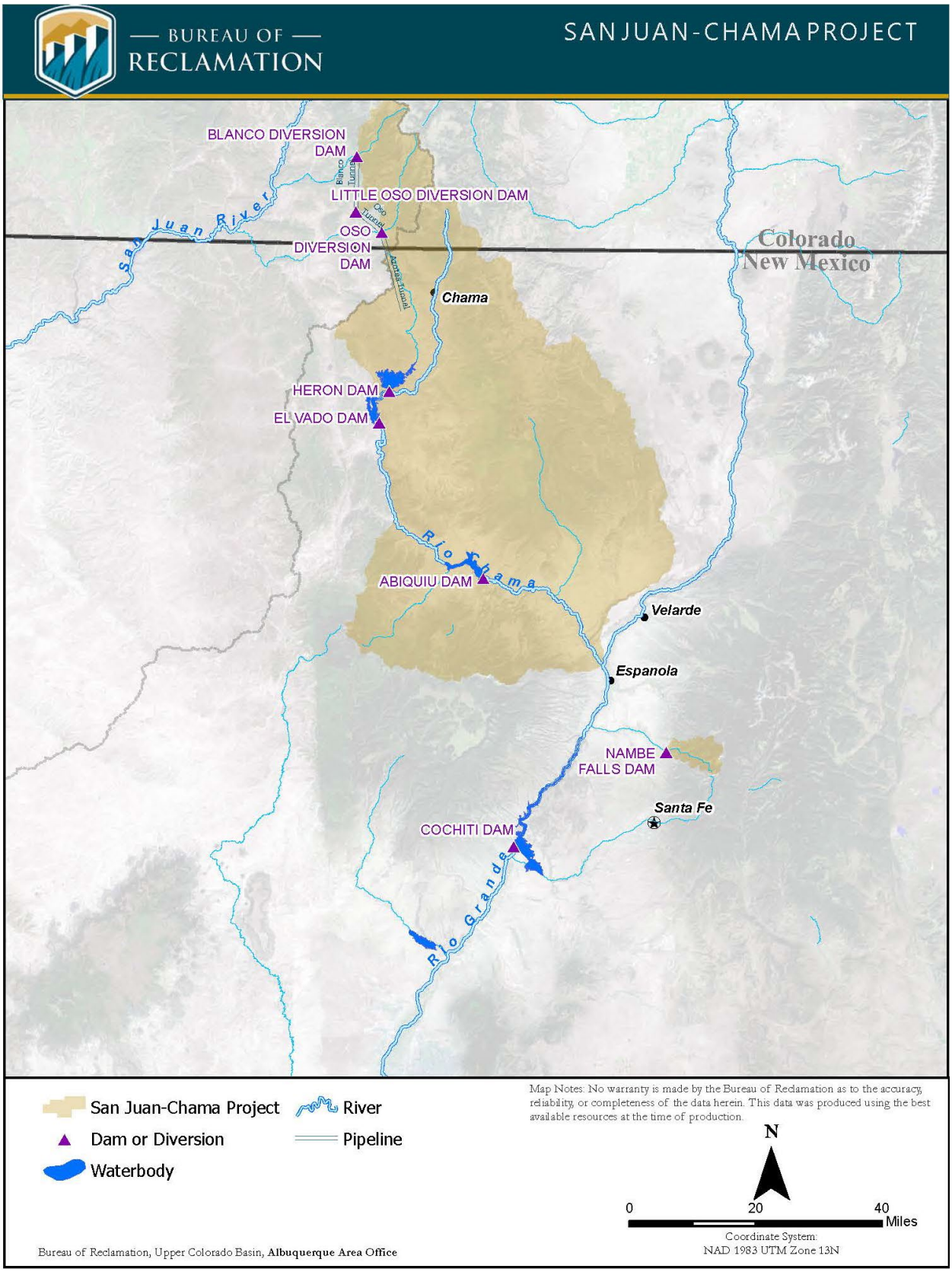


Figure 3: Area Map of the San Juan-Chama Project

Table 3: SJ-C Diversions through Azotea Tunnel[1]

Azotea Tunnel	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	10-Year Total
Month											
January	0	0	0	0	28	109	0	0	0	0	137
February	0	0	0	227	974	1,917	1,488	0	0	9	4,615
March	2,008	7,014	1,036	1,984	6,890	6,489	16,839	1,598	1,036	1,644	46,538
April	13,570	18,133	7,068	13,808	8,163	13,687	32,628	12,869	24,049	10,605	154,580
May	22,315	17,032	16,844	20,251	24,470	27,940	45,326	15,616	33,926	26,972	250,692
June	42,779	4,037	8,387	18,851	38,438	35,427	46,227	2,636	56,925	7,866	261,573
July	8,404	670	511	1,550	8,581	3,535	10,617	152	26,285	876	61,181
August	1,594	260	3,115	788	889	3,681	4,809	7	5,841	159	21,143
September	1,852	76	4,930	902	126	1,271	1,806	0	208	83	11,254
October	4,452	0	2,761	1,334	811	253	2,413	1,216	0	0	13,240
November	1,295	0	1,049	335	862	0	279	283	0	0	4,103
December	0	52	0	59	0	334	0	90	0	0	535
Annual	98,321	47,222	45,760	60,030	90,566	94,309	162,522	34,377	148,270	48,214	829,591

Heron Reservoir began the year at elevation 7,116.65 feet (106,096 ac-ft). The maximum elevation/storage was reached on June 10 at 7,127.95 feet (137,806 ac-ft). Heron Reservoir ended the year at elevation 7,088.42 feet (53,271 ac-ft), close to the low point of 7088.40 feet (53,244 ac-ft), which occurred from December 24 to 28.

An initial allocation of 40,000 ac-ft was made to the SJ-C contractors in January 2020. Subsequent allocations were made in April, May, and June. The total volume allocated amounted to 78,000 ac-ft or 81% of a full allocation.

[1] Units are ac-ft

The SJ-C contractors' 2020 and waivered 2019 allocations were delivered as shown in Table 4, for a total delivery of 90,589 ac-ft. The remaining 2020 allocations are being held in Heron according to waivers, which grant an extension of the delivery date into 2021. Table 5 presents actual monthly Heron water operations for 2020.

Table 4: SJ-C Water 2020 Releases from Heron Reservoir[1]

SJ-C Heron Release	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Release
MRGCD	0	0	0	0	0	17,078	1,230	249	170	0	0	0	18,727
Santa Fe	0	0	0	0	0	0	0	757	4,423	0	0	0	5,180
Santa Fe County	0	0	0	0	0	0	0	0	0	0	0	0	0
Cochiti	0	0	0	0	0	0	0	0	46	0	0	124	170
City of Albuquerque	0	0	0	0	0	0	0	20,707	27,493	0	0	0	48,200
Pojoaque Unit	0	0	0	0	0	0	303	0	0	0	0	422	725
Taos	0	0	0	0	0	0	0	0	0	0	0	0	0
County of Los Alamos	0	0	0	0	0	0	0	0	0	0	0	0	0
City of Española	0	0	0	0	0	0	0	0	0	0	0	0	0
Taos Ski Valley	0	0	0	0	0	0	0	0	2	0	0	12	14
Village of Los Lunas	0	0	0	0	0	0	80	0	0	0	0	0	80
Town of Bernalillo	0	0	0	0	0	100	0	0	119	0	0	0	219
Belen	0	0	0	0	0	350	0	0	0	0	0	0	350
Red River	0	0	0	0	0	0	0	0	0	0	0	0	0
Jicarilla Apache	0	0	0	0	0	0	0	0	0	0	0	0	0
Ohkay Owingeh	0	0	0	0	0	0	0	0	0	0	0	0	0
Reclamation	104	0	0	1,480	5,967	1,379	7,995	0	0	0	0	0	16,925
El Prado	0	0	0	0	0	0	0	0	0	0	0	0	0
Taos Pueblo	0	0	0	0	0	0	0	0	0	0	0	0	0
Aamodt Settlement	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	104	0	0	1,480	5,967	18,906	9,608	21,713	32,252	0	0	559	90,589

[1] Units are ac-ft

Table 5: SJ-C Monthly Water Operations in Heron Reservoir[1]

Heron Reservoir	Rio Grande Inflow	San Juan Chama Inflow	Rio Grande Outflow	San Juan Chama Outflow	San Juan Chama Loss	Rio Grande EOM Content	San Juan Chama EOM Content	Total	Elevation (feet)
Dec. 2019	-	-	-	-	-	893	105,304	106,197	7,116.69
January	263	0	611	104	0	195	105,550	105,745	7,116.51
February	406	9	64	0	0	536	105,560	106,096	7,116.65
March	1,231	1,644	69	0	496	1,698	106,708	108,406	7,117.56
April	1,163	10,584	2,199	1,480	2,249	662	113,563	114,225	7,119.78
May	494	26,918	811	5,967	1,842	346	132,672	133,018	7,126.38
June	1,474	7,850	1,474	18,906	2,719	346	118,897	119,243	7,121.62
July	352	876	71	9,608	915	626	109,250	109,876	7,118.13
August	118	159	66	21,713	1,196	678	86,500	87,178	7,108.45
September	43	83	372	32,252	468	350	53,863	54,213	7,089.11
October	32	0	32	0	260	350	53,603	53,953	7,088.92
November	31	0	31	0	69	350	53,534	53,884	7,088.87
December	32	0	32	559	54	350	52,921	53,271	7,088.42
Sub-Total	5,639	48,123	5,832	90,589	-	-	-	-	-
Adjustment[2]	-	-	-	-	-	-350	-	-	-
Annual	53,762		96,421		10,268	0	52,921	53,271	-

[1] Units are ac-ft except as noted

[2] 350 ac-ft of native Rio Grande water is annually retained in Heron to cover water use by New Mexico State Parks' facilities under a water rights file No. 1545

Pojoaque Tributary Unit – Nambé Falls Dam and Reservoir

Operations of Nambé Falls Reservoir consist of non-irrigation and irrigation season operations. During non-irrigation season (November-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-October), water is stored and released on demand to meet downstream requirements.

Nambé Falls Reservoir began 2020 at an elevation of 6,821.06 feet (1,437 ac-ft). The reservoir filled in early March, began spilling water and remained full and spilling until mid-June when irrigation releases began. The maximum elevation was 6,826.80 feet (1,740 ac-ft) which occurred on May 30-31. Releases continued through July 22, also the day of the minimum elevation of 6,797.33 feet (545 ac-ft). A small volume, approximately 150 ac-ft, was stored between July 22 and August 10. Of this about 30 ac-ft evaporated and 120 ac-ft was released prior to September 3 when releases from storage concluded for the year. The reservoir ended 2020 at elevation 6,813.56 feet (1,091 ac-ft).

The Nambé Falls depletion for the year was 706 ac-ft. A release of 721 ac-ft from Heron Reservoir was required to account for losses to Otowi. That volume was released before December 31, and the required amount to pass Otowi was fulfilled.

Table 6 shows all SJ-C water at Otowi, and includes a summary of Nambé Falls use above Otowi and the Pojoaque Unit return flow credit used to calculate depletions during 2020. A summary of 2020 Nambé Falls Reservoir operations is provided in Table 7.

Table 6: SJ-C Water at Otowi[1]

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	Nambé Falls Use Above Otowi	Return Flow Credit - Pojoaque Unit	San Juan Water at Otowi
January	104	0	6,255	6,359	-2,710	103	199	24	3,371
February	0	0	5,780	5,780	-3,182	87	112	29	2,428
March	0	0	6,072	6,072	-3,401	91	25	33	2,588
April	1,480	0	6,608	8,087	813	169	59	17	8,689
May	5,967	0	5,769	11,736	-3,983	199	46	22	7,530
June	18,906	2,157	0	16,750	18,301	500	6	17	34,562
July	9,608	0	2,029	11,637	15,971	376	99	72	27,205
August	21,713	16,100	0	5,613	971	121	58	103	6,508
September	32,252	10,252	0	22,000	-10,608	345	121	47	10,974
October	0	0	4,917	4,917	-836	91	133	33	3,890
November	0	0	2,674	2,674	-2,343	32	146	28	181
December	559	0	3,018	3,576	-2,749	47	152	25	653
Annual	90,589	28,509	43,122	105,201	6,244	2,161	1,156	450	108,578

[1] Units are ac-ft

Table 7: SJ-C Monthly Water Operations at Nambé Falls Reservoir[1]

Nambé Falls	Inflow	Outflow Bypassed	Outflow Storage Release Operational	Outflow Storage Release Irrigation	Reservoir Losses	Total Outflow + Losses	End of Month (EOM) Content	EOM Elevation (feet)
Dec. 2019							1,430	6,820.91
January	255	54	3	0	1	59	1,626	6,824.71
February	246	130	9	0	5	144	1,728	6,826.59
March	510	480	14	0	12	506	1,732	6,826.66
April	689	623	0	57	21	700	1,721	6,826.47
May	1,418	1,365	0	8	27	1,399	1,740	6,826.80
June	624	603	0	481	18	1,101	1,263	6,817.43
July	277	165	0	723	13	901	639	6,800.70
August	175	114	0	108	4	226	588	6,798.88
September	176	53	0	16	4	74	690	6,802.38
October	183	50	0	0	4	54	819	6,806.43
November	204	57	0	3	5	65	958	6,810.27
December	184	17	0	18	15	51	1,091	6,813.56
Annual	4,941	3,711	26	1,414	129	5,280	-	-

2021 San Juan-Chama Project Outlook

On December 31, 2020, Heron Reservoir had 4,014 ac-ft of SJ-C storage. This amount is just over 4% of the calculated firm yield of 96,200 ac-ft. 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 storage to cover both the dead pool and anticipated reservoir evaporation from January 1 until runoff begins in the spring. Therefore, contractors were notified on January 15, 2021, that there would be no initial allocation.

Water scarcity was contemplated in the SJ-C authorization, and all SJ-C 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. The March NRCS median forecast for the Rio Blanco and the Navajo River at the diversions are for 40,000 and 45,000 ac-ft respectively. That may translate to an inflow into Heron of 73,000 ac-ft. Median annual project inflow for the period of 1971 to 2019 is 89,403 ac-ft, so a full allocation is unlikely in 2021.

[1] Units are ac-ft except as noted

Facility Review and Safety of Dams Program

Heron Dam

There are no significant dam safety related O&M issues associated with Heron Dam and Dike. In 2020, Heron Dam was scheduled for a Comprehensive Review (CR). The CR did not take place due to the COVID-19 pandemic. Portions of the ASI were used in lieu of the CR Civil and Mechanical exams. The embankment point surveys were taken out of stand-by status and are scheduled to be completed in 2021 and 2027, after which they will be completed on an eight-year recurring cycle.

Currently, there are six incomplete Category 2 O&M recommendations for Heron Dam, two of which were issued from the 2020 CR, and two new Safety of Dams (SOD) recommendations also issued from the 2020 CR. The ASI was completed in July 2020. The FRR was completed in September 2020. The FRR score for Heron Dam was 84, resulting in an overall rating of "Good".

Nambé Falls Dam

There are no significant dam safety-related issues associated with Nambé Falls Dam. The scheduled dive inspection was completed in 2020. In Summer 2020, the dam tender noticed that the No. 1 jet flow gate was not opening as designed. After further review, a decision was made to have Reclamation inspect the jet flow gate. Nothing was noted and a decision was made to operate the gate manually until the end of the irrigation season. After irrigation season, Reclamation staff were able to operate the gate normally during testing. During 2021, Reclamation will conduct a CR which will include a full gate evaluation.

In August 2020, the Medio forest fire, above and to the south of the dam, was started by lightning. The fire burned approximately 4,000 acres and had no effect to the Rio Nambé watershed. It did burn power lines and poles to the dam which resulted in a loss of power at the dam. In restoring power to the dam, the transfer unit to the backup generator stopped functioning. In October 2020, Reclamation evaluated the transfer unit and completed repairs. There is currently one incomplete Safety of Dams recommendation and three incomplete Category 2 O&M recommendations. Work on O&M recommendation 2007-2-A, to update the dam break analysis and resulting inundation mapping, is in progress.

The ASI was completed in June 2020. No O&M recommendations were added during 2020. The 2020 FRR was updated in September. The FRR score for Nambé Falls was 84, resulting in an overall rating of "Good."

Middle Rio Grande Project, New Mexico

The Middle Rio Grande Project (MRG) is operated by the AAO, with support from the Chama Field Division for operations and maintenance of MRG and SJ-C facilities. The Socorro Field Division performs construction throughout the area. The MRG includes El Vado Dam and Reservoir and the River Maintenance Program from Velarde, NM to Caballo Reservoir (Figure 4). MRGCD acts as Reclamation's agent with the transferred O&M authority and responsibility for the MRG diversion dams and irrigation distribution system.

El Vado Dam and Reservoir Operations

El Vado Reservoir began 2020 at an elevation of 6,825.45 feet (32,087 ac-ft) and ended the year at 6,813.18 feet (20,105 ac-ft), which was also the low point of the year. The peak was on May 18 at an elevation of 6,851.80 feet (68,404 ac-ft).

MRGCD started 2020 with 22,326 ac-ft of SJ-C water in El Vado from previous years' allocations. As part of the initial 2020 SJ-C allocation, MRGCD received 8,690 ac-ft in Heron on January 1. By the end of the year, they had received 16,945 ac-ft, or 81% of their full 20,900 ac-ft allocation. Unlike in recent years, MRGCD took delivery of and released their current year allocation.

MRGCD began the year with no native Rio Grande water in storage in El Vado for Middle Valley irrigation. At the beginning of 2020, Article VII[1] Compact restrictions on storage of native water were not in effect. Between January 1 and June 18, 56,501 ac-ft was stored while not under Article VII restrictions. On June 19, Article VII restrictions came into in place for the rest of the year. After June 19, other than incidental storage, no native water was stored in El Vado in 2020. Native Rio Grande storage in El Vado reached a peak of 64,736 ac-ft on May 20.

El Vado was used as a re-regulating reservoir for water moving between Heron and Abiquiu for efficient operations and multi-pupose water availability. The Albuquerque Bernalillo County Water Utility Authority (ABCWUA) moved some of their 2018 SJ-C allocation out of Heron and into El Vado late in 2019. Some of Reclamation's leased water in Heron was also moved to El Vado near the end of 2019. This SJ-C water (2,826 ac-ft – ABCWUA and 6,591 ac-ft – Reclamation) was used to maintain winter flows between El Vado and Abiquiu while allowing native inflows to be stored in El Vado. Some of this SJ-C water was also used for weekend rafting flows in July and August when there was no need to release stored Rio Grande water for irrigation. MRGCD also moved 10,000 ac-ft of its SJ-C water from El Vado to Abiquiu to pay back ABCWUA.

Total storage in the reservoir at the end of the year was 20,105 ac-ft (6,813.18 feet). It was comprised mostly of SJ-C water: 169 ac-ft – MRGCD, 11,284 ac-ft –ABCWUA, 5,144 ac-ft – City of Santa Fe, and 71 ac-ft – Santo Domingo Pueblo. In addition, there was 3,437 ac-ft of native Rio Grande water. Table 8 provides a summary of monthly operations and water accounting for El Vado Reservoir.

[1] See Article VII Section under Rio Grande Project

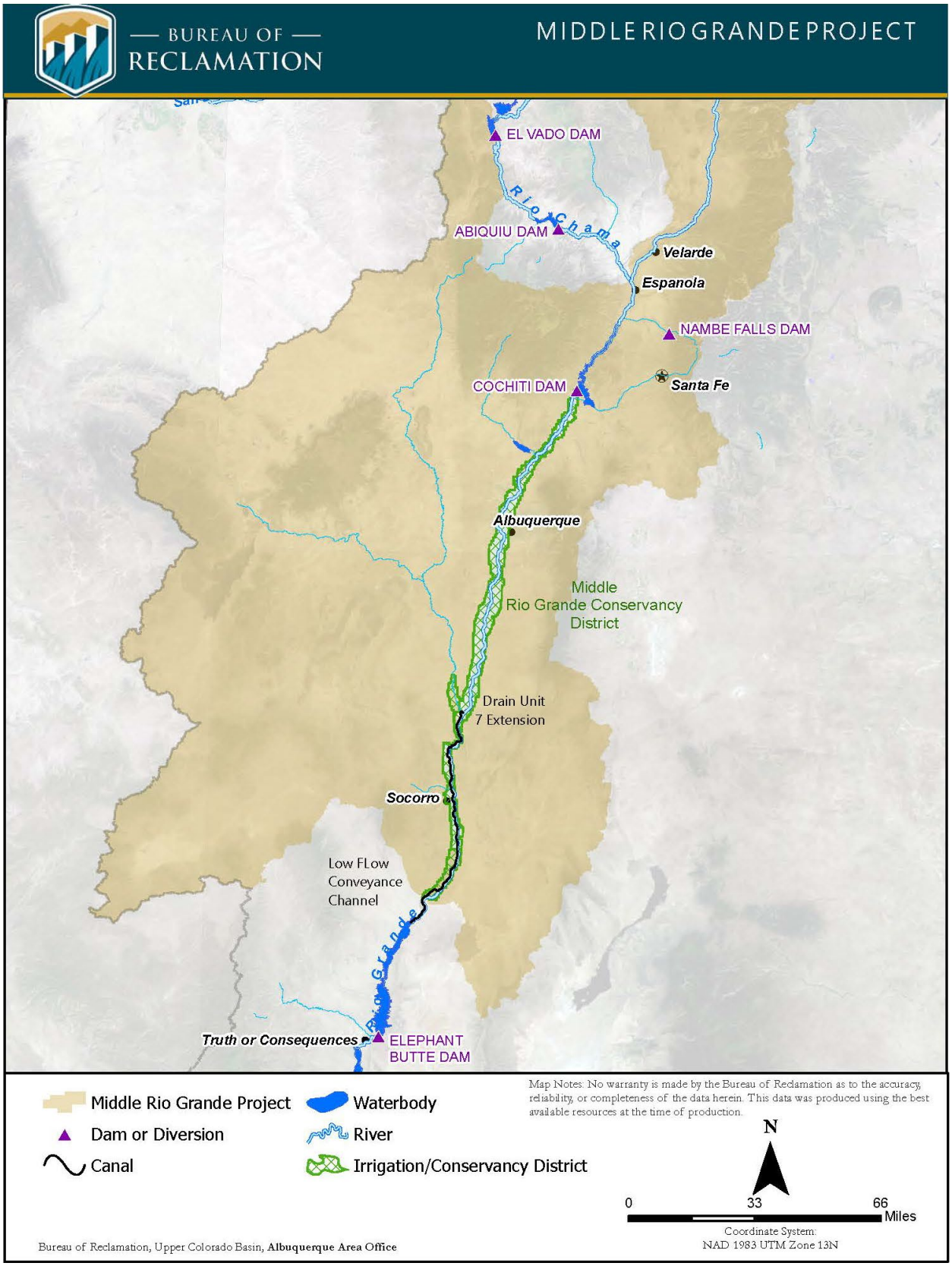


Figure 4: Area Map of the Middle Rio Grande Project

Table 8: Reservoir Operation for El Vado Dam[1]

El Vado Reservoir Operation	Rio Grande Inflow	San Juan - Chama Inflow	Rio Grande Outflow	San Juan - Chama Outflow	Rio Grande Losses	San Juan - Chama Losses	Rio Grande EOM Content	San Juan - Chama EOM Content	Total EOM Content
Dec. 2019	3,083	26,174	9,185	7,775	164	-37	391	31,718	32,109
January	4,346	104	0	6,284	0	0	4,737	25,463	30,200
February	3,980	0	0	5,780	0	0	8,717	19,683	28,400
March	6,395	0	119	6,072	100	33	14,892	13,579	28,471
April	28,904	1,480	7,665	8,087	141	80	35,990	6,891	42,881
May	42,590	5,967	17,354	11,736	460	30	60,766	1,092	61,858
June	6,920	18,906	12,727	16,750	394	17	54,565	3,232	57,797
July	3,516	9,608	13,650	11,637	3,118	24	44,113	1,178	45,291
August	3,430	21,713	33,368	5,613	95	51	14,079	17,228	31,307
September	4,698	32,252	15,103	22,000	94	86	3,580	27,394	30,974
October	1,522	0	1,494	4,917	125	100	3,482	22,377	25,859
November	3,776	0	3,705	2,674	104	31	3,449	19,672	23,121
December	2,919	559	2,804	3,576	127	-14	3,437	16,668	20,105
Annual	112,996	90,589	107,989	105,126	1,958	438	-	-	-

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 Compact-approved data, may differ from reservoir storage used to make daily operational decisions. Hence, the dates mentioned above may differ from those found using final 2020 data.

Prior and Paramount Operations

Reclamation stores native water in El Vado Reservoir for use on Prior and Paramount (P&P) acreage of the six MRG Pueblos when natural Rio Grande flows are not sufficient to meet the irrigation demand. The Bureau of Indian Affairs' (BIA) call for P&P storage in 2020 was 20,095 ac-ft. That volume was transferred to P&P storage in El Vado on May 21 from the native water stored since January 1. Between June 20 and September 30, 17,771 ac-ft of that was released for irrigation on the P&P lands per BIA's call. Additionally, 1,573 ac-ft were transferred to MRGCD, and evaporative losses through September 30 were 751 ac-ft. Of the amount transferred to MRGCD, most was released for irrigation.

The total P&P storage demand is calculated by month and them summed for the entire irrigation season. Because all P&P water was stored outside of Article VII restrictions, BIA was able to return any unused portion of a given month's volume to MRGCD for general irrigation use. In June, August, and September, a total of 1,573 ac-ft were returned to MRGCD. By the end of the irrigation season, there was only 91 ac-ft of unused P&P storage which was held and transferred to MRGCD. Further evaporative losses reduced that to 87 ac-ft at the end of the year. The 87 ac-ft was released to Elephant Butte in January 2021 per Texas' Article VII call.

[1] Units are ac-ft

Emergency Drought Water

Allocations of EDW made by the New Mexico State Engineer and available for capture and storage during future years are 14,000 ac-ft by Reclamation, 5,000 ac-ft by ABCWUA, 12,600 ac-ft by NMISC, and 53,767 ac-ft by MRGCD. Reclamation was distributed 19,000 ac-ft of which 5,000 ac-ft were granted to ABCWUA as repayment for water released during the early 2000s under an Agreed Order. Under a 2016 multi-party EDW Agreement, MRGCD agreed to jointly manage Reclamation's allocation for the sole purpose of Endangered Species Act (ESA) compliance.

On January 1, 2020, only the New Mexico Interstate Stream Commission (NMISC) had any Emergency Drought Water (EDW) in storage in El Vado Reservoir. In 2019, 400 ac-ft was captured in El Vado for NMISC. Of that, 390 ac-ft remained in storage at the start of 2020 after 10 ac-ft were lost to evaporation. Between August 13 and 26, the remaining 362 ac-ft was released to supply flows in the Middle Rio Grande Valley. Evaporative losses in 2020 were 28 ac-ft. No additional EDW was stored in 2020.

Compact Debit Water

The New Mexico State Engineer directed Reclamation, citing Compact Article VI, to hold water in El Vado Reservoir against New Mexico's Compact debit. Accordingly, 36,406 ac-ft, the volume available, was transferred to a Compact debit account in El Vado on June 18. This Compact Debit water was part of the water stored from January 1 through June 18. By mid-July, as MRGCD's irrigation supply decreased, New Mexico asked the other Compact states for an emergency release of that water for MRGCD irrigation and to maintain critical habitat for endangered species. Colorado and Texas agreed, and the release of native water retained in storage against New Mexico's Compact debit began on July 18. The last release was on September 7 with a total of 31,892 ac-ft released. Evaporative losses from June 18 to December 31 were 1,165 ac-ft. The 3,531 ac-ft left was held in storage and released from El Vado in early 2021 per Compact Article VIII call made by Texas.

2021 Middle Rio Grande Project Outlook

Based on the March 2021 NRCS spring runoff forecast for the Rio Grande at Otowi of 390,000 ac-ft (54% of average) and El Vado Reservoir inflow of 113,000 ac-ft (50% of average), the current La Niña conditions for El Niño-Southern Oscillation activity, and current hydrologic conditions, MRGCD is expected to have a shorter irrigation season than normal. In February 2021, MRGCD announced plans to delay the start of irrigation season by one month to April 1. Reclamation began storing water for P&P lands on January 1, 2021.

Facility Review and Safety of Dams Program – El Vado Dam

In 2020, El Vado Dam was scheduled for a CR. The CR did not take place due to the COVID-19 pandemic. Portions of the ASI were used in lieu of the CR Civil and Mechanical exams.

In Summer 2020, four more drill holes were made to install piezometers on the crest and downstream left abutment of the dam. During an Ongoing Visual Inspection Checklist review, the dam tender noticed fine sediment on the 1-foot flume behind the powerplant workshop.

Reclamation's Technical Service Center (TSC) was notified and concluded that the sediment came from the drilling operation to install the piezometers. The dam tender took pictures and monitored, and the sediment disappeared several days later. The four piezometers are currently read manually but will eventually be automated. The monthly inclinometer data collection schedule was changed to an annual recurrence. Reclamation is now implementing results from the Corrective Action Study (CAS) primarily associated with the dam embankment and service spillway

There are currently three incomplete Safety of Dams recommendations and 10 incomplete Category 2 O&M recommendations for El Vado Dam. Most of these recommendations concern the spillway and are tied to issues addressed in the CAS. When construction is complete, most of the outstanding incomplete recommendations will be either reevaluated, completed, or removed. Established in 2019, recommendation 2019-SOD-A refers to preparing final designs for preferred alternatives to address risk associated with the failure of the service spillway, an uncontrolled release via the emergency spillway, and internal erosion through the embankment. Another SOD recommendation issued last year, 2019-SOD-B, restricts El Vado Reservoir to an elevation of 6,875 feet to reduce overall risk. The Standing Operating Procedures were updated with the new elevation restriction in 2020.

In spring 2020, the environmental and cultural compliance aspect of the CAS was completed. The spillway and embankment must be recorded by an architectural historian prior to construction and a contractor was selected to perform the work. The final design for the spillway is ongoing and expected to be completed in 2021. The 2020 FRR was completed in September 2020. The El Vado Dam FRR score is 56, resulting in an overall rating of "Poor." The rating is due to the new SOD recommendation described above as well as the 2020 Dam Safety Priority Rating (DSPR) of 2, standing for an "Urgent Priority."

Related Reservoir Operations

Abiquiu Dam and Reservoir

Abiquiu Dam and Reservoir is a U.S. Army Corps of Engineers' (USACE) facility. P.L. 97-140 authorizes storage up to 200,000 ac-ft of SJ-C water in Abiquiu Reservoir. SJ-C water in storage in 2020 peaked on May 14 at 90,397 ac-ft. Total storage in the reservoir peaked at 92,386 ac-ft (6,192.55 ft) from May 12 to 14. Unlike the previous year, there was no flood storage in 2020. Abiquiu ended 2020 with 64,341 ac-ft of SJ-C water in storage. Table 9 provides a summary of monthly operations and water accounting for Abiquiu Reservoir.

Table 9: Reservoir Operations for Abiquiu Dam[1]

Abiquiu Reservoir Operations	Rio Grande Inflow	SJ-C Inflow	Rio Grande Outflow	SJ-C Outflow	Rio Grande Losses	SJ-C Losses	EOM Content Sediment	EOM Content Rio Grande	EOM Content SJ-C	EOM Content Total
Dec. 2019	10,388	7,594	9,647	4,610	-2	-110	1,985	483	79,453	81,921
January	723	6,111	1,265	3,401	0	108	1,985	-59	82,043	83,969
February	1,388	5,720	1,571	2,538	0	247	1,986	-242	84,978	86,722
March	1,159	6,067	859	2,666	0	558	1,986	59	87,822	89,867
April	9,989	7,329	10,049	8,141	0	1,092	1,990	-2	85,917	87,905
May	18,685	12,334	18,691	8,351	0	1,839	2,006	-7	88,060	90,059
June	14,076	16,197	14,076	34,497	0	1,284	2,024	-7	68,475	70,492
July	16,565	10,979	16,425	26,949	1	914	2,038	132	51,591	53,761
August	33,386	5,367	33,429	6,338	-7	1,016	2,063	96	49,603	51,762
September	14,554	22,072	14,427	11,464	3	654	2,086	221	59,557	61,864
October	2,827	4,842	2,861	4,007	-3	849	2,086	190	59,545	61,821
November	4,062	2,655	4,136	312	2	215	2,086	114	61,672	63,873
December	2,477	3,603	2,588	854	0	76	2,087	3	64,345	66,435
Annual	119,891	103,276	120,377	109,518	-4	8,852	-	-	-	-

[1] Units are ac-ft

Cochiti Dam and Reservoir

Cochiti Dam and Reservoir is another USACE facility. It is located downstream from 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 for fish and wildlife. This pool is composed of SJ-C water, and evaporation losses are replaced with more SJ-C water to maintain 1,200 surface acres.

Rec Pool water may be released from Heron Reservoir and temporarily stored in Abiquiu, then released over the winter to provide flows in the Rio Chama between Abiquiu and the confluence with the Rio Grande. In 2020, 1,819 ac-ft was released from Abiquiu Reservoir and 1,796 ac-ft arrived in Cochiti to maintain flows on the Rio Chama and fill the Rec Pool. The year ended with a deficit of 1,971 ac-ft needed to reach 1,200 surface acres. Table 10 is a summary of monthly operations and water accounting for Cochiti Reservoir.

Table 10: Reservoir Operations for Cochiti Dam[1]

Cochiti Reservoir Operations	EOM SJ-C Pool	Area SJ-C Pool (acres)	EOM SJ-C Pool Losses	Hold Pool (SJ-C + Sed.)	EOM Wetlands Elevation (feet)	EOM Wetlands Area (acres)	Alloc. SJ-C Pool Area (acres)	Alloc. SJ-C Pool Capacity	Demand for SJ-C Pool	Monthly SJ-C Delivery
Dec. 2019	44,067	1,076	43	47,515	5,354	0	1,200	46,860	2,793	1,603
January	44,860	1,233	4	48,313	5,354	0	1,200	44,129	-731	796
February	45,515	1,265	102	48,975	5,354	0	1,200	44,129	-1,386	757
March	45,506	1,264	252	48,974	5,354	0	1,200	44,129	-1,377	243
April	45,134	1,246	372	48,611	5,354	0	1,200	44,129	-1,055	0
May	44,582	1,221	552	48,074	5,354	0	1,200	44,129	-453	0
June	44,085	1,197	498	47,585	5,354	0	1,200	44,129	44	0
July	43,568	1,165	517	47,090	5,354	0	1,200	44,129	561	0
August	43,084	1,124	483	46,626	5,354	0	1,200	44,129	1,045	0
September	42,751	1,095	333	46,306	5,354	0	1,200	44,129	1,378	0
October	42,416	1,070	335	45,973	5,354	0	1,200	44,129	1,713	0
November	42,240	1,061	176	45,800	5,354	0	1,200	44,129	1,889	0
December	42,158	1,058	83	45,721	5,354	0	1,200	44,129	1,971	0
Annual	-	-	3,707	-	-	-	-	-	-	1,796

[1] Units are in ac-ft unless noted otherwise

MRG River Gage Operation and Maintenance

Data from river gages helps Middle Rio Grande water management agencies meet the needs of water users, fulfill the requirements of the Compact, maintain adequate water in the river to support ESA operations, 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.

Reclamation continues to fund four gages operated and maintained by the USGS to support ESA operations: 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).

MRGCD continues to operate and maintain gages on many of their facilities. These gages show how much water is diverted from and returned to the river and how water is moving through the irrigation system. Funding from Reclamation allowed MRGCD to set up the first set of these gages. Reclamation displays the data from these gages on its Evapotranspiration Toolbox (see ET Toolbox section below).

River Maintenance

Reclamation has authorization through the MRG for maintenance of the Rio Grande from Velarde, New Mexico, south to the headwaters of Caballo Reservoir. 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, design, environmental compliance, construction, and adaptive management. Most 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 17 sites and/or reaches along the MRG area. Of the active sites, five require an annual review of channel capacity and possible maintenance due to sediment accumulation.

The 2020 spring runoff was extremely low (40% of average at the Otowi gage). The Bosque del Apache National Wildlife Refuge (BDANWR) RM 82-79 Pilot Realignment Project for realigning the river to a lower elevation in the eastern floodplain was substantially completed in September

2020, associated with excavation of the inlet, outlet, and channel portions. Work continued handling of excavation spoils and repositioning them in the previous channel area. This effort should be complete in March 2021. Due to the low spring runoff, the realignment channel hasn't seen higher spring flows to further advance the river slope adjustment from the new downstream connection. Monitoring efforts are in progress associated with evaluation of the channel's adjustment and conveyance. At the time of this report, the realignment is functioning as expected with no need for more excavation work or further adaptive 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 those developed following high flow events on the Rio Grande in the previous year. "Existing" sites are those in the process of completion. "Adaptive" sites have been substantially completed and are being monitored for function and performance.

San Felipe (Existing Maintenance Site)

A total of ten 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 put on hold at that time 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. During the 2019 spring runoff, bank erosion towards the levee was observed at the two eastern bends located at RM(s) 212.8 and 214.4. Again, work at these locations is currently on hold. A letter was sent to the Pueblo of San Felipe on October 31, 2019, informing the Pueblo of the potential risk to riverside facilities presented by conditions at these locations.

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 pavilion. Nine bendway weirs and a low elevation floodplain were designed by a contractor hired by the Pueblo and were constructed by Reclamation in 2014. Through a P.L. 93-638 contract, the Pueblo of Santa Ana planted vegetation at this site in early 2015. During the 2015 spring runoff, erosion at the site washed away the newly planted vegetation and caused bankline scalloping between some of the weirs shortly after 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. These repairs will include the placement of

longitudinal stone toe protection between the existing bendway weirs for toe strength, the construction of a new side channel on the opposing bankline to relieve hydraulic pressure on the bendway, and the installation of vegetated, mechanically stabilized earth along the hillslope above the stone toe to promote further bank stability.

Photo 1: Looking downstream at Santa Ana River Mile 205.8 east bankline bendway weirs and bankline repairs (Reclamation photo)

Angostura to Montaño Reach Planning (Existing Maintenance Reach)

In 2014, Reclamation identified the reach of the Rio Grande from RM 201 to Montaño Bridge for hydraulic and geomorphic assessment and project planning. This reach is transitioning, with riverbed incision and migrating bends that have caused problematic erosion at locations such as 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 goal 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-GeomorphicandHydraulicAnalysis.pdf.

Reclamation continues to assess river maintenance needs and/or opportunities for habitat restoration within the MRG area to support ESA compliance.

Sandia Priority Site Bendway Weir Repairs (Adaptive Maintenance Site)

In collaboration with the Pueblo of Sandia, Reclamation constructed the Sandia Priority Site in 2008 as the river was approaching the east levee. Upon completion, Reclamation transitioned oversight of the Sandia Priority Site to the adaptive maintenance and monitoring phase. Post-project geomorphic monitoring such as cross section data collection at the project site, aerial flights, and longitudinal profile data collection on the Rio Grande have been performed since 2008 as part of the adaptive maintenance activities.

In 2016, there was new erosion along the east bankline at the site. With the approval of the Pueblo's tribal council, Reclamation strengthened the bankline at the bendway weirs 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. As a result of this investigation, Reclamation has planned adaptive maintenance work at the site as part of a longer-term repair project. The adaptive maintenance work consists of Phase I which includes rehabilitating the side channels constructed on the western floodplain as part of the original 2008 project and a new side channel to facilitate water and sediment transport from an arroyo on the western floodplain. Phase II includes two new side channels just downstream of the project in an area that is also eroding. Construction on Phase I began in early 2020, but progress has been impeded due to the COVID-19 pandemic. The expected completion of Phase I is in March 2021. Construction on Phase II is expected to start in fall 2021 or later.

Photo 2: Construction of a new side channel on the western floodplain of the Sandia Priority Site (Reclamation photo)

Corrales Siphon (Adaptive Maintenance Site)

The Corrales Siphon at RM 199.7 is in Corrales, New Mexico, just north of Albuquerque and about 700 feet downstream of the Arroyo de la Barranca confluence. The siphon was constructed in the early 1930s by the MRGCD to supply irrigation water to the Corrales Main Canal. During river reconnaissance in 2012, Reclamation discovered that degradation in the area had exposed the siphon. 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 and east bank of the river channel. In fall 2020, MRGCD placed more riprap downstream of the siphon extending the entire width of the river and keying a short distance into the bankline.

Photo 3: Looking east at the Corrales Siphon and the 2020 riprap protection placed downstream of the siphon (Reclamation photo)

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 Angostura to Montaño reach plan provides a detailed geomorphic and hydraulic study of the reach and sub-reaches and has helped evaluate erosion at RM 199 in the context of the overall reach needs.

In 2019, Reclamation began alternative formulation and analysis to address bank erosion near the Corrales levee system. Project goals include dissipating energy in the surrounding two-mile reach between the Corrales Siphon and RM 198 and improving ecological function at this site. Alternative selection and design will take place in 2021, with construction targeted for fall 2022.

Photo 4: New erosion in the RM 199 project area looking downstream below Corrales Siphon (Reclamation photo)

Isleta to San Acacia Reach Planning (Existing Maintenance Reach)

In 2014, Reclamation identified the stretch of the Rio Grande from the Isleta to the San Acacia Diversion Dams for further 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 and 2019 runoffs. 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 have river maintenance and/or habitat value.

In 2019, Reclamation began to identify sites that may need river maintenance and/or offer opportunities to perform habitat restoration in support of the 2016 MRG Biological Opinion (MRG BO)[1]. Part of that effort included a focused study on the Los Lunas subreach which has been completed and which identified Los Lunas RM 163 for possible further action (please see the next section for more details). Site identification for the Isleta to San Acacia reach is expected to be completed in spring 2021.

Los Lunas River Mile 163 (Proposed New Maintenance Site)

In 2020, Reclamation analyzed the hydrology, hydraulics, and habitat of the Los Lunas subreach. The Los Lunas subreach overbanks at low flows and due to the semi-perched nature of the floodway, the overbanked water often becomes trapped against the levee toes. Data has shown that the flows at which overbanking occurs is getting lower over time. This investigation identified 5 locations along the eastern floodplain that overbanks at flows less than the 2-yr return flow.

[1] See the MRG Programmatic Water Operations and River Maintenance ESA Compliance Section

The 2020 analysis identified RM 163 as one of the first locations where water overbanks and saturates the levee toes during a rising hydrograph. In collaboration with ISC and MRGCD, Reclamation plans to complete bank lowering and drainage channels to improve channel conveyance capacity. Construction of Los Lunas RM 163 is tentatively targeted for spring 2022.

Escondida Burn Scar Habitat Restoration

In June 2016, a wildfire burned approximately 524 acres in the bosque near Escondida, New Mexico. Two aquatic habitat restoration sites were designed, and construction was completed in July 2018. The two sites include floodplain lowering at the Arroyo de la Parida delta and a side channel network just upstream of Nogal Arroyo. This work helps Reclamation and its partners meet MRG BO commitments.

In 2019, six monitoring visits were made to the sites. The monitoring included surveying sedimentation changes, collecting inundation extents, flow velocity and depth, water temperature, isolated pool monitoring, and noxious weed mapping. This monitoring data will inform future adaptive management decisions. No site visits were made in 2020 due to the COVID-19 pandemic and the low runoff year. Further monitoring is planned in 2021.

Photo 5: Escondida side channel project during 2019 spring runoff (Reclamation photo)

Rhodes Property Habitat Restoration

A multi-disciplinary design team assessed the Rhodes Property site located south of Socorro, New Mexico for opportunities to create aquatic habitat. Again, this work supports Reclamation and its partners in meeting the commitments of the MRG BO. Project designs and environmental permitting were completed in December 2018. Construction of the project was completed in mid-February 2019, with as-built surveys collected at the end of February 2019. Monitoring will continue for the next five years.

Highway 380 to Elephant Butte Reservoir Reach Planning (Existing Maintenance Reach)

Planning efforts are currently underway to identify river maintenance and habitat restoration sites along this 50-mile long stretch of the Rio Grande. This river reach has essential habitat to several listed threatened and endangered species which include the Rio Grande Silvery Minnow (RGSM), the Southwestern Willow Flycatcher (flycatcher), and the Yellow-billed Cuckoo (cuckoo). Riverside infrastructure in this reach delivers irrigation flows to the Bosque del Apache National Wildlife Refuge to support terrestrial habitat for the endangered New Mexico Meadow Jumping Mouse. In addition to providing critical habitat for these endangered species, this reach of the Rio Grande is critical for the delivery of surface water flows to Elephant Butte Reservoir for year-round storage and further downstream allocations to Texas and Mexico, being the delivery point for Colorado and New Mexico under the Compact. Reclamation's planning work in this reach looks to balance contemporary water conveyance goals on the river while supplying necessary nursery and mature habitat sites for the listed species.

Bosque del Apache River Realignment Upstream Phase (New Maintenance Site)

Work is underway to plan the approximately 4.5-mile long river realignment on the Rio Grande, extending from just downstream of the Highway 380 bridge crossing near San Antonio, New Mexico to a point just below the northern boundary line of the Bosque del Apache National Wildlife Refuge. This realignment will serve the purpose of preventing sediment plug formation in the main channel through this section by redirecting river flows to the lower point within the active floodplain just to the east of the existing channel alignment. Like the downstream phase of this project, the upstream phase looks to reduce river perching and to reconnect floodplain areas with the main body of channel flow. It is expected that this project will improve riverside habitat and downstream channel conveyance of surface waters once it has been constructed. A proposed alignment is developed in the eastern floodplain. This project is beginning its planning phase with the bulk of this year's work being focused on private landowner identification, outreach, and concurrence for this new proposed alignment.

Bosque del Apache River Realignment Downstream Phase (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 to address river maintenance concerns in the area. The project will move two river segments to the east, about 4.5 miles (Upstream Phase) and 2.5 miles in length (Downstream Phase), and then reconnect them with the current channel.

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

Designs were completed on the BDA Pilot Realignment Project in 2017. Mowing began in January 2018. During the extended 2019 spring runoff, a plug again formed in the main river channel at the same location as in 2017. This plug completely blocked flow from the main channel, and water was forced into the area mowed for the Pilot Realignment Project. The necessary Clean Water Act compliance was obtained from USACE that summer and Reclamation's Socorro Field Division began excavating the pilot realignment channel at the beginning of September 2019, following the end of migratory bird season. By October, a pilot channel was excavated along the planned realignment, restoring river conveyance.

The excavation phase of the project was completed in September 2020 despite some construction delay caused by the COVID-19 pandemic. Spoils movement from the excavation for spreading over the old river channel continues and is expected to be completed by March 2021. A Reclamation-led hydraulic data collection effort through the realignment corridor was completed in March 2020 and additional hydraulic data collection efforts will be undertaken again in March 2021. Site revegetation work has begun with the planting of the northern willow grid within the old river channel in January 2021. Ongoing project monitoring efforts will continue with invasive species vegetation control being carried out by Refuge field crews over the next several years, regular channel monitoring being undertaken by Reclamation staff in coordination with ISC staff, and minnow studies being carried out with funding by both the State and Federal stakeholders.

Photo 6: View of realigned Rio Grande channel on the BDANWR from the west bank following summer monsoonal flows (Reclamation photo)

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 both effectively and safely pass the two-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.

In 2020, spring runoff was below average for the Rio Grande resulting in no significant changes to the channel capacity findings from the previous year. Channel excavation work for approximately 2.5 miles of the Rio Grande through the Bosque del Apache National Wildlife Refuge was completed by Reclamation force account crews in September 2020. It is expected that downstream water conveyance has been improved through this river section and that this work has minimized sediment plug formation in the channel at this location. NMISC contracted out Delta Channel maintenance work to Wilco this year and removed debris from the lower channel that had deposited out as reservoir levels dropped to near record lows this past summer. All work was focused south of the Narrows this year with the NMISC contractor completing this effort in December 2020. Reclamation construction crews performed no Delta Channel maintenance work this year and effort was instead focused at completing construction on the Lower BDA Realignment and the movement of spoils material from the realignment channel prior to next year's runoff season.

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 outsides of these bends are 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 and access road. Downstream water delivery and habitat for endangered species are likely to be negatively affected 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. More than likely, more repair work will be needed at the RM 60 bend in 2021. Currently the Fort Craig bend appears to be stable. A new project team will evaluate the feasibility of reconnecting the LFCC with the main river channel from San Acacia south to RM 60, and one possibility includes an outfall to the river at RM 60.

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 each fall after releases are shut off from Elephant Butte Dam. Primarily, sediment is removed 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 2021 involves sediment removal at the mouths 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 associated with this work for another 5-year period was issued in 2018.

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, including both 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 to Montaño 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 Needs 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 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 using the method 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 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 the 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 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). 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 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 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 MRG BO for River Maintenance Actions.

Delta Channel Maintenance with the State of New Mexico

In 2017, a five-year Cooperative Agreement (17-WC-40-678), between Reclamation and NMISC, provides funding for joint benefits; water salvage work within the MRG and reservoir vegetation management in the RGP. This work currently includes Delta Channel maintenance, river maintenance projects, and riverside irrigation drain improvements with water salvage potential.

Work continued through the Delta Channel to maintain a 20-mile temporary channel into the Elephant Butte Reservoir pool for effective water delivery. The maintenance work performed in 2020 extended from River Mile (RM) 37 upstream to approximately RM 41. NMISC's contractor, Wilco, conducted maintenance of the Delta Channel from October 15 to December 16, 2020, and removed a sediment plug in the Delta Channel with Reclamation support. Maintenance work included in-channel excavation and sandbar de-vegetation. Reclamation provided all necessary engineering and environmental compliance support for the continued maintenance of the Delta Channel through this Cooperative Agreement.

Programmatic Water Operations and River Maintenance ESA Compliance

The U.S. Fish and Wildlife Service (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 MRG BO is based on the mandatory accomplishment of numerous commitments by Reclamation and the MRG BO partners (86 Conservation Measures, 11 Reasonable and Prudent Measures, and 50 Terms and Conditions). The USFWS provided an Incidental Take Statement (ITS) for the RGSM, flycatcher, and cuckoo.

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 has also included operation of a pumping network in the San Acacia Reach to pump water from the LFCC to the river. The Supplemental Water Program supports ESA coverage under Section 7(a)(2) of the MRG BO.

Water Acquisition and Management

In 2020, 29,267 ac-ft of supplemental water was released for endangered species purposes. Of that volume, 22,267 ac-ft was SJ-C water Reclamation leased from 2019 and 2020 contractor allocations. Because of the extremely dry conditions, Reclamation also released 7,000 ac-ft of water leased from ABCWUA's SJ-C water stored in Abiquiu. Of this 7,000 ac-ft, MRGCD and NMISC contributed funds for 2,500 ac-ft and 1,000 ac-ft, respectively.

The release of supplemental water began at 100 cfs on April 6, as flow decreased in reaches prone to drying. Release of Reclamation's leased water reached a maximum of 125 cfs on April 20, was reduced to 40 cfs on June 23, and remained there until October 12. The additional 7,000 ac-ft were released from September 9 to October 4 at 150 cfs, for a total supplemental release of 190 cfs, with the intent of helping keep the Rio Grande wetted from Cochiti Dam to Isleta Diversion Dam and to provide supplemental irrigation water. Releases of all supplemental water were gradually reduced beginning October 13 and stopped on October 24.

Reclamation ended 2020 with a total of 1,276 ac-ft of SJ-C water in storage: 408 ac-ft of 2020 leased SJ-C water in Abiquiu Reservoir and 868 ac-ft of water in Heron, all acquired via short term leases or other water contracts. In 2021, Reclamation will have potential leases of approximately 12,000 ac-ft from 2021 SJ-C allocations. However, available leased water could be much less, depending on the SJ-C shortage.

Other Sources of Supplemental Water

In addition to the water released by Reclamation, two other sources of water were used to support the needs of the ESA-listed species in 2020. They were SJ-C water leased by Audubon New Mexico and pre-1907 native water rights owned or leased by Reclamation. As shown in Table 11, approximately 727 ac-ft was released to the river by MRGCD at four wasteway outfalls in the Isleta Reach: Alejandro, Los Chavez, Lower Peralta Drain #2, and Sabinal.

Table 11: 2020 Isleta Reach Outfall Deliveries

Isleta Reach Outfall Delivery Dates, 2020	Delivered Water Volume, ac-ft	Water Source
May 6 – 11	139.61	Native water acquired, permitted, and used for offset
July 5 – August 6	433	SJ-C (Audubon New Mexico)
September 9 – 14	154	Native water acquired, permitted, and used for offset

First, Audubon New Mexico acquired a total of 530 ac-ft of SJ-C water. They leased 350 ac-ft from the City of Belen and 180 ac-ft from the Town of Bernalillo, both out of Heron Reservoir. Conveyance losses from Heron to Abiquiu were 5.85 ac-ft, and evaporative losses while in storage in Abiquiu were 11.87 ac-ft. This resulted in a release of 512.3 ac-ft between July 1 and August 2, with subsequent delivery to the Isleta Reach from July 5 to August 6, 2020.

A total of 293.61 ac-ft of pre-1907 native water rights owned or leased by Reclamation and permitted to be used for offsetting via the NMISC's Strategic Water Reserve were released from the outfalls from May 6 to 11 and from September 9 to 14.

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 success of the RGSM 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 MRG BO do not stipulate pumping, and instead focus on using adaptive management and a variety of tools to meet or exceed RGSM density thresholds in the Incidental Take Statement. As an optional tool in support of meeting these thresholds, Reclamation used the pumps at the south boundary of BDANWR in 2020 to maintain river connectivity from that location to the Elephant Butte Reservoir pool.

In the early 2000s, Reclamation maintained portable pumps with flow meters at four strategic locations along the LFCC. In 2020, Reclamation only equipped the south boundary site. The Neil Cupp site, which Reclamation used to maintain, is now operated by MRGCD who installed a permanent pumping site capable of pumping to the river and to irrigation facilities.

The pumps return water from the LFCC to the Rio Grande. Data for Reclamation's pumping sites is posted in orange boxes on the MRGCD Gage Schematic page on Reclamation's Evapotranspiration Toolbox web site at: https://www.usbr.gov/uc/albuq/water/ETtoolbox/rg/riog/schematic/SCHEMATICsocorrodiv.html.

The maximum total pumping rate is limited to 150 cfs by the 2004 permit granted by the New Mexico Office of the State Engineer (NMOSE).

In April and May, MRGCD pumped 1,350 ac-ft from the Neil Cupp site to the river. This water was intended to maintain river connectivity as flow into the reach declined.

Flow arriving at the south boundary pump site began to decline in early May. To maintain river connectivity from the south boundary of BDANWR to Elephant Butte Reservoir, pumps at the south boundary site were turned on May 1, 2020, at 4 pm. Reclamation and FWS conducted a study to understand some of the consequences of river drying to fish and aquatic habitat in this section of the river system affected by pumping. The pumping rate was reduced in late June and all pumping was stopped on July 13. Soon after that, storm runoff rewet the river, which reconnected fully on July 27.

The south boundary pumps were turned on again in early August as the storm flow declined. Reclamation and partners decided that the pumps would be shut off for the season on August 26, 2020, due to the water shortages in the system upstream.

The pumps at the south boundary site were the only ones used by Reclamation for pumping supplemental water during the 2020 season. The total volume of supplemental flow provided at the south boundary in 2020 was 5,188 ac-ft. With MRGCD's pumping at Neil Cupp, 6,538 ac-ft were pumped from the LFCC to the river in 2020.

Endangered Species

Incidental take of RGSMs is authorized for the Proposed Action if: October density is greater than or equal to 1.0 fish per 100 m^2 for ten of the 15 years; October density is less than 1.0 fish per 100 m^2 for no more than five of the 15 years; and October density is less than 0.3 fish per 100 m^2 for no more than two of the 15 years. Incidental take for the RGSM will be considered exceeded if these densities and time limits are not met because of the Proposed Action.

RGSM density decreased from 2.11 fish per 100 m^2 in October 2019 to 0.29 fish per 100 m^2 in October 2020. Low spring runoff years, such as 2020, typically result in lower October density estimates. While the October 2020 density was less than the October 2019 density, it was greater than the October 2018 density (0.10 fish per 100 m^2), which also provided below average hydrologic conditions. Reclamation continues to evaluate if the density estimated in 2020 occurred due to proposed actions or more likely, was the result of reduced spring runoff associated with poor snowpack and precipitation conditions.

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 also not exceeded in 2019.

There was no incidental take of flycatcher or cuckoo nests/territories in 2020. However, less than one acre of moderately suitable flycatcher and cuckoo habitat was disturbed in 2020 due to vegetation clearing that occurred during the installation of a new range line near Sevilleta National Wildlife Refuge in Socorro County, NM.

In 2020, 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 25, March 24, and April 23, 2020, to determine the best use of available water.

During 2020, 22,267 ac-ft of supplemental water was released by Reclamation for endangered species purposes.

Planning and work on the following projects took place in 2020:

- Fish passage at San Acacia and Isleta Diversion Dams (planning & design phase)
- Bosque del Apache Pilot River Realignment/Sediment Plug Circumvention (underway)
- Initiated and completed study on the effects of Bosque del Apache South Boundary water pumping on aquatic habitat, fish movement and density

The 2020 annual report, due to the USFWS on April 1, 2020, will provide more information on the implementation of BO requirements and the Proposed Action.

Rio Grande Silvery Minnow

Since 1993, Reclamation has funded or supported the systematic sampling of the fish community in the Middle Rio Grande (MRG) with a focus on the endangered Rio Grande Silvery Minnow (*Hybognathus amarus*; RGSM). With some exceptions (e.g., 1998), fish sampling (by rapidly drawing a seine through the water column to capture fish from various habitats) has been conducted monthly during April to November at 20 (+/-) standard monitoring sites along the MRG (Dudley et al. 2020a). The catch of RGSM (and other fishes) are standardized to a density or Catch-Per-Unit-Effort (CPUE) (number of RGSM per 100 m^2 seining effort). RGSM density data are then evaluated by site, month, markings, and assigned age, in three river reaches (Angostura, Isleta, and San Acacia) and for the MRG overall.

Based on monitoring data from the 20 standard sites only, RGSM were present at 4 of 20 sites with an overall density of 0.29 RGSM/100 m^2 during October 2020 (Dudley et al. 2020b). At these 20 standard sites, the October 2020 density (0.29 RGSM/100 m^2) was less than the October 2019 density (2.11 RGSM/100 m^2) but greater than the October 2018 density (0.10 RGSM/100 m^2). Based on all October surveys since 1993, the overall density averaged 7.21 RGSM/100 m^2 and ranged from 0.00 to 37.86 RGSM/100 m^2.

However, based on 33 sampling sites, RGSM densities in October 2020 were 0.06, 0.76, and 0.23 RGSM/100 m^2 in the Angostura, Isleta, San Acacia river reaches, respectively. Of the 51 unmarked RGSM collected at all 33 sites in October 2020, 21.6% (n=11) were assigned age-0, 15.7% (n=8) were age-1, and 62.7% (n=32) were age-2. At these 33 sites in the MRG, the overall density was 0.36 RGSM/100 m^2 (Dudley et al. 2020b).

In the annual reports, RGSM status, trends, and mixture model estimated RGSM densities (i.e., (E(x)) as RGSM/100 m^2; which address zero-catch inflated data), are used for long-term analyses, site occupancy, mesohabitat associations, evaluating sampling variation, and modeled to evaluate their relationships with flows or other environmental conditions (see Dudley et al. 2020a). The October 2020 estimated density (E(x)) was 0.23 RGSM/100 m^2. Reclamation continues to evaluate whether this low estimated density occurred due to the proposed action or more likely, was the result of reduced spring runoff associated with poor snowpack and precipitation conditions during 2019/2020.

In previous annual reports, changes in the occurrence and estimated density of RGSM were reliably predicted by seasonal differences in flows across years (1993–2019; Dudley et al. 2020a). Of the

models considered, extended high flows during spring, were crucial in explaining why some years had dramatically elevated densities of RGSM. In contrast, extended low flows during summer were key to explaining reductions in the occurrence of this species across years. Thus, prolonged high flows during spring were most predictive of increased density and prolonged low flows during summer were most predictive of decreased occurrence of RGSM over time in the MRG (Dudley et al. 2020a).

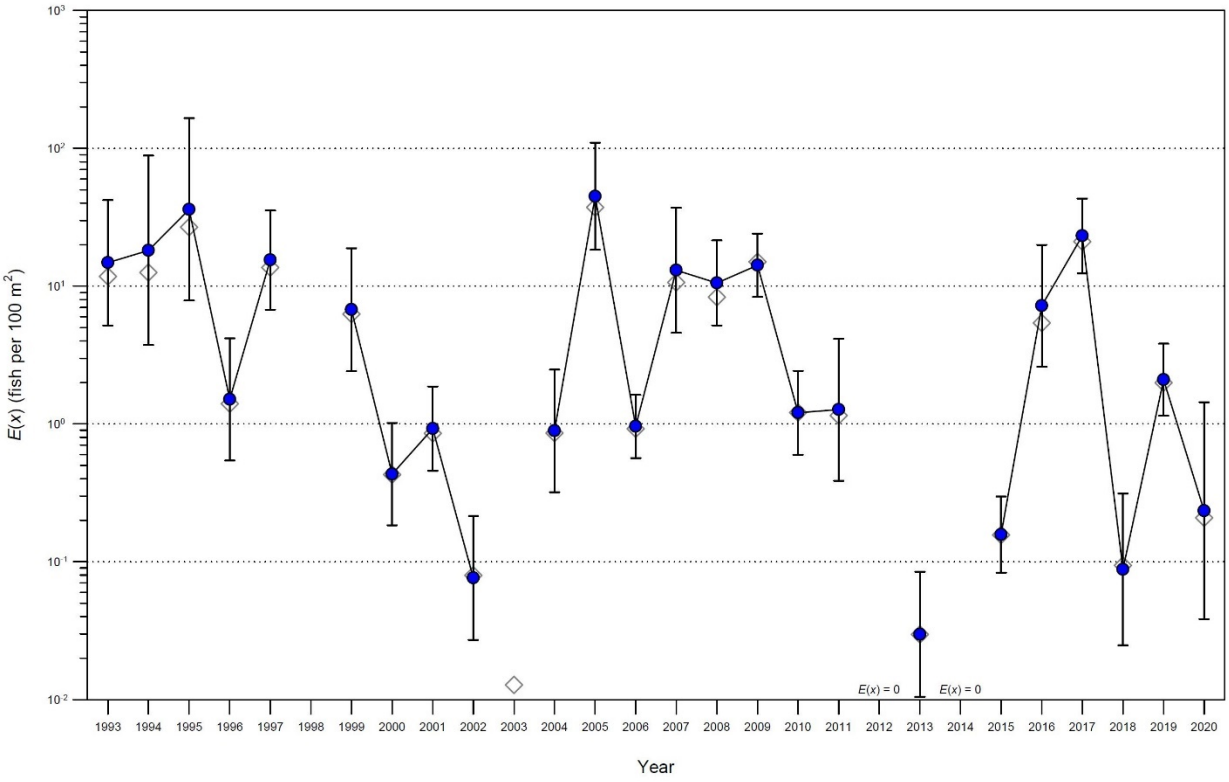


Figure 5: RGSM estimated densities (E(x)) using standard site October data for 1993-2020. Solid circles indicate estimated densities, bars represent 95% confidence intervals, and hollow diamonds represent simple methods-of-moments estimates (Dudley et al. 2020a, and written comm.).

Literature Cited:

Dudley, R.K., S.P. Platania, and G.C. White. 2020a. Rio Grande Silvery Minnow Population Monitoring during 2019. Annual Contract 140R4019P0048 Report to U.S. Bureau of Reclamation, American Southwest Ichthyological Researchers (and others), Albuquerque, NM.

Dudley, R.K., S.P. Platania, and G.C. White. 2020b. Rio Grande Silvery Minnow Population Monitoring during October 2020. November Contract 140R4019P0048 Report to U.S. Bureau of Reclamation, American Southwest Ichthyological Researchers (and others), Albuquerque, NM.

Southwestern Willow Flycatcher

The flycatcher (*Empidonax traillii extimus*) 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 New Mexico: Upper Rio Grande Management Unit and 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
- A 1.24-mile segment above Coyote Creek State Park to the second bridge on State Route 518, upstream from Los Cocas
- 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 2020, Reclamation conducted surveys and nest monitoring of flycatchers in 10 distinct reaches along approximately 267 miles of the Rio Grande in New Mexico, mainly between the southern boundary of the Isleta Pueblo and Elephant Butte Reservoir (Table 12). Other areas surveyed include portions of reaches between the Caballo Reservoir delta and the international boundary in El Paso, TX. Surveys were performed to contribute to the baseline population data of the flycatcher along the Rio Grande, and to meet Reclamation's ESA compliance commitments for the MRG BO as well as the ESA compliance for the RGP (RGP BO[1]).

A total of 722 resident flycatchers were documented in 2020. These flycatchers established 383 territories, of which 340 had pairs. This represents a one percent decrease in territory numbers from 2020. As in previous years, the San Marcial Reach was by far the most productive, containing 384 resident flycatchers and 200 territories, of which 184 were pairs – a 32 percent decrease in territories from 2019 (although not all sites were surveyed in 2020).

The biggest increase, however, was documented within the Percha Reach of the Lower Rio Grande, which grew from one territory in 2018 to 18 in 2019 due to the addition of three new survey sites.

[1] See the RGP Operating Agreement and Storage of SJ-C water ESA Compliance Section

Table 12: Southwestern Willow Flycatcher Territories 2013-2020[1]

Location[2]	2020	2019	2018	2017	2016	2015	2014	2013
Frijoles	N/S[3]	N/S	0	0	0	0	0	1
Belen	25	N/S	20	17	20	17	18	23
Sevilleta	N/S	N/S	12	4	5	8	4	4
San Acacia	N/S	0	0	0	0	0	0	0
Escondida	3	9	4	8	5	7	4	8
BDANWR	35	24	24	16	14	11	23	27
Tiffany	N/S	0	0	0	5	1	8	4
San Marcial	200	293	277	257	302	300	307	266
MRG Subtotals	263	326	337	302	351	344	364	333
Caballo Reservoir	11	9	7	8	9	14	15	4
Caballo to El Paso, TX	109	91	77	60	41	31	26	34
RGP Subtotals	120	100	84	68	50	45	41	38
Total	383	426	421	370	401	389	405	371

In 2020, due to COVID-19 pandemic related staffing limitations, rigorous nest monitoring was not conducted. However, nest searching and monitoring was conducted when possible during protocol surveys within most sites. A total of 439 nests was discovered and roughly half were sufficiently monitored to determine success rates, productivity, and brown-headed cowbird (*Molothrus ater*) parasitism. The San Marcial Reach was most productive at 229 nests.

Other studies continued in 2020 include: 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) Elephant Butte delta hydrology monitoring. These studies are designed to provide insight into potential threats and habitat requirements of flycatcher populations.

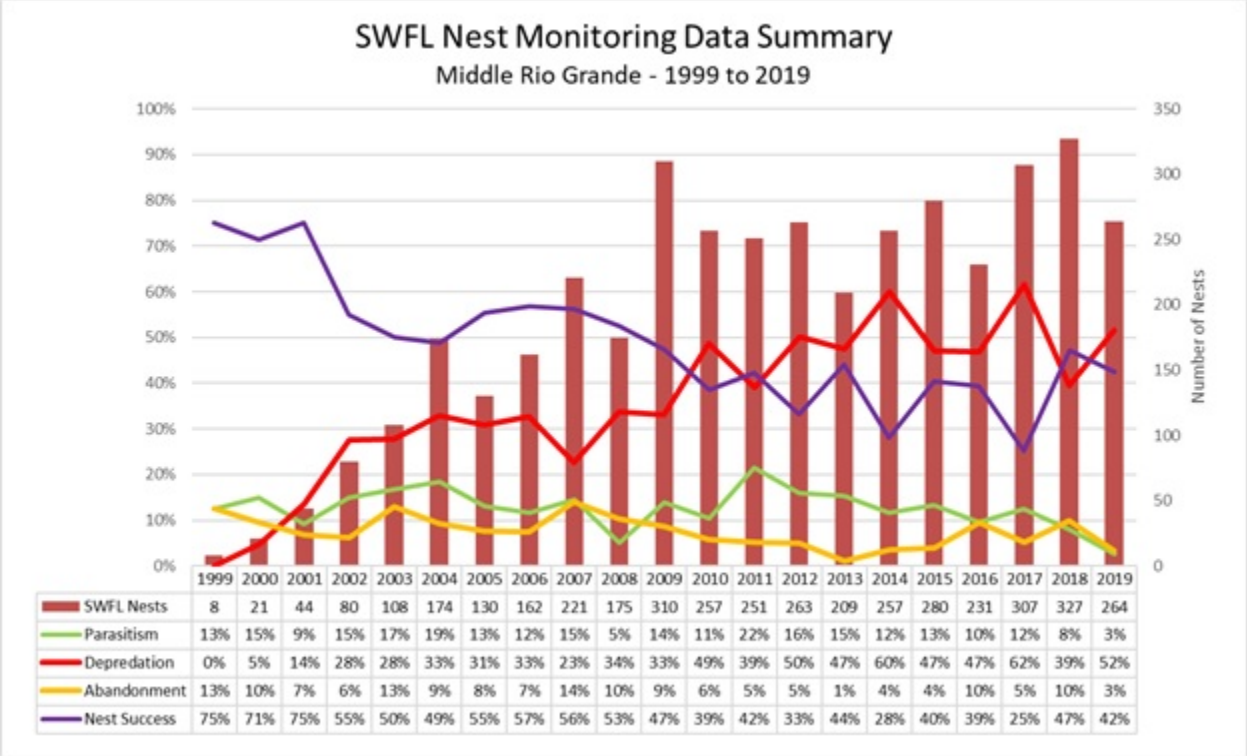
At Elephant Butte Reservoir, flycatchers have expanded their occupied habitat south, to near Mitchell Point at RM 38. Flycatcher-occupied areas in the Elephant Butte Reservoir delta – RM 60 to 54 – were previously mostly dense Goodding's and coyote willow of various age classes, with water provided by the LFCC outfall. However, drought conditions during the past 10 years reduced flow from the LFCC, and invasive saltcedar is encroaching and becoming dominant. Although this provides refuge habitat for flycatchers, breeding flycatchers are not as successful or productive in saltcedar-dominated habitats. Additionally, the arrival of the saltcedar leaf beetle may be an issue as it will likely defoliate saltcedar during nesting periods, reducing foliage cover, and making nests more vulnerable to predation, parasitism, and natural elements.

Habitat modeling since 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.

[1] Breeding seasons only
[2] Table does not include detections outside of the active floodplain at BDANWR
[3] N/S = Not Surveyed

However, the overall quality of the habitat is likely reducing success and productivity. It is likely that flycatchers do not expand into all areas of suitable habitat due to their site fidelity and overall population size.

Nest success in the Middle Rio Grande rebounded to 47 and 42 percent in 2018 and 2019, respectively, following a study period low of 25 percent in 2017 (Figure 5).

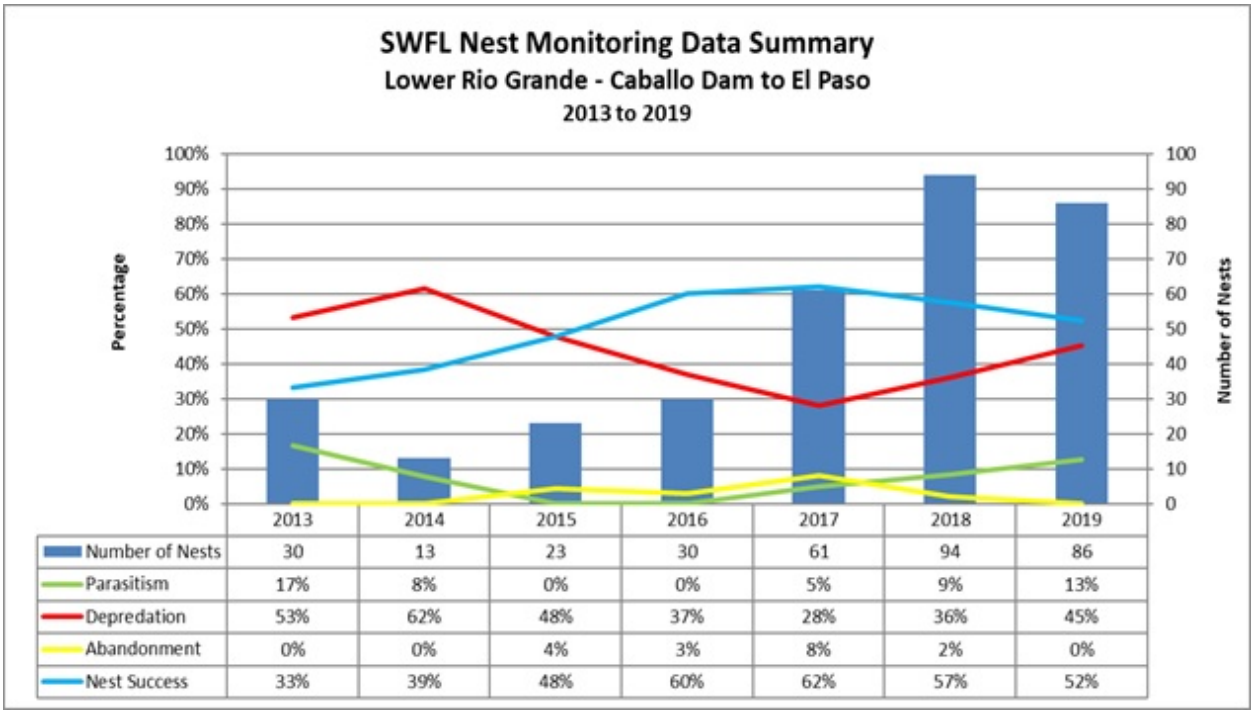


	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
SWFL Nests	8	21	44	80	108	174	130	162	221	175	310	257	251	263	209	257	280	231	307	327	264
Parasitism	13%	15%	9%	15%	17%	19%	13%	12%	15%	5%	14%	11%	22%	16%	15%	12%	13%	10%	12%	8%	3%
Depredation	0%	5%	14%	28%	28%	33%	31%	33%	23%	34%	33%	49%	39%	50%	47%	60%	47%	47%	62%	39%	52%
Abandonment	13%	10%	7%	6%	13%	9%	8%	7%	14%	10%	9%	6%	5%	5%	1%	4%	4%	10%	5%	10%	3%
Nest Success	75%	71%	75%	55%	50%	49%	55%	57%	56%	53%	47%	39%	42%	33%	44%	28%	40%	39%	25%	47%	42%

Figure 6: Summary of Flycatcher nesting in the Middle Rio Grande from 1999 to 2019

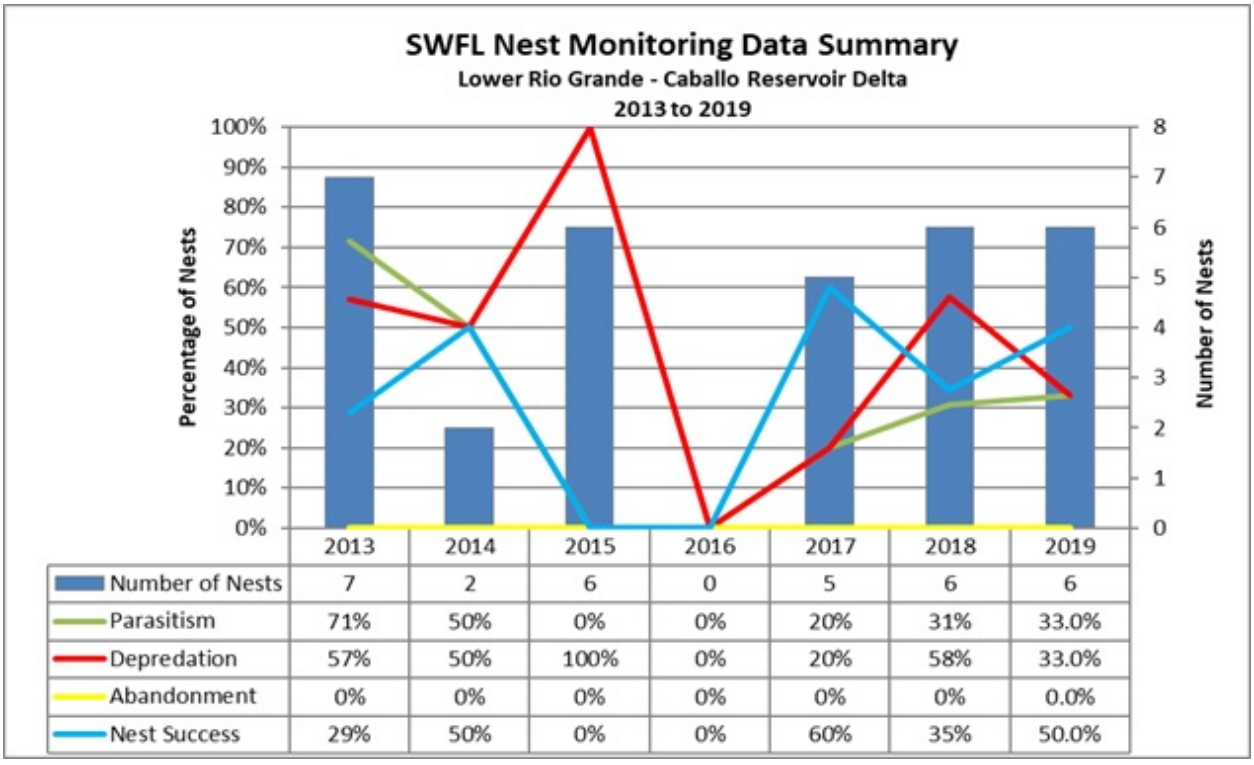
The decline in nest success from 2009 to 2017 may be related to the decline in habitat suitability and quality in heavily populated areas. Depredation, the biggest source of nest failure, averaged 27 percent from 1999 to 2011. Since 2012, the depredation rate has nearly doubled, averaging 51 percent. 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 a result of reduced habitat quality because of lower flows. 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 effects and may be of greater concern in the future. Nest success in the Lower Rio Grande has been much higher in recent years, averaging 58 percent between 2016 and 2019 for territories downstream of Caballo Dam, primarily in the Hatch Reach, and 48 percent within the Caballo Reservoir Delta (Figures 6 and 7).



	2013	2014	2015	2016	2017	2018	2019
Number of Nests	30	13	23	30	61	94	86
Parasitism	17%	8%	0%	0%	5%	9%	13%
Depredation	53%	62%	48%	37%	28%	36%	45%
Abandonment	0%	0%	4%	3%	8%	2%	0%
Nest Success	33%	39%	48%	60%	62%	57%	52%

Figure 7: Flycatcher nest variables, Lower Rio Grande, Caballo Dam to El Paso, 2013 to 2019



	2013	2014	2015	2016	2017	2018	2019
Number of Nests	7	2	6	0	5	6	6
Parasitism	71%	50%	0%	0%	20%	31%	33.0%
Depredation	57%	50%	100%	0%	20%	58%	33.0%
Abandonment	0%	0%	0%	0%	0%	0%	0.0%
Nest Success	29%	50%	0%	0%	60%	35%	50.0%

Figure 8: Flycatcher nest variables, Lower Rio Grande, Caballo Reservoir delta, 2013 to 2019

During 2017 and 2019, the Rio Grande and LFCC both saw higher flows compared to the past several years, resulting in extensive overbank flooding and higher groundwater levels in some areas. This improved plant vigor, structure, density, and overall habitat quality. Conversely, Rio Grande and LFCC flows were extremely low in 2020 which likely had negative impacts on habitat quality. Also, during 2020, a 330-acre fire burned suitable occupied flycatcher habitat in the vicinity of Fort Craig, including an area that contained 14 flycatcher territories in 2019.

Western Yellow-billed Cuckoo

The western distinct population segment of the Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) was listed as a threatened species by the USFWS in October of 2014. Critical habitat for the cuckoo was proposed in the Federal Register (79 FR 48548) in August 2014 and included eight units in New Mexico.

Along the Rio Grande, three critical habitat units were proposed:

- 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 Pueblo of San Ildefonso upstream to a point on the river in Rio Arriba County south of La Mesilla (1,173 acres)
- 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 2020, Reclamation conducted cuckoo surveys in 10 distinct reaches of the Rio Grande within sites also surveyed for flycatcher from the south boundary of the Pueblo of Isleta to El Paso, TX (Table 13). Surveys were conducted to contribute to baseline population data of the cuckoo along the Rio Grande and to meet Reclamation's ESA compliance commitments for the MRG BO and RGP BO. In 2020, there were an estimated 66 breeding territories, all assumed to be pairs, derived from 284 cuckoo 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, and in the delta of Caballo Lake.

Table 13: Cuckoo Detections/Estimated Territories 2013- 2020[1]

Location[2]	2020	2019	2018	2017	2016	2015	2014	2013
Belen	15/3	N/S	41/10	34/4	54/12	39/10	24/5	20/6
Sevilleta	N/S[3]	N/S	41/10	12/4	32/10	18/5	9/2	19/6
San Acacia	N/S	28/8	47/14	50/13	23/8	27/8	15/4	20/5
Escondida	16/5	51/11	55/10	44/11	58/16	62/16	27/7	80/23
BDANWR	49/11	59/14	46/13	43/10	32/11	40/12	34/12	29/8
Tiffany	N/S	0	0	2/0	9/0	2/0	2/0	4/1
San Marcial	68/17	190/42	193/49	227/56	220/59	215/59	190/61	219/70
MRG Subtotal	148/36	328/75	423/106	412/98	428/116	403/110	301/91	391/119
Caballo	72/16	47/11	58/13	64/16	62/15	48/15	28/8	N/S
Percha	22/4	13/2	7/1	8/2	3/1	1/0	0/0	N/S
Hatch	21/4	11/2	17/6	11/1	6/2	4/1	0/0	N/S
Radium Springs	19/5	9/3	25/7	10/4	16/6	10/4	8/2	N/S
Las Cruces	0	12/2	10/3	9/3	N/S	N/S	N/S	N/S
Mesilla	1/0	5/1	9/2	0	N/S	N/S	N/S	N/S
RGP Subtotal	135/29	101/21	126/32	93/23	87/24	63/20	36/10	N/S
Total	283/65	429/96	549/138	505/121	515/140	466/130	337/101	391/119

New Mexico Meadow Jumping Mouse

A final rule was published in the June 10, 2014, Federal Register to list the jumping mouse as an endangered species under the ESA, with final critical habitat designation following in March 2016. While designated critical habitat units for the species occur in Colorado, New Mexico, and Arizona, only Unit 6 (BDANWR) is within the MRGV. Unit 6 consists of 995 acres along 13.1 mi of ditches and canals associated with managed irrigation for wildlife purposes on the refuge in Socorro County, New Mexico. This unit begins in the northern part of the BDANWR and generally follows the Riverside Canal to the southern boundary of the refuge. Jumping mice have not been found on the Rio Grande in this area.

While the MRG BO does not provide any supportive analysis for jumping mouse ESA requirements, Reclamation is committed to support efforts by the BO Partners or others seeking to provide water to BDANWR when it is available, dependent on available water supply and the water rights of BDANWR and other users.

[1] Breeding seasons only
[2] Table does not include detections outside of the active floodplain at BDANWR
[3] N/S = Not Surveyed

Jumping mice at BDANWR were monitored during mid-June to mid-October using remote cameras from 2016 to 2020. The goals of monitoring jumping mice at BDANWR are to assess jumping mouse presence by unit and assess the effectiveness of management actions to improve habitat for this species. Trail cameras or "camera traps" are considered an efficient means of collecting data over a long period with minimal stress to the animals being surveyed (Caravaggi et al. 2017). Cameras were used as a less invasive method of tracking the population compared to the standard method of live trapping rodents using Sherman traps. RECONYX™ PC850 cameras were deployed between 2016 and 2020 during which there were 97 independent detections of jumping mice. There were: 27 detections at 7 locations in 2016, 26 detections at 19 locations in 2017, 26 detections at 13 locations in 2018, 11 detections at 7 locations in 2019 and 7 detections at 7 locations in 2020.

Refuge staff have implemented a variety of management and restoration activities to expand jumping mouse habitat at BDANWR. They have focused on habitat creation and restoration in areas adjacent to suitable jumping mouse habitat, and thus far have mechanically and/or chemically treated nine moist soil units and several areas bordering the Riverside Canal. They have also installed six water control structures, a Langemann® Gate, and three flow-metering devices to effectively provide consistent water to these areas. In addition, BDANWR staff have begun restoring the six-acre rookery unit to further expand jumping mouse habitat southward. To ensure that targets for desirable conditions are being met (proper soil moisture, vegetation height and structure, etc.), continued monitoring of habitat restoration efforts and identification of thresholds that will trigger additional management actions will continue.

Reclamation approved a Categorical Exclusion (CE) provided by BDANWR's federal categorical exclusion CE for Service Projects that covers the proposal for the following (Proposed Action). BDANWR is proposing to re-drill a well adjacent to one that is currently collapsing (Well #11), thus allowing the refuge to efficiently divert water to the Riverside Canal for the benefit of these federally listed species.

The re-placement/re-drilling of this existing well is essential for BDANWR to sufficiently manage federally designated critical habitat for the mouse during drought conditions. Currently, the existing well is collapsing; therefore, its longevity is unknown, and its output is suboptimal. This well is essential in maintaining surface water flows when available flows are limited. The new well will increase water flow output at this location. We are currently in extreme drought conditions and the water flows within the Riverside Canal have been unreliable. Therefore, BDANWR is currently relying on well water outputs to maintain habitat adjacent to the Riverside Canal where the only known occupied mouse habitat remains within the Middle Rio Grande Valley. The use of this well will assist in maintaining the appropriate seasonal surface water flows needed to support both mouse and flycatcher habitat downstream of the well location.

Except for BDANWR, systematic surveys for jumping mice and their habitat have not been conducted throughout the riparian corridor of the MRG. However, 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). The Delta Channel is located on the southern fringe of the geographic area where the jumping mouse could potentially inhabit. During the habitat assessment it was determined that the Delta Channel area does not represent a suitable natural environment 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 and no additional populations have been identified along the Middle Rio Grande.

Literature Cited:

Frey, J.K., 2006. Status of the New Mexico meadow jumping mouse (Zapus hudsonius luteus) in the Sangre de Christo Mountains, New Mexico. Final Report submitted to New Mexico Department of Game and Fish, Santa Fe, 14 December 2006, 78 pp.

Frey, J.K., and D.A. Kopp. 2014. Final Report: Preliminary Assessment of jumping mouse habitat associated with Middle Rio Grande Project U.S. Department of the Interior, Bureau of Reclamation, Albuquerque Area Office, 18 pp.

Frey, J.K., and G.D. Wright. 2012. Multiple scale habitat selection by a small mammal habitat specialist (Zapus hudsonius luteus) in a managed floodplain landscape. Final Report submitted to U.S. Fish and Wildlife Service, Cooperative Agreement 201819J806, 16 March 2012, 109 pp.

Reclamation. 2014. River Maintenance Program: San Marcial Delta Water Conveyance Channel Maintenance Project Biological Assessment. Bureau of Reclamation, Albuquerque Area Office, September 2014, 80 pp.

U.S. Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the New Mexico Jumping Mouse Through Its Range; Final Rule. Federal Register 79: 33119-33137.

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.

U.S. Fish and Wildlife Service. 2014. New Mexico meadow jumping mouse (Zapus hudsonius luteus) Survey Results at Bosque del Apache National Wildlife Refuge, United States Government Memorandum. 12 pp.

Other ESA-Related MRG Projects

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 RGSM salvage.

The 2016 MRG BO does not set specific flow targets or maximum rates of drying but instead focuses on thresholds of RGSM 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 2020 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 April through October. Drying was first observed in the San Acacia and Isleta Reaches on May 10 and June 12, respectively. The total maximum extent of river drying during the 2020 RiverEyes monitoring period was 47.8 miles on July 17; 37.3 miles was in the San Acacia Reach and 10.5 miles in the Isleta Reach. The last occurrence of drying was on October 31 in the Isleta Reach, and November 13 in the San Acacia Reach.

Middle Rio Grande Endangered Species Collaborative Program

In response to ESA species listings in the MRG, 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 RGSM and flycatcher, and address environmental issues along the MRG.

The Collaborative Program consists of stakeholders representing diverse interests including federal, state, and local government entities, Pueblos and Tribes, 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 in compliance with applicable state and federal laws, including Compact delivery obligations.

The Collaborative Program is not included in the MRG BO and does not have responsibility or authority for meeting requirements. However, Reclamation and the partners work with the Collaborative Program to provide science recommendations in support of adaptive management. The Collaborative Program also hosts an annual symposium for entities conducting science within the basin to share information and maintains the online portal and common database management system as common repositories for information, reports, and data.

In 2020, Reclamation funded third-party management of the Collaborative Program as well as ongoing monitoring activities and studies related to endangered species. This included funding in the amount of $3,838,635 to the Program as authorized by the Omnibus Appropriations Act of 2009 (P.L. 111-8). FY 2020 accomplishments include:

- Captive propagation of RGSM at the Southwestern Native Aquatic Resources and Recovery Center; the City of Albuquerque's BioPark Aquatic Conservation Facility; and the NMISC's Los Lunas Silvery Minnow Refugium
- Annual monitoring of RGSM population
- Genetics study of RGSM
- Development of high throughput markers to allow for an enhanced and rapid assessment of RGSM genetic diversity
- RGSM rescue and salvage efforts during river drying
- Reproductive monitoring of RGSM
- Annual monitoring of southwestern willow flycatcher and yellow-billed cuckoo populations
- Establishment of a Science and Adaptive Management Committee
- Program management, assessment, reporting, and outreach activities

Rio Grande Project, New Mexico – Texas

Reclamation's AAO 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 the Elephant Butte powerplant. The AAO determines the release from Elephant Butte Reservoir to meet irrigation demand while supporting hydropower production, maintaining compliance, and achieving other benefits. The release from Caballo Reservoir is based on irrigation demand to make water deliveries at the canal headings for the Elephant Butte Irrigation District, El Paso County Water Improvement District No. 1, and Mexico (under the 1906 Convention).

EBID operates and maintains Reclamation's diversion dams on the Rio Grande, including Percha, Leasburg, and Mesilla in New Mexico, under a contract with Reclamation. 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.

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.

In September 2003, Reclamation completed work to remove Riverside Diversion Dam and the adjacent Coffer Dam, both in Texas. Prior to removal, Riverside Diversion Dam had been inoperable since 1987 when flooding on the Rio Grande caused the structure to fail.

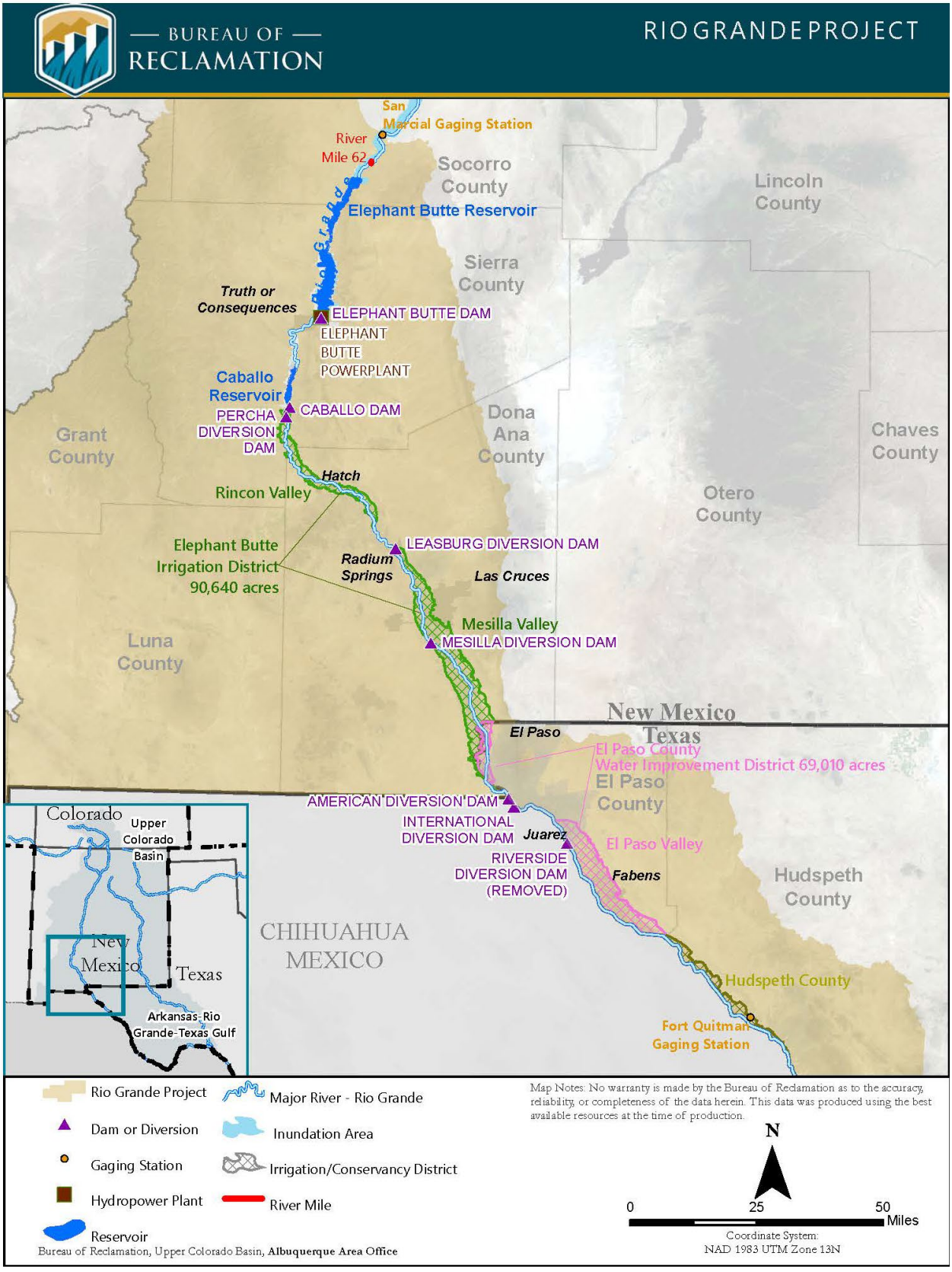


Figure 9: Area Map of the Rio Grande Project

Rio Grande Project Operations

Combined total storage for Elephant Butte and Caballo Reservoirs for 2020 began with 579,808 ac-ft (or 25% of their total capacity) and ended with 156,702 ac-ft (7%). Maximum combined total storage was 654,594 ac-ft (28%) and minimum was 109,913 ac-ft (5%) on March 12 and September 25, respectively. With the combined RGP storage and runoff, Reclamation allocated 596,457 ac-ft to RGP water users in 2020. Reclamation communicated with stakeholders to provide information and projections of reservoir elevations throughout the irrigation season.

Compact Accounting in RGP Storage

Since 2011, the three Compact states have not reached consensus on the appropriate Compact accounting method. Because of that, Compact accounting has not been finalized since that year, and two sets of accounting sheets are currently maintained. Accounting method 1 is advocated by Texas, and accounting method 2 is advocated by New Mexico and supported by Colorado.

The Rio Grande Compact Commission (RGCC) determines final Compact accounting annually. Reclamation performs daily accounting of SJ-C, Compact Credit water, 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 daily 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 RGCC Reports since 2011.

In the URGWOM, an account with a non-zero value is assessed gains and losses, so end-of-year debits are given a value of zero. All the numbers that follow reference accounting method 1 unless otherwise specified.

Usable Water

Rio Grande Project (RGP) supply available for release is determined from the Usable water on January 1, as defined in Compact Article 1, and tracked daily for increases from inflows and decreases from evaporation and releases.

The Usable water in RGP storage (Elephant Butte and Caballo Reservoirs combined) was 578,707 ac-ft on January 1 and 155,864 ac-ft on December 31. Usable storage reached a high of 653,515 ac-ft and low of 109,011 ac-ft on March 12 and September 25, respectively.

Article VII Restrictions

Article VII of the 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 water has been relinquished. Usable water in RGP storage fell below 400,000 ac-ft on June 19 and remained below that limit for the rest of 2020.

Compact Credit Water

Compact credit water for Colorado and New Mexico is stored as wet water in Elephant Butte Reservoir and not included as Usable Water. New Mexico began 2020 with a 34,300 ac-ft debit

(38,800 ac-ft debit under method 2). Colorado began 2020 with a 900 ac-ft credit (800 ac-ft credit method 2).

Elephant Butte Dam, Reservoir and Powerplant

In 2020, the minimum daily storage at Elephant Butte Reservoir was 81,640 ac-ft (elevation 4,293.07 feet) on September 22, 2020. The maximum daily storage was 611,125 ac-ft (elevation 4,349.37 feet) on March 2, 2020.

Releases from Elephant Butte Reservoir began on March 3 and continued through September 22. During this period, a release of 612,432 ac-ft was recorded by the USGS Rio Grande below Elephant Butte Gage. The 2020 annual volume measured was 612,938 ac-ft.

The total gross hydropower generation for 2020 was 54,260,847 kilowatt-hours (kWhr). Net hydropower generation was 53,698,406 kWhr, which is 15 percent of the ten-year average (2011 through 2020) of 357,012,163 kWhr. The Elephant Butte powerplant record showed releases of 501,668 ac-ft to meet downstream irrigation demand and manage Caballo Reservoir storage levels. Note that Elephant Butte operators consistently record a lower discharge than the USGS Gage.

Reclamation conducted a bathymetric sediment survey during June 2017 and a LiDAR survey in January 2019. The bathymetric data were combined with data from the LiDAR survey to produce a complete and continuous digital surface of the reservoir bottom. An accompanying report was published in January 2020. The 2017 & 2019 area-capacity table was implemented at the reservoir on January 1, 2020. Results show that Elephant Butte Reservoir lost about 13,700 ac-ft of capacity between the 2017 & 2019 and 2007 sediment surveys and has lost 623,900 ac-ft since 1915.

Caballo Dam and Reservoir

Caballo Reservoir started 2020 at 33,480 ac-ft (4,141.78 feet) and ended the year at 29,449 ac-ft (4,140.38 feet). During 2020, the maximum storage was 80,437 ac-ft (4,152.98 feet) on March 23. The minimum storage occurred on September 25, at 27,411 ac-ft (elevation 4,139.64 feet).

The irrigation release period extended from March 13 through September 25, 2020, releasing 592,862 ac-ft measured at the Rio Grande below Caballo Dam Gage. During that period, Reclamation operated Caballo Reservoir to maintain storage levels adequate to respond to irrigation calls while protecting facilities and historical sites. The calendar year 2020 volume measured was 593,140 ac-ft.

The Bonita Lateral irrigation diversion from Caballo Dam measured 1,138 ac-ft of delivery from March through September.

Reclamation conducted a bathymetric sediment survey in April 2017, and a report was published in 2019. The 2017 area-capacity table was implemented at the reservoir on January 1, 2020. The results show that Caballo Reservoir lost 425 ac-ft of capacity between the 2017 and 2007 sediment surveys and has lost 22,227 ac-ft since 1938.

Warren Act Deliveries

Drainage waters from the RGP 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 RGP between March 1 and September 30. For 2020, 45,792 ac-ft was diverted under the contract period and 55,620 ac-ft for the calendar year.

Rio Grande Project Water Accounting

Prior Year Accounting Updates

In early 2020 and 2021, Reclamation, EBID and EPCWID reviewed and adjusted the accounting for both 2018 and 2019. The adjustments to the 2018 accounting included updating the allocation calculations to the day after the Caballo Dam gate was closed for the season, including August 31 charges for EPCWID which were omitted from the charges sheet, adding the Canutillo Well Field charges, and the American Canal Extension Credit. The adjustments to the 2019 accounting included updating the beginning of year allocation balances due to the revised 2018 accounting, including August 31 charges for EPCWID which were omitted from the charges sheet, and updating the final allocation calculations to the day after the Caballo Dam gate was closed for the season. The revised 2018 and 2019 accounting quantities are shown in Table 14 and Table 15.

Table 14: 2018 Revised Rio Grande Project Water Accounting[1]

	2018 Final Allocation	2018 Final Charges	2018 Caballo Release for Irrigation	2018 Calculated Diversion Ratio	Adjustment for Mexico Over Delivery	Account Balance for 2019
EBID	127,657	127,487	-	-	-1,865	-1,696
EPCWID	347,042	282,352	-	-	-1,420	64,690
Mexico	34,450	37,735	-	-	-	-
Total	509,148	447,574	491,305	0.911	-	-

Table 15: 2019 Revised Rio Grande Project Water Accounting[2]

	2019 Final Allocation	2019 Final Charges	2019 Caballo Release for Irrigation	2019 Calculated Diversion Ratio	District to District Allocation Transfer (Operating Agreement 1.11)	Account Balance for 2020
EBID	217,912	191,462	-	-	+71,420	97,870
EPCWID	462,924	158,589	-	-	-71,420	232,915
Mexico	60,000	39,935	-	-	-	-
Total	740,836	389,986	453,564	0.860	-	-

[1] Volumes in ac-ft
[2] Volumes in ac-ft

2020 Water Accounting

Reclamation provided the 2020 initial allocation to Mexico in January. The U.S. Districts were not provided an allocation in January or February because the 2018 and 2019 accounting had not been finalized, and the allocation balance from the previous year was needed for their current year allocations.

The provision of the 1906 Convention for extraordinary drought was applied and Reclamation provided Mexico with monthly updated allocations through April. The last in-season allocation to Mexico, 50,362 ac-ft (84% of a full allocation), was made in April 2020. Mexico's allocation is calculated from the anticipated release of usable water and once allocated to Mexico, the U.S. cannot reduce the allocation even if the anticipated release or actual release is significantly less than originally anticipated. In May, EPCWID determined it would not order all its 2020 allocated water, causing the actual Caballo release to be significantly less than the water available for release. While this reduced, the final allocation to Mexico (for RGP accounting purposes) to 43,968 ac-ft (73% of a full allocation) the over delivery of water to Mexico gets charged to the U.S. Districts. The over delivery of water was due to EOY allocation balances the amount of the over delivery was charged proportionally to EBID and EPCWID.

Reclamation provided the U.S. Districts with updated allocations monthly as usable water increased in storage. The last in-season allocation was on June 9 due to the below average inflows and usable water, and the anticipated shortened irrigation season.

Releases from Caballo for irrigation deliveries began on March 13 and ended on September 25, 2020. EPCWID and Mexico began the season with coordinated orders and diversions. EBID delayed their initial order and diversions began on April 13. EBID ended their surface water diversions on August 28 with Mexico following on September 7. EPCWID ended all diversions on September 25, 2020.

The total Caballo release for Rio Grande Project water accounting was 592,896 ac-ft, which was used to calculate the diversion ratio, a quantitative measure of delivery performance. This is 26 ac-ft less than the volume reported for Compact water accounting and is attributed to seepage when the dam's gates were closed. This volume was not charged to the Districts. For 2020, the calculated diversion ratio was 0.886.

The calculated delivery to Mexico was 50,362 ac-ft. The calculated charges to EBID were 198,107 ac-ft. EPCWID's charges for their irrigation diversions were 276,820 ac-ft. EBID and EPCWID were charged 245 and 6,148 ac-ft for the over delivery to Mexico, respectively based on the proportion of the EOY 2020 allocation balances. The allocation balance to begin 2021 for EBID and EPCWID is 3,378 ac-ft and 84,660 ac-ft, respectively. See Table 16 for a summary of the 2020 water accounting.

Table 16: 2020 Rio Grande Project Water Accounting[1]

	2020 Final Allocation	2020 Final Charges	2020 Caballo Release for Irrigation,	2020 Calculated Diversion Ratio	Adjustment for Over Delivery to Mexico	Account Balance for 2021
EBID	201,730	198,107	-	-	-245	3,378
EPCWID	367,629	276,820	-	-	-6,148	84,660
Mexico	43,968	50,362	-	-	-	-
Total	622,869	525,289	592,836	0.886	-	-

2021 Rio Grande Project Outlook

On December 1, 2020, Usable water was 128,927 ac-ft. This volume is below the range of the standard allocation equations used by the RGP. Therefore, Reclamation determined the initial 2021 allocation was 0 ac-ft. On February 1, 2021, the calculated Usable water (using estimated 2021 Compact credit in Elephant Butte) was 182,057 ac-ft. With this increase in storage, Reclamation allocated 2,458 ac-ft to Mexico. EBID and EPCWID have requested no official allocations until April 2021. Reclamation will evaluate the Usable water at least monthly to determine the RGP allocations.

Based on the March 2021 NRCS spring runoff forecast for the Rio Grande at San Marcial of 177,000 ac-ft (35% of average), the current La Niña conditions for El Niño Southern Oscillation activity, and current hydrologic conditions, Reclamation anticipates a near-record low allocation for 2021 and expects a shortened irrigation season beginning around June 1 lasting for six to eight weeks.

RGP River Gage Operation and Maintenance

The EBID and EPCWID operated and maintained gages for flow measurements at canal headings, river stations, and lateral headings during 2020. Reclamation operated and maintained 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 RGP water supply use and accounting for 2020.

[1] Volumes in ac-ft

Facility Review and Safety of Dams Program

Elephant Butte Dam

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

Previously identified and evaluated during the 2005 Comprehensive Facility Review, recommendation 2005-SOD-A was completed to evaluate breach parameters, breach outflow, and downstream consequences associated with specific failure modes. Two Category 2 O&M recommendations were also completed, 2019-2-A and 2019-2-B, respectively.

TSC is working on O&M recommendation 2015-2-B, pending a future site visit yet to be scheduled. This was delayed due to COVID-19 travel restrictions. Upon site visit, repair design can be completed and subsequently implemented.

Caballo Dam

There are no significant dam safety-related O&M issues associated with Caballo Dam other than aging infrastructure. There are currently eleven incomplete Category 2 O&M recommendations for Caballo Dam.

Three Category 2 O&M recommendations were completed, 2019-2-E, 2019-2-I, and 2019-2-K.

Outlet energy dissipation devices underwent spot repairs to their protective coating. A toe drain Remote Operated Vehicle (ROV) video inspection was scheduled for December 2020 but was delayed due to COVID-19 travel restrictions. A time for this to be completed has not been set yet.

An inspection for the Bonita Lateral 30" irrigation pipe is scheduled with TSC for ROV video and Ultrasonic Thickness inspection for 2021. This will be phase 1 of a multiphase project to repair or replace approximately 1,000 feet of the irrigation pipe from the head gate to the outlet gate.

Reservoir Vegetation Management

Vegetation Management Agreement with the State of New Mexico did not occur in 2020 due to concerns over mowing locations. Reclamation, however, still performed maintenance of vegetation at Caballo Reservoir primarily through mowing, which limits non-beneficial consumption of water by woody phreatophytes like saltcedar.

During 2020, Reclamation performed work to maintain areas previously cleared at Caballo Reservoir. Approximately 627 acres of phreatophyte vegetation at Caballo was managed utilizing mowers and mulchers during 2020. In addition, approximately 700 acres that had been previously treated were maintained free of woody phreatophytes by means of longer-term inundation during irrigation season.

ESA Compliance for Operating Agreement and Storage of SJ-C Water

The USFWS issued a final *Biological and Conference Opinion on effects of actions associated with the proposed continuation of the Rio Grande Project Operating Agreement and storage of San Juan-Chama Project water in Elephant Butte Reservoir, New Mexico* (Consultation Number 02ENNM00-2015-F-0734) on May 25, 2016. The non-jeopardy determination in the RGP BO is based on the mandatory accomplishment of numerous commitments by Reclamation (9 Conservation Measures, 4 Reasonable and Prudent Measures, and 9 Terms and Conditions). The USFWS provided an Incidental Take Statement for the flycatcher and cuckoo.

Incidental take of flycatcher will be considered exceeded if more than 33 flycatcher territories, 24 nests or 96 eggs/nestlings, 81 acres of occupied suitable or marginally suitable habitat are taken from high surface water events above the 2014 baseline data. Incidental take of cuckoos will be considered exceeded if more than 5 cuckoo territories, 3 nests or 12 eggs/nestlings, 606 acres of occupied suitable or marginally suitable habitat are taken from high surface water events above the 2014 baseline.

In 2020, Reclamation continued implementing the commitments set forth in the RGP BO. There was no incidental take of flycatcher or cuckoo nests/territories in 2020. Annual Survey data for the RGP BO is included in the MRG BO section of this report.

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. EBID et al.*, Civ. No. 97-0803 JP/RLP/WWD (Quiet Title to the Waters for the Rio Grande Project) on June 12, 1997, in the U.S. District Court of NM (D.N.M.) petitioning for quiet legal title to the waters of the Rio Grande Project in its name. The court dismissed the case in August 2000. On May 7, 2002, the U.S. Court of Appeals (10th Circuit) vacated the lower court's August 2000 decision and remanded the case for further proceedings. On remand, the court issued an order to stay the case and close for administrative purposes on August 15, 2002. The court further ordered that, if it becomes necessary or desirable during the pendency of 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 – if so determined by the court – would mean the United States has a right to such inflows once they become surface water again. This proceeding is suspended while the parties negotiate. The suspension was continued on October 26, 2018, and all parties are required to file status reports with the court every 6 months.

State of New Mexico v. United States

On August 8, 2011, the State of New Mexico filed a lawsuit against the United States Bureau of Reclamation (*State of New Mexico v. United States et al.*, D.N.M. Civ. No. 11-0691) regarding the Rio Grande Project 2008 Operating Agreement (OA) 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 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 Compact and the Rio Grande Project Act; and award damages and other relief for the injury suffered by the State of Texas.

Discovery closed on August 31, 2020. Special Master Michael J. Melloy has appointed Judge Oliver W. Wanger (Retired) to mediate. Parties also filed dispositive motions in the same time frame. Trial is currently anticipated in the fall of 2021.

Related 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 has been given to various Pueblos to evaluate and improve irrigation system efficiency. Projects funded in 2020 include grade stabilization for the Rio Tesuque within the Pueblo of Tesuque lands, funding for the Pueblo of Laguna to upgrade 14 rangeland wells for improved water conservation, and funding for Jemez Pueblo to design improvements for the Pecos Diversion Dam on the Jemez River. In addition, the Secretary's Indian Water Rights Office funded a Pueblo water well installation project in support of ongoing water rights discussions.

Contained in 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. The Study Report was drafted in 2017 and has been in coordination with the Office of Management and Budget during 2020. When this last step is concluded, the report will be submitted to Congress. Since the expiration of the original legislation, the authorization has been extended annually. While limited program funding was received in 2020, existing contracts are ongoing.

Isleta Settlement

Isleta Diversion Dam was built by the MRGCD on Pueblo of Isleta land in 1934 and rehabilitated by Reclamation in 1954. Long-standing issues from dam construction and operation on Pueblo lands were resolved when Reclamation, the Pueblo of Isleta, and the MRGCD signed a global settlement on October 21, 2016. This global settlement granted the United States easement for the next 100 years, provided the Pueblo of Isleta with a lump sum damage compensation, and established a team to plan and implement diversion dam modifications to better manage sediment transport into irrigation canals and provide fish passage through the dam, as well as bosque and riverine restoration.

In 2020, the settlement team achieved major milestones including initiation of a funding agreement for TSC to support the dam modifications through analyses and studies to select preferred alternatives for sediment management and fish passage. The team has conducted a value planning study to review alternatives and has constructed a large-scale physical model to test sediment transport in various alternative configurations. The model has been validated and testing is ongoing. In addition, a new P.L. 93-638 contract with the Pueblo was drafted, which will fund further Pueblo participation in the Isleta Settlement Technical Team through alternative selection and design.

The Isleta Settlement Technical Team will continue development, review, and implementation of projects to meet the settlement commitments. The commitments are scheduled to be completed by 2026.

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 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 SJ-C water with the Pueblo for 2,200 ac-ft per year; the Town of Taos for up to 366 ac-ft per year (in addition, Reclamation typically leases the Town of Taos' non-Settlement allocation of 400 ac-ft); and El Prado Water and Sanitation District for 40 ac-ft per year.

The Settlement Act authorizes and directs Reclamation to provide financial assistance in the form of grants on a non-reimbursable basis to plan, permit, design, engineer, and construct Mutual-Benefit Projects. These efforts 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. 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 Mutual-Benefit Projects.

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, 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 Environmental Impact Statement (EIS) was published in the Federal Register in January 2018. The Record of Decision was signed on September 11, 2019. Reclamation completed designs at the 100 percent level on Phase 1 in August 2019 that included 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 designs at the 60 percent level are also complete and include conveyance of treated water to existing and proposed distribution tanks within the Nambé, southern Pojoaque, and Tesuque Pueblos, and Bishops Lodge in Santa Fe County. A revised funding agreement was signed with TSC to continue with Phase 2 designs that are planned to be at 90 percent by mid-2021. The 30 percent level of designs for Phase 3 are complete and include distribution piping for the Pueblos of San Ildefonso, Pojoaque, Nambé, 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 had initiated negotiations with the parties for an agreement regarding non-federal contributions to ensure the RWS can be constructed.

An agreement pursuant to Section 611(g) of Title VI of the Claims Resolution Act of 2010 was signed by settlement parties on September 17, 2019, addressing the scope, funding shortfall, and extension of the project construction completion from June 2024 to June 2028. Santa Fe County Board of County Commissioners approved the Cost Sharing, System Integration and Contributed Funds Agreements (CFA) on May 26, 2020. The Santa Fe County CFA was signed June 18, 2020 by Reclamation's Upper Colorado Basin (UCB) Regional Director. The Cost Sharing, System Integration Agreement was signed by Reclamation Commissioner Brenda Burman on August 26, 2020, and the UCB Regional Director signed the Amended and Restated State CFA on October 2, 2020.

Federal funding was obligated to the design-build contractor for a limited construction contract at the intake area on the Pueblo de San Ildefonso in September 2019. The notice to proceed was issued on November 7, 2019, and construction was planned to begin in early 2020. The Construction Agreement was signed by the Pueblo de San Ildefonso on May 15, 2020 allowing for the notice to proceed for construction to be issued on May 18, 2020. The contractor, CDM Smith, was able to mobilize on June 8, 2020 to start construction. The Limited Construction portion award amount was $12,509,979 and was expected to be completed in April of 2021. The Omnibus Bill which included the increase in the project funding and time extension to 2028 was passed by the House and Senate and was signed by the President into law on December 27, 2020. This bill will allow the remainder of Phase 1 Construction to be completed as planned.

No diversions, river sampling, or water quality analysis of Rio Grande water occurred in 2020.

Hydrologic Models

Upper Rio Grande Water Operations Model (URGWOM)

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 and track 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 accounting of SJ-C Project water and forecasting of daily storage and delivery operations in the Rio Grande Basin. The model is used to simulate processes for Annual Operating Plan(s) (AOP) that forecast the remainder of the year, and for long-term forecasts for planning studies. The model is currently being used for the Rio Grande New Mexico Basin Study.

The URGWOM Technical Team (Team) generally meets monthly while the Executive Committee meets no less than annually. An Advisory Committee initially strengthened URGWOM's interagency nature, but this committee no longer meets as attendees were consistently the same as those present at the monthly 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 2020, work has continued in implementing the newly developed deep groundwater aquifer objects to the Middle and Lower Rio Grande portions of URGWOM so that URGWOM's shallow groundwater aquifer objects no longer depend on input from USGS's Modular Three-Dimensional Finite-Difference Groundwater Flow Model (MODFLOW). As needed, updated documentation for URGWOM is being tracked, developed, reviewed and finalized by the Team. In consultation with the Team, Reclamation is studying how to incorporate the National Weather Service's ensemble forecast – in conjunction with the currently utilized NRCS forecast – into forecast runs. Reclamation is also working with the National Center for Atmospheric Research (NCAR) on creating hydrographs at forecast locations in URGWOM. These forecast locations use seasonal climate model data and a runoff model instead of historical hydrographs that are generally unrepresentative of current hydrology. Reclamation finished the enhancements to the representation of Elephant Butte Reservoir in URGWOM, which is intended to maximize hydropower generation while meeting downstream targets. These enhancements were used to assist in 2020's water release directives to Elephant Butte. There have also been multiple other minor fixes and updates throughout the year.

Rio Grande Transboundary Integrated Hydrologic Model (RGTIHM)

RGTIHM is being developed through an interagency effort between the USGS and Reclamation and funded by Reclamation. The model is being developed to simulate the availability and use of surface water and groundwater in the Rincon and Mesilla Valleys, including surface-water deliveries by the Rio Grande Project and groundwater use for irrigation and non-irrigation uses. RGTIHM represents the dominant natural and human components of the hydrologic system, thereby providing a reliable assessment of surface-water and groundwater conditions and processes that can inform water users and help improve planning for future conditions and sustained operations of the Rio Grande Project.

Model development includes revision of the conceptual model of the flow system, construction of a Transboundary Rio Grande Watershed Model (TRGWM) water-balance model using the Basin Characterization Model (BCM), and construction of an integrated hydrologic flow model using the MODFLOW One-Water Hydrologic Flow Model (MODFLOW-OWHM). The conceptual model identifies surface-water and groundwater inflows and outflows, including the movement and use of water through both natural and anthropogenic processes. The groundwater-flow system is characterized by a layered geologic sedimentary sequence combined with the effects of natural runoff and recharge, operation of the Rio Grande Project, and groundwater pumping for irrigation

and non-irrigation uses. Notably, operation of the Rio Grande Project includes the application of surface water for irrigation, recharge from applied irrigation water, return flows through drains and wasteways, and reuse of return flows to meet irrigation demands lower in the Rio Grande Project.

TRGWM and RGTIHM were developed for and calibrated to historical conditions of water and land use, and parameters were adjusted (calibrated) so that simulated values closely match available measurements. The calibrated model was then used to assess the movement and use of surface water and groundwater in the Rincon Valley, Mesilla Basin, and northern part of the Conejos-Médanos Basin. RGTIHM and TRGWM provide a tool for analyzing the hydrologic system response to the historical evolution of water use in the region, including development of surface-water and groundwater supplies for irrigation, municipal, industrial, and domestic uses. The models also provide a tool for evaluating the hydrologic system response to potential changes in water supplies and demands, including changes in irrigated acreage and cropping patterns, population and per capita water use, local and regional climate and hydrologic conditions, and surface water and groundwater management.

In 2020, USGS and Reclamation continued to work on RGTIHM improvements as summarized below.

RGTIHM development

- Republished the RGTIHM Open-File Report as a Scientific Investigations Report (SIR) and posted the USGS Model Archive on the SIR page (https://doi.org/10.3133/sir20195120).
- Began and continued investigating possible factors controlling RGTIHM's over-simulation of observed surface-water flows at the Rio Grande at El Paso stream gage, and excessive aquifer storage depletions as compared to other models in the study area. Remedies that were explored included modifications to initial conditions, boundary conditions, and parameterization.
- Incorporated consumptive use estimates developed by Montgomery and Associates into RGTIHM.
- Revised RGTIHM initial conditions based on dynamic equilibrium spin-up over the first year of the RGTIHM simulation period (March 1940 through February 1941). Initial conditions were developed for three model versions: 1) all layers confined, 2) layers 1- 2 convertible and layers 3-9 confined, and 3) layers 1-4 convertible and layers 5-9 confined.
- Performed initial transient simulations using the full RGTIHM simulation period for three model versions: 1) all layers confined, 2) layers 1- 2 convertible and layers 3-9 confined, and 3) layers 1-4 convertible and layers 5-9 confined. Preliminary analysis showed little difference in simulated groundwater heads and surface-water flows between the three model versions. However, preliminary analysis of simulated versus observed heads, surface-water flows, and groundwater pumping indicated that recalibration of RGTIHM parameters was necessary. The all-layers confined model version was chosen for recalibration because of improved model convergence, improved mass balance closure, and shorter run time.
- Updated the Parameter ESTimation (PEST) framework of RGTIHM. Updates included incorporating new observation datasets (e.g., reported historical Rio Grande Project surface-water deliveries to farms and canal waste), refining PEST-adjustable parameter ranges, and implementing regularization constraints to impart expert knowledge on PEST-adjustable parameters.

- Began and continued model recalibration runs for the all-layers confined model version using BeoPEST on the USGS Yeti and Denali supercomputers (https://www.usgs.gov/core-science-systems/sas/arc).

MF-OWHM and related software development

- Published the Techniques and Methods report describing MF-OWHM version 2 (https://doi.org/10.3133/tm6A60) online on April 7, 2020.
- Continued implementation of the Surface-water Operations Process in RGTIHM.

Water Accounting Reports Projects

2020 San Juan-Chama Project Water Accounting

The 2020 SJ-C Project water accounting was accomplished using version 8.1.1 of the RiverWare® modeling system software, and version 8.0 of the URGWOM accounting module. All accounting data and information is stored directly in the final version of the 2020 accounting model. Data are also sent to Reclamation's HDB via a Data Management Interface (DMI). Reclamation consulted with representatives of the NMISC and USACE – Albuquerque District, to verify accounting data throughout the year. This ongoing discussion minimized concerns regarding year-end data quality and accounting methods.

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 use by Reclamation with RiverWare® models. HDB is an Oracle® relational database application and includes connections to data sources such as Reclamation's Hydromet, Domestic Communications Satellite (DOMSAT), Data Storage System (DSS), and modeling software, like RiverWare®. HDB was originally developed at the University of Colorado's CADSWES. The HDB instance housing URGWOM data is in the Upper Colorado Basin Regional Office and is maintained by that 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 Basin HDB installation continued during 2020. Water accounting data is directly transferred from the RiverWare® URGWOM accounting model to HDB, and thereafter from HDB to URGWOM via an HDB/RiverWare® DMI. OpenDCS 6.8 and HDB-POET 3.6.11 were released in 2020. OpenDCS is an application that allows automated computations, data manipulation, and decoding of satellite transmitted data. HDB-POET is an interface for data viewing and analyses. With assistance from Reclamation's contractor, MRGCD gage data is now being imported into HDB.

UCB Region has made strives forward in 2020 utilizing HDB as a data hub to be imported from for a variety of newly developed websites. Using a flat-file architecture, multiple websites were developed for internal and public use that assist in reporting, visualizing, and exporting data from Reclamation's HDB.

Planned work for 2021 includes continued maintenance of HDB, as well as back-population of historical data for both the Middle Rio Grande and Rio Grande Projects into HDB. Reclamation is also working on moving historical MRGCD gage data from the Evapotranspiration (ET) Toolbox to HDB. Reclamation will also investigate accessing, recording, and back-populating Colorado Division of Water Resources' published gage data which will eventually overwrite preliminary data, like the process used for USGS gage data. Improvements to the newly developed websites that utilize HDB are also planned.

RiverWare®

Numerous improvements to RiverWare® were accomplished during 2020 through contracts that Reclamation and USACE have with CADSWES at the University of Colorado. Work included completing enhancements to the RiverWare® window and workspace, as well as improvements to the undo function, scripting, DMI, and the geospatial view. An annual report produced by CADSWES summarizes the 2020 changes to URGWOM and RiverWare®. The report is distributed to the user community at CADSWES' annual meeting.

Evapotranspiration (ET) Toolbox

ET Toolbox is an extension of Reclamation's Agricultural Water Resources Decision Support (AWARDS) system that provides high-resolution rainfall and real-time water use predictions and estimates via a dedicated website. Real-time water-use data include estimates of daily riparian and crop water use and open water evaporation. The ET Toolbox is used both within and outside of Reclamation as a tool for improving the efficiency of water management and irrigation scheduling. Rainfall coverage extends from the headwaters of the Rio Grande in Colorado to El Paso, Texas. ET coverage extends from Abiquiu Dam on the Rio Chama in New Mexico, and from Embudo on the Rio Grande in New Mexico to El Paso, Texas.

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

ET Toolbox can be accessed at:
https://www.usbr.gov/uc/albuq/water/ETtoolbox/riogrande.html.

In 2020, general development and maintenance tasks were performed on ET Toolbox and an update process was initiated in collaboration with the National Aeronautics and Space Administration's (NASA) Jet Propulsion Laboratory (JPL) to create a satellite-based ET product that will eventually replace the calculated evapotranspiration displayed on ET Toolbox. Through this collaboration, daily 30-meter ET data are being developed, along with corresponding updates to the forecast system and web interface.

In 2021, Reclamation plans to complete the update work identified above in collaboration with JPL, which experienced technical and security delays in 2020. Reclamation will also continue improvements to the access and display of the various water operations tools currently provided on the ET Toolbox.

Aquatic Invasive Species- Zebra and Quagga Mussels

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

Reclamation does not have a direct role in the inspection and decontamination of watercraft. Reclamation manages invasive species through its Integrated Pest Management Program as well as various other authorities including the Fish and Wildlife Coordination Act of 1934. The Fish and Wildlife Coordination Act, as amended by section 7001 of Public Law 116-9, provides authority for Reclamation to "enter into any contract or cooperative agreement with another Federal agency, an eligible State, a federally recognized Indian tribe, a political subdivision of an eligible State, or a private individual or entity to assist with the control and management of an invasive species." In New Mexico, Reclamation supports these AIS prevention activities by furnishing equipment and contractual support to the New Mexico Department of Game and Fish (NMDGF).

Reclamation has contracted AIS monitoring for the following:

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

In general, AIS watercraft inspection efforts have increased in New Mexico since 2013, with the total number of watercraft inspections statewide increasing from 9,346 in 2013 to 42,929 in 2020. Table 17, below, provides the number of watercraft inspections and decontaminations conducted in 2020 in coordination with the NMDGF at waterbodies in New Mexico. Of these, 42 percent of the inspections and 28 percent of the decontaminations were conducted at Elephant Butte Reservoir.

Table 177: 2020 AIS Inspection Data (compiled by NMDGF and Reclamation)

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

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

In 2020, Reclamation collected 48 water samples from seven of its New Mexico reservoirs (Navajo, Heron, El Vado, Elephant Butte, Caballo, Sumner, and Brantley). These samples were analyzed by microscopy and molecular methods, providing early detection, and can be used to trigger immediate containment action. In 2020, there were NO detections of invasive mussels or their markers by Reclamation's Ecological Research Laboratory.

WaterSMART Program

Congress recognized the increasing stresses on water supplies in the Western U.S. with the passage of the SECURE Water Act in 2009. The law authorizes federal water and science agencies to work together with state and local water managers to plan for threats to water supplies, as well as take action to secure water resources for the communities, economies, and ecosystems they support.

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

As the Department's main water management agency, Reclamation plays a key role in the WaterSMART Program. Reclamation's portion of the WaterSMART Program is focused on improving water conservation and helping water resource managers make wise decisions about water use. Goals are achieved through administration of grants, scientific studies, technical assistance, and sharing scientific expertise. Reclamation will continue to work cooperatively with States, Pueblos and Tribes, and local entities as they plan for and implement actions to increase

water supply through investments to modernize existing infrastructure and give attention to local water conflicts.

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

- WaterSMART Grants
  - Water and Energy Efficiency Grants
  - Small-Scale Water Efficiency Projects
  - Water Marketing Strategy Grants
- Water Conservation Field Services Program
- Cooperative Watershed Management Program (Phases I and II)
- Drought Response Program
  - Drought Contingency Planning
  - Drought Resiliency Projects
  - Emergency Response Actions
- Title XVI Water Reclamation and Reuse Program
- Basin Study Program
  - West Wide Risk Assessment activities
  - Baseline Assessments (previously called Impact Assessments)
  - Basin Studies
  - Reservoir Operations Pilots
  - Water Management Options Pilots
  - Applied Science Grants
  - Applied Science Tools

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

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

General information about Reclamation's WaterSMART Program is provided below. Ongoing or newly funded projects within the jurisdiction of the AAO in the Rio Grande Basin are listed in Table 18 at the end of this section.

WaterSMART Grants

Water and Energy Efficiency Grants

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

Small-Scale Water Efficiency Projects

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

Water Marketing Strategy Grants

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

Water Conservation Field Services Program

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

Cooperative Watershed Management Program

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

Watershed Group Development and Watershed Restoration Planning

In 2012, Reclamation began providing funding for watershed group development, watershed restoration planning, and watershed management project design (Phase I). A watershed group is a self-sustaining, non-regulatory, consensus-based group that is composed of a diverse array of stakeholders, which may include but is not limited to, private property owners, non-profit organizations, Federal, State, or local agencies, and Pueblos and Tribes. As part of Phase I activities, applicants may use funding to develop bylaws, a mission statement, perform stakeholder outreach, develop a watershed restoration plan, and design a watershed management project. For Phase I projects, Reclamation awards a successful applicant up to $50,000 per year for a period of up to two years with no non-Federal cost-share required.

Implementation of Watershed Management Projects

In 2017, Reclamation started to provide cost-shared financial assistance to watershed groups to implement watershed management projects (Phase II). These on-the-ground projects, collaboratively developed by members of a watershed group, address critical water supply needs and water quality concerns, helping water users meet competing demands and avoid conflicts over water. Reclamation

awards up to $100,000 per project over a two-year period. For Phase II projects, applicants must contribute at least 50% of the total project costs.

Drought Response Program

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

Drought Contingency Planning

Reclamation will provide financial assistance on a competitive basis for applicants to develop a drought contingency plan or to update an existing plan to meet the required elements described in the Drought Response Framework. Most drought contingency planning processes are structured to address 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 three questions and to encourage an open and inclusive planning effort that employs a proactive approach to building long-term resiliency to drought.

Drought Resiliency Projects

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

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

Emergency Response Actions

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

Title XVI Water Reclamation and Reuse Projects

Title XVI of P.L. 102-575, as amended (Title XVI), provides authority for Reclamation's water recycling and reuse program. Through the Title XVI Program, Reclamation identifies and investigates opportunities to reclaim and reuse wastewaters and impaired ground and surface water

in the 17 Western States and Hawaii. Title XVI includes funding for the planning, design, and construction of water recycling and reuse projects in partnership with local government entities.

In 2020, an estimated 7,268 ac-ft of water was recycled through Title XVI projects through AAO.

Basin Study Program

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

Baseline Assessments (formerly West-Wide Risk Assessments)

Reclamation conducts Baseline Water Assessments to develop water supply and demand projections for the Western U.S., with emphasis on Reclamation's service areas, as well as guidance, and tools needed to conduct planning activities across Reclamation's mission areas. Baseline Water Assessments support reservoir operations planning, appraisal and feasibility studies, basin studies, drought contingency planning, and environmental analyses. In 2020, new projections of future conditions (and paleoclimate analyses to refine those projections) were developed by Reclamation and will be published in the spring of 2021 on Reclamation's SECURE Water Act 2021 Report website. A summary report, which includes an overview of these projections, has been delivered to Congress and is currently available at: https://www.usbr.gov/climate/secure/.

Reservoir Operations Pilots

Reclamation is completing an analysis of water operations on the Rio Chama, located in northwestern New Mexico as a Reservoir Operations Pilot project. 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 them; 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. The Rio Chama Reservoir Operations Pilot Report is anticipated to be released to the public in 2021.

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.

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 evaluated 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, the City of Santa Fe received funding from Reclamation for a Title XVI Feasibility Study, which was completed in 2017. The completed study describes alternatives for implementation of a water reuse project for the City.

In 2016, the City of Santa Fe was also awarded funding from Reclamation for a Basin Study Update. In this project, Reclamation and Santa Fe collaborated to determine the likely timeline for projected impacts of climate change on Santa Fe's water supply over the coming century, empowering the Santa Fe water utility to plan for implementation of the remainder of its adaptation portfolio. In 2018, the City was awarded a Water Management Options Pilot Project to redevelop the system dynamics model used to simulate its water supply sources and distribution. Completion of the Basin Study Update has been postponed until the new system dynamics model is available to complete the assessments.

Rio Grande Basin Study: Lobatos to Elephant Butte

Reclamation is now in partnership with the MRGCD, the ABCWUA, and a large number of Pueblos and Tribes and other basin stakeholders to perform a Basin Study for the portion of the Rio Grande under New Mexico's jurisdiction per the Compact, from Lobatos gage to Elephant Butte Dam. This study follows from the Middle Rio Grande Basin Study – Plan of Study and seeks to include a broad and diverse consortium of basin stakeholders, including State and municipal government entities, Pueblos and Tribes, irrigation districts, acequias, and non-governmental and community organizations. The study seeks to develop projections of future water supply and demand and collectively evaluate and model potential adaptations to the projected changes. No water management decisions will be made as part of the Basin Study; instead, the study partners will create an interactive decision-support tool for water managers to consider, along with other considerations such as political and economic factors, as they manage water in increasingly challenging conditions. The study is being funded as a 50/50 cost split between Reclamation and all other partners combined.

Applied Science Grants

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

Under the Applied Science Grants Program, Reclamation is funding the following project:

- *Forecasting of Elephant Butte Deliveries* – Reclamation has awarded a grant to the NMISC to develop a tool to forecast water supplies in the Upper Rio Grande to help manage Elephant Butte deliveries in accordance with the Compact. This effort is being coordinated through

monthly meetings with Reclamation and the NCAR team for the projects described above, and will build on the NCAR work.

Science & Technology Program and Other Research Projects

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

The AAO is an active participant in Reclamation's S&T Program, and initiates and participates in research to improve the services that Reclamation provides to its stakeholders. S&T Program projects underway in 2020 include:

- FY 2018 Award – ongoing: *Improving the Robustness of Southwestern US Water Supply Forecasting in the Face of Climate Trends and Variability* (AAO partnership with NCAR, Boulder, CO). Seeks to improve forecasting for spring snowmelt runoff using a new model that provides ensembles of streamflow prediction based on current snowpack along with climate and weather drivers. Forecasts used to this point have been based only on snowpack and resulting streamflow in similar past years, so this forecasting work, which will be tested in 2021, has potential to provide significant improvement to our water supply and operational forecasts.
- FY 2018 Award – ongoing: *Collison Floating Evaporation Pan* (AAO Partnership with University of New Mexico). This project aims to improve reservoir evaporation monitoring through the development and calibration of an in situ floating evaporation pan. Through this project, a floating evaporation pan was deployed on Cochiti Reservoir where it was used to monitor reservoir evaporation for a year and a half. Pans are currently being deployed at Elephant Butte and Caballo Reservoirs, and evaporation monitoring results are being integrated and compared with those generated by New Mexico State University in the project below.

- FY 2019 Award – ongoing: *Using Remote Sensing and Ground Measurement to Improve Evaporation Estimation and Reservoir Management* (AAO and Elephant Butte Field Office partnership with New Mexico State University). This project aims to improve reservoir evaporation monitoring and reservoir management through the comparison of evaporation estimates from in situ and remotely sensed measurements. In situ evaporation estimates for this project are being measured through eddy covariance towers at Elephant Butte and Caballo Reservoirs and compared with those generated from the Collison Floating Evaporation Pans described above. Remotely sensed evaporation estimates are being developed from Landsat-8 images.

- FY 2019 Award – ongoing: *Software Tool Development to Generate Stochastic Hydraulic Simulations using HEC-RAS* (AAO partnership with USACE and the Hydrologic Research Center of San

Diego, CA). Main modules including Monte-Carlo sample generation and ingestion, implementation of samples through modifying HEC-RAS input files, post-processing, statistical analysis, and visualization are nearing completion and will go out to partners for beta testing.

- FY 2020 Award – completed: *Utilizing Acoustic Sensors to Detect Streambed Mobilization* (Internal to AAO). This project assesses the viability of utilizing acoustic sensors to determine the flows under which streambed mobilization is initiated on the Rio Chama. The goal of this project is to improve management of high flow pulses by correlating the moment of mobilization to a flow rate. Additional funding is being sought to apply this technology for field measurements.

- FY 2020 Award – ongoing: *Characterizing the Predictability and Sensitivity of Streamflow to Monsoon Season Precipitation* (AAO partnership with NCAR, Boulder, CO). This project builds on a previous S&T Program project characterizing extreme events in New Mexico: https://www.usbr.gov/research/projects/detail.cfm?id=1782. This project uses a process called "weather typing", along with statistical analyses, to begin to develop forecasts for summer monsoons in New Mexico. This process will be tested in 2021 and incorporated into model runs in 2022. Although this work will not provide prediction of specific monsoon events, it will provide information on the likely strength of the monsoon season, allowing us to plan for that water supply in ways we have not been able to in the past.

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

Likewise, through Reclamation's UCB Regional Office, AAO is partnering with NASA's JPL on a project to update the technology used to produce evapotranspiration estimates in the Rio Grande Basin. This is described in more detail in the *ET Toolbox* subsection above. The project will provide daily ET estimates at 30-meter spatial resolution derived from the Moderate Resolution Imaging SpectroRadiometer (MODIS) on the Terra and Aqua satellites and Landsat imagery, and forecast ET estimates.

Literature Cited:

Llewellyn, D., S. Vaddey, J. Roach, and A. Pinson. 2013. Upper Rio Grande Impacts Assessment: An Activity of the West Wide Climate Risk Assessment. Bureau of Reclamation, Albuquerque, NM.

Llewellyn, D., W. Schneider, P. A. Erdmann, R. Carpenter, C. Borchert, K. Collins, L. Starosta, and J. Roach. 2015. Santa Fe Basin Study: Adaptations to Projected Changes in Water Supply and Demand.

Table 18: Active WaterSMART Projects in the Rio Grande Basin Managed by the AAO[1]

Agreement No.	Program[2]	Completion Date	Recipient Name	Project Title	Federal Total Obligation Amount	Non-Federal Total Est Amount
R20AP00127	ASG	TBD	NMISC	Developing a Projection Tool for Rio Grande Compact Compliance	$141,272	$147,038
R19AP00240	CWMP	TBD	New Mexico Wilderness Alliance	Employing Citizen Science to Establish Baseline Water Quality Conditions in the Wild and Scenic Reach of the Rio Chama to Assess the Environmental Impacts of Changing Water Quality	$99,852	$10,375
R19AP00276	CWMP	TBD	Chama Peak Land Alliance	Enhancing the Capacity of the San Juan - Chama Watershed Partnership	$100,000	$0
R18AP00119	CWMP	9/30/21	National Audubon Society, Inc.	Isleta Reach Watershed Restoration Group, Middle Rio Grande Basin Watershed Group Development and Restoration Plan	$99,964	$0
R19AP00267	CWMP	TBD	New Mexico Jornada Resource Conservation & Development Council	Furthering Watershed Restoration Planning	$99,982	$0
R18AP00120	CWMP	6/30/21	Northern Arizona University	Developing a Watershed Restoration Strategy for the Eastern Jemez	$97,673	$0
R19AP00264	CWMP	TBD	Santa Fe Watershed Association	Linking Shareholder Priorities with Water Management and Adaptation Strategies in the Santa Fe River Watershed	$100,000	$0

[1] As of January 22, 2021

[2] ASG = Applied Science Grants (Part of Basin Study Program yet to be awarded)
CWMP = Cooperative Watershed Management Program
DROUGHT = Contingency Planning, Resiliency Projects, or Emergency Response Actions
WEEG = Water and Energy Efficiency Grant
SWEP = Small-Scale Water Efficiency Project
WCFSP = Water Conservation Field Services Program
Title XVI = Water Reclamation and Reuse Program
WIIN Act = Water Infrastructure Improvements for the Nation

Agreement No.	Program[2]	Completion Date	Recipient Name	Project Title	Federal Total Obligation Amount	Non-Federal Total Est Amount
R18AP00116	CWMP	9/30/20	Save Our Bosque Task Force	Updating and Expanding the Restoration Plan for New Mexico's Middle Rio Grande through Socorro County	$100,000	$0
R18AP00117	CWMP	3/31/20	Colorado Rio Grande Restoration Foundation	Rio Grande, Conejos River, and Saguache Creek Stream Management Plan	$35,000	$145,172
R19AP00105	DROUGHT	9/30/20	City of Las Cruces	Better Managing Water Supplies with Neutral Output Discharge Elimination System (NO-DES)	$238,696	$239,696
R18AC00122	DROUGHT	TBD	EBID	Watershed Scale Stormwater Monitoring and Capture	$180,670	$181,784
R19AV00009 PL 93-638	DROUGHT	9/30/21	Pueblo of Zia	Zia Flume Reconstruction	$750,000	$1,113,391
R19AP00115	DROUGHT	6/30/22	Santa Fe County	Aquifer Storage and Recovery in Rancho Viejo, Santa Fe County	$286,520	$659,480
R20 Pending	DROUGHT	TBD	Village of Tijeras	Well No. # Drilling, Testing, and Construction (Drought Well)	$748,980	$748,980
R17AP00223	SWEP	9/30/22	City of El Paso, TX	Water Conservation in the City of El Paso Parks	$70,500	$75,000
R18AP00258	SWEP	9/30/20	City of Las Cruces	Smart Irrigation Technology Water Supply Reliability Project	$73,920	$74,420
R18AP00255	SWEP	8/30/21	City of Rio Rancho	Ultrasonic Water Meter Replacement	$70,000	$92,470
R20AP00156	SWEP	TBD	County of Bernalillo	Well Meter Upgrade Project	$28,156	$28,156
R18AP00261	SWEP	3/31/20	EPCWID	Ysla Lateral Concrete Lining Project	$74,000	$119,576
R19AP00207	SWEP	9/30/21	EPCWID	Advanced Metering Infrastructure Upgrades to Irrigation Wells	$74,000	$82,922
R19AP00208	SWEP	TBD	EPCWID	Montoya Main and Montoya A Laterals Concrete Lining Project	$75,000	$122,143
R20AP00155	SWEP	TBD	EPCWID	Ysla Lateral Concrete Lining Project, Phase 3	$75,000	$122,294
R20AP00141	SWEP	TBD	EBID	Williams Lateral Piping	$75,000	$116,097
R19AP00280	SWEP	6/30/21	Ponderosa Mutual Domestic Water Consumers Association	Meter Upgrade Project	$24,000	$29,531
R19AP00223	SWEP	TBD	Pueblo of Zia	Residential Metering Project	$70,320	$91,578
R20AP00129	SWEP	TBD	Pueblo of Zia	Residential Metering Project, Phase 2	$73,000	$80,851

Agreement No.	Program[2]	Completion Date	Recipient Name	Project Title	Federal Total Obligation Amount	Non-Federal Total Est Amount
R17AP00222	SWEP	12/31/20	Village of Los Lunas	Effluent Reuse for Construction Water	$74,181	$77,090
R17AP00215	SWEP	9/30/20	City of Rio Rancho, NM	Water Efficiency Rebates	$29,300	$47,110
R16AP00217	Title XVI	12/31/20	El Paso Water Utilities Public Service Board	Fred Hervey Reclaimed Water Project	$1,221,692	$3,665,076
R20AP00332	Title XVI	9/30/21	El Paso Water Utilities Public Service Board	El Paso Water Reclamation and Reuse Project - Advanced Water Purification Facility	$3,500,000	$10,500,000
Agreement Pending	Title XVI	TBD	El Paso Water Utilities Public Service Board	El Paso Aquifer Storage and Recovery Using Reclaimed Water Project	$400,000	$1,200,000
R20AP00036	WCFSP	9/30/21	City of Rio Rancho	Water Resources Management Plan Update	$16,925	$16,925
R18AP00142	WCFSP	9/30/20	EPCWID	Designing Improvements to Franklin Canal and Franklin Feeder Canal	$75,000	$75,000
R19 pending	WCFSP	TBD	EPCWID	La Union Canal Concrete Lining Project	$75,000	$75,317
R17AP00022	WCFSP	6/30/20	MRGCD	Demonstrating Conservation Project Technologies	$49,989	$95,558
R20AP00056	WEEG	3/31/24	EPCWID	Riverside Canal Concrete Lining Project (Phase III)	$1,000,000	$1,039,504
R18AP00193	WEEG	6/30/21	EPCWID	Riverside Canal Lining Project (Phase I)	$999,000	$1,302,500
R19AP00150	WEEG	TBD	EPCWID	La Union East Canal Concrete Lining Project	$300,000	$625,298
R18AP00197	WEEG	6/30/22	EBID	Picacho W-H-E-N Project	$997,182	$1,152,288
R20AP00339	WIIN Act	10/31/22	El Paso Water Utilities Public Service Board	Kay Bailey Hutchison (KBH) Desalination Plant, Phase I Part A Expansion	$2,050,000	$6,050,000