

# RECLAMATION

*Managing Water in the West*

## Calendar Year 2010 Report to the Rio Grande Compact Commission

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U. S. Department of the Interior  
Bureau of Reclamation  
Albuquerque Area Office  
Albuquerque, New Mexico

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## MISSION STATEMENTS

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

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

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# Table of Contents

<b>Table of Contents</b> .....	<b>i</b>
<b>List of Figures</b> .....	<b>iii</b>
<b>List of Tables</b> .....	<b>iii</b>
<b>List of Photos</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>1</b>
<b>San Luis Valley Project, Colorado</b> .....	<b>3</b>
Conejos Division, Platoro Reservoir .....	3
Platoro Dam Facility Review and Safety of Dams Programs.....	4
Closed Basin Division.....	4
Closed Basin – Operations and Maintenance .....	5
Operations .....	5
Maintenance.....	6
Water Quality.....	7
Rio Grande Water Conservation District.....	7
<b>San Juan – Chama Project, Colorado – New Mexico</b> .....	<b>9</b>
San Juan-Chama Project Accounting.....	9
San Juan-Chama Diversion Dams and Tunnels.....	10
Heron Dam and Reservoir Operations.....	10
Heron Dam Facility Review and Safety of Dams Programs .....	12
Pojoaque Tributary Unit - Nambé Falls Dam and Reservoir.....	13
Nambé Falls Dam Facility Review and Safety of Dams Programs .....	14
M&I Water Use - National Environmental Policy Act Compliance .....	15
<b>Middle Rio Grande Project, New Mexico</b> .....	<b>16</b>
New Mexico Relinquishment of Rio Grande Compact Credit .....	16
El Vado Dam and Reservoir Operations.....	17
El Vado Dam Facility Review and Safety of Dams Programs .....	18
U.S. Army Corps of Engineers’ Related Reservoir Operations.....	19
Cooperative Programs with the State of New Mexico.....	20
Elephant Butte Temporary Channel History.....	20
Elephant Butte Temporary Channel — 2010 Maintenance.....	21
Irrigation Drain Improvements .....	23
River Maintenance .....	24
River Maintenance Priority Sites .....	24
San Ildefonso Pond .....	25
Santo Domingo .....	26
San Felipe.....	28
Santa Ana River Mile 208.4.....	28
Santa Ana River Mile 205.8.....	29
Corrales Siphon.....	31
Arroyo de las Cañas .....	32
Bosque del Apache Sediment Plug .....	32
Bosque del Apache Levee.....	33
Tiffany Sediment Plug .....	35
Fort Craig Bend.....	36

Tiffany and San Marcial Levees .....	37
Truth or Consequences .....	37
Middle Rio Grande River Maintenance Plan.....	38
Preparation for 2011 Spring Runoff .....	38
<b>Middle Rio Grande Endangered Species Act Collaborative Program .....</b>	<b>40</b>
Habitat Restoration Projects .....	40
Phase II Isleta Reach Riverine Restoration and Habitat Improvements for the Rio Grande Silvery Minnow and Bosque Ecosystem Project.....	40
Pueblo of Sandia Riverine Habitat Restoration Project.....	41
Santo Domingo Endangered Species Habitat Improvement Project Phase IV.....	41
Additional Habitat Restoration Projects Funded in 2010 .....	41
Fish Passage at San Acacia Diversion Dam .....	41
Captive Propagation.....	42
Rio Grande Silvery Minnow Sanctuary (Sanctuary) .....	42
Supplemental Water Program.....	42
Water Acquisition and Management .....	42
Low Flow Conveyance Channel (LFCC) Pumping Program – San Acacia to Fort Craig Reach.....	42
Other Ongoing Water Management and Water Quality Related Projects .....	43
Upper Rio Grande Water Operations Model (URGWOM).....	43
U.S. Geological Survey (USGS) Groundwater/Surface Water Interaction in the MRG Valley.....	43
USGS MRG River Gage Operation and Maintenance (O & M) .....	44
Decision Support System (DSS) for the MRGCD.....	44
Endangered Species .....	44
Programmatic Water Operations and River Maintenance ESA, Section 7, Consultation ....	44
Rio Grande Silvery Minnow.....	45
Southwestern Willow Flycatcher.....	48
Rio Grande Silvery Minnow v. Keys Litigation.....	50
RiverEyes.....	51
New Middle Rio Grande Water Management and River Maintenance Consultation .....	52
<b>Rio Grande Project (New Mexico - Texas).....</b>	<b>53</b>
Water Supply Conditions.....	54
Project Irrigation and Drainage Systems and Title Transfer .....	55
Elephant Butte Reservoir and Powerplant .....	56
Elephant Butte Dam Facility Review and Safety of Dams Programs .....	56
Caballo Dam and Reservoir.....	58
Caballo Dam Facility Review and Safety of Dams Programs.....	58
Rio Grande Project Adjudications .....	59
Rio Grande Project Operating Agreement.....	60
Elephant Butte and Caballo Reservoir Vegetation Management Cooperative Agreement .....	61
<b>Other Reclamation Programs.....</b>	<b>62</b>
The Secure Water Act.....	62
WaterSMART Grants (Formerly the Water for America Initiative) .....	62
Basin Study Program .....	63
Title XVI Water Reclamation and Reuse Projects .....	63

Reclamation’s Water Conservation Field Services Program.....	65
Upper Rio Grande Water Operations Model .....	66
Water Accounting Reports Projects.....	67
2010 San Juan – Chama Project Water Accounting.....	67
Excel® Based Water Accounting Spreadsheet.....	67
Water Accounting Documentation .....	67
2010 San Juan – Chama Water Accounting Reporting .....	67
Oracle® Hydrologic Database (HDB).....	68
RiverWare® .....	68
Evapotranspiration (ET) Toolbox Decision Support System .....	68
Native American Affairs Programs .....	69
Emergency Drought Program .....	70
Quagga and Zebra Mussel Update.....	71
Non-Federal Hydroelectric Power Development.....	72

## List of Figures

Figure 1: Project Map of Reclamation's Albuquerque Area Office.....	2
Figure 2: Area Map of San Luis Valley Project .....	3
Figure 3: Area Map of the San Juan-Chama Project .....	9
Figure 4: Area Map of the Middle Rio Grande Project .....	16
Figure 5: Total Number of Rio Grande Silvery Minnow Captured in October Population Monitoring Surveys .....	47
Figure 7: Area Map of the Rio Grande Project.....	53

## List of Tables

Table 1: San Luis Valley Project - Closed Basin Division Water Accounting .....	6
Table 2: SJ-C Project - Diversions through Azotea Tunnel .....	11
Table 3: SJ-C Project – Water Deliveries from Heron Reservoir.....	12
Table 4: SJ-C Project – Monthly Water Storage in Heron Reservoir.....	12
Table 5: SJ-C Project – San Juan-Chama Water at Otowi.....	14
Table 6: SJ-C Project – Monthly Water Storage in Nambe Falls Reservoir .....	14
Table 7: Reservoir Operation for El Vado Dam .....	18
Table 8: Reservoir Operations for Abiquiu Dam.....	20
Table 9: Species collected during Reclamation sampling in the temporary channel upstream of Elephant Butte Reservoir, September 27 and 28, 2010 .....	46
Table 10: Total Numbers of Rio Grande Silvery Minnow from October Surveys, 2001-2010, by Reach.....	47
Table 11: Southwestern Willow Flycatcher Territories – Middle Rio Grande Project, 2000 - 2010 Breeding Seasons .....	49
Table 12: 2010 Pumping Volume by Site.....	43
Table 13: Summary of 2010 Rio Grande Coordinated Spring Runoff Forecasts .....	54

Table 14: 2010 Rio Grande Coordinated Spring Runoff Forecasts .....	55
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## List of Photos

Photo 1: Headwaters of Elephant Butte Reservoir, prior to construction of the Temporary Channel .....	21
Photo 2: Aerial map showing plotted locations of 2010 breaches.....	22
Photo 3: Amphibious excavator working on Breach B south of the Red Rock Staging Area.....	23
Photo 4: Reclamation construction crews repairing washout at Drain Unit 7 Extension, near the north end of the Ladd Gordon Waterfowl Complex.....	24
Photo 5: San Ildefonso bankline erosion and riprap windrow .....	26
Photo 6: Kewa Pueblo RM 224.6 Priority Site .....	27
Photo 7: Kewa Pueblo RM 223.9 Priority Site, looking west .....	27
Photo 8: Rock toe placement at Priority Site 213.4, San Felipe.....	28
Photo 9: Looking upstream at location of sediment spoil pile on the Pueblo of Santa Ana after sediment has been removed. Flow in the Rio Grande is approximately 3000 cfs.....	29
Photo 10: Looking downstream at the bend erosion at the Santa Ana RM 205.8 priority site.....	30
Photo 11: Increased wetted width at higher flows (approximate river flow is 2800 cfs) from the Corps of Engineers' bar lowering at the Pueblo of Santa Ana across from the Santa Ana RM 205.8 priority site.....	30
Photo 12: Looking towards the west at the Corrales Siphon river maintenance site location during the spring runoff. Note the high flow channels cut in the bar by the Pueblo of Sandia. Flow in the Rio Grande is approximately 3000 cfs .....	31
Photo 13: Aerial photograph of the Arroyo de las Cañas .....	32
Photo 14: The reach of river currently considered most prone to sediment plug formation, taken from just north of the North Boundary BDANWR, looking south.....	33
Photo 15: A completed section of the 2009 Bosque del Apache Levee ARRA improvements ...	34
Photo 16: Levee raising north of BDANWR.....	35
Photo 17: Vicinity of 2005 Tiffany Sediment Plug .....	36
Photo 18: Fort Craig Bend priority site, looking southwest .....	37
Photo 19: Rio Grande and Cuchilla Negro Creek confluence after sediment excavation .....	38

# Introduction

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

The *San Luis Valley Project* consists of the Conejos and Closed Basin Divisions. The Conejos Division, which includes Platoro Dam and Reservoir, provides water for approximately 86,000 acres within the Conejos Water Conservancy District. The Closed Basin Division is a ground water salvage project located near Alamosa, Colorado, which pumps water from the shallow unconfined aquifer.

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

The *Middle Rio Grande Project* consists of El Vado Dam and Reservoir and irrigation and drainage facilities in the Middle Rio Grande Valley. The project also entails 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 Middle Rio Grande Conservancy District (MRGCD) which supplies water to 50,000 to 70,000 acres of land.

The *Rio Grande Project* includes Elephant Butte and Caballo Reservoirs and Percha, Leasburg, Mesilla, and Riverside Diversion Dams. The Project resides in the lower Rio Grande valley of southern New Mexico to just south of El Paso, Texas. The *Rio Grande Project* provides an agricultural water supply for approximately 178,000 acres of land within the Elephant Butte Irrigation District in New Mexico and the El Paso County Water Improvement District No. 1 in Texas. Water is also provided for diversion to Mexico by the International Boundary and Water Commission-United States Section according to the terms of the 1906 Treaty between the United States and Mexico. Drainage waters from the Rio Grande Project lands provide a supplemental supply for approximately 18,000 acres of land within the Hudspeth County Conservation and Reclamation District No. 1 in Texas. Elephant Butte Dam also provides generation of electrical power for communities and industries in southern New Mexico. Reclamation transferred title to the canal and drainage facilities to the districts in a 1996 operating agreement.

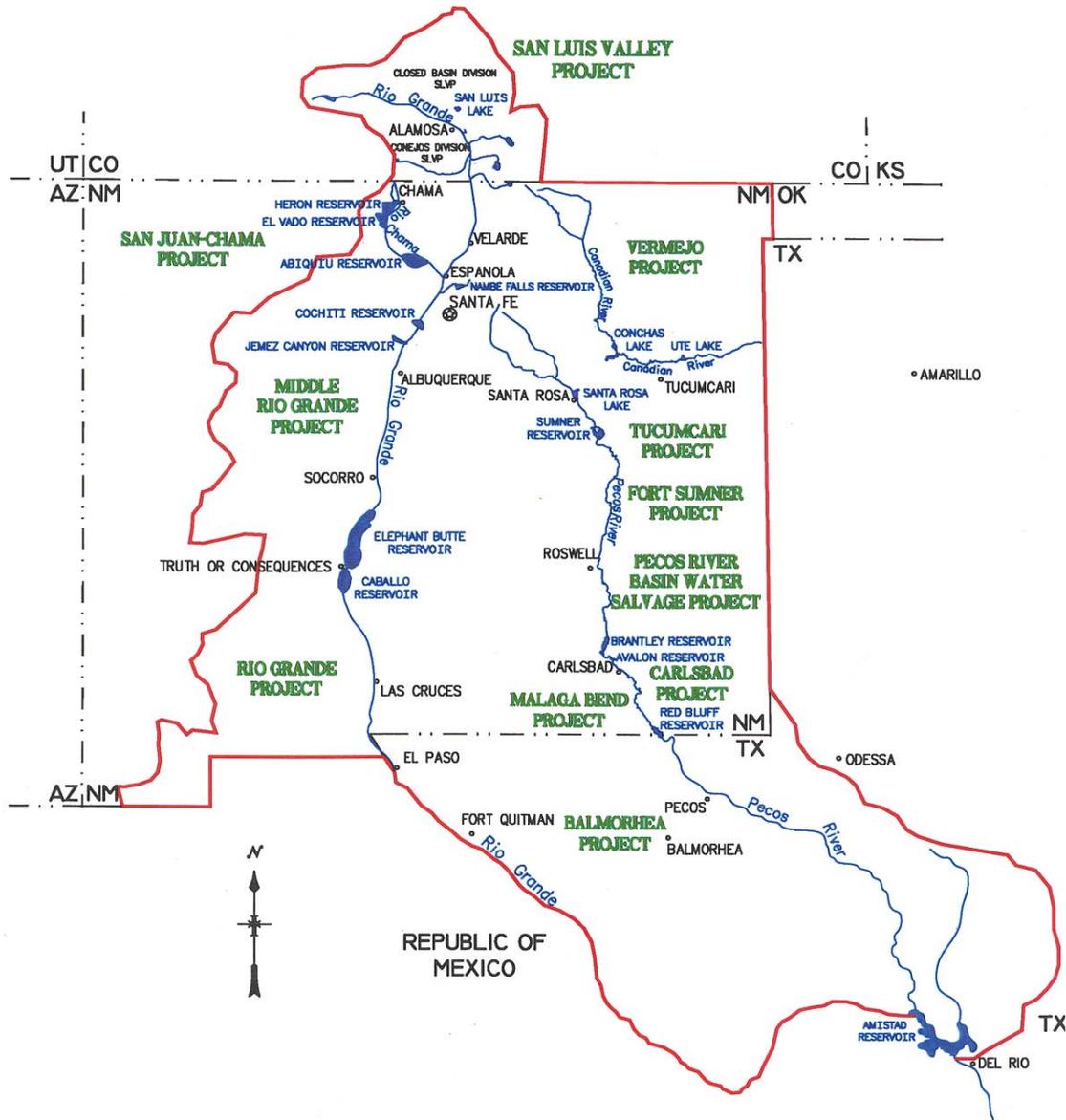


Figure 1: Project Map of Reclamation's Albuquerque Area Office

# San Luis Valley Project, Colorado

## Conejos Division, Platoro Reservoir

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

Platoro Reservoir began January 1, 2010, at elevation 9,997.94 feet AMSL, with a content of 29,518.5 ac-ft. The September 30, 2010, elevation was 9,984.74 feet, with a content of 21,047.0 ac-ft. Of that content, none was direct-flow storage (in 2010, re-regulated water was evacuated by the end of September 2010 to perform facility repairs), and 1,617 ac-ft of Compact water. December 31, 2010, data were: elevation 9,985.62 feet, with a storage content of 21,565 ac-ft. A volume of 2,720.5 ac-ft of Compact water remained in storage.

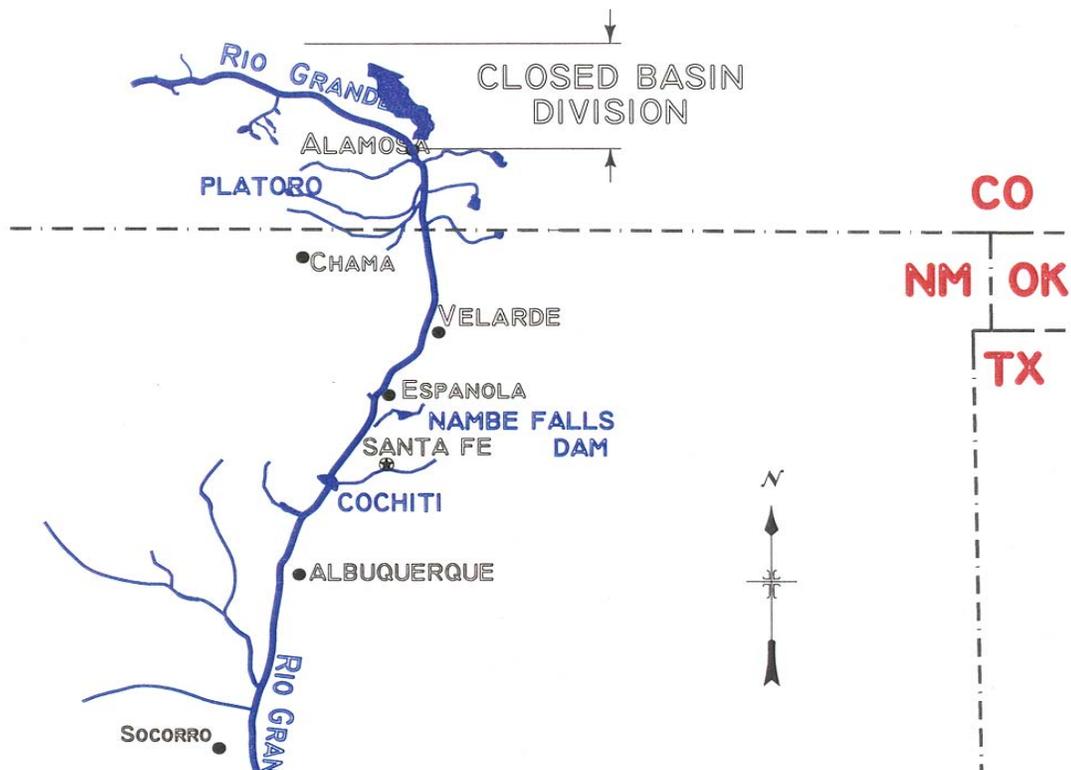


Figure 2: Area Map of San Luis Valley Project

## Platoro Dam Facility Review and Safety of Dams Programs

In 2010, the following activities occurred at Platoro Dam in 2010:

### Routine activities:

- The 2010 Facility Reliability Rating (FRR) was updated with no significant issues.
- The 2010 Periodic Facility Review (PFR) exam was completed in August with no new recommendations.
- The 2010 Security Plan was completed.

### Replacement of outlet works regulating gates:

- The two 48-inch butterfly valves were replaced with two 40-inch jet flow valves in 2010. The Conejos Water Conservancy District (CWCD) was the responsible entity for this work.
- The new valves eliminate use of the guard gate filler line as a winter bypass system, increasing safety and efficiency during winter flow releases.
- The new valves should also provide an increase in capacity, as follows:
  - The butterfly valves had a design capacity of 935 cfs at reservoir elevation 10,042 feet, but restrictions had been placed on the valves such that the maximum allowable valve openings were as follows: 70 percent between elevations 10,042 and 9,980 feet, and 80 percent below 9,980.0 feet.
  - The aforementioned condition is scheduled for a reevaluation in the spring/summer of 2011 given the newly installed jet flow valves.
- The local Bureau of Land Management (BLM) office provided \$50,000 to CWCD for design of the replacement valves. This funding was utilized to employ Reclamation's Technical Service Center (TSC) for design of the new valves.
- Adjoining the new jet flow valves was a new remote Supervisory Control and Data Acquisition (SCADA) system.

### Stop-log gate installation and upper conduit inspection:

- Installation of a stop log bulkhead gate was required to allow for inspection of the upper conduit and filler line.
- A preliminary dive inspection was completed by CW Divers from Farmington, New Mexico in late December 2009 to verify intake/trashrack condition, location, and stop log slot dimensions. The information obtained from the dive allowed TSC to complete designs for the stop log gate.
- The stop log gate was installed by contract divers (C&W Dive Services from San Diego, California) in November 2010, followed immediately by TSC's inspection of the upper conduit and filler line.
- Total cost of the stop log gate installation and inspection was roughly \$700,000.

## Closed Basin Division

The Alamosa Field Division of the Albuquerque Area Office operates and oversees the maintenance of a water salvage project constructed in the Closed Basin area of the San Luis Valley, Colorado (Figure 2). The purpose of the project is to salvage unconfined ground water from the Closed Basin that would otherwise be lost to evaporation and evapotranspiration. The

salvaged water is pumped from 170 salvage wells and delivered through a conveyance channel to the Rio Grande to assist Colorado in meeting its commitment under the Rio Grande Compact. The project also provides for the delivery of mitigation water to the Alamosa National Wildlife Refuge and Blanca Wildlife Habitat Area, and stabilization of San Luis Lake. Reclamation continues to work under the guidance of the Closed Basin Division Operating Committee in management of Closed Basin operations and water deliveries. A Review of Operations and Maintenance examination (RO&M) was conducted in October of 2005. The next RO&M examination is scheduled for 2011.

## **Closed Basin – Operations and Maintenance**

### **Operations**

Closed Basin water deliveries in Calendar Year (CY) 2010 included deliveries to the Rio Grande, Blanca Wildlife Habitat Area, Alamosa National Wildlife Refuge, and pumping from San Luis Lake to help reduce the Total Dissolved Solids (TDS).

A total of 17,098 ac-ft of project water was delivered in CY 2010. Total deliveries of Compact water to the Rio Grande for CY 2010 were 12,849 ac-ft. Total water deliveries to the Bureau of Land Management (BLM) Blanca Wildlife Habitat Area for CY 2010 were 800 ac-ft for annual mitigation and 250 ac-ft for a Colorado Division of Wildlife (CDOW) exchange, 87.9 ac-ft for a San Luis Valley Conservancy District exchange, 185.8 ac-ft for Ellsworth/Forrest exchange (private water), and 106 ac-ft of lake water mixed with Project water. Total water deliveries to the Alamosa National Wildlife Refuge for CY 2010 were 2,713 ac-ft for annual mitigation and 106 ac-ft of lake water mixed with Project water. There was also an exchange of 0.5 ac-ft with San Luis Valley Conservancy District for construction use by SLV Earthmovers, Inc.

Natural inflows to San Luis Lake (SLL) are measured by the SLL inlet flume or estimated at the spillway and culverts. Natural inflow to SLL during CY 2010 totaled 1,230 ac-ft. The total amount pumped out of San Luis Lake was 121 ac-ft.

Closed Basin Division water accounting for the 2010 calendar year is summarized in Table 1.

Table 1: San Luis Valley Project - Closed Basin Division Water Accounting (units are acre-feet)

SLV CBD	BLANCA WILDLIFE HABITAT AREA			PARSHALL FLUME		ALAMOSA NAT'L WILDLIFE REFUGE (ANWR)				DELIVERY TO THE RIO GRANDE			PROJECT TOTALS
	CH03 STA. 730+00	CH04 STA. 798+60	MONTH TOTALS	TOTAL PASSING FLUME	CREDIT-ABLE AMOUNT AT FLUME	CH01 CHICAGO TURN-OUT	CH02 MUM TURN-OUT	PUMPING PLANT	MONTH TOTALS	TOTAL AT FLUME MINUS DEL. @ ANWR	Credit. Amt. del. to RGrande & not used by ANWR	NON-CREDIT-ABLE @ LOBATOS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
JAN	0	0	0	1,642	1,642	0	0	0	0	1,642	1,642	0	1,642
FEB	0	0	0	1,410	1,410	0	0	0	0	1,410	1,410	0	1,410
MAR	0	0	0	1,553	1,553	0	0	0	0	1,553	1,553	0	1,553
APR	0	0	0	1,406	1,406	204	147	79	430	976	976	0	1,406
MAY	0	0	0	1,501	1,501	219	298	375	892	609	609	0	1,501
JUN	0	0	0	1,373	1,373	0	44	4	48	1,325	1,325	0	1,373
JUL	111	237	348	984	984	90	0	88	178	806	806	0	1,332
AUG	118	245	363	1,002	1,002	88	0	89	177	825	825	0	1,365
SEP	105	204	309	1,137	1,137	169	0	272	441	696	696	0	1,446
OCT	111	211	322	1,000	569	304	0	349	653	347	347	0	1,322
NOV	31	57	88	1,194	1,194	0	0	0	0	1,194	1,194	0	1,282
DEC	0	0	0	1,466	1,466	0	0	0	0	1,466	1,466	0	1,466
ANNUAL	476	954	1,430	15,668	15,237	1,074	489	1,256	2,819	12,849	12,849	0	17,098

The project continues to provide Priority 1 (Compact) and Priority 2 (Mitigation) water deliveries. The San Luis Valley is in the midst of a severe drought and the water table in the unconfined aquifer has dropped significantly in some areas. Pumping levels remain stable to allow the water table to recover while minimizing impacts to the surrounding area and preserving the integrity of existing project wells.

Wells turned off at the recommendation of the Project Hydrologist in 2007 remained off in 2008, 2009, and 2010.

The Alamosa Field Division has been meeting with other interested parties (US Fish and Wildlife Service, Colorado Division of Parks and Outdoor Recreation, Colorado Division of Wildlife and Rio Grande Water Conservation District) on the operation of San Luis Lake in an effort to make the Lake a viable recreation area and to provide storage of water for later use to deliver to the Rio Grande to meet compact requirements.

The United States Geological Survey's (USGS) Pueblo Colorado Office continues to provide quality assurance/quality control (QA/QC) of the observation wells' network data for Reclamation. The Water Quality Laboratory participated in the spring and fall USGS Evaluation Program for Standard Reference Water Samples. The Laboratory continues to perform commendably on these audits.

## Maintenance

Routine preventive maintenance and repair activities continued at salvage and observation well sites, canal structures, pumping plants, and shelterbelts. Other work included aquatic and noxious weed control, rodent control, and ice removal.

A total of eight replacement wells were drilled and 25 wells were rehabilitated in 2010. Reclamation has requested permits for six more wells in 2011. These replacement salvage wells range from 100 gallons per minute (gpm) to 500 gpm. With the different well screen designs and changes in the gravel pack style, these wells continue to prove that the re-drills have been very successful to the Project and the commitment to the Rio Grande Compact, the Alamosa National

Wildlife Refuge, and the Blanca Wildlife Habitat Area. A total of 59 salvage wells have been re-drilled from 2002 through 2010.

Repair and replacement of pumps and motors in the salvage well vaults is an ongoing process. The maintenance crew will continue to chemically treat salvage wells as part of the rehabilitation efforts in 2011. Annual preventive maintenance of salvage wells is ongoing as well as maintenance on the lateral valves.

Over the last 24 months, Reclamation has undertaken a program to improve salvage well efficiency by increasing salvage well yield while reducing pump energy consumption and cost. The improvement in salvage well efficiency is being achieved by:

1. Designing pumps to maintain a higher pumping water level in re-drilled wells. This requires smaller pumps and less energy use by reducing the water lift requirement. This will also maintain well efficiency over a longer period of time.
2. Rehabilitation of existing wells. A combination of brushing, surge blocking, and an acid treatment is used to maintain or improve salvage well yield.
3. Improvement in monitoring and measurement techniques. Great improvements have been made in the measurement and monitoring of salvage well flow and drawdown, and pipeline pressure. By having good measurement of these parameters the most efficient pump can be selected for each well.

Equipment has been updated with a new mower and tractor. In addition, a 40 foot x 40 foot building was constructed at Check4, and a 40 foot x 40 foot 3-sided building was constructed on G road next to the canal. A 10,000 kilowatt solar system was installed in the compound next to the Administrative building. This solar system is supplying around one third of the electrical needs of the building.

## **Water Quality**

Water quality monitoring of Closed Basin Division salvage wells, the Rio Grande, San Luis Lake, Head Lake, and the conveyance channel continued throughout 2010.

The Water Quality Laboratory continues to support the Operations and Maintenance groups with their salvage well rehabilitation and bio-fouling mitigation efforts. Currently all salvage wells are monitored for the presence of iron related bacteria. The Water Quality Laboratory participated in the spring and fall USGS Evaluation Program for Standard Reference Water Samples. The Laboratory continues to perform commendably on these audits.

## **Rio Grande Water Conservation District**

The Rio Grande Water Conservation District (RGWCD) continues to perform civil maintenance

on the Project based on a cooperative agreement with Reclamation. Canal berms, lateral access roads, and right-of-ways were maintained by blading and mowing. Other work included removal of aquatic weeds and sediment from structures and the canal, repair of fences, repair of berms damaged by erosion during large precipitation events, and assisting Reclamation personnel in maintaining equipment. RGWCD continued its involvement in the groundwater monitoring program and continues maintenance of the irrigation systems for shelterbelt areas.

The RGWCD continues to assist Reclamation in the re-drill and rehabilitation efforts due to the bio-fouling in numerous wells. Eight wells were replaced during 2010 and numerous others were treated and rehabilitated.

# San Juan – Chama Project, Colorado – New Mexico

Reclamation's Albuquerque Area Office Water Management Division continued to maintain its internet web page for Middle Rio Grande Water Operations during 2010. This web site provides the current year's monthly data for the operation and water accounting of the San Juan – Chama Project. To reach the internet web page, type <http://www.usbr.gov/uc/albuq/water/> into a web browser. An area map of the San Juan – Chama Project is provided below in Figure 3.

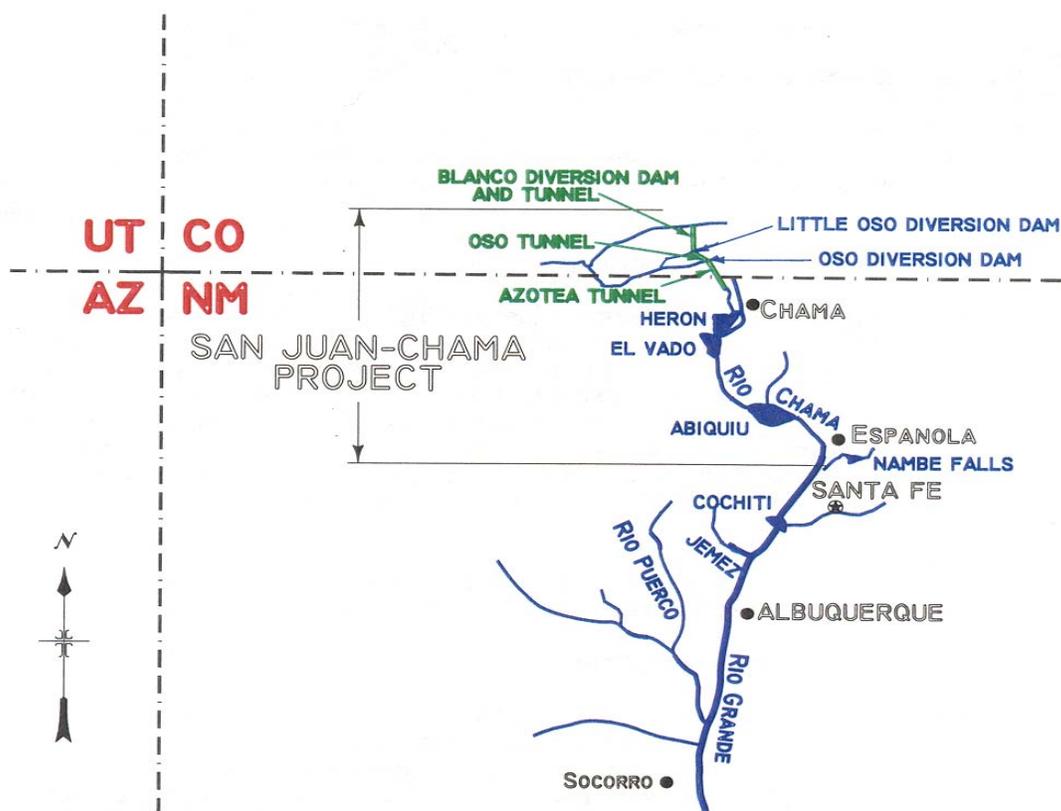


Figure 3: Area Map of the San Juan-Chama Project

## San Juan-Chama Project Accounting

Water diverted from the San Juan Basin in Colorado through the San Juan – Chama Project authorized by Congress in 1962 through P.L. 87-483, introduced special circumstances for water use and management in the Middle Rio Grande Valley. Imported San Juan Chama Project water must be accounted for separately from native Rio Grande flow, and fully consumed in New Mexico.

Reclamation is responsible for water contracts and accounting for the San Juan – Chama Project.

Historically, accounting was accomplished with Fortran code models, which were replaced by reports produced via a Lotus<sup>®</sup> electronic file spreadsheet around 1993. A Microsoft Excel<sup>®</sup> version of the Lotus<sup>®</sup> spreadsheet was developed around 2004, at about the time a RiverWare<sup>®</sup> accounting model was constructed. The Fortran models and Lotus<sup>®</sup> spreadsheet captured and implemented the approved Compact methods of accounting until 2008, when an Excel<sup>®</sup> spreadsheet, developed to capture and implement approved Compact methods, replaced the unsupported Lotus<sup>®</sup> spreadsheet and was used to produce the final accounting document. Improvements to the RiverWare<sup>®</sup> accounting model using the hydrologic database (HDB) for data storage and Crystal Reports<sup>®</sup> for report generation allowed side-by-side comparison of accounting tables produced independently by Excel<sup>®</sup> and the RiverWare<sup>®</sup> accounting model/HDB/ Crystal Reports<sup>®</sup> method with favorable results. This practice continued in 2010, but in 2011 and into the future Reclamation will use the RiverWare<sup>®</sup> accounting model/HDB/ Crystal Reports<sup>®</sup> method exclusively. San Juan – Chama Project accounting for 2010 is provided in the separate report *2010 Water Accounting Report*.

## San Juan-Chama Diversion Dams and Tunnels

Initial diversions for the San Juan – Chama Project begin in Colorado at the Blanco, Oso, and Little Oso diversion dams, depicted in Figure 3. Operation begins with the spring runoff, and maintenance occurs in the fall, when the intake forebay areas and associated structures are dredged and cleaned to allow unobstructed access to the associated tunnels. The Azotea Tunnel collects diversion flows for transport to the outfall at Willow Creek above Heron Reservoir.

As a requirement of the Corps of Engineers 404 program, permits for maintenance at the Blanco and Oso Diversion Dams were acquired, and are available at the Albuquerque Area Office and Chama Field Division Office. The permits expire December 1, 2011, and require an annual reporting of any maintenance that was accomplished for that year, including sediment removal, bank stabilization, and maintenance of the diversion dams and associated infrastructure.

In 2009, a sluice gate malfunctioned at the Oso Diversion that allowed about 700 cubic yards of sediment to discharge downstream. Reclamation received a Notice of Violation of the Clean Water Act from the Corps of Engineers (Corps). In October 2009 and February 2010, Reclamation submitted interim reports of findings to the Corps due to the need to conduct a three year survey of fish and macro-invertebrates to ascertain the health of the Navajo River. Reclamation will submit interim reports to the Corps in December 2010 and 2011. In December 2012, Reclamation will submit the final report to the Corps. Reclamation has corrected the sluice gate programming error that caused the accidental discharge of sediment. Reclamation also worked with downstream property owners to remove sediment deposited on their property.

## Heron Dam and Reservoir Operations

(All elevations are 1929 NGVD, storage reference is 1987 ACAP survey)

Diversions into the Azotea Tunnel began on March 18 and ended on November 3 during 2010. The total volume diverted through the tunnel was 89,403 ac-ft. The running 10-year average

Azotea Tunnel diversion increased significantly this year, from 89,163 ac-ft for the period 2001 through 2010 to 93,829 ac-ft for the period of 2001 through 2010 (Table 2). Heron Reservoir began the year at an elevation of 7157.45 feet (252,110 ac-ft), and finished the year at an elevation of 7151.67 feet (226,680 ac-ft), which was also lowest point in the year. Storage peaked on August 1 at an elevation of 7174.22 feet (334,670 ac-ft).

Table 2: SJ-C Project - Diversions through Azotea Tunnel (units are acre-feet)

AZOTEA MONTH	YEAR										10 YEAR TOTAL
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
JANUARY	0	0	0	0	0	0	0	0	0	0	0
FEBRUARY	0	0	0	0	93	0	179	0	272	0	544
MARCH	1512	743	1170	11505	1931	706	12976	4745	5938	546	41772
APRIL	19284	4499	11366	15427	31721	17799	17745	25816	19111	21,908	184676
MAY	51092	865	26613	30164	45146	25674	33837	44461	51766	35,368	344986
JUNE	29283	204	18816	20390	50210	7600	26679	47463	23544	27,249	251438
JULY	4643	0	669	2139	13347	3785	4302	13428	4392	1,815	48520
AUGUST	4455	0	487	237	3779	4868	7375	2606	232	1,501	25540
SEPTEMBER	313	0	3340	1973	3360	5567	1948	1465	99	712	18777
OCTOBER	0	0	246	1821	4873	12795	33	0	0	251	20019
NOVEMBER	0	0	0	1218	735	0	0	0	0	53	2006
DECEMBER	0	0	0	12	0	0	0	0	0	0	12
ANNUAL	110582	6311	62707	84886	155195	78794	105074	139984	105354	89,403	938290
										TEN YEAR AVERAGE =	93829

The SJ-C contractors' 2010 and waived 2009 annual allocations were delivered as shown in Table 3, for a total delivery in 2010 of 106,832 ac-ft. The remaining 2009 allocations are being held in Heron according to waivers which grant an extension for the delivery date for several contractors into 2010. Table 4 presents actual monthly Heron water operations for the 2010 calendar year.

Table 3: SJ-C Project – Water Deliveries from Heron Reservoir (units are acre-feet)

SJ-C HERON RELEASE	MR GCD	SANTA FE	SANTA FE COUNTY	COCHITI	CITY OF ALBUQUERQUE	POJOAQUE UNIT	TAOS	COUNTY OF LOS ALAMOS	CITY OF ESPAÑOLA	TWINING SANITATION	VILLAGE OF LOS LUNAS	TOWN OF BERNALILLO	BELÉN	RED RIVER	JICARILLA APACHE	SAN JUAN PUEBLO	UNCONTRACTED	TOTAL
MONTH																		
ALLOCATION	20,900	5,230	375	5,000	48,200	1,030	400	1,200	1,000	15	400	400	500	60	6,500	2,000	2,990	
JANUARY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FEBRUARY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MARCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
APRIL	0	0	0	0	0	0	0	0	26	0	0	0	2	0	0	0	0	28
MAY	0	458	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	458
JUNE	0	238	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	238
JULY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AUGUST	0	0	0	4,996	26,538	275	0	0	80	0	0	0	0	0	0	0	0	31,889
SEPTEMBER	0	5,034	0	3,652	21,662	433	0	0	44	0	0	0	0	0	0	0	0	45,008
OCTOBER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NOVEMBER	9,328	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9,328
DECEMBER	11,007	8,230	0	0	0	646	0	0	0	0	0	0	0	0	0	0	0	19,882
2009 CY TOTAL	20,335	13,960	0	8,648	48,200	1,354	0	0	150	0	0	0	2	0	0	0	0	106,832

Table 4: SJ-C Project – Monthly Water Storage in Heron Reservoir (units are acre-feet)

HERON STORAGE	INFLOW		OUTFLOW		SAN JUAN CHAMA LOSS	END-OF-MONTH CONTENT			ELEVATION (FEET)
	RIO GRANDE	SAN JUAN CHAMA	RIO GRANDE	SAN JUAN CHAMA		RIO GRANDE	SAN JUAN CHAMA	TOTAL	
MONTH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DEC. 2009						0	252,110	252,110	7,157.45
JANUARY	574	0	122	0	0	452	252,110	252,562	7,157.55
FEBRUARY	522	0	110	0	0	864	252,110	252,974	7,157.64
MARCH	3,323	546	2,822	0	0	1,365	252,656	254,021	7,157.87
APRIL	8,058	21,864	9,387	28	0	35	274,492	274,527	7,162.27
MAY	132	35,298	132	458	719	35	308,613	308,648	7,169.21
JUNE	956	27,195	138	238	2,710	853	332,859	333,712	7,174.04
JULY	546	1,815	144	0	1,315	1,255	333,359	334,614	7,174.21
AUGUST	1,423	1,501	2,299	31,889	0	378	302,970	303,349	7,168.16
SEPTEMBER	125	712	126	45,008	959	378	257,715	258,093	7,158.76
OCTOBER	124	251	124	0	1,032	378	256,935	257,312	7,158.59
NOVEMBER	119	53	119	9,328	979	378	246,681	247,058	7,156.33
DECEMBER	117	0	117	19,882	496	378	226,302	226,680	7,151.67
SUB-TOTAL	16,019	89,235	15,641	106,832					
ADJUSTMENT						-350			
ANNUAL		105,253		122,473	8,210	28	226,652	226,680	

## Heron Dam Facility Review and Safety of Dams Programs

The following work was completed for Heron Dam during 2010:

- Facility Reliability Rating (FRR) was completed with no major issues.

- A new Emergency Action Plan (EAP) was prepared and a tabletop exercise was completed March 2010. The final EAP was delivered in November 2010 as a standalone document.
- The scheduled Periodic Facility Exam was completed in August 2010.
- The annual EAP Review, Drill, and Communication Directory update was completed.
- The Standing Operating Procedures (SOP) were revised, and delivered in January 2011.
- Operations and Maintenance recommendations were completed throughout the year.
- The seepage area downstream of the west dike was cleaned and excess vegetation was removed.
- Updates to the grounding on the radio systems were completed, as a result of new Federal Communication Commission (FCC) regulations.
- Data collection for a sedimentation survey was completed in July 2010. The new capacity tables will not be delivered until later in FY2011.

## **Pojoaque Tributary Unit - Nambé Falls Dam and Reservoir**

(All elevations are 1929 NGVD, storage reference is 2004 ACAP survey)

Nambé Falls began 2010 with the reservoir at elevation 6,819.31 feet, providing a storage volume of 1,531 ac-ft. During the winter, releases averaged around 1 ft<sup>3</sup>/s to maximize conservation storage as agreed to by the Pojoaque Valley Irrigation District and Native American water users. The reservoir filled and spilled in 2010. The maximum elevation for the year was 6,826.89 feet (1,937 ac-ft) on May 28. The reservoir filled (elev. 6826.6 feet) on March 26, 2010, and remained full until June 21, 2010, when irrigation releases began and reservoir storage and elevation started falling. Nambé Falls Reservoir ended the year at elevation 6,820.67 feet (1,599 ac-ft).

Cyclical operations of Nambé Falls Reservoir consist of non-irrigation season operations and irrigation season operations. During non-irrigation season (November through April), all inflow in excess of the bypass requirement of 0.5 ft<sup>3</sup> is stored until an elevation of 6,825.60 feet is reached. Once an elevation of 6,825.60 feet 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 6826.6 feet, which is the top of the spillway crest. During irrigation season (May through October), water is stored and released on demand to meet downstream requirements.

A net depletion of 1,238 ac-ft was calculated for Nambé Falls operations for the entire year. The depletion amount (plus transportation loss) was released from Heron and Abiquiu reservoirs throughout 2010. Table 5 provides a summary of Nambé Falls use above Otowi, and the Pojoaque Unit return flow credit used to calculate depletions during 2010. A summary of 2010 Nambé Falls reservoir operations is provided in Table 6.

Table 5: SJ-C Project – San Juan-Chama Water at Otowi (units are acre-feet)

SJ-C AT OTOWI	RELEASE FROM HERON	HERON RELEASE STORED IN EL VADO	RELEASE FROM EL VADO	TOTAL BELOW EL VADO	RELEASE FROM OR STORAGE IN ABIQUIU	TRANS. LOSSES	NAMBE FALLS USE ABOVE OTOWI	RETURN FLOW CREDIT - POJOAQUE UNIT	SAN JUAN WATER AT OTOWI
MONTH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
JANUARY	0	0	4,717	4,717	111	95	179	17	4,571
FEBRUARY	0	0	605	605	1,139	22	142	15	1,596
MARCH	0	0	0	0	1,766	16	95	14	1,669
APRIL	28	0	0	28	1,604	15	21	15	1,611
MAY	458	0	9,979	10,438	4,912	253	31	12	15,078
JUNE	238	0	6,869	7,107	10,781	239	-1	11	17,662
JULY	0	0	12,055	12,055	-2,280	221	374	32	9,213
AUGUST	31,889	9,028	0	22,862	-18,061	295	245	65	4,326
SEPTEMBER	45,008	29,035	0	15,974	-9,484	234	61	43	6,238
OCTOBER	0	0	11,014	11,014	-609	215	76	87	10,201
NOVEMBER	9,328	4,106	0	5,223	-3,414	74	193	36	1,578
DECEMBER	19,882	9,194	0	10,688	1,032	223	200	29	11,326
ANNUAL	106,832	51,362	45,241	100,711	-12,504	1,902	1,615	377	85,067

Table 6: SJ-C Project – Monthly Water Storage in Nambé Falls Reservoir (units are acre-feet)

NAMBÉ FALLS MONTHLY	INFLOW	OUTFLOW		RESERVOIR LOSSES	TOTAL OUTFLOW + LOSSES	END OF MONTH		
		BYPASSED	STORAGE RELEASE			CONTENT	ELEVATION	
MONTH	(1)	(2)	OPERATIONAL	IRRIGATION	(5)	(6)	(7)	(8)
DEC. 2009							1,525	6,819.20
JANUARY	225	46	0	0	0	46	1,704	6,822.71
FEBRUARY	210	69	0	0	0	69	1,846	6,825.31
MARCH	715	621	0	17	-3	634	1,927	6,826.72
APRIL	1,884	1,863	0	0	19	1,881	1,929	6,826.76
MAY	2,423	2,392	0	0	24	2,416	1,936	6,826.88
JUNE	1,920	1,915	0	179	26	2,120	1,736	6,823.30
JULY	985	604	0	453	5	1,061	1,660	6,821.86
AUGUST	783	532	0	217	10	760	1,683	6,822.31
SEPTEMBER	461	391	0	570	8	969	1,176	6,811.48
OCTOBER	365	286	0	33	7	326	1,215	6,812.41
NOVEMBER	263	70	0	0	6	76	1,402	6,816.62
DECEMBER	260	61	0	0	3	63	1,599	6,820.67
ANNUAL	10,495	8,848	0	1,469	105	10,421	1,599	6,820.67

## Nambé Falls Dam Facility Review and Safety of Dams Programs

In 2010 there were no issues or concerns at Nambé Falls Dam. Everything operated as designed. Accomplishments in 2010 include:

- The scheduled Periodic Facility Review (PFR) exam was completed in September 2010 without any major recommendations.
- The Facility Reliability Rating (FRR) was completed with no major issues.

## **M&I Water Use - National Environmental Policy Act Compliance**

Reclamation is involved in City and County of Santa Fe water supply projects. The City, County, and a private developer (Las Campanas) worked with the U.S. Forest Service and the Bureau of Land Management on an Environmental Impact Statement (EIS) to address effects of the proposed Buckman Direct Water Diversion Project. Reclamation served as a cooperating agency on the Buckman EIS. U.S. Fish and Wildlife Service issued a Biological Opinion on the Buckman project in June 2007.

The final Buckman EIS and Record of Decision (ROD) are completed. The Notice of Availability for the ROD was published in February 2008, and construction began in July of 2008. The diversion structure is complete and operations began in early 2011. Construction of the other project features is ongoing.

## Middle Rio Grande Project, New Mexico

The *Middle Rio Grande Project* (Figure 4) 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, which can supply water to approximately 50,000 to 70,000 acres of land.

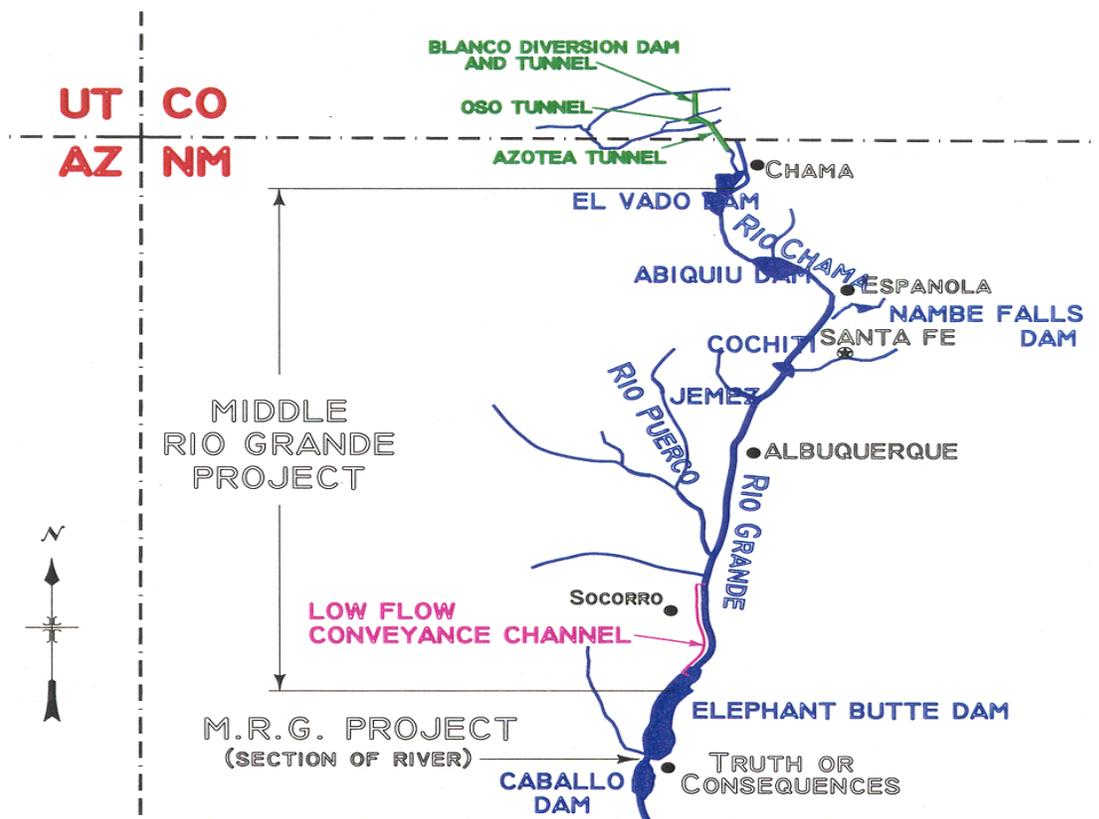


Figure 4: Area Map of the Middle Rio Grande Project

### New Mexico Relinquishment of Rio Grande Compact Credit

Per the Rio Grande Compact Article I definition, the usable water in Project storage (Elephant Butte and Caballo Reservoirs together) was above 400,000 ac-ft for part of 2010. Article VII of the Rio Grande Compact stipulates that when usable water in Project storage is below 400,000 ac-ft, no “native Rio Grande flows” will be stored in post-1929 reservoirs upstream of Elephant Butte Reservoir in New Mexico and Colorado unless relinquishment of credit waters in Elephant Butte Reservoir occurs. Article VII storage restrictions were in effect from January 1 to February 28, 2010. Usable storage fell below 400,000 ac-ft on March 16, and Article VII restrictions were in effect until May 9, 2010, when New Mexico relinquished 80,000 ac-ft of

credit to Texas. This caused usable storage to increase to greater than 400,000 ac-ft. Usable storage again fell below 400,000 ac-ft on July 8, and storage restrictions in upstream reservoirs were once again put into place and remained until the end of the year.

During 2010 no Emergency Drought Water was captured by Reclamation for the benefit of the Middle Rio Grande Conservancy District (MRGCD) under the Emergency Drought Water Agreement (EDWA), nor was any of Reclamation's remaining Emergency Drought Water balance captured during the year. The balance of Emergency Drought Water available for capture and storage by Reclamation and MRGCD during 2010 or later years is 78,036 ac-ft. Reclamation's balance for use as supplemental water for endangered species is 30,451 ac-ft, and 48,585 ac-ft remains to be captured for the benefit of MRGCD. These amounts may increase as further relinquishment of credit water in Elephant Butte Reservoir by the State of New Mexico occurs.

Reclamation started 2010 with 0 ac-ft of Emergency Drought Water stored in El Vado Reservoir for use on behalf of listed endangered species. MRGCD started 2010 with 9,666 ac-ft of Emergency Drought Water in El Vado Storage, and ended the year with a total of 9,200 ac-ft in storage.

## **El Vado Dam and Reservoir Operations**

(All elevations are Middle Rio Grande Project Datum – add 7.8 feet for 1929 NGVD, storage reference is 2007 ACAP survey)

El Vado reservoir began 2010 at an elevation of 6,876.05 feet (116,717 ac-ft). The reservoir peaked on May 8 at an elevation of 6,899.91 feet (184,170 ac-ft). The lowest elevation of the year, 6,864.43 feet (91,329 ac-ft), occurred on November 14, 2010. The reservoir finished the year at an elevation of 6,872.59 feet (108,611 ac-ft).

MRGCD began the year with 9,666 ac-ft of Emergency Drought Water, 46,250 ac-ft of general Rio Grande storage, and 52,248 ac-ft of San Juan – Chama (SJ-C) water in El Vado for Middle Valley irrigation. This was in addition to MRGCD's 2010 SJ-C allocation of 20,900 ac-ft in Heron, and a beginning year balance of 1,917 ac-ft of SJ-C stored in Abiquiu Reservoir. At the end of the year, MRGCD had 9,666 ac-ft of Emergency Drought Water, 46,250 ac-ft of general El Vado Rio Grande storage, and 52,248 ac-ft of SJ-C storage in El Vado reservoir. MRGCD also had 576 ac-ft of SJ-C stored in Abiquiu as of December 31, 2010.

Reclamation re-regulated a total of 16,500 ac-ft of native inflow for the Prior and Paramount (P&P) needs of the six Middle Rio Grande Pueblos during 2010. The plan for storage in 2010 was to capture higher flows, above 1,800 cfs, and store them for P&P purposes. This operation began in mid-April. Several cold spells, however, reduced flows below 1,800 cfs for brief periods. During these times flows below the dam were not reduced, and captured water was released until flows increased again. Also occurring at this time was the proposal for New Mexico to relinquish credit which would allow for storage outside of Article VII restrictions. Because water stored under Article VII restrictions must be released by the end of the year, all P&P water captured while under the restrictions was released. Once out of Article VII, a lump sum of 16,500 ac-ft was transferred for P&P needs on May 19. No calls for P&P water were made during the irrigation season, and 15,903 ac-ft were transferred back to the Rio Grande pool

on October 31.

The total SJ-C water in El Vado storage at the end of the year was 65,649 ac-ft. It should be noted that, due to minor operational problems during December 2010, not all of MRGCD's allocation was released from Heron in time. The small amount that remained was released in January 2011. It should also be noted that El Vado was used as a re-regulating reservoir in September to temporarily store water destined for Abiquiu due to lack of available storage in Abiquiu. This water was gradually released over the next few months as space became available in Abiquiu. Table 7 provides a summary of monthly operations and water accounting for El Vado Reservoir.

Table 7: Reservoir Operation for El Vado Dam (units are acre-feet)

EL VADO RESERVOIR OPERATION	INFLOW		OUTFLOW		LOSSES		EOM CONTENT		
	RIO GRANDE	SAN JUAN - CHAMA	TOTAL						
MONTH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DEC. 2009	2,881	10,372	2,752	8,709	109	-73	55,916	60,801	116,717
JANUARY	3,241	0	3,236	2,287	6	6	55,914	56,078	111,992
FEBRUARY	3,724	0	3,631	605	0	0	56,007	55,473	111,480
MARCH	9,996	0	7,392	0	0	0	58,611	55,473	114,083
APRIL	74,548	28	68,138	28	357	168	64,665	55,304	119,969
MAY	103,419	458	35,496	10,438	672	360	131,915	44,964	176,879
JUNE	23,100	238	19,632	7,107	1,108	205	134,275	37,890	172,165
JULY	5,620	0	35,203	12,055	553	127	104,140	25,707	129,847
AUGUST	3,095	31,889	25,640	22,862	330	103	81,264	34,632	115,896
SEPTEMBER	-722	45,008	31,965	15,974	275	232	48,303	63,434	111,736
OCTOBER	1,496	0	7,410	11,014	193	74	42,195	52,345	94,541
NOVEMBER	1,612	9,328	1,537	5,223	103	74	42,167	56,377	98,544
DECEMBER	4,327	19,882	3,349	10,688	183	-77	42,962	65,649	108,611
ANNUAL	233,457	106,832	242,630	100,711	3,780	1,274			

## El Vado Dam Facility Review and Safety of Dams Programs

The following routine activities occurred at El Vado Dam during 2010:

- The Facility Reliability Rating (FRR) was updated with no major issues.
- The scheduled Periodic Facility Review inspection (PFR) was completed in August 2010 with no significant new recommendations.
- Several O&M recommendations from previous inspections were completed.
- The 2010 Security Plan was completed.
- The Emergency Action Plan (EAP) was revised and a tabletop exercise was completed in March 2010. The EAP was separated from the SOP and is now a standalone document.
- The Annual EAP Review, Drill, and Communication Directory updates were completed.
- Updates to the grounding on the radio systems were completed due to new Federal Communications Commission (FCC) regulations.

The following special issues at El Vado Dam were addressed in 2010:

- In the spring there was an increase of seepage downstream of the dam. The increased seepage was first noticed on June 1, by the Dam Operator. The changes were noted on his monthly visual inspections and he continued to closely monitor. On June 7 there was additional seepage noticed including a white milky substance. The seepage was diverted to the 3-inch parshall flume by installing a pipe across the dirt road, and monitoring continued on a daily basis. A site visit was conducted and a pond on the left abutment was identified. The pond was monitored for any changes and within a matter a few days it was completely dry. The Albuquerque Area Office coordinated water sampling on both the reservoir and the seepage.
- In early to mid July, a crack on the upstream steel metal plate was noticed between the elevations of 6,896 and 6,900 feet, which correlated approximately to the elevation of the pond. This may have been the cause of the pond and the increased seepage. The crack was fixed immediately. Prior to the 2011 runoff a visual inspection of the upstream faceplate will be completed.
- After the Dam Safety Advisory Team (DSAT) meeting in 2009 and other meetings throughout the year, it was decided to proceed with the Corrective Action Study (CAS) on the spillways. Reclamation's Denver office has set up a Project Management Team (PMT) to evaluate the need for repairs and several meetings were held in 2010.
- The Cathodic Protective System is still functioning, but has a life span of 20 years and began operation more than 20 years ago. Additional funding will be needed to replace the whole system with deeper anode beds. Monthly rectifier readings are sent to Reclamation's Denver office for analysis. Replacement designs and specifications are planned for 2012, with replacement to follow.

## **U.S. Army Corps of Engineers' Related Reservoir Operations**

Abiquiu Dam and Reservoir is a Corps of Engineers' facility. Public Law 97-140 authorizes storage of up to 200,000 ac-ft of San Juan-Chama (SJ-C) water in Abiquiu Reservoir. Adjustments for sediment reduced the sum of the available storage allocations to 180,713 ac-ft at the start of 2010, which is calculated as the total capacity at the top of the SJ-C storage pool (elevation 6,220.00 feet) less the total accumulated sediment in the reservoir at the end of 2009. The volume of SJ-C water in storage in Abiquiu Reservoir peaked on January 12, 2010, at 180,782 ac-ft. Abiquiu ended 2010 with 179,012 ac-ft of SJ-C water in storage. Table 8 provides a summary of monthly operations and water accounting for Abiquiu Reservoir.

During 2010 Reclamation had a storage agreement with the Albuquerque Bernalillo County Water Utility Authority to store up to 10,000 ac-ft of supplemental water in the ABCWUA's storage space in Abiquiu Reservoir. Over the course of the year, 19,837 ac-ft of leased SJ-C water was released by Reclamation for silvery minnow purposes.

Table 8: Reservoir Operations for Abiquiu Dam (units are acre-feet)

ABIQUIU RESERVOIR OPERATION	INFLOW		OUTFLOW		LOSSES		EOM CONTENT			
	RIO GRANDE	SAN JUAN CHAMA	RIO GRANDE	SAN JUAN CHAMA	RIO GRANDE	SAN JUAN CHAMA	SEDIMENT	RIO GRANDE	SAN JUAN CHAMA	TOTAL
MONTH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DEC. 2009	3,971	8,607	4,004	6,723	0	87	3,168	-37	180,509	183,640
JANUARY	4,264	4,823	4,264	4,934	0	170	3,168	0	180,191	183,359
FEBRUARY	4,042	668	3,887	1,807	0	100	3,168	155	178,952	182,275
MARCH	9,202	0	9,294	1,766	3	536	3,169	63	176,650	179,883
APRIL	83,106	0	63,630	1,604	127	1,480	3,313	19,539	173,567	196,419
MAY	50,160	9,374	69,699	14,286	215	2,142	3,390	0	166,513	169,903
JUNE	20,401	7,876	20,400	18,658	-1	2,499	3,404	1	153,233	156,639
JULY	36,870	11,158	36,492	8,879	-6	1,735	3,443	380	153,778	157,601
AUGUST	28,840	23,050	29,220	4,988	3	1,350	3,490	0	170,489	173,978
SEPTEMBER	34,496	15,482	34,496	5,998	-3	1,631	3,533	0	178,342	181,875
OCTOBER	8,374	11,430	8,373	10,821	-3	1,176	3,539	0	177,775	181,314
NOVEMBER	1,665	5,288	2,590	1,874	-1	766	3,539	-925	180,423	183,037
DECEMBER	3,717	10,680	1,385	11,712	0	379	3,543	1,407	179,012	183,962
ANNUAL	285,472	99,829	283,730	87,326	335	13,964				

## Cooperative Programs with the State of New Mexico

In February 2007, a new Cooperative Agreement was executed between the New Mexico Interstate Stream Commission (NMISC) and Reclamation to provide funding for water salvage work on the Middle Rio Grande Project. Work funded under this Agreement includes Elephant Butte Temporary Channel maintenance, as well as other river maintenance projects and irrigation drain improvements with water salvage potential.

The new Agreement provided funding in the amount of \$1,140,900, and a balance of \$33,340 was also carried over from the previous 2004 agreement. Additional funds in the amount of \$1,960,000 have been added by modification to the Agreement for a new total of \$3,100,900. A modification was executed at the end of fiscal year 2010 for carryover of funds to fiscal year 2011. As of December 31, 2010, the balance of unspent funds was \$1,125,502.

### Elephant Butte Temporary Channel History

River disconnection has been an issue at the headwaters of Elephant Butte Reservoir since the early 1950s. The contributing factors for the occurrence of disconnection are many: the valley slope is very slight, the incoming sediment load is high, the clay deposits are highly cohesive, and vegetation growth is extremely aggressive. During drought periods when the reservoir pool decreases rapidly, all of these factors make it difficult for the river channel to maintain connection with the reservoir pool (Photo 1). The latest incidence of disconnection began in the late 1990s, and construction of the Temporary Channel began in 2000. The channel was constructed in three phases:

- Temporary Channel 2000: This reach was constructed from 2000 to 2004 and is seven miles in length, beginning at River Mile (RM) 58 and ending at Nogal Canyon (RM 51.5). This reach has a high flow channel with an average width of 250 feet and a smaller channel within

the larger channel to carry low flows. The low flow channel width is approximately 75 feet.

- Temporary Channel 2002: Constructed from 2003 to 2004, a length of 11 miles, it begins at Nogal Canyon (RM 51.5) and ends just downstream of the Elephant Butte Narrows (RM 41). The average width for this reach is 150 feet.
- Temporary Channel 2004: Construction began in 2004, and approximately 3 miles have been constructed to date. This channel begins at RM 41 and will be extended downstream as needed in response to future retreat of the reservoir. The average width for this reach is 75 feet.

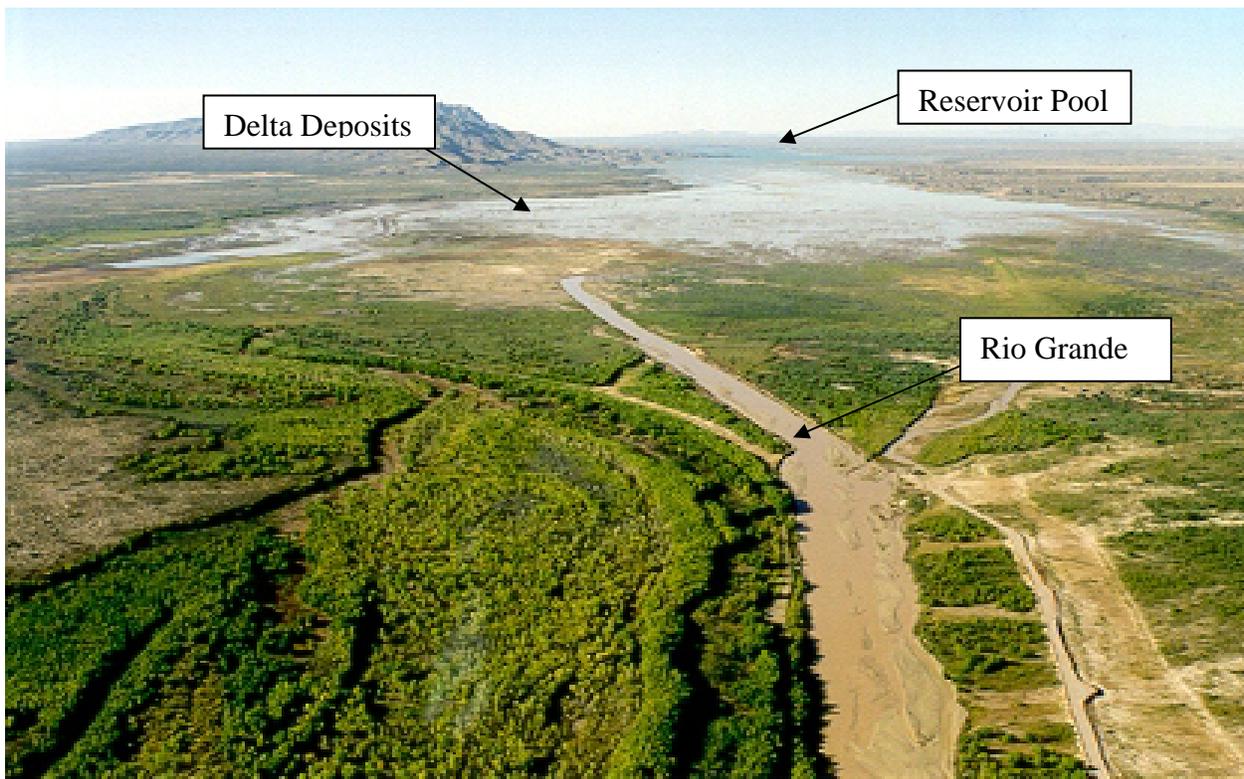


Photo 1: Headwaters of Elephant Butte Reservoir, prior to construction of the Temporary Channel (1998)

### Elephant Butte Temporary Channel — 2010 Maintenance

The majority of work performed in 2010 was on the Temporary Channel 2002 reach within the vicinity of the Red Rock Staging Area. A review of the Temporary Channel was conducted by Reclamation personnel at the end of July 2010. Based on visual observations five breaches were identified as needing repair between EB-45 and EB-49 (Photo 2). Breach A is an outflow breach and is located upstream of the Red Rock Staging Area at EB-44. The breach is located along the east side of the channel and is approximately 500 feet long. Breaches B and C are both located downstream of the Red Rock Staging Area between range lines EB-45 and EB 46. Breach B is an outflow breach located on the west side of the channel and is also approximately 500 feet long. Breach C is an outflow breach located on the east side of the channel and is approximately 700 feet long. Breach D is an outflow breach located downstream of the Red Rock Staging Area starting at range line EB-46. It is located on the east side of the channel and is approximately

400 feet in length. The last breach is Breach E. It is a return flow breach located downstream of the Red Rock Staging Area between range lines EB-48 and EB-49. It is located on the east side of the channel and is approximately 200 feet in length.

The Socorro Field Division began mobilization of equipment and access road maintenance on October 12, 2010. Dredging of the channel and berm repair began on October 25, 2010. Initial repairs of the larger outflow breaches were completed in early December 2010. However the repaired berms have not proven stable as they are composed of fine cohesionless sand. The Socorro Field Division monitors and repairs the berms, as they are continually eroding.

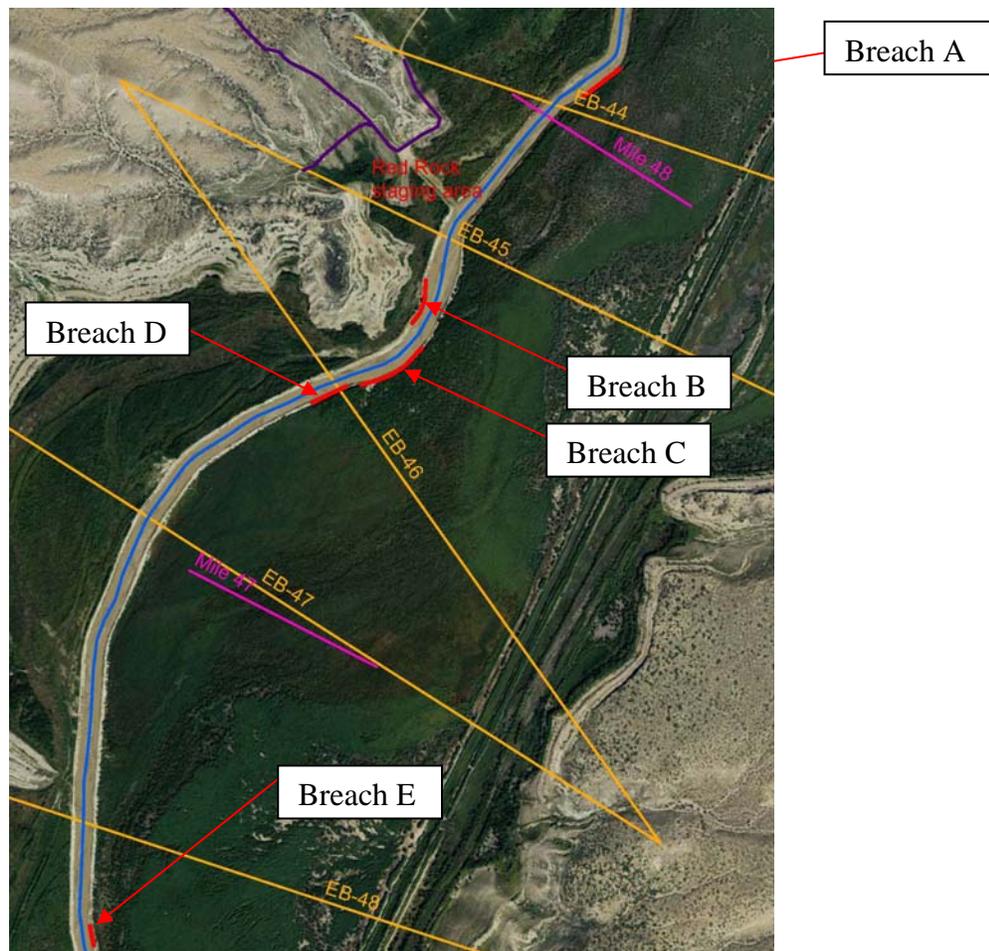


Photo 2: Aerial map showing plotted locations of 2010 breaches (November 2010, Holste)



Photo 3: Amphibious excavator working on Breach B south of the Red Rock Staging Area (November 2010, Holste)

Reclamation continues to perform river channel and species monitoring work up to the Bosque del Apache Wildlife Refuge as mandated by the January 25, 2008, Biological Opinion from the U.S. Fish and Wildlife Service (Service), which provides for Temporary Channel maintenance work through July 2013. NMISC and Reclamation are working together to meet one of the Reasonable and Prudent Measures (RPM) from that Biological Opinion, which requires a completed Southwestern Willow Flycatcher habitat restoration project by July 2013. NMISC, in collaboration with the New Mexico State Parks, is working on a habitat restoration plan and project on the Broad Canyon Ranch Property near Selden Canyon (north of Las Cruces) for the Service to consider and approve to meet the RPM requirement.

In March 2010, Reclamation received notification from the Service requesting re-initiation of ESA, Section 7. Reclamation met with the Service on July 28, 2010, and reached agreement that Reclamation remains in compliance with the terms of the 2008 Biological Opinion and that new consultation would be done for the Fall 2011 - Spring 2012 work season. Reclamation followed up with an official letter on October 4, 2010, of the meeting, discussions, and decisions made.

### **Irrigation Drain Improvements**

The following work was accomplished in 2010 under the Cooperative Agreement.

- Escondida Drain: Task Order RG-10-01 was executed on March 2, 2010, providing for the use of \$125,000 of Agreement funds for completion of critical safety rehabilitation work identified by Reclamation and NMISC. Washouts in the maintenance road and banklines were repaired to provide access along the drain. The work was completed in May 2010, with Reclamation providing inspection and administration.
- Drain Unit 7 Extension: Task Order RG-10-01 was executed on March 2, 2010,

providing for the use of \$125,000 of Agreement funds for completion of critical safety rehabilitation work identified by Reclamation and NMISC. Work at Drain Unit 7 Extension began in late May 2010 and was completed in November. Repairs included fixing washouts in the access road and drain bankline, replacing the gate at the north end of the Ladd Gordon Waterfowl Complex, repair of an existing weir, and mowing and blading roads to improve accessibility. Reclamation provided inspection and administration for the work.



Photo 4: Reclamation construction crews repairing washout at Drain Unit 7 Extension, near the north end of the Ladd Gordon Waterfowl Complex (June 2010, Weems)

## River Maintenance

Reclamation has authorization for river channel maintenance of the Rio Grande from Velarde, New Mexico, south to the headwaters of Caballo Reservoir, as specified by the Flood Control Acts of 1948 and 1950. Project purposes include ensuring effective water delivery, transporting sediment, protecting riverside facilities and property, and preventing flooding. Reclamation prioritizes river maintenance based on public safety, property damage risk, and potential for reduction of water delivery.

### River Maintenance Priority Sites

Reclamation is actively pursuing work at 21 priority sites along the Middle Rio Grande Project reach where bank erosion or reduced channel capacity could cause levee failure resulting in shallow overland flooding, reduction of water delivery, or destruction of canals and drains. These sites are described below. Reclamation's efforts on addressing river maintenance work at these sites include data collection, geomorphic and sediment investigations, design studies,

alternative evaluation, design and development of construction drawings, material supply and development, lands access, environmental compliance, project and construction management, and construction maintenance.

Work to address the backlog of river maintenance priority sites along the project reach has involved completion of a total of 13 sites since 2004. Of the 21 priority sites, five require an annual review of channel capacity and possibly maintenance due to sediment accumulation. These five are the Bosque del Apache sediment plug, the Bosque del Apache levee, the Tiffany and San Marcial levees, the Truth or Consequences reach, and the Temporary Channel, which—although it is discussed in the State of New Mexico Cooperative Programs section—is also a priority site.

### **San Ildefonso Pond**

This priority site is located at River Mile (RM) 259. In spring 2007, a river maintenance project was constructed by Reclamation's Socorro Field Division to provide protection for the San Ildefonso fishing pond. Eight buried rock vanes were placed with this project and were intended to become functional as bankline erosion progressed. To further stabilize the site, Reclamation worked with the Pueblo de San Ildefonso to plant 150 cottonwood and Gooding's willow poles throughout the project site during the winter of 2008. A line of dense vegetation north of the project site provided additional protection to the pond through recent spring runoffs (2005, 2007, and 2008), despite the active bank erosion seen on the bend immediately upstream of the pond. During the spring runoff of 2009, however, the channel eroded through this line of dense vegetation, resulting in the loss of about 80 feet of bankline in portions of the previously constructed project area.

This bank erosion exposed and threatened to flank three of the buried rock vanes. Reclamation worked with the Pueblo de San Ildefonso to construct a temporary solution prior to the 2010 spring runoff. The project consisted of two design components: a buried trench riprap revetment and a riprap windrow. The trench riprap revetment has a length of 205 feet with an alignment approximately parallel to the river. The riprap windrow ties into the upstream end of the trench riprap and extends for a distance of 180 feet with an alignment on top of the existing diagonal rock vane (Photo 5). Approximately 2,200 cubic yards of rock was installed with a nominal diameter of 24 inches. This temporary protection provides flanking protection and additional bankline stabilization for the previously placed rock vanes, allowing time for the development and permitting of a longer term solution.



Photo 5: San Ildefonso bankline erosion and riprap windrow (May 2010, Holste)

### **Santo Domingo**

There are currently three priority sites on the reach of the Rio Grande passing through Santo Domingo Tribe lands (RM 225.1, RM 224.6, and RM 223.9). At these sites, bankline erosion on the west side of the river is cause for concern because of the close proximity to the levee and riverside drain. RM 224.6, which is across from the confluence of the Rio Galisteo, is shown in Photo 6, and RM 223.9 is shown in Photo 7. A Data Collection and Confidentiality Agreement was executed between the Santo Domingo Tribe and Reclamation in August 2007 to allow collection of design data for the three priority sites. Reclamation is currently working with the Santo Domingo Tribe to reach consensus on a final design.



Photo 6: Kewa Pueblo RM 224.6 Priority Site (June 2010, Benoit)



Photo 7: Kewa Pueblo RM 223.9 Priority Site, looking west (May 2010, Benoit)

## San Felipe

There are currently nine river maintenance priority sites on the Pueblo of San Felipe. Current conditions at these sites could lead to damage of levees, irrigation infrastructure, roads, and a residential area of the Pueblo. In late 2006, Reclamation obtained permission from the Pueblo to collect cross-section and bed material data for use in designs to address these sites. Construction commenced at four of these sites in 2010, with two expected to be completed by April 2011. Photo 8 shows the site at RM 213.4.



Photo 8: Rock toe placement at Priority Site 213.4, San Felipe (September 2010, AuBuchon)

## Santa Ana River Mile 208.4

Reclamation's tasks associated with a large scale river maintenance project at the Pueblo of Santa Ana are complete. The work at this site extended from RM 208.4 to 207.2, with major features including river realignment and construction of a gradient restoration facility completed in 2002 by Reclamation's Socorro Field Division. In the spring of 2007, riprap was installed at the upstream end of the gradient restoration facility, and a reinforced bankline at the Jemez River confluence was extended to protect against flanking caused by bank erosion. This construction was performed by Reclamation's Socorro Field Division. In October 2009, Reclamation's Socorro Field Division removed the remaining sediment spoil piles to allow increased inundation of the floodplain. Planting of native vegetation on the redistributed sediment was accomplished through an existing PL 93-638 contract in place with the Pueblo of Santa Ana.

The 2010 spring runoff saw increased inundation in the project area (Photo 9), and also new bank erosion on the eastern bank upstream of gradient restoration facility. A planned solution to protect the bank and prevent flanking of the gradient restoration facility is underway and is expected to be completed in 2011.



Photo 9: Looking upstream at location of sediment spoil pile on the Pueblo of Santa Ana after sediment has been removed. Flow in the Rio Grande is approximately 3000 cfs (April 2010, Holste)

### **Santa Ana River Mile 205.8**

An additional priority site was added within the Pueblo of Santa Ana, on the east bank of the Rio Grande across from the Tamaya Resort special events tent, following the 2008 spring runoff. For many years, the bankline had been stable and followed the jetty jack line. Prior to the 2008 runoff, the bankline migrated beyond the jetty jack line; further erosion occurred during the 2008 spring runoff.

Due to the close proximity of the spoil levee and the amount of bankline erosion observed during 2008, this site was elevated to the status of a priority site. The Corps of Engineers, through their Section 1135 project authority, undertook an island and bar lowering project on the Rio Grande through the Pueblo of Santa Ana, a portion of which was adjacent to this priority site (Photo 10). Observations from the 2009 and 2010 spring runoff indicate that this project helped reduce the active bank erosion at this site by increasing the conveyance capacity at high flows (Photo 11). Reclamation is currently working with the Pueblo of Santa Ana to implement an Information Sharing Agreement and develop a preferred protection strategy.



Photo 10: Looking downstream at the bend erosion at the Santa Ana RM 205.8 priority site (October 2010, AuBuchon)



Photo 11: Increased wetted width at higher flows (approximate river flow is 2800 cfs) from the Corps of Engineers' bar lowering at the Pueblo of Santa Ana across from the Santa Ana RM 205.8 priority site (April 2010, AuBuchon)

## Corrales Siphon

The Corrales Siphon river maintenance site is located at RM 199.8, about 600 feet downstream of the Arroyo de la Barranca confluence (which is also the site of the Rio Rancho wastewater treatment outfall). At this site, an inverted siphon operated by MRGCD conveys irrigation water to the Corrales Main Canal by passing under the Rio Grande channel. During the high flows of the 2005 spring runoff, the bank experienced erosion primarily associated with undercutting. In late 2006, a preferred alternative for the project, consisting of installation of a bio-engineered bankline with a rock toe and coir fabric encapsulated soil, was selected. Preliminary designs were completed in 2007.

However, in early 2008, Reclamation became aware that the inverted siphon consists mostly of a wood pipeline that was constructed in the 1930s. Because of concerns about the stability of the wood pipeline when subjected to the loading and vibration of construction equipment, vibration testing and video examination of the pipe were performed. While the video was inconclusive, the vibration testing indicated that equipment should stay approximately 50 feet from the pipe to avoid damaging it. In addition, conditions at the site have changed, as deposited sediment and high flow side channels cut in the bar on the opposite bank by the Pueblo of Sandia have alleviated some of the pressure at the higher discharges (Photo 12).

Reclamation has downgraded the status of this project to a monitored site but is currently considering techniques that would not impact the siphon, but would help to further stabilize the upstream sediment deposition, thereby increasing the protection on the undercut bank.



Photo 12: Looking west at Corrales Siphon river maintenance site location during spring runoff. Note high flow channels cut in bar by Pueblo of Sandia. Flow in the Rio Grande is approximately 3000 cfs. (April 2010, Holste)

### **Arroyo de las Cañas**

This river maintenance site is located at RM 95.5 (Photo 13) on the west bank of the Rio Grande, upstream of Arroyo de las Cañas. When the site was identified in 2005, the bankline was less than 100 feet from the levee toe, and the thalweg was along the outside of the bend nearest the levee. While the bankline was eroded during the 2005 runoff, subsequent years (2006 and 2007) saw extensive deposition at this site. Spring runoff conditions in 2008 and 2009, along with a fire that burned a majority of the vegetation in the area in the early part of 2009, have again raised concerns that this site may be susceptible to erosion, although no additional erosion was observed through the 2010 spring runoff. This site has been downgraded to monitored site status. Proactive bank stabilization of depositional features is being evaluated to see if it could reduce the risk of further erosion.



Photo 13: Aerial photograph of the Arroyo de las Cañas (April 2010, Gonzales)

### **Bosque del Apache Sediment Plug**

During the 2008 spring runoff a sediment plug formed in the main channel of the Rio Grande at RM 81, within the Bosque del Apache National Wildlife Refuge (BDANWR), forcing river flows into the floodplain. The plug was first identified during a river flight on May 17, and growth of the plug continued during the remainder of the runoff, to a length of approximately 1.5 miles. Reclamation and NMISC partnered to construct a pilot channel, and that work was completed in October 2008. Reclamation monitored this site closely after completion of the 2008 pilot channel. While the pilot channel area remained open, the river channel remained partially plugged upstream of the pilot channel area, extending several miles.

Overbanking began near the North Boundary, BDANWR, in early April 2009 at river flows just over 1,000 cfs. At that time it was determined that a high probability existed for formation of another sediment plug during the 2009 spring runoff, and Reclamation began preparation of a

Biological Assessment (BA) that would allow for pilot channel excavation, if needed, beginning in September 2009. The BA was submitted to the U.S. Fish and Wildlife Service in May 2009 but withdrawn after the runoff, as a sediment plug did not form. In mid April 2010, overbanking was observed just upstream of the North Boundary at river flows of 2,000 cfs. A BA was not submitted in 2010, and no plug occurred.

Reclamation continues to monitor the 2008 sediment plug area, and has analyzed sediment plug potential in the general reach of river from RM 89 (2 miles upstream of the U.S. Highway 380 Bridge) to RM 80. A geomorphic assessment and hydraulic and sediment-continuity analyses report for this reach was completed in February 2010. In addition to assessing sediment plug potential, the report identified specific areas most vulnerable to plug formation and measures that may prevent future plug formation. Evaluation of alternatives for addressing sediment plugs is in progress, and Reclamation will monitor river conditions and runoff projections during 2011. The area thought to currently have the greatest potential for sediment plug formation is shown in Photo 14.



Photo 14: The reach of river currently considered most prone to sediment plug formation, taken from just north of the North Boundary BDANWR, looking south (April 2010, Gonzales)

### **Bosque del Apache Levee**

The Bosque del Apache Levee is located on the west side of the Rio Grande from approximately RM 87 to 74, and is a spoil levee that was formed during excavation of Reclamation's Low Flow Conveyance Channel (LFCC) in the 1950's. The portion of the levee from approximately RM 85 to 80 has become an area of concern in recent years due to the amount of sediment deposition in the river, and of particular concern during the 2008 spring runoff, when a sediment plug formed in the river channel in the vicinity of RM 81. The sediment plug caused a rise in water surface against the levee and prompted emergency work on a portion of the levee during the

runoff.

In 2009, Reclamation requested American Recovery and Reinvestment Act (ARRA) funds for improvements to the levee, and received \$2 million. The improvements included raising low areas and widening narrow areas within a three mile stretch of levee where conditions are of greatest concern. This work was awarded to Stoven Construction, Inc., by a task order under the 2009 Simplified Acquisition of Basic Engineering Requirements (SABER) contract. Contract work included loading and hauling Government-furnished borrow material from the Valverde borrow site to the levee. Reclamation's Socorro Field Division shaped the material on the levee after it was dumped by the contractor.

Because of schedule limitations imposed by the BDANWR due to migratory bird season, construction for this project was divided into two periods of performance. The first period ran from October 26, 2009, to November 10, 2009, and provided approximately 52,200 tons (33,700 cubic yards) of material on the levee (Photo 15). The second period went from March 1, 2010, to March 26, 2010, and added approximately 83,300 tons (53,800 cubic yards) of material. The total quantity of material hauled and added to the levee is estimated to be 135,500 tons (87,500 cubic yards). The Reclamation crew is currently working on a 1.2 mile portion of the levee north of BDANWR (Photo 16). Initial material placement to bring the top of the levee to width and grade took place from August 16, 2010, to October 7, 2010. Work will resume in spring 2011 to widen the base of the levee.



Photo 15: A completed section of the 2009 Bosque del Apache Levee ARRA improvements (October 2009, Rolland)



Photo 16: Levee raising north of BDANWR (September 2010, Weems)

### **Tiffany Sediment Plug**

During the 2005 spring runoff, a sediment plug formed in the vicinity of RM 70 (approximately 1.5 miles upstream of the San Marcial railroad bridge), and then grew in the upstream direction to a length of over 3 miles. In a joint effort between NMISC and Reclamation, the plug was removed in 2005. Reclamation has continued to monitor this site closely, and has evaluated alternatives for solutions to the problem. However, a recent evaluation indicates that channel bed lowering in this reach of the river (Photo 17) in the last few years has increased the channel capacity and therefore lowered the risk for formation of another sediment plug at this site. Reclamation may eventually implement a project for channel work to reduce the probability of future plugs in this area, but it has become a lower priority due to the recent bed lowering.



Photo 17: Vicinity of 2005 Tiffany Sediment Plug (May 2010, Padilla)

### **Fort Craig Bend**

This site is located on the west bank of the Rio Grande, approximately 4.5 miles downstream from the San Marcial railroad bridge. It is also approximately 0.25 miles upstream of the Fort Craig Pump Site, where water is pumped from the LFCC to the river during the dry summer months. The active bankline is currently approximately 30 feet from the toe of the San Marcial Levee, which protects the LFCC from the river (Photo 18). The levee road also provides the only access to 9.5 miles of the river downstream of this site, including the upper 3.5 miles of the Elephant Butte Temporary Channel.

The river bend at this site has been fairly stable in past years, but became active during the 2008 runoff, with even more erosion activity during the 2009 runoff. The upper portion of the bend was stable during the 2010 runoff, but the erosion continued to progress downstream, with almost 50 feet of bankline lost at one location. A riprap windrow has been designed to provide short term protection and is anticipated to be placed between the top of bank and the levee toe during spring 2011.



Photo 18: Fort Craig Bend priority site, looking southwest (May 2010, Gonzales)

### **Tiffany and San Marcial Levees**

These two levee segments are located along the western edge of the Rio Grande floodplain, from the South Boundary of Bosque del Apache National Wildlife Refuge (RM 74) to the Ft. Craig area (RM 60). They are non-engineered spoil levees, created during excavation of the Low Flow Conveyance Channel (LFCC), and serve to protect that structure. The conveyance capacity of these levees has been monitored closely in the past, but that capacity has increased significantly in the last few years, due to bed lowering in this reach of the river. The levees currently meet or exceed the target conveyance capacity that has been established for river maintenance purposes (8,500 cfs with two feet of freeboard).

### **Truth or Consequences**

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 Reservoir. Maintenance activities are conducted after releases are shut off from Elephant Butte Dam each fall. The primary activity consists of sediment removal at arroyo mouths. Secondary activities include sediment removal in other areas throughout the reach and bank stabilization with riprap at selected sites. During periods of non-release, Reclamation installs a dike in the river to raise the stage for the benefit of hot spring bathhouse owners in Truth or Consequences. Owing to the interaction between the river and the hot spring aquifer, the increased stage within the river floodway increases water temperatures and the flow of water at hot spring sites.

Sediment excavation was performed in 2010 at arroyo mouths (Photo 19) and various reaches of the river channel, with a total volume of 9,900 cubic yards removed.



Photo 19: Rio Grande and Cuchilla Negro Creek confluence after sediment excavation (November 2010, AuBuchon)

### **Middle Rio Grande River Maintenance Plan**

The Middle Rio Grande River Maintenance program is undertaking an effort to develop a long term River Maintenance Plan that will assist in accomplishing project purposes in an environmentally and economically sound manner that is consistent with Project authorization. The Plan's main objective is to provide a technical guide for Reclamation's future river maintenance activities, to meet the original project authorization (core mission) purposes and environmental compliance needs.

Part 1 of the Plan provides documentation of the authority and necessary maintenance actions, including legal requirements, water delivery needs, endangered species needs, current river and LFCC conditions, historical changes in these conditions, and potential river and LFCC realignment strategies downstream of the San Marcial railroad bridge. This Part 1 report was completed in May 2007. Part 2 of the report addresses future maintenance strategies, conditions, and needs, and is scheduled for completion in April 2011. Combined, the two parts of this maintenance plan are envisioned to be 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.

### **Preparation for 2011 Spring Runoff**

As of January 2011, it appears that the spring runoff will be near normal on the Rio Grande, with some potential for erosion damage to riverside facilities. In preparation, Reclamation is assessing riprap availability for potential emergency placement and analyzing levee capacity and

the need for levee work prior to the runoff. Specific attention will be given to the Bosque del Apache Levee, the Ft. Craig Priority Site, and the new bank erosion observed at the Santa Ana RM 208.4. Attention is given to the Bosque del Apache Levee due to the potential for sediment plug formation and the other two sites will be watched because of the high risk of additional bank erosion. Additionally, periodic monitoring by aerial flights and levee patrols will occur during high flow periods, and rates of bankline erosion will be monitored at selected sites as necessary. Discharge reported by gages on the Rio Grande and its tributaries will be monitored daily. If flow predictions become above normal as the spring runoff period approaches, Reclamation will coordinate with other flood control agencies to facilitate efficient reporting of river maintenance needs and issues.

# Middle Rio Grande Endangered Species Act Collaborative Program

The Middle Rio Grande Endangered Species Collaborative Program (Program) brings diverse groups together, as an alternative to litigation, to address serious environmental issues along the Middle Rio Grande (MRG). The Program is comprised of Federal, State, local, and tribal governments; universities; nonprofit institutions, and other nongovernmental entities working collaboratively to protect and improve the status of endangered listed species along the MRG and to simultaneously protect existing and future regional water uses, while complying with state and federal laws, including Rio Grande Compact delivery obligations. The Program implements activities required by the March 2003 Biological Opinion (2003 BiOp), as amended, and additional activities that contribute to recovery of the Rio Grande silvery minnow (silvery minnow) and the Southwestern willow flycatcher (flycatcher).

The Program has embraced the need for new Endangered Species Act (ESA) Section 7 consultation, as the 2003 BiOp expires in early 2013. In 2009, the Executive Committee (EC) decided to become a Recovery Program based on a Long-Term Plan (LTP) linked to the silvery minnow and flycatcher endangered species recovery plans. This will be done in a manner that benefits the ecological integrity, where feasible, of the MRG riverine and riparian ecosystem, and allows for creative and flexible options so that existing water uses continue and future water development proceeds in compliance with applicable federal and state laws. The Upper Colorado and San Juan River Recovery Programs are being used as models as the Program develops its own approach to recovery.

During FY2010 on behalf of the Program, Reclamation awarded approximately \$10,700,000 to: acquire and manage water; captively propagate and rear silvery minnow; plan, construct, and monitor habitat restoration projects; provide for fish passage at diversion structures; monitor the status of the silvery minnow and the flycatcher; conduct biological and hydrological studies; and rescue silvery minnow during river drying. All of these activities meet BiOp requirements or address recovery goals.

## Habitat Restoration Projects

Program-funded habitat restoration projects restore and enhance habitat in the MRG by increasing backwaters, oxbows, and overbank flooding to enhance native vegetation and regenerate stands of cottonwoods and willows for the flycatcher, and producing shallow, low velocity habitats over a wide range of instream flows to increase habitat available for the silvery minnow. The following briefly describes habitat restoration work accomplished during FY2010.

### **Phase II Isleta Reach Riverine Restoration and Habitat Improvements for the Rio Grande Silvery Minnow and Bosque Ecosystem Project**

This project was initiated in October 2010. Habitat improvement and modification include nonnative species removal and bank lowering. In calendar year 2010, 33 sites were completed for a total of 56.24 acres. Seventeen sites and 45.4 acres remain to be improved.

### **Pueblo of Sandia Riverine Habitat Restoration Project**

The final design plans were completed as well as environmental compliance documents, including the Biological Opinion, Clean Water Act Sec. 404 permit, National Historic Preservation Act Sec. 106 compliance letter, Environmental Assessment, and Finding of No Significant Impact. Construction began in early November 2010 by contractors to the Pueblo of Sandia. Project features include island and bar vegetation removal and destabilization, bank lowering, and backwater embayments on an estimated 30 acres of pueblo lands. Construction will be completed in mid-January 2011.

While construction was completed in 2009, all deliverables for the Pueblo of Sandia Habitat Restoration Project, originally awarded in 2002, were received in 2010. This project involved the enhancement and restoration of approximately 46 acres, manual and mechanical treatment of exotic invasive species, removal of sixty jetty jacks, GPS and mapping of the sites, wildlife habitat creation, soils characterization, revegetation with native plants, flycatcher surveys, and wildlife monitoring. In addition, a secondary high-water channel was created to enhance and restore the Pueblo of Sandia bosque into a more functional ecosystem.

### **Santo Domingo Endangered Species Habitat Improvement Project Phase IV**

This project proposes to improve and restore approximately 58 acres, with approximately 9 acres completed in 2010. Ongoing non-native vegetation re-growth monitoring was conducted in addition to silvery minnow and flycatcher surveys. There are three construction sites associated with this project, one of which (reconstruction of a historic side channel) was excavated in February 2010. Construction at the other two sites will resume in January 2011 with vegetation replanting to follow in early spring.

A grant for the associated Northern Bosque Floodplain Habitat Restoration Project was awarded in September 2010. This project proposes to improve and restore approximately 24 acres of floodplain habitat and 0.24 miles of perennial side channel. Work has started on the required EA.

### **Additional Habitat Restoration Projects Funded in 2010**

In addition to those projects mentioned above, the Collaborative Program provided funding for Ohkay Owingeh Pueblo. The Pueblo completed several areas of invasive species removal along the Three Falls and Two Rivers area as well as planting 15,000 herbaceous wetland plants, 3,500 coyote and Goodding's willows, and 148 box elder.

### **Fish Passage at San Acacia Diversion Dam**

This Reclamation project, a required activity per the 2003 BiOp, is presently in the planning and design stage. Studies continue to gather information about silvery minnow longitudinal movement. An external peer review process was begun in August 2010 to evaluate the science behind the requirement to implement fish passage at San Acacia Diversion Dam. The results of this peer review are expected to be available at the end of February 2011. The findings will be incorporated into the ESA consultation process for Middle Rio Grande water operations and river maintenance. Several recommended actions from the 2009 independent oversight review of designs and cost estimates (DEC review) were completed in 2010: (1) revision of project cost

estimates, (2) development of a project charter and designation of a project management team, and (3) initial hydraulic modeling of the velocities within the fish passage channels. A fourth recommendation was initiated in September 2010: a geomorphic assessment of the likely future degradation downstream of the diversion dam. The earliest date that construction of the fish passage facility could begin is FY2014.

## **Captive Propagation**

### **Rio Grande Silvery Minnow Sanctuary (Sanctuary)**

Reclamation, the U.S. Fish and Wildlife Service (Service), the Middle Rio Grande Conservancy District (MRGCD), and the City of Albuquerque (City) cooperated in the development of the off-channel Sanctuary for the silvery minnow at a site in Albuquerque. The Sanctuary will serve as one of the two additional refugia required by the 2003 BiOp. Construction of the Sanctuary is complete, as well as a protective fence around the facility. The Service has begun the transition to operating and maintaining the facility.

Water is pumped from the Albuquerque Riverside Drain to supply the facility. After flowing through the Sanctuary, water is returned to either the drain or to the river, consuming little or no water. Gates and fish screens will allow fish to be held in the channel and eventually released directly back into the river. Releases will be timed according to river conditions. Start up testing of the facility was conducted in late 2010. Numerous technical issues indicated the need for further work before the facility can become fully operational.

## **Supplemental Water Program**

### **Water Acquisition and Management**

Reclamation ended the year with 21,642 ac-ft in storage (0 ac-ft in El Vado, 9,564 ac-ft in Abiquiu, and 12,078 leased and waived in Heron), with approximately 12,000 ac-ft in potential leases for 2011/2012 (from 2011 SJC allocations). In 2010, a BiOp “dry” year, 19,837 ac-ft of supplemental water was released for endangered species purposes.

### **Low Flow Conveyance Channel (LFCC) Pumping Program – San Acacia to Fort Craig Reach**

During the irrigation season, flows in the Rio Grande between San Acacia Diversion Dam and the headwaters of Elephant Butte Reservoir can drop to a level that may result in adverse impacts to the silvery minnow and flycatcher. Reasonable and Prudent Alternatives D, G, K, and O of the 2003 BiOp require the use of pumps to manage river recession, maintain river connectivity, and supply water for nesting flycatchers. The LFCC Pumping Program also helps Reclamation comply with the continuous river requirements stipulated by Reasonable and Prudent Alternatives E, H, and L, and has been effective in allowing Reclamation to maximize the effectiveness of supplemental water releases made for ESA purposes.

Reclamation has installed portable pumps with flow measurement devices at strategic locations to move water from the LFCC into the Rio Grande. Discharge data for the pumping sites is now

posted in orange boxes on the Reclamation ET Toolbox web site within the MRGCD Rio Grande Silvery Minnow Operations schematic pages. The URL of the referenced site is:

[www.usbr.gov/pmts/rivers/awards/Nm2/rg/riog/schematic/SCHEMATICsouth.html](http://www.usbr.gov/pmts/rivers/awards/Nm2/rg/riog/schematic/SCHEMATICsouth.html)

The total available pumping capacity for all pump locations is approximately 200 cfs, although the maximum total combined rate is limited to 150 cfs by the 2003 permit granted by the New Mexico Office of the State Engineer.

Due to the low flows in the Rio Grande, the pumps located at Neil Cupp, North Boundary, and South Boundary pumping sites were started on July 24, 2010. In response to the conclusion of the 2010 irrigation season, all pumps were turned off on October 29, 2010. Table 12 below summarizes the acre feet used by each pumping site for the year.

Table 12: 2010 Pumping Volume by Site

Total Per Pumping Site For The Year	Neil Cupp	North Boundary	South Boundary	Ft. Craig
	129 ac-ft	78 ac-ft	6749 ac-ft	0 ac-ft

As table 12 illustrates, the pumps located at the South Boundary site were used primarily, while the pumps located at the Ft. Craig pumping site were not used during the 2010 irrigation season. The total supplemental flows for the 2010 irrigation season provided by the pumping effort was 6956 ac-ft.

## Other Ongoing Water Management and Water Quality Related Projects

### Upper Rio Grande Water Operations Model (URGWOM)

Funding has been provided to support collaborative URGWOM modeling efforts since FY 2006. In 2010, the URGWOM planning model continued to be enhanced to allow evaluation of various water management scenarios, with different target flows and various water management tools, to support the new ESA Section 7 consultation for MRG water operations, river maintenance activities, and USACE flood operations. The planning model has been updated to reflect current water operations practices and calibrated to be consistent with observed conditions during low flow periods. The calibration model was further refined using historic data from 2003 to 2007, to better represent the amount of supplemental water needed to meet flow targets and manage multiple river recessions. Using the five synthetic 10-year hydrologic sequences representing a range of conditions from very wet to very dry, developed for use as URGWOM inputs, initial water management scenarios were developed and run through the planning model for all five hydrologic sequences. The results of the model runs will be utilized to evaluate and further refine water management options for upper Rio Grande operations.

### U.S. Geological Survey (USGS) Groundwater/Surface Water Interaction in the MRG Valley

The monitoring network presently consists of 252 groundwater piezometers on both sides of the Rio Grande, from I-25 to the Alameda bridge crossings, and 27 surface water staff gages. The majority of these components are equipped with data loggers, which monitor water level and

temperature at regular intervals. FY2010 was the seventh year of funding by the Program. This project has been successful in the collection of continuous data sets and the posting of data on the USGS website, <http://nm.water.usgs.gov/projects/riograndesections/>.

USGS Scientific Investigations Reports are expected to be published in 2011 which summarize the data collection program and include calculations of river leakage based on water elevation measurements. The reports will also evaluate the effect that water temperature has on ground water viscosity and flow. In a presentation given to the Program's Species Water Management workgroup in May 2009, the project's principal investigators concluded that: 1) the hydraulic conductivity of the Inner Valley alluvium ranges from 30 to 80 feet per day; 2) heat transport in the riparian zone is limited below 20 to 30 feet in depth and that, above that depth, flow is primarily horizontal; 3) rates of groundwater flow range from 0.1 to 0.8 feet per day; 4) infiltration from the Rio Grande is highest and reaches its greatest depths at the Paseo Del Norte and Montano East cross sections; and 5) fining of sediments in the Rio Bravo area likely results in lower rates of river leakage.

### **USGS MRG River Gage Operation and Maintenance (O & M)**

This project has been funded by the Program since FY2002. The USGS operates and maintains a network of 24 streamflow gages in the MRG, including 12 in the mainstem and 12 in tributaries or distribution features. Four of these gages are funded by the Program. Data from the river gages help MRG water management agencies meet the needs of water users, fulfill the requirements of the Rio Grande Compact, maintain sufficient water in storage for future needs, maintain adequate water in the river to support the silvery minnow, and provide the information needed to improve the daily management of the river system from Cochiti Dam to Elephant Butte Reservoir. The data from these gages are available to the public at the web address: <http://waterdata.usgs.gov/nm/nwis/current/?type=flow>.

### **Decision Support System (DSS) for the MRGCD**

This project is an on-going cooperative effort since FY2003 to support the implementation of efficient rotational water delivery in the MRGCD irrigation system. The DSS will allow irrigation demands to be met with reduced diversions from the Rio Grande, which could extend the irrigation season in water-short years. The DSS is a network of interlinked models that compute demand information at the farm and lateral level and then use that information to recommend water delivery schedules. During 2010 a final report was issued for the DSS project. Full implementation and utilization of the DSS is up to the MRGCD.

## **Endangered Species**

### **Programmatic Water Operations and River Maintenance ESA, Section 7, Consultation**

On March 17, 2003, the Service issued the 2003 BiOp on the effects of actions associated with the *Programmatic Biological Assessment of Bureau of Reclamation's Water and River Maintenance Operations, Army Corps of Engineers' Flood Control Operation, and Related Non-Federal Actions on the Middle Rio Grande, New Mexico* for March 10, 2003, through February 28, 2013. The 2003 BiOp contained a Reasonable and Prudent Alternative (RPA) designed to

alleviate jeopardy to the silvery minnow, adverse modification to silvery minnow critical habitat, and jeopardy to the flycatcher based on the biological needs of the species. The RPA elements address some of the long-term recovery needs of the silvery minnow by incorporating four essential factors during the 10-year scope of the project: 1) water operations; 2) habitat improvement; 3) population management; and 4) water quality. The water operations elements establish flow requirements under different hydrologic scenarios that are needed to alleviate jeopardy to both species. Reclamation remains in compliance with the 2003 BiOp.

The Service made a determination that dry year flow requirements would be in effect for the 2010 irrigation season. In compliance with the 2003 BiOp, the Rio Grande was allowed to dry in isolated locations within the Isleta Reach and within the San Acacia Reach downstream to the south boundary of Bosque del Apache National Wildlife Refuge. Water pumped from the Low Flow Conveyance Channel (LFCC) maintained flow in the river channel south of the refuge. Native flow reconnected the river at the end of the irrigation season, and all LFCC pumping ceased on October 29, 2010, for the year. Incidental take due to Reclamation's water operations was identified as 95 individuals for 2010.

As of December 31, 2010, the Service had conducted rescue and salvage activities on 28.2 unique miles of the Rio Grande in the Isleta and San Acacia Reaches, between Los Lunas and the south boundary of Bosque del Apache National Wildlife Refuge, respectively, on 42 days between June 28 and October 17, 2010. A total of 9,668 silvery minnow > 30 mm SL were salvaged, transported, and released alive to a continuously flowing site of the Rio Grande at either the Isleta Diversion Dam, the San Acacia Diversion Dam, or the San Marcial Railroad Bridge, depending on the location from which they were salvaged. In addition, a total of 1,958 either were too small to salvage (< 30 mm SL), died during transport, were too sick to salvage, or were found dead during secondary drying not attributable to water operations. These mortalities count towards the Service permit and do not count towards incidental take.

Efforts by the Conservation Breeding Specialist Group and the Service, and Montana State University and the Middle Rio Grande Conservancy District, to develop silvery minnow population viability (PVA) models continued in 2010. The Collaborative Program's ad hoc PVA Work Group is moving forward in a coordinated process to develop both models and is working to address science matters cooperatively.

### **Rio Grande Silvery Minnow**

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

Reclamation conducted two periods of Rio Grande fish monitoring during 2010. The winter electrofishing survey was carried out from February 15 through February 26, 2009. Surveys were conducted at nine sites between Santa Clara Pueblo and the Refuge. Species frequently caught included common carp, channel catfish, flathead chub, river carpsucker, longnose dace, white sucker, and silvery minnow.

Summer monitoring was adjusted to fill information gaps in the temporary channel above Elephant Butte Reservoir. Monitoring was conducted at four sites in late September in the temporary channel. Overall, silvery minnow was the most numerous species in collections in 2010, comprising over 60% of the fish collected (Table 9).

Table 9: Species collected during Reclamation sampling in the temporary channel upstream of Elephant Butte Reservoir, September 27 and 28, 2010

Common Name	Species	Species Code	Number	Mean Fish/100 Square Meters	Standard Error
<b>Yellow Bullhead</b>	<i>Ameiurus natalis</i>	AMENAT	1	0.08	0.08
<b>Red Shiner</b>	<i>Cyprinella lutrensis</i>	CYPLUT	78	6.68	3.08
<b>Threadfin Shad</b>	<i>Dorsoma petenese</i>	DORPEN	1	0.09	0.09
<b>Western Mosquitofish</b>	<i>Gambusia affinis</i>	GAMAFF	41	3.70	1.74
<b>Rio Grande Silvery Minnow</b>	<i>Hybognathus amarus</i>	HYBAMA	233	24.07	9.69
<b>Channel Catfish</b>	<i>Ictalurus punctatus</i>	ICTPUN	24	1.93	0.58
<b>Flathead Chub</b>	<i>Platygobio gracillis</i>	PLAGRA	2	0.30	0.21
<b>AREA SAMPLED (Square Meters)</b>			<b>1084</b>		

Figure 5 shows silvery minnow population monitoring trends from 2001 through 2010, based on annual October population monitoring contracted through the Program. This monitoring is conducted using seining by habitat and has been the consistent method used for over ten years. The silvery minnow population has fluctuated since 2003. Despite spring runoff being enhanced by a planned Cochiti overbanking deviation and effective post-runoff water management, population appears to have experienced reduced recruitment success in 2010 in all reaches. This apparent decline may be due to a combination of habitat loss and crowding within existing habitats during periods of low flow accompanied by drying, however, further studies may be necessary to determine the actual cause. Table 10 shows the total numbers of silvery minnow captured and the number of sample sites (in parentheses), by reach, during October surveys between 2001 and 2010.

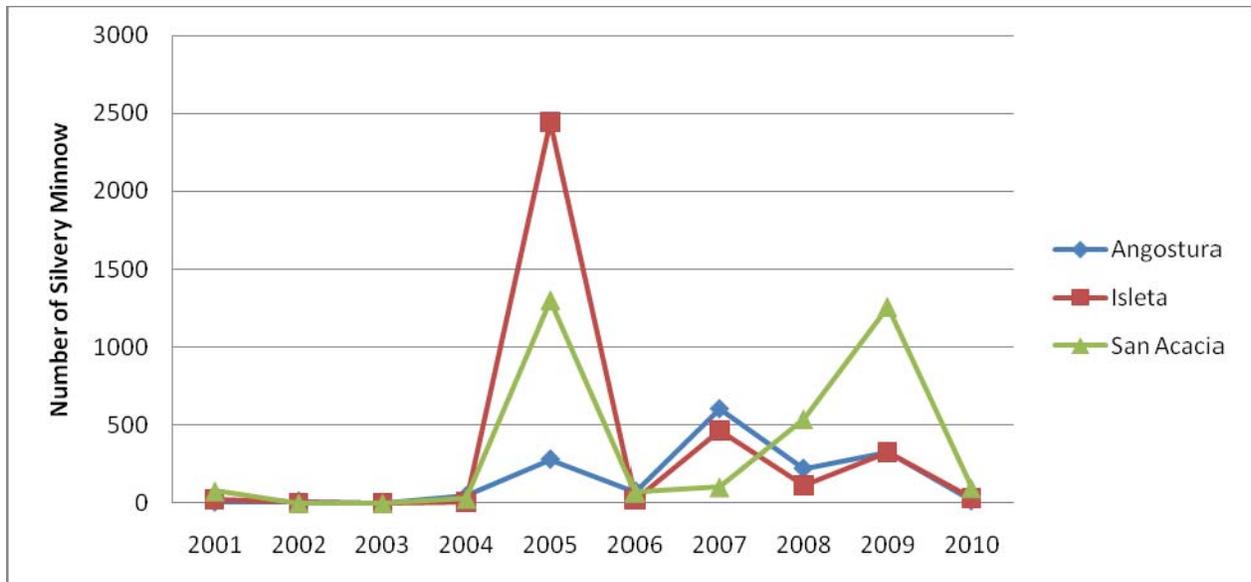


Figure 5: Total Number of Rio Grande Silvery Minnow Captured in October Population Monitoring Surveys

Table 10: Total Numbers of Rio Grande Silvery Minnow from October Surveys, 2001-2010, by Reach, with Number of Sample Sites in Parenthesis

Year	Angostura (5)	Isleta (6)	San Acacia (9)	Total
2001	3	23	77	103
2002	9	2	1	12
2003	1	1	0	2
2004	44	4	30	78
2005	278	2445	1299	4022
2006	73	24	69	166
2007	601	463	102	1166
2008	219	111	538	868
2009	328	327	1256	1911
2010	11	30	96	137
<b>Grand Total</b>	1567	3430	3468	8465

Captive silvery minnow populations include the Albuquerque Biopark and Dexter National Fish Hatchery. Additionally, the Interstate Stream Commission's Los Lunas Silvery Minnow Refugium has completed a series of test runs required to fulfill their permitting requirements for the Service. The facility should begin to be fully functional in 2011. The Service's Minnow Sanctuary is expected to begin test operations in late 2010.

The Service reintroduced approximately 1.4 million silvery minnow into Big Bend National Park, Texas, between 2008 and 2010, with reintroductions planned for two additional years. Monitoring for survival is conducted quarterly. During spring 2010, personnel caught and positively identified silvery minnow eggs through genetic analysis. During summer monitoring, one juvenile was caught (J. Remshardt, pers. comm.). Establishment of sustainable populations outside the Middle Rio Grande is essential for downlisting the species to threatened status.

### **Southwestern Willow Flycatcher**

The flycatcher was listed as endangered by the Service effective March 29, 1995. Critical habitat was designated, effective August 21, 1997, in some areas of New Mexico and other states throughout the species' range. The Rio Grande was not designated as critical habitat for the flycatcher at that time. The 1997 critical habitat proposal was later retracted. On October 13, 2004, under court order, the Service reissued a proposed designation for critical habitat for the flycatcher that now includes portions of the Rio Grande in New Mexico. The final rule designating critical habitat was issued October 19, 2005, and includes four sections of riparian forest in the Middle Rio Grande Valley: from the Taos Junction bridge to the north boundary of San Juan Pueblo, from the south boundary of the Pueblo of Isleta to the north boundary of Sevilleta National Wildlife Refuge (NWR), from the south boundary of Sevilleta NWR to the north boundary of Bosque del Apache NWR, and from the south boundary of Bosque del Apache NWR to the powerline crossing of the Rio Grande near Milligan Gulch. The Service is re-opening the assessment of critical habitat in 2011 due to a new court decision, which may involve including the Elephant Butte reservoir pool within such determination.

During the summer 2010, Reclamation conducted surveys and nest monitoring of the flycatcher in eight distinct reaches along approximately 200 kilometers (124 miles) of the Rio Grande in New Mexico, between the south boundary of the Isleta Pueblo and Elephant Butte Reservoir. Surveys were performed to contribute to current baseline population data of the flycatcher along the Middle Rio Grande, and also to meet Reclamation's ESA compliance commitments. In 2009, there were 633 resident flycatchers documented in 367 territories and forming 264 breeding pairs. In 2010, there were 629 resident flycatchers documented in 357 territories and forming 272 breeding pairs. As in previous years, the San Marcial reach of the river was by far the most productive, containing 319 territories and 224 pairs in 2009, and 298 territories and 235 pairs in 2010.

In 2010, nest monitoring was conducted at all sites where nesting pairs were detected. Nests were monitored for success rates, productivity, and Brown-headed cowbird (*Molothrus ater*) parasitism. The San Marcial reach proved most productive, producing 241 nests and fledging approximately 200 young. Other studies were continued in 2010. These include: (1) vegetation and avian monitoring, (2) Elephant Butte Reservoir photo station documentation and summary

report, (3) a flycatcher restoration assessment study, and (4) a flycatcher nesting hydrology study. These studies are designed to provide further insight into potential threats to and habitat requirements of flycatcher populations.

Table 11: Southwestern Willow Flycatcher Territories – Middle Rio Grande Project, 2000 - 2010 Breeding Seasons (N/S = Not Surveyed)

	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
Velarde	N/S	0	0	0	1	0	1	0	0	1	2
Frijoles	N/S	1	1	N/S							
Belen	4	3	4	10	1	4	0	N/S	1	N/S	N/S
Sevilleta	13	18	31	14	21	17	19	17	13	11	8
San Acacia	0	1	2	0	0	0	0	0	0	0	0
Escondida	4	0	1	0	1	0	0	0	4	0	0
BDANWR	33	20	5	7	4	0	1	3	3	0	0
Tiffany	5	5	8	4	9	3	6	4	3	0	0
San Marcial	298	319	235	197	142	107	113	86	63	25	23
Total	357	367	287	232	179	131	150	113	87	37	33

### Elephant Butte Reservoir

In 2010, the flycatcher population grew in the Bosque del Apache National Wildlife Refuge and declined slightly to the south. At Elephant Butte Reservoir, flycatchers occupied habitat to the south end of the Narrows section, just at the north end of the south pool. As reservoir levels decreased during the late 1990s and early 2000s, vast expanses of primarily native habitat have developed on the western side of the floodplain, and by 2010 have developed as far south as the north end of the south reservoir pool. This habitat consists of dense Goodding's and coyote willow of various age classes, with water provided by the LFCC outfall. During this same period, habitat upstream of the reservoir pool in the San Marcial reach declined in quality. Due to these factors, the vast majority of flycatcher territories within this reach, and the study area as a whole, are located within the reservoir pool.

Habitat modeling throughout the Middle Rio Grande has shown that there is suitable habitat that is not occupied, thus indicating that habitat is not a limiting factor to this population. The reason that flycatchers do not expand into all areas of suitable habitat is more a cause of their site fidelity. Predation rates during summer 2010 were higher than average and nest success was

lower than average. It is possible this is a chance event, but results from summer 2011 surveys will better indicate if a pattern is beginning to form. Vegetation in the northern end of the reservoir pool may be over-mature, eventually causing the population to shift their territories to other areas of suitable habitat.

The LFCC provides water to much of the high quality flycatcher habitat on the western side of the floodplain. Large portions of the western area of the Elephant Butte reservoir pool are continually flooded, even with low flows in the LFCC. As the reservoir is unlikely to approach full capacity in the near future, and high-quality flycatcher habitat on the western side of the reservoir pool will not likely see relief from flooding to allow seedling establishment, it is likely that currently occupied habitat will become over-mature within the next several years. Flycatcher habitat has historically been a dynamic system that is created and destroyed in relatively short periods of time. Flycatchers depend on this type of dynamic system for breeding habitat. Habitat may be gained and lost from year to year, but as a whole this population should persist and be a valuable source population for the surrounding areas over the next several years.

#### Flycatcher Issues at Elephant Butte Reservoir

Since Reclamation's submittal of a Biological Assessment in February 2009 and the Service's draft Biological Opinion in August 2009, the ESA Section 7 process for Elephant Butte reservoir water operations has not been completed. The reason for this is that Reclamation has been re-assessing federal discretion related to water operations, including San Juan – Chama Project water storage, and the temporary high quality habitat for flycatchers that has developed within the pool of Elephant Butte reservoir. There is legal precedence for this issue with a similar situation at Lake Mead. Due to the ongoing drought, Elephant Butte Reservoir has receded and remained low. Reclamation has allowed the temporary habitat to develop as the reservoir recedes as part of Reclamation's ESA Section 7(a)1 authority to help in the conservation of threatened and endangered species. Under ESA Section 9, Reclamation would still need to address incidental take of flycatchers if the reservoir were to fill up and impact flycatchers or their habitat. Reclamation is exploring establishing a voluntary ESA Section 7(a)1 habitat conservation program to develop flycatcher habitat as part of the Rio Grande Project.

## **Rio Grande Silvery Minnow v. Keys Litigation**

In November 1999, environmental groups collectively filed suit against Reclamation and the Corps for alleged Endangered Species Act (ESA) and National Environmental Policy Act (NEPA) violations. The Middle Rio Grande Conservancy District (MRGCD), State of New Mexico, City of Albuquerque, and Rio Chama Acequia Association subsequently intervened. The plaintiffs identified the central issue as the scope of discretionary authority that Reclamation and the Corps have over the Middle Rio Grande and San Juan-Chama Projects' water deliveries and river operations.

The District Court of New Mexico (District Court) issued a final judgment and memorandum opinion in this case on November 22, 2005, and dismissed portions of the case. Judge Parker denied all motions to vacate his 2002 rulings regarding Reclamation's discretion over water operations. The judge ruled that in future consultations under the ESA, Reclamation must

consult with the U.S. Fish and Wildlife Service over the full scope of Reclamation's discretion concerning Middle Rio Grande Project operations. The San Juan-Chama Project water-related claims were dismissed as moot with prejudice. Judge Parker's reasoning included the fact that the December 2004 "minnow rider" enacted by Congress removed Reclamation's discretion to use San Juan-Chama Project water to meet ESA requirements. Federal defendants, the State of New Mexico, and MRGCD appealed Judge Parker's November rulings to the 10th Circuit Court of Appeals. On April 21, 2010, the Tenth Circuit Court of Appeals dismissed the appeal, and remanded to the district court to vacate its memorandum opinions and orders of 2002 and 2005, and to dismiss the Environmental Groups' complaint with regard to their scope-of-consultation claim under the ESA.

In MRGCD's cross-claim against the United States in the *Minnow v. Keys* lawsuit, MRGCD sought to quiet title to certain Middle Rio Grande Project properties. The United States' position in this cross-claim was that MRGCD conveyed these Middle Rio Grande Project properties to the United States and that these properties remain in the name of the United States until, among other things, Congress authorizes title transfer. The repayment contract also stays in effect until such time. Judge Parker ruled in favor of the United States on July 25, 2005. Ownership of all properties necessary for MRG project operations, including El Vado Dam and San Acacia and Angostura diversion dams, was declared to be in the United States. In September 2005, MRGCD and the City of Albuquerque appealed Judge Parker's decision in the quiet title cross-claim. On March 26, 2010, the Tenth Circuit Court of Appeals ruled that the MRGCD's quiet title action was time-barred and that the district court did not have jurisdiction to provide judgment on the merits. The Court of Appeals therefore remanded to the district court with instructions to vacate the portion of its judgment that resolved the merits of MRGCD's quiet-title action and to enter judgment on its jurisdictional dismissal of the claim.

## RiverEyes

Reasonable and Prudent Alternative Element C of the 2003 BiOp states that RiverEyes monitoring must be performed when flows are less than 300 cfs at San Acacia. RiverEyes provides current information on river flows and river drying that allows action agencies to react quickly to changing conditions on the river and facilitates coordination among agencies to prevent unexpected drying and prepare for silvery minnow salvage and rescue actions.

RiverEyes monitoring for the 2010 irrigation season monitored channel drying along the Rio Grande from Isleta Diversion Dam to the headwaters of Elephant Butte Reservoir from June 15, 2010, through October 31, 2010. The total maximum river miles dried during the 2010 RiverEyes monitoring period was 29.50 miles. The first occurrence of channel drying was recorded on June 28, 2010; the last occurrence of channel drying was observed on October 22. River drying was restricted to two river segments; from the Los Lunas Bridge to the Peralta Wasteway in the Isleta Reach, and from Brown Arroyo to the South Boundary pumping station in the San Acacia Reach. The first segment involved about 9.0 miles of river drying, extending from river mile 161 to river mile 152. This segment experienced several episodes of drying, especially the segment between the Los Chaves Wasteway and the Peralta Wasteway. The second segment of river drying covered just over 20.5 miles, from river mile 94.5 to river mile

74. There were four main periods of drying punctuated by re-wetting events that were caused by flooding during the summer monsoons.

## **New Middle Rio Grande Water Management and River Maintenance Consultation**

Reclamation has been successful in meeting the requirements of the 2003 BiOp, in part through supplemental water acquisition and management with willing lessors, mainly San Juan-Chama Project (SJCP) contractors. In the future, the availability of these imported water supplies will be limited, contributing to the hydrologic unsustainability of the 2003 BiOp. In addition, the term of the 2003 BiOp expires prior to the 2013 irrigation season, and new ESA Section 7 consultation is needed to provide future federal and non-federal coverage. For these reasons, Reclamation and the U.S. Army Corp of Engineers (USACE) are proactively working with the Program to draft biological assessments (BA) of the effects of discretionary Middle Rio Grande water management actions and river maintenance on the silvery minnow and flycatcher. Consultation goals are to establish comprehensive and stable ESA compliance through a hydrologically viable BiOp that maintains the biological integrity of listed species. A water management strategy must be developed that optimizes management of native water and allows for carryover of leased SJCP supplemental water for dry years.

A new BiOp will be established along with the Long Term Plan and the development of an adaptive management plan for the Program leading to both the road map to recovery and the Reasonable and Prudent Alternatives and Measures to avoid jeopardy. The BiOp would remain in effect as long as annual sufficient progress is being made. Reclamation is coordinating with the USACE, the U.S. Fish and Wildlife Service, and non-federal entities in developing the new BA. Current scheduling milestones include BA submittal by October 1, 2011, and a BiOp anticipated by mid-February of 2012. Reclamation will initiate government-to-government consultation with the pueblos and tribes based on this approach.

## Rio Grande Project (New Mexico - Texas)

Reclamation's El Paso and Elephant Butte Field Divisions are jointly responsible for the operations of the Rio Grande Project (Figure 7). Elephant Butte Field Division operates and maintains Elephant Butte and Caballo Dams. El Paso Field Division is responsible for scheduling releases from Elephant Butte and Caballo Reservoirs to meet irrigation demand and the delivery of Rio Grande Project water to the canal headings of Elephant Butte Irrigation District (EBID), El Paso County Water Improvement District No. 1 (EPCWID), and Mexico (under the 1906 International Treaty). EBID operates and maintains Reclamation's diversion dams on the Rio Grande, including Percha Diversion Dam, Leasburg Diversion Dam, and Mesilla Diversion Dam in New Mexico. EBID operates and maintains the three diversion dams in New Mexico under a contract with Reclamation. In September 2003, Reclamation completed work to remove Riverside Diversion Dam and the adjacent Coffey Dam, both in Texas. Riverside Diversion Dam had been inoperable since 1987, when flooding on the Rio Grande caused the structure to fail.

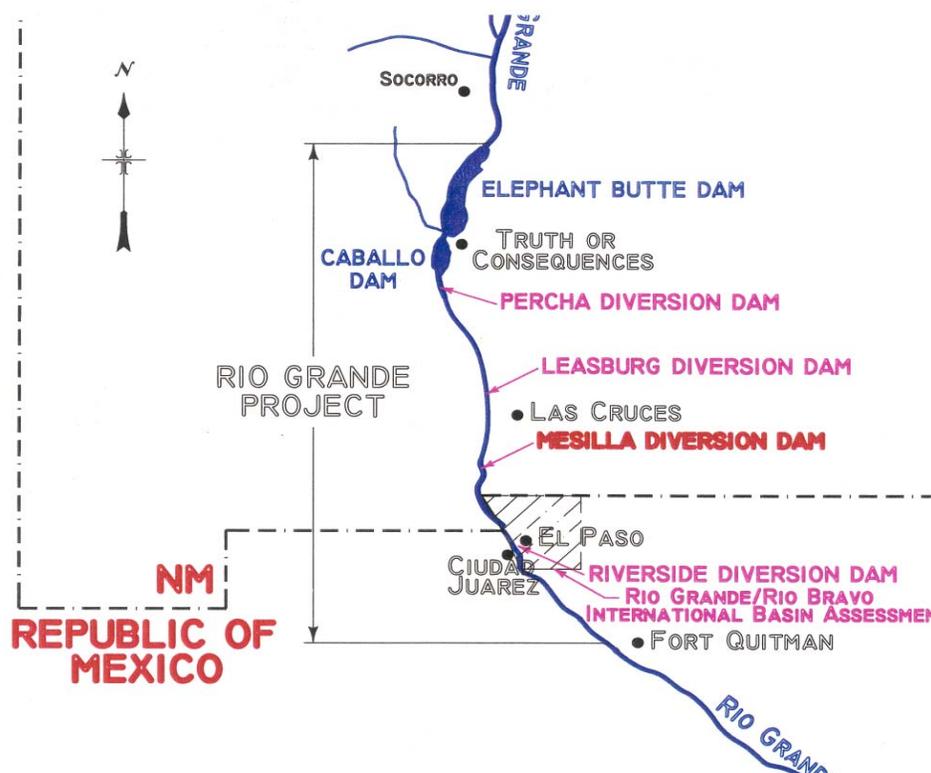


Figure 7: Area Map of the Rio Grande Project

## Water Supply Conditions

Inflow into Elephant Butte Reservoir during 2010 as measured at the Rio Grande Floodway (FW) plus the Low Flow Conveyance Channel (LFCC) at San Marcial (FW+LFCC) was 527,000 ac-ft, which is 61.6 % of the 97-year average annual flow at the San Marcial stations (FW+LFCC). The actual 2010 March through July runoff, measured at San Marcial (FW+LFCC), was 322,000 ac-ft, which was 56.19 % of the 30-year average. During the period from 1996 to 2010, spring runoff (March-July) at the San Marcial gauging station has consistently been below average. During 2010, 669,000 ac-ft of water was released from Elephant Butte Reservoir. There was a release of 652,000 ac-ft to meet the irrigation requirements of Project water users from Caballo Reservoir.

The January through June Natural Resources Conservation Service and National Weather Service (NRCS and NWS) coordinated forecasts received for the 2010 March through July runoff season are presented in Table 13.

Table 13: Summary of 2010 Rio Grande Coordinated Spring Runoff Forecasts

Month	Forecasted Otowi Runoff (ac-ft)	Percent of 30-Year Average	Forecasted San Marcial Runoff (ac-ft)	Percent of 30-Year Average
Jan 1	700,000	93	525,000	91
Feb 1	775,000	102	580,000	101
Mar 1	760,000	100	570,000	99
Apr 1	750,000	99	560,000	98
May 1	700,000	93	480,000	84
June 1	615,000	81	360,000	63
Actual Runoff	683,681	90	322,000	56

Combined total storage for Elephant Butte and Caballo Reservoirs was 459,220 ac-ft on December 31, 2010. This combined storage was 19.5% of the total capacity of both reservoirs. In 2010, the available storage for both reservoirs during the winter months (October 1 to March 31) is equal to the capacity of Elephant Butte Reservoir, 2,024,586 ac-ft minus 25,000 ac-ft that Reclamation reserves for winter operational flood control space (50,000 ac-ft during the summer), plus the capacity of Caballo Reservoir, 324,934 ac-ft minus 100,000 ac-ft for flood control space, or 2,224,520 ac-ft during the winter (2,199,520 ac-ft during the summer).

Per the Rio Grande Compact Article I definition, the usable water in Project storage (Elephant Butte and Caballo Reservoirs together) was below 400,000 ac-ft on January 1, 2010 (379,114 ac-ft, with 171,306 ac-ft of Compact Credit and San Juan – Chama (SJ-C) water). On February 28, 2010, Compact usable water in Project storage went above 400,000 ac-ft, removing the Compact's Article VII restriction on upstream storage in post-1929 reservoirs. On March 16, the usable water fell below 400,000 ac-ft, and remained there until May 9, 2010, when New Mexico relinquished credit water, increasing usable Project water to 487,304 ac-ft, with Compact Credit and SJ-C water at 147,036 ac-ft. On June 22<sup>nd</sup>, the total of Compact Credit and SJ-C water was 168,064 ac-ft.

The Rio Grande Project usable water once again fell below 400,000 ac-ft on July 8, 2010, with total usable water at 396,526 ac-ft (168,064 ac-ft Credit and SJ-C). On July 13<sup>th</sup>, total Credit and SJ-C water was at 165,218 ac-ft. On August 6<sup>th</sup>, the amount of Credit and SJ-C water increased to 162,096 and remained at there for the rest of the year. Usable project water remained below 400,000 ac-ft (Article VII) for the remainder of the year.

A final allocation to the Rio Grande Project water users of 83.72% of a full supply was declared by Reclamation in October 2010 for the irrigation season. The initial allocation to the Rio Grande Project water users (declared in February 2010) started at only 54.73% of a full supply. Initially, 2010 seemed promising because of the projected snowmelt, but proved to fall short of an average year.

For the 2011 irrigation season initial allocation, a less than full allocation (203,204 ac-ft or 21.81% of a full supply) was declared on January 19, 2011. Based on the February 1st NRCS/NWS spring runoff forecast at the San Marcial gauging stations and present hydrologic conditions, Reclamation anticipates a less than full supply for irrigation during 2011 for the Rio Grande Project.

The 2011 coordinated forecasts from the NRCS and NWS for the 2011 March through July runoff season is presented in Table 14.

Table 14: 2010 Rio Grande Coordinated Spring Runoff Forecasts

Month	Otowi Runoff (ac-ft) (Mar-Jul)	Percent of 30-Year Average	San Marcial Runoff (ac-ft) (Mar-Jul)	Percent of 30-Year Average
Jan 1	680,000	90	505,000	88
Feb 1	575,000	76	405,000	71

## Project Irrigation and Drainage Systems and Title Transfer

In 1992, Congress authorized the transfer of title to certain irrigation facilities to the Irrigation Districts. The official transfer of the irrigation and drainage rights-of-way and facilities to the Districts was completed on January 22, 1996. In 2010, the irrigation and drainage system continued to be owned, operated, and maintained by Elephant Butte Irrigation District in the New Mexico portion of the Rio Grande Project and by El Paso County Water Improvement District No. 1 in the Texas portion of the Project. Reclamation continues to own and administer the lands and rights-of-way activities of the reservoirs and diversion dam areas.

Reclamation retains title and operation and maintenance responsibilities for Elephant Butte and Caballo Dams and Reservoirs. Operation and maintenance of the diversion dams are performed by the Districts under contracts with Reclamation. Reclamation retains the rights-of-way and title of the diversion dams and their associated reserved works. The Districts performed flow measurements at canal headings, river stations, and lateral headings during 2010. Reclamation coordinated and maintained central control of releases, river operations, and water accounting.

To accomplish the water allotment accounting, the Districts collected field flow measurements and coordinated data from all water user entities. Utilizing the summarized flow data submitted by the Districts for their areas of responsibility, Reclamation calculated and summarized the monthly and end-of-year Project water supply use and accounting for 2010. The International Boundary and Water Commission (IBWC) continued to own, operate, and maintain the American Diversion Dam and the American Canal during 2010 in accordance with the International Treaties with Mexico (1906 and 1933). In addition, the IBWC operated the International Diversion Dam which diverts irrigation waters into the Acequia Madre headgates operated by Mexico.

Drainage waters from the Rio Grande Project lands provide a supplemental irrigation water supply 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 gauging 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 was charged for drainage water from the Project between March 1 and September 30 which amounted to 59,999 ac-ft in 2010.

Water flows measured by IBWC on the Rio Grande at Fort Quitman Station, downstream of the Project and HCCRD boundaries, amounted to 123,602 ac-ft during 2010.

## **Elephant Butte Reservoir and Powerplant**

Elephant Butte Reservoir reached a minimum storage of 362,100 ac-ft (elevation 4,329.08 feet) on September 22, 2010. A maximum storage of 604,150 ac-ft (elevation 4,348.19 feet) was reached on June 5 and again on June 7, 2010. Storage levels in Elephant Butte Reservoir did not enter into the 50,000 ac-ft prudent flood control space in 2010.

Net power generation for 2010 was 67,484,225 kilowatt-hours, which was 92 percent of the 69-year average (1940 through 2008) of 73,397,441 kilowatt-hours. The power plant releases were utilized to meet downstream irrigation demand and manage Caballo Reservoir storage levels. The balanced valves were not needed to meet peak releases during 2010. Reclamation anticipates that all three turbines will be available for generation and discharge by the spring of 2011.

The 2010 summer monsoon season was relatively mild, and did not produce any flood events or sediment discharges into the Rio Grande below Elephant Butte Dam.

## **Elephant Butte Dam Facility Review and Safety of Dams Programs**

During FY2010, the Elephant Butte Field Division implemented and completed the following activities.

Powerplant Scroll Case, Elephant Butte: Unit 3 scroll case was inspected, finding excessive rust

and above normal coating loss. Given the findings it was determined that the entire interior should be recoated. Assistance from Alan Skaja of Reclamation's Technical Service Center (TSC) was crucial. The coating was uniformly applied at a 10 - 12 mil thickness with a pneumatic gun. At areas such as rivets and sharp transitions, a paint brush was used to apply the coating material.

Visual Inspection of the Balance Valve Wells: This completes A 2005 CFR recommendation which asked to video/photograph the balance valve wells. With this recommendation and the recent formation of a high scaling team at Elephant Butte Field Division, a rope access repel down the 200 foot well allowed both an inspection of the well and additional training for the team, with the assistance of Mark Neeley of Reclamation's Regional office. The inspection revealed that the well is in excellent condition, although a few areas showed signs of spalling but none that had occurred recently.

New Video Surveillance System: One segment of the video security has been installed with the power plant portion soon to follow.

Completion of Emergency Action Plan Functional Exercises: A functional exercise, which simulates flooding and an actual dam failure, was completed for both Caballo and Elephant Butte Dams. Local emergency responders and law enforcement from Sierra County south to Dona Ana and El Paso Counties were involved in the exercise. The Emergency Action Plan is being modified based upon recommendations received after the exercise.

Land Slide Surveillance, Elephant Butte: The Upper Colorado Regional Office performed the annual land slide surveillance. The east abutment below Elephant Butte Dam is presently stable as a result of the Division Rock Scaling Crew. There were concerns with several bank erosion areas in the vicinity of South Monticello Boat Ramp within the Elephant Butte State Park. Several alternatives were recommended and it is advisable to coordinate with the New Mexico State Parks to implement the best solution.

Elephant Butte and Caballo Dam Site Security Plans: The Elephant Butte Field Division reviewed and updated its Site Security Plans for Elephant Butte and Caballo Dams and Reservoirs as a result of the FY2010 Periodic Security Review.

New Batteries for Penstock Controls: New batteries for the penstock controls were installed in the power plant by EBFD. A new battery charger was also installed in the emergency penstock building.

Penstock Operator Installation Process: TSC's Don Reed is designing a replacement for the penstock gate operators. The old operators need to be removed from the upper and lower penstock through A Gallery. Construction will be contracted out, and is projected to begin in 2014.

## Caballo Dam and Reservoir

Caballo Reservoir reached a minimum storage of 16,700 ac-ft (4,134.71 feet) on October 7, 2010. A maximum storage of 73,690 ac-ft (4,151.63 feet) was reached on April 26 and 27, 2010.

According to Court Order No. CIV-90-95 HB/WWD of October 17, 1996, which resulted from a negotiated settlement with the Irrigation Districts, the Caballo Reservoir storage level is targeted not to exceed 50,000 ac-ft (4,146.44 feet) from October 1 to January 31 of each year, unless flood control operations, storage of water for conservation purposes, re-regulation of releases from Elephant Butte Dam, safety of dams purposes, emergency operations, or any other purpose authorized by Federal law, except non-emergency power generation, dictate otherwise. Significant variation above 50,000 ac-ft during the winter months of October through January requires collaboration and consultation between the Districts and Reclamation.

Reclamation's plan for operation of Caballo Reservoir during February 1 through September 30, 2010, was to maintain storage levels such that they would not exceed 50,000 ac-ft in February, not exceed 65,000 ac-ft in June, and not be less than 20,000 ac-ft by the end of September. Operating Caballo Reservoir at these storage levels during the 2010 irrigation season allowed Reclamation to:

- Reduce evaporative losses between Elephant Butte and Caballo Reservoirs,
- Provide sufficient operational hydraulic head at Caballo Reservoir for irrigation demand releases,
- Have Caballo serve as a reserve pool should releases from Elephant Butte Dam be interrupted, and minimize changes to release rates from Elephant Butte Dam,
- Compensate for loss in discharge capacity from Elephant Butte Dam power plant due to the penstock guard gate repair work,
- Allow for data collection and maintenance of OPEC and 3D-sec (ET) systems at Caballo through cooperative research with New Mexico State University.

Caballo Reservoir's operating plan for October 1, 2010, through September 30, 2011, has not yet been finalized, but will likely be similar to prior year's plans. Storage in Caballo Reservoir at the end of the 2011 irrigation season will not exceed 50,000 ac-ft. Reclamation will finalize its reservoir operating plan in the spring of 2011. The 2011 operations plan will reflect accommodations to minimize evaporation differences between Elephant Butte and Caballo Reservoirs. Initial measurements of open water evaporation at both reservoirs using OPEC and 3D-sec (ET) systems indicate that losses at Caballo reservoir were less than predicted, depth-dependent, and in some cases less than Elephant Butte. Minimizing surface area fluctuations at Caballo reservoir during irrigation season may reduce losses.

## Caballo Dam Facility Review and Safety of Dams Programs

During FY2010, Elephant Butte Field Division (EBFD) implemented and completed the following recommendations.

Bonita Pipe Inspection: Charles Cooper, of Reclamation's Technical Service Center, administrated a Remote Operation Vehicle (ROV) inspection of the Caballo Bonita pipe that runs directly beneath the outlet. There was concern that the pipe might be leaking into the surrounding drains due to their proximity and a noticeable increase in toe-drain flows. The outlet works makes a pounding noise when in use, so EBFD personnel thought the increase in flow in the drain either came from the outlet works or from a leak in the Bonita pipe.

The ROV inspection was completed on January 12, 2010. The inspection showed that the pipe was in excellent condition and is not the cause of the increased drain flow. During the exam it was found that the drain flow had little discoloration and showed no signs of piping.

Programmable Logic Controller (PLC): The Caballo regulating gates had been controlled remotely from the Elephant Butte Powerplant until 2008 when an electrical short destroyed the remote capability. Until 2010 the gates had to be manually operated at the control house. In 2010 a new PLC system was installed with a redesign of the control cabinet that makes it much easier to troubleshoot and maintain. This control system uses Graphical User Interface (GUI) system and is connected by a dedicated T1 line from Caballo to the Elephant Butte Powerplant. This interface shows the opening of the gate and reservoir elevation. This system also allows for expandability in the future. The system was very reliable during the 2010 irrigation season and has decreased staff time needed to make changes at Caballo Dam.

Functional Exercise Completed: A full scale functional exercise, which simulated flooding and dam breach via embankment failure of Caballo Dam, was successfully completed. Local emergency responders and law enforcement from Sierra County south to Dona Ana and El Paso Counties were involved in the exercise. The Emergency Action Plan is being modified based upon recommendations received after the exercise.

Staff Gages: The staff gages at Caballo reservoir have been strategically placed within an enclosed and fenced area to minimize damage.

## **Rio Grande Project Adjudications**

The United States filed the case United States of America v. Elephant Butte Irrigation District, et al Civ. No. 97-0803 JP/RLP/WWD (Quiet Title to the Waters for the Rio Grande Project) on June 12, 1997, requesting the Court to quiet legal title to the waters of the Rio Grande Project in its name. The United States District Court (USDC) for the District of New Mexico dismissed the case in August 2000. On May 7, 2002, the United States Court of Appeals (10th Circuit) vacated the USDC's August 2000 decision and remanded the case back to District Court for further proceedings. Chief Judge James A. Parker issued an order to stay the case and close for administrative purposes on August 15, 2002, but further ordered that should it become necessary or desirable during the pendency of the water adjudications in New Mexico and Texas, any party may initiate proceedings as though the case had not been closed for administrative purposes.

Lower Rio Grande Basin Adjudication (New Mexico), State of New Mexico, ex rel, Office of the State Engineer v. EBID, et al, CV-96-888: This "stream adjudication" was originally filed by

Elephant Butte Irrigation District (EBID) against the State Engineer in 1986. Negotiation meetings on the Offers of Judgment on Lower Rio Grande Basin Adjudication (New Mexico) have been held between the Office of the State Engineer and the United States. The most recent meetings were held on November 19, 2010, and December 9, 2010. Work has continued in coordination with EBID and El Paso County Water Improvement District No. 1 (EP#1) to satisfy the concerns of the Office of the State Engineer about the new operations of the Rio Grande Project. Hopefully, additional information will promote understanding of the 2008 Rio Grande Project Operating Agreement and how it will comply with any stream adjudication offer from the state.

The Texas Commission on Environmental Quality (TCEQ) posted public notice of adjudication of all claims of water rights in the Upper Rio Grande (above Ft. Quitman) segment of the Rio Grande Basin and the requirement to file sworn claims pursuant to section 11.307 of the Texas Water Code on or before April 22, 1996. The Investigation Report was completed under Phase 1. Phase 2 calls for evidentiary hearings in which claimants present evidence to support the validity of their claims. Threshold issues were briefed, and on July 31, 2003, the Administrative Law Judge ruled as follows: (1) the TCEQ has jurisdiction over the proceeding, (2) the river segment subject to the adjudication does not need to be revised or expanded, and (3) the proceeding qualifies as an adjudication of water rights under the McCarran Amendment. An evidentiary hearing was held on December 11, 2003, and Reclamation presented expert testimony about the Rio Grande Project. Notice was given under Texas Administrative Code §86.18 (c) that on April 13, 2006, the Texas Commission on Environmental Quality issued a Final Determination of all claims of water rights under adjudication in the Upper Rio Grande Segment of the Rio Grande Basin (above Fort Quitman) located within the State of Texas and which includes all portions of Hudspeth and El Paso Counties, Texas. The effective date of the Final Determination is May 15, 2006.

## **Rio Grande Project Operating Agreement**

On February 14, 2008, Reclamation, Elephant Butte Irrigation District (EBID), and El Paso County Water Improvement District No. 1 (EP#1) agreed to, finalized, and signed a new operating agreement for the Rio Grande Project. This is very significant in that the first negotiations of a draft operating agreement started almost 30 years ago. This historic document, and its accompanying operations manual finalized in August 2008, provides detailed procedures for operating the Rio Grande Project between Reclamation, EBID, and EP#1 while recognizing and fulfilling the terms of the 1906 Convention Treaty with Mexico to supply up to 60,000 ac-ft of irrigation water from the Rio Grande Project.

The most important items in the operating agreement are: (1) procedures for allocation of Rio Grande Project water supply to the three Project water users, (2) recognition of groundwater pumping in the Rincon and Mesilla valleys affecting the water supply available to EP#1 and adjusting the allocation procedures to mitigate the allotment for EP#1, and (3) an incentive for EBID and EP#1 to carry over their respective unused allotments each year with a maximum carry over provision for each District of 60% of their respective historical full allocation. This carry over incentive encourages each District to conserve and effectively utilize irrigation water,

particularly during drought periods on the Rio Grande Project. The Rio Grande Project has completed two irrigation seasons under the 2008 Operating Agreement and began the third irrigation season on the first week in March 2010.

EP#1 ended the 2010 irrigation season with 232,915 ac-ft on their allocation account and EBID ended the season with 20,015 ac-ft on their allocation account. In compliance with the Operating Agreement, which limits the carryover account to 60% of a full allocation and allows for any carryover water exceeding the limits to be transferred to the other district if they are under their limit, 8,567 ac-ft of water was transferred from EP#1's account to EBID's account. In addition 10,000 ac-ft were transferred from EP#1 to EBID in recognition of the pumping effects from the Canutillo well field operated for municipal purposes by the City of El Paso, Texas.

The technical team for the Rio Grande Project, which consists of representatives from EBID, EP#1, and Reclamation, will meet in early 2011 to review and approve amendments to the operations manual. Amendments to be discussed are additional wasteways within EBID, which may be used to account for water placed back in the river for use downstream.

The 2008 Operating Agreement has not affected total usable Project storage. The Operating agreement has promoted the efficient use of water. During the 2010 irrigation season, the Project released 659,670 ac-ft of from Caballo Dam. The project water users (EBID, EP#1, and Mexico) were charged for 643,902 ac-ft of delivered water.

The release to delivery ratios were very similar, at about 0.98, for the three years that the operating agreement has been in effect and show that we are still operating in a drought scenario. Reclamation continues to work with each district to account accurately for water released from Caballo and water delivered at each diversion point. Snow pack conditions presently are below normal, so reservoir levels are expected to fall during the 2011 irrigation season.

## **Elephant Butte and Caballo Reservoir Vegetation Management Cooperative Agreement**

Under this Agreement, Reclamation performs maintenance of previously managed vegetation, primarily by mowing to limit the non-beneficial consumption of water by woody phreatophytes such as saltcedar (Tamarix). Herbicide treatments to saltcedar and tornillo (screwbean mesquite) are also made to limit the amount of mowing necessary to complete the task. Approximately 6,931 acres have been sprayed at both reservoirs over the past seven years with varying amounts of success. With assistance from New Mexico State University, scientific investigations are being done concurrently to estimate reductions in evapotranspiration after various treatments.

During FY2010, Reclamation managed 2,939 acres of phreatophytic vegetation at Elephant Butte and Caballo reservoirs utilizing mowers, mulchers, grubbers, and spraying equipment. This included 1,441 acres mowed, grubbed, or mulched, and 1,498 acres treated with herbicides.

# Other Reclamation Programs

## The Secure Water Act

The Secure Water Act became law on March 30, 2009, as a component of the Omnibus Land Management Act of 2009. This Act provides authority for Federal water and science agencies to work together with States and with local water managers to plan for climate change and other threats to our water supplies, and to take action to secure water resources for the communities, economies, and ecosystems they support. The Secure Water Act authorizes and funds a number of programs, under the Department of the Interior's WaterSMART Program, to evaluate the risk that climate change and other threats pose to water supply, and to initiate local actions to mitigate these threats. These programs include:

- WaterSMART Grants
- Basin Study Program
  - West-Wide Climate Risk Assessments
  - Basin Studies
  - Landscape Conservation Cooperatives
- Title XVI Water Reclamation and Reuse Program

### **WaterSMART Grants (Formerly the Water for America Initiative)**

In 2009, the WaterSMART Initiative replaced the Water for America Initiative, which had replaced the Water 2025 Initiative. The Department of the Interior's WaterSMART Initiative is a plan for working with communities, irrigation districts, and states to help resolve and avert water supply crises in the West. The Rio Grande has been identified as among the most likely areas in the West to experience the kinds of water-related conflicts that the WaterSMART Initiative is addressing. The WaterSMART Initiative's goals are being accomplished primarily through competitive award of challenge grants to irrigation districts, communities, and states. Through the Challenge Grant Program, Reclamation provides 50/50 cost-share funding for projects focused on water conservation, efficiency, and water marketing. The focus is on projects that can be completed within 24 months. The following projects are currently being funded under the WaterSMART Initiative.

Reclamation is cooperating with MRGCD on NEPA compliance for a cross-river siphon proposed for the La Joya area. The proposed siphon would convey water directly from the Lower San Juan Riverside Drain to Drain Unit 7, which connects directly with the Socorro Main Canal North at San Acacia. WaterSMART funds for the siphon have been exhausted.

In FY 2010, Arch Hurley Conservancy District was awarded a grant to apply sodium bentonite to areas along the main canal to reduce water loss due to poor soil conditions. Construction is to begin after irrigation season.

## **Basin Study Program**

### West-Wide Climate Risk Assessments

In 2010, Reclamation performed data compilation and evaluation to summarize water supply and demand parameters and available data analysis tools to assist in the evaluation of the risks that climate change poses to the water resources of the Middle Rio Grande. Reclamation has been allocated Fiscal Year 2011 funding for the performance of a basin-scale risk assessment for the Middle Rio Grande Valley. Downscaled results from Global Circulation Models will be used as input to local watershed and water routing models, and the results from these local-model simulations will be used to evaluate future hydrologic.

### Basin Studies

After the completion of the climate risk assessment for the Middle Rio Grande, the valley will be a candidate for the completion of a Basin Study. Basin studies build on the Climate Risk Assessments through evaluation of adaptation and mitigation strategies, and involve considerable cooperation with other members of the water community. Basin studies require a 50% cost share from a local partner, and Reclamation is currently seeking partners for this work.

### Landscape Conservation Cooperatives

Reclamation is partnering with the Fish & Wildlife Service to establish Landscape Conservation Cooperatives (LCCs). LCCs are designed to link science and conservation actions to address climate change and other stressors within and across landscapes. The Middle Rio Grande straddles the Southern Rockies and the Desert LCC. Reclamation invites all federal, state, tribal, local government, and non-governmental management organizations to become partners in the development of these cooperatives.

## **Title XVI Water Reclamation and Reuse Projects**

Under the authority of Public Laws 102-575 and 104-266, Reclamation is/was participating with the cities of Albuquerque, New Mexico, and El Paso, Texas, in the construction of water reclamation and reuse projects. Reclamation has also participated in a Title XVI feasibility study with the City of Espanola.

### City of Albuquerque

In 1999 Reclamation entered into agreements with the Albuquerque Bernalillo County Water Utility Authority (ABCWUA – formerly the City of Albuquerque) that provide the framework for participation and cost sharing in their \$67 million non-potable water reclamation and reuse project. Up to 25 percent federal cost share was authorized for construction of the project, not to exceed \$20 million.

- North I-25 Industrial and Non-Potable Surface Water (Northside) Project: The northside project diverts San Juan-Chama project water directly from the Rio Grande using horizontal wells, then blends it with reclaimed water from industrial recycling, and delivers this water to turf irrigation customers in the northern portions of Albuquerque. In FY2010 this project beneficially (consumptively) used approximately 2,242 acre-feet. ABCWUA also completed a pilot aquifer storage and recovery project on Bear Canyon arroyo. The combined consumptive use for these projects in 2011 is anticipated to be between 2,400 and 2,800 acre-feet of San Juan-Chama project water.

- **Southside Municipal Effluent Reuse Project:** The southside municipal effluent reuse project will design and construct an expanded treatment system at the Southside Water Reclamation plant to include a clearwell/chlorine contact tank, two pump stations, a 1.9 million gallon storage reservoir, and associated distribution pipelines. Construction began in December 2009. The project will be operational in fall of 2011, and will provide about 2,500 acre-feet per year of polished municipal effluent. This project also received American Recovery and Reinvestment Act funding in FY2009 to accelerate construction of the southside distribution pipeline that will facilitate delivery of about three million gallons per day of reclaimed waters treated at the southside municipal effluent polishing facility. Reclaimed water will be used primarily for turf irrigation by various municipal, industrial, and commercial customers along the pipeline route. Currently, contract #2 for the distribution pipeline is complete and the other is projected to finish in March 2011. The storage reservoir and facilities at Puerto Del Sol golf course are nearing completion and are projected to be finished early 2011. Construction on the expanded treatment system and facilities started construction at the end of 2010.
- **Arsenic Pilot Demonstration Project:** The Arsenic Pilot Demonstration Project started operating in 2008. The project removes arsenic from two wells on the west side of Albuquerque (College No. 1 and No. 2), and provides about five million gallons per day of drinking water that meets or exceeds the EPA drinking water maximum contaminant level (MCL) for arsenic.
- **Alameda Trunk Arsenic Project:** The feasibility study began in 2008 to evaluate a new treatment system for existing wells where water quality is impaired due to naturally-occurring arsenic. Water from the wells will be piped to a central treatment facility to remove arsenic from the groundwater prior to distribution to service area customers. NEPA compliance is anticipated to begin in 2011, with construction estimated for the summer of 2012. Design and construction of the project are contingent upon receiving federal matching funding. Facilities construction is currently estimated at an additional \$15 million.

#### Town of Chimayo

In October 2004, P.L. 108-354 was enacted, which authorized up to \$3 million for emergency water supply development assistance for the Town of Chimayo. In Fiscal Year 2010, Congress provided a \$233,000 earmark for the construction of storage tanks, extension of domestic water lines, and development of additional ground water supplies for the Town which will be awarded by the end of September. The Greater Chimayo Mutual Water Users Association is the project sponsor.

#### City of El Paso

The City of El Paso has been using recycled water since 1961. Reclamation has contributed to El Paso's efforts since 1996 through Title XVI. El Paso currently recycles nearly 2 billion gallons (~6,000 AFPY) of water per year through 50 miles of purple pipe. This recycle program has cost the City \$56 million dollars, with Reclamation's contribution of \$14.4 million. Future plans are to extend the recycled water program to Fort Bliss, which would add an additional 10

million gallons of water per day and require an additional 12 miles of pipe. There was no progress on the Fort Bliss extension during 2010, due to the El Paso Water Utility taking over storm and flood control for the City and County.

The recycled water has been applied to some sites not suited for this water, resulting in damage to vegetation. The City of El Paso, in conjunction with Texas A&M, has proactively implemented a best management program to help water users to better prepare their sites and select vegetation better suited for recycled water. Reclamation has contributed more than \$50,000 to aid El Paso's best management practices program.

Reclamation was working with the El Paso Water Utilities-Public Service Board (EPWU-PSB) to conduct a pilot plant study for utilizing the Montoya Drain flows during the non-irrigation season (October – March). Plans are to use reverse osmosis and nano-filtration technology to reduce total dissolved solids levels (up to 2000 ppm) from the Montoya Drain to augment potable supplies. Consequently, the removal of sodium from the brine may render what has normally been a reverse osmosis waste product into a viable soil amendment that is rich in calcium and magnesium. This would eliminate the disposal costs associated with brine production as the “useful” salts would be discharged directly into the existing irrigation works of the Rio Grande Project. If this pilot study proves successful, a full sized production plant may be installed at the existing Canal Street surface Water Treatment Plant. This work has been on hold while the EPWU-PSB has concentrated on repair and upgrades to their infrastructure since the flooding in 2006. A second option would be to discharge the brine into the river channel in the downtown area. This concrete channel is essentially devoid of water except during storm events. The total amount of salts added to the river is insignificant (less than 0.5%) as compared to the salts generated by a single average storm event.

## **Reclamation's Water Conservation Field Services Program**

Through the Water Conservation Field Services Program, Reclamation provides cost-share funding and technical assistance to a number of water management entities in New Mexico and Texas. The Water Conservation Field Services Program seeks to promote water use efficiency through support of outreach efforts, research projects, and technical assistance to water users.

Reclamation continued to support conservation outreach aimed at increasing public and industrial awareness of water issues during 2010, and also completed a water conservation plan for Santa Fe County. Funding was used to promote the nation's largest xeriscape conference, as well as for irrigation water management workshops that were co-sponsored by Reclamation, the New Mexico Office of the State Engineer, and the New Mexico Water Conservation Alliance. The New Mexico Association of Conservation Districts provided funding to support the Rolling Rivers Educational Trailers throughout New Mexico. Outreach demonstrations are generally held at the State and County Fairs, public and private schools, teacher workshops, water conferences, and other outreach activities. Funding was provided for children's water festivals in Albuquerque, Santa Fe, Artesia, Carlsbad, Lovington, and Las Cruces, and to the Waste-Management Education and Research Consortium for workshops and community water training. Reclamation has provided funding to the Arch Hurley Conservancy District through the Water

Conservation Field Services Program, as well as the 2009 Water Smart Initiative, to apply sodium bentonite to areas along the main canal to reduce water loss due to poor soil conditions. Construction will begin after irrigation season.

The Village of Tijeras and Rio Rancho Public Schools received grants to write Water Conservation Plans. The Office of the State Engineer received a grant to develop a Regional Water Conservation Planning Guidebook.

## **Upper Rio Grande Water Operations Model**

The Upper Rio Grande Water Operations Model (URGWOM) is a set of daily time step, river-reservoir models for the Upper Rio Grande basin that utilize a numerical computer modeling software (RiverWare) developed by the Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) at the University of Colorado at Boulder. URGWOM is capable of simulating the river and reservoir hydrology, water accounting, and operational policy on the Rio Grande from the Colorado-New Mexico state line to Elephant Butte Reservoir in New Mexico. URGWOM also models flood control operations from Elephant Butte Dam to American Dam, which is located in El Paso, Texas. The URGWOM models are used in flood control operations, water accounting, and for the evaluation of short- and long-term water operation alternatives.

Since 2002, the URGWOM accounting model has been the primary tool used by Reclamation for San Juan-Chama and Rio Grande Compact accounting. The Nambé Falls Accounting Model was added to the Accounting Model workspace in 2008, but was not linked to the rest of the model, and continued to be operated as a separate model independent of the main URGWOM Accounting Model through 2010. URGWOM's water operations module was used to develop the 2010 Middle Rio Grande Annual Operating Plan, and to compute operational scenarios for the Middle Rio Grande Biological Assessment.

URGWOM development during 2010 continued to concentrate on the connectivity of RiverWare to other applications for preparation of reports and data transfer to other applications, application of new methods for modeling the groundwater and surface water interactions within the middle valley, continued improvement, documentation and clean-up of the water operations ruleset, and improvements to the Accounting Model and Hydrologic Database (HDB) interface.

Application of the newly developed functionality in Riverware to present information similar to the Reclamation "Greenbook" was initiated in 2010. The URGWOM Technical Team and Sandia National Laboratory continued to work cooperatively during 2010 on refinements of a monthly time step model (URGSIM) using the Sandia Powersim simulation software. In the process of performing validation work on URGSIM, potential deficiencies in the ET Toolbox computations used by URGWOM were discovered and analyzed, and need to be studied rigorously for acceptance and improvement.

Planned work for 2011 will concentrate on continuing the implementation of the many new improvements and capabilities of RiverWare in URGWOM. These include improvements to the

user interface and model run setup, the shallow groundwater - surface water interaction simulation capability and river evaporation methods, and improvements to the Daily Water Operations Model to better simulate daily water operations, including meeting in-stream flow targets and functionality for daily use. Modeling work is also scheduled for the new Middle Rio Grande water operations and river maintenance consultation. The Accounting Model improvements and documentation that were completed in 2007 have improved reporting efficiency and accuracy in 2008 through 2010. Additional work to improve data storage, security, and reporting efficiency are also anticipated to complement work done in 2010.

As there is currently no policy dependency between the Nambé Falls Accounting Model and the main URGWOM Accounting Model, linking the two portions of the model may not be practical. The Nambé Falls network is now contained within the main URGWOM Accounting Model, which is sufficient until a confirmed need arises for such linkage. Due to the lack of data in the Nambé Falls portion of the model, a linkage could stop or limit running of the main URGWOM Accounting Model.

Additional information about URGWOM and the RiverWare modeling software can be found at the Corps of Engineers' web site: <http://www.spa.usace.army.mil/urgwom/default.asp>.

## **Water Accounting Reports Projects**

### **2010 San Juan – Chama Project Water Accounting**

The 2010 San Juan – Chama Project water accounting was accomplished using version 6.0.2 of the RiverWare modeling system software and the URGWOM accounting module. All accounting data and information is stored directly in the final version of the 2010 accounting model. Reclamation held monthly meetings with representatives of the New Mexico Interstate Stream Commission and the U. S. Army Corp of Engineers, Albuquerque District, to verify accounting data entered for the previous month. Monthly resolution of accounting data minimized year-end data quality and accounting concerns.

### **Excel<sup>®</sup> Based Water Accounting Spreadsheet**

Reclamation no longer maintains the Microsoft Excel<sup>®</sup>-based San Juan – Chama accounting spreadsheet.

### **Water Accounting Documentation**

All accounting methods are documented directly in the RiverWare<sup>®</sup> URGWOM accounting module.

### **2010 San Juan – Chama Water Accounting Reporting**

The 2010 San Juan - Chama water accounting reporting, the Annual Water Accounting Report, was produced using Crystal Reports<sup>®</sup> and the Albuquerque Area Office's Hydrologic Database (HDB).

## **Oracle® Hydrologic Database (HDB)**

The Hydrologic Database (HDB) is a specialized relational database for storing and recovering hydrologic data used by Reclamation in the management of river and reservoir systems. A generalized version of HDB was specifically developed for Reclamation use with RiverWare® models. HDB is an Oracle® relational database application, and includes connections to data sources such as Reclamation's Hydromet, DOMSAT, DSS, and models such as RiverWare. HDB was originally developed at the University of Colorado, Center for Advanced Decision Support for Water and Environmental Systems (CU-CADSWES). Reclamation's Albuquerque Area Office HDB instance is now maintained by contract with Sutron Corporation. HDB has been customized by independent Reclamation consultants and Reclamation offices for specific office and model requirements. HDB is currently used by Reclamation's Upper and Lower Colorado Regional Offices for joint management of the Colorado River. Several other Reclamation offices, including the Albuquerque Area Office (AAO) and the El Paso, TX, office, depend on HDB installations for the purposes of data storage and retrieval. The AAO instance of HDB is located in the Salt Lake City Regional Office.

Development of water accounting and reporting functionalities for the AAO's HDB installation continued during 2010. Water accounting data is now directly transferred from the RiverWare URGWOM Accounting Model to HDB via a new HDB/RiverWare Direction Data Connection interface. Further improvements to DECODES, the Computation Processor, the Calculation Application, Compedit, and the MetaData Application were accomplished to improve data storage and availability in 2010.

Planned work for 2011 includes continued work on DECODES, the Computation Processor, the Calculation Application, Compedit, and the MetaData Application. Additional Crystal Reports (Version 2008) accounting table reports for internal use and external reporting will also be developed. Easy Street's EasyView software is under review for possible adoption as a Crystal Reports report viewer.

## **RiverWare®**

The use of the new RiverWare® URGWOM Accounting Module Data Objects allow for all accounting and accounting report table data to be derived within and acquired directly from the RiverWare® based URGWOM Accounting Module. The URGWOM Accounting Module Data Objects easily allow Reclamation, the USACE, and the NMISC to check the current status of individual or multiple accounts, transfers, and storage.

Numerous improvements to RiverWare® were accomplished during 2010 through multiple contracts (Reclamation and USACE) with the Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) at Colorado University-Boulder, Colorado. The improvements are documented in the annual report produced by CADSWES and distributed to the user community at the February 2011 annual meeting.

## **Evapotranspiration (ET) Toolbox Decision Support System**

Reclamation and others have determined a need for rapid improvement in measuring and

predicting both daily open water evaporation, and daily riparian and crop water use in the Rio Grande Basin. Reclamation has developed an ET Toolbox for estimating these daily water use requirements at a resolution useful for implementation in URGWOM.

The primary purpose of the ET Toolbox project is to supply water managers within and outside of Reclamation with accurate, real-time ET predictions via a dedicated website, while making the real-time ET dataset (daily riparian and crop water use estimates, open water evaporation estimates, and rainfall estimates) available to URGWOM for daily water operations model runs. The ET Toolbox is an extension of Reclamation's Agricultural Water Resources Decision Support (AWARDS) system that provides Internet access to high-resolution rainfall and daily crop water use estimates for improving the efficiency of water management and irrigation scheduling. The initial development work focused on the middle Rio Grande area from Cochiti Dam to San Marcial, which is just south of the Bosque del Apache National Wildlife Refuge in New Mexico. ET Toolbox coverage has now been extended to Elephant Butte Reservoir. ET currently accounts for an estimated 67 percent of the water depletions over this reach of the Rio Grande, including riparian vegetation, irrigated crops, and open water/wet sand evaporation.

The ET Toolbox model processes and predictions are highly dependent on local farm weather station data feeds. Other remote forms of data acquisition are under study, but for the near term significant resources are necessary to update and maintain the data collection and telemetry platforms that feed critical hourly weather data to the Toolbox.

The ET Toolbox daily rainfall and water depletion predictions for the Rio Grande are available to users and water managers via the Internet at the URL <http://www.usbr.gov/pmts/rivers/awards/Nm2/riogrande.html>.

Development in 2010 focused on a review of ET estimation methods, maintaining data availability, and improving delivery of ET and related information. A number of new pages were completed in 2010. Links to these pages, some of which are still under development, are available from the ET Toolbox home page (above), by clicking on the links under the heading "**Stream Flow Data Under Development:**"

The ET Toolbox estimation method may be changed for 2011 as a result of continuing analyses.

## **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, water rights settlements, cooperative ventures with other federal agencies, and special projects funded through Congressional legislation.

As part of Reclamation's Native American and other programs, assistance was given to various Pueblos to improve irrigation system efficiency. Some of the items funded or purchased included concrete lining of farm ditches, terracing, laser leveling, check structures, pipes, and turnouts. Reclamation is working with the U.S. Department of Agriculture, Natural Resources

Conservation Service (NRCS), on additional irrigation improvements at several Pueblos. Reclamation is also working with the Bureau of Indian Affairs (BIA) on irrigation system improvements for Middle Rio Grande Conservancy District facilities on lands of the six Middle Rio Grande Pueblos. The BIA is providing funding which is being passed through to these six pueblos via Reclamation contracts.

The Omnibus Public Land Management Act of 2009, Public Law 111-11, authorized up to \$4,000,000 in federal appropriations to conduct a study of the eighteen Rio Grande Pueblos' irrigation infrastructure. The focus will be to obtain increased water efficiency through infrastructure improvements. Construction is authorized up to \$6 million per year through Fiscal Year 2019, not to exceed \$60 million. In Fiscal Year 2010, Congress did not appropriate any funding to accomplish either the study or construction. The study cannot begin until Congress appropriates funds. However, Reclamation has begun working with the eighteen pueblos by entering into contracts with the pueblos and providing limited funding to do some project identification and prioritization.

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 the implementation of the Aamodt (Pojoaque, Nambe, Tesuque, and San Ildefonso Pueblos) settlement. Reclamation will be working with the Bureau of Indian Affairs, the Pueblos, the State of New Mexico, and other involved parties in carrying out the provisions of these settlements.

Work proceeded on a negotiated settlement of the Abousleman adjudication on the Rio Jemez involving Jemez, Zia, and Santa Ana Pueblos.

## **Emergency Drought Program**

Congress provided supplemental appropriations in Fiscal Year 2007 for emergency drought relief in the Reclamation states. In the Rio Grande basin, Reclamation, through an interagency agreement with the U.S. Indian Health Service, is providing drought relief by providing drinking water wells for the Pueblos of Acoma, Nambe, Isleta, and San Felipe. Acoma Well #8 was completed in May 2009. A contract was signed with Saigan Construction for the drilling of the Nambe Buffalo and San Felipe East Side Wells, with a total contract amount of \$660,062.75.

Wells for Eunice, Hagerman, and Brazos in New Mexico were completed in 2009. Wells for Carlsbad, Wildlife West, Colonias, and Cannon were completed in 2010. The Cannon Well was abandoned due to insufficient water bearing strata.

The Regina and Capitan Wells will be drilled in FY 2011. The wells for Capitan and Cannon are "re-drills" due to the poor quality of water and other issues at the previous wells. Reclamation provided funding for the previous wells at Capitan and Cannon.

## Quagga and Zebra Mussel Update

In January 2007, an employee with the National Park Service at Lake Mead, NV, discovered the first quagga mussel in the western United States. The mussels were likely transported to the west via a contaminated boat from an eastern state. Since that time, mussels have expanded their range throughout many western states, including all states bordering New Mexico.

For the past two years, Reclamation's Albuquerque Area Office has been monitoring six reservoirs (Heron, El Vado, Elephant Butte, Caballo, Sumner, and Brantley) for the presence of quagga and/or zebra mussels. The American Recovery and Reinvestment Act (ARRA), along with funding obtained from the Upper Colorado Regional Office, paid for monthly sampling at the six reservoirs. Different sampling sites are established at each reservoir pool; water quality data along with water samples are collected and shipped to Reclamation's Denver Laboratory for analysis. Microscopic analysis is performed utilizing a set protocol to determine if adult or juvenile (veliger stage) mussels are present. If an invasive mussel in any stage is discovered, additional water samples are collected for both microscopic and Polymerase Chain Reaction (PCR) analysis. At this time, New Mexico does not have a confirmed mussel-contaminated body of water.

To help keep mussels out of New Mexico's waterways, Reclamation, along with New Mexico State Parks (NMSP) and New Mexico Department of Game and Fish (NMDGF), have been working together to prevent the spread of aquatic invasive species through public education and outreach, which includes the following:

- With the assistance of NMSP and NMDGF, Reclamation distributed 2,000 brochures and 1,500 posters to sporting goods shops, convenience food stores, libraries, and other locations to provide information and knowledge on inspecting, cleaning, and drying boats and trailers to prevent the spread of mussels.
- Through ARRA funding Reclamation, has made and posted metal signs around boat launch sites and marinas to remind the public to clean, drain, and dry boats and associated equipment to prevent the spread of aquatic invasive species.
- Reclamation funded the hiring and training of temporary staff to assist NMSP with inspections at key boating reservoirs within the state.
- Reclamation purchased three mobile decontamination units; one is permanently assigned to Elephant Butte Reservoir, one is available for the Chama River area, and the third unit is in the Pecos River basin area.
- State and Federal employees are being trained to perform watercraft inspections (Level 1) and decontamination procedures (Level 2).

To protect Reclamation's facilities, the following work has been completed:

- Reclamation developed a Technical Memorandum, *Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species*, (2010, No. 86-68220-07-05).
- An action plan for Elephant Butte entitled, *Elephant Butte Field Division Action Plan for Prevention and Rapid Response of Dreissenid Mussels*, was developed.

- Facility Vulnerability Assessments have been developed for seven Reclamation reservoirs within New Mexico (Heron, El Vado, Elephant Butte, Caballo, Sumner, Brantley, and Avalon).

## Non-Federal Hydroelectric Power Development

The Administration would like to increase America's renewable energy resources. The Town Sites and Power Development Act of 1906 and the Reclamation Project Act of 1939 (1939 Act) authorize Reclamation to enter into lease of power privilege contracts with non-Federal entities to use Reclamation facilities for electric power generation consistent with Reclamation project purposes. Reclamation recently made available to the public the *Hydropower Resource Assessment at Existing Reclamation Facilities Draft Report*. The draft report indicates that it may be economically feasible to develop the hydropower potential at Caballo Dam.

The Albuquerque Area Office (AAO) has received several inquiries from private power developers and two New Mexico public utilities who may be interested in developing non-federal hydropower at Caballo Dam and/or in conjunction with San Juan-Chama Project (SJCP) facilities. A notice will be published in the Federal Register for each lease of power privilege opportunity that Reclamation offers to ensure fair and open competition through a public process.

Powerplant construction, operation, and maintenance must not interfere with operation and maintenance of Reclamation Projects (including water deliveries for irrigation, municipal and industrial, and domestic purposes and compliance with Rio Grande Compact and international treaty requirements); jeopardize water rights, water quality, Federal power sales and deliveries, or environmental commitments; or create any safety or security problems. Reclamation is not responsible for the economic and technical feasibility of the lessee's facility. The lessee will be required to compensate Reclamation and/or other Project users for any interruptions to operations at Reclamation facilities due to the operations and maintenance of the lessee's facilities.

The potential lessee is responsible for state and Federal environmental planning and certification, and for the design, construction, operation and maintenance of the powerplant facilities and any transmission facilities required. The Federal Energy Regulatory Commission (FERC) has concurred with Reclamation's determination that Reclamation has jurisdiction over development of hydropower at Caballo Dam. The lessee is required to provide, in advance of expenditures, the necessary funding to cover all Reclamation costs related to the development, construction, operation, maintenance, and security of the lessee's power facilities and any related administrative costs.

Title to Reclamation Project facilities, and any modifications to those facilities, remains with the United States. Title to any installed powerplant facilities is with the lessee, unless legislated or contracted otherwise.