

# RECLAMATION

*Managing Water in the West*

## Calendar Year 2007 Report to the Rio Grande Compact Commission

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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.

Cover photo – Installation of Bendway Weirs to prevent bank erosion at the Sandia priority site.

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# Introduction

The Albuquerque Area Office of the Bureau of 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 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 1996.

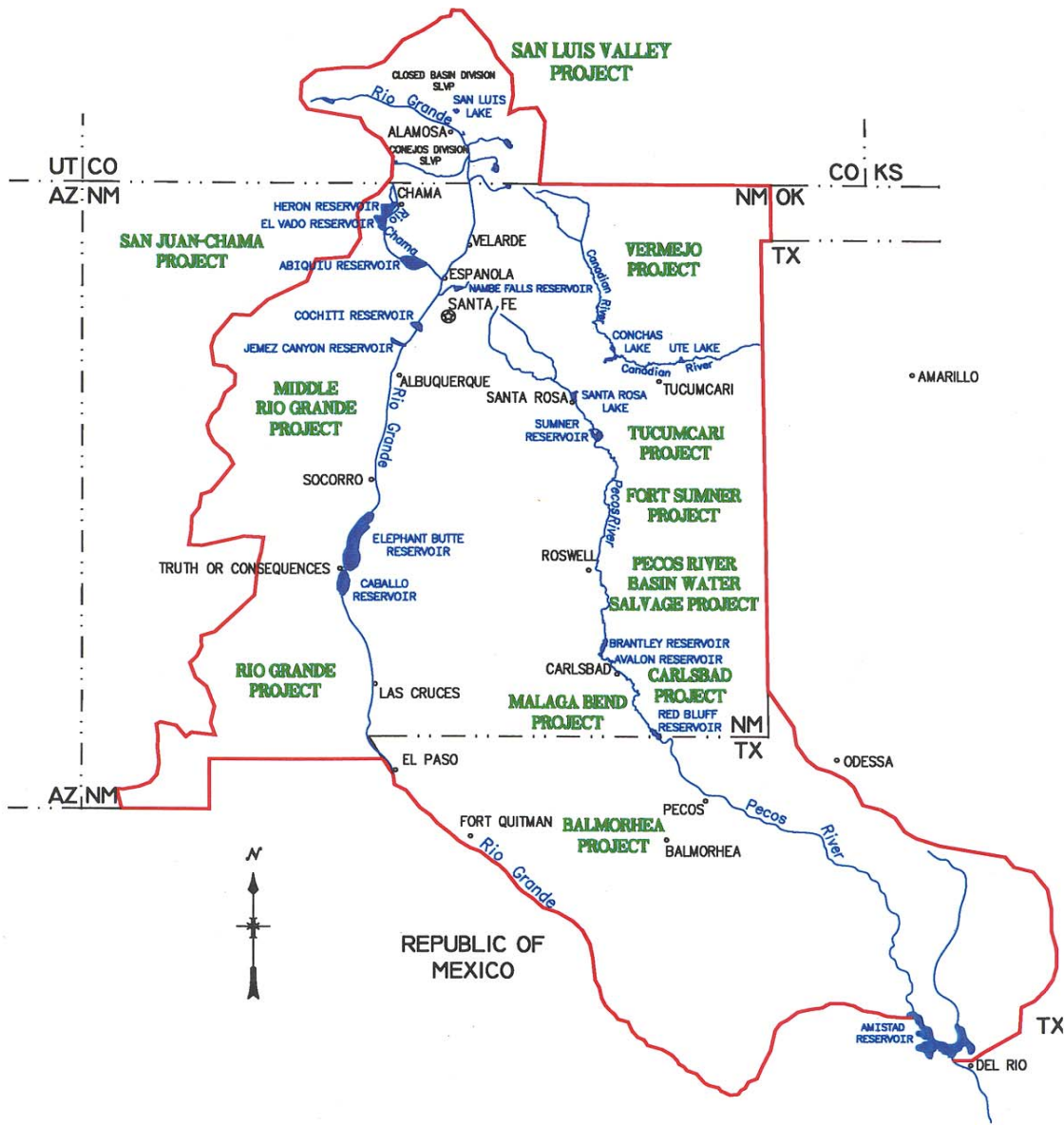


Figure 1: Project Map of Reclamation's Albuquerque Area Office

# San Luis Valley Project, Colorado

## Conejos Division, Platoro Reservoir

The Conejos Water Conservancy District (CWCD) operates Platoro Reservoir, which provides storage and flood control for the Conejos portion of the San Luis Valley Project. The District office is at 318 Main Street in Manassa, Colorado.

Platoro Reservoir began 2007 with an elevation of 9961.64 feet and a content of 9,376.5 acre-feet (af). It ended the year with an elevation of 9991.16 feet on December 31. A total of 18,773 af of re-regulated water was stored and released to the storing ditches; 5,876 af of project water was released for use, with 308 af of that total was attributed to evaporation for the year.

Reclamation and CWCD have not yet formalized a Memorandum of Understanding to clarify O&M responsibilities at Platoro Dam.

## Platoro Dam Facility Review and Safety of Dams Programs

In 2007, the following activities were implemented for Platoro Dam:

- The Comprehensive Facility Review (CFR) was completed in July of 2007.
- The Conejos Water Conservancy District, in collaboration with the Albuquerque Area Office and the Denver Technical Service Center (TSC), along with an outside hired contractor, have developed a plan for addressing O&M recommendation 1998-2-B 2001-2-C (recoating of the butterfly valves and also 400 feet of the downstream outlet works from the guard-gate). The water district plans on splitting the O&M into three separate phases. Phase I will focus on designing and installing a new bypass system, with Phases II and III to follow in years two and three. Tentative start date is fall of 2008.
- Conejos Water Conservancy District is still considering using Mix Lake as an option to help meet the downstream flow requirements of 7 cfs during the recoating work. The details of this proposal need to be worked out between the U.S. Forest Service and the Conejos Water District.
- The final CFR report is scheduled for completion in early spring of 2008.

## 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 transpiration. 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.

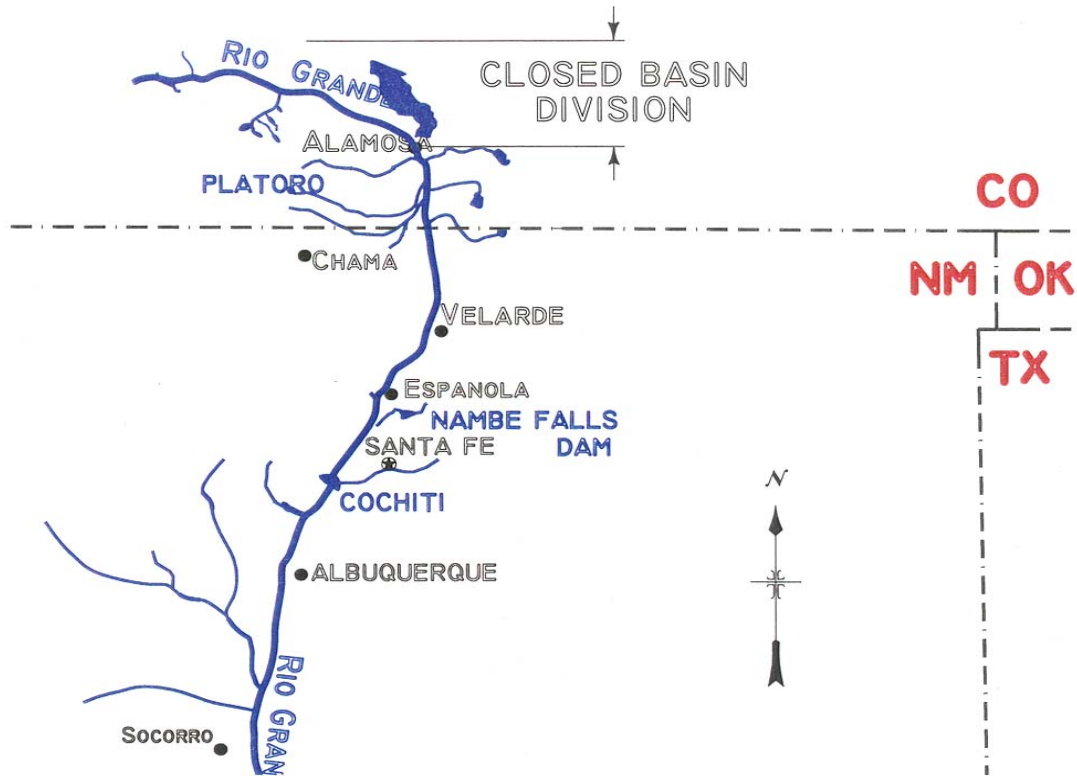


Figure 2: Area Map of San Luis Valley Project

## Closed Basin – Operations and Maintenance

### Operations

Closed Basin water deliveries in Calendar Year (CY) 2007 included deliveries to the Rio Grande, Blanca Wildlife Habitat Area, Alamosa National Wildlife Refuge, and San Luis Lake for lake level stabilization.

A total of 18,814 AF of project water was delivered in CY 2007. Total deliveries of Compact water to the Rio Grande for CY2007 were 15,038 AF.

Total water deliveries to the BLM Blanca Wildlife Habitat Area for CY2007 equate to 800 AF annual mitigation and 250 AF Division of Wildlife exchange.

Total water deliveries to the Alamosa National Wildlife Refuge for CY2007 were 2726 AF annual mitigation.

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 CY2007 totaled 1657.9 AF. Deliveries were made to SLL for the purpose of stabilizing the lake.

Closed Basin Division water accounting for the 2007 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		
	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	1845	1845	0	0	0	0	1845	1845	0
FEB	0	0	0	1255	1255	70	68	0	138	1117	1117	0
MAR	56	67	123	1087	1087	137	156	296	589	498	498	0
APR	0	0	0	1337	1337	0	65	24	89	1248	1248	0
MAY	0	0	0	1305	1305	0	281	0	281	1024	1024	0
JUN	6	12	18	1444	1444	0	0	0	0	1444	1444	0
JUL	106	197	303	1372	1372	0	0	0	0	1372	1372	0
AUG	118	176	294	1478	1478	0	0	0	0	1478	1478	0
SEP	111	183	294	1367	1367	120	188	227	535	832	832	0
OCT	7	11	18	1722	1722	373	131	518	1022	700	700	0
NOV	0	0	0	1751	1751	0	0	72	72	1679	1679	0
DEC	0	0	0	1801	1801	0	0	0	0	1801	1801	0
ANNUAL	404	646	1050	17764	17764	700	889	1137	2726	15038	15038	0

Note: The project total of Table 1 does not reflect the 441.8 acre foot delivery to San Luis Lake.

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.

At the recommendation of the Project Hydrologist some salvage wells were turned off due to continuing water level declines along the southeast boundary. SW001, SW007, and SW013 were turned off on April 7, 2007. SW014 was turned off on March 22, 2007. SW020 was turned off February 1, 2007. SW026 was turned off April 23, 2007. To offset the decrease in production the remaining salvage wells in Stage 1 and Schedule C are being operated at maximum capacity.

As of December 31, 2007, the project changed the operating frequency of all of the data radios. This change was necessary to comply with the new narrow band policy.

The 2006 annual report on vegetation monitoring within the project boundary summarized that an average of 2,628 acres within the project boundary indicated a significant decrease in vegetation from the pre-project baseline. Much of this amount is known to be attributed to factors other than project pumping. This amount is far less than the 8,460 acres that were predicted in the Final Environmental Impact Statement, and subsequently mitigated. An average of 803 acres within the project boundary indicated significant increase in vegetation from the pre-project baseline.

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. Reclamation received an excellent rating through the 2007 QA/QC program.

## **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 six (6) replacement wells were drilled in 2007. These replacement salvage wells ranged from 100 gallons per minute (gpm) to 500 gpm. These wells use a different well screen design and gravel pack style, and they show that the re-drills have been very successful for the project and the commitment to the Rio Grande Compact, the Alamosa National Wildlife Refuge, and the Blanca Wildlife Habitat Area. A total of 47 salvage wells have been re-drilled from 2002 to 2007.

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 2008 rehabilitation efforts. Annual preventive maintenance of salvage wells is ongoing as well as maintenance on the lateral valves.

Equipment has also been updated with two brush hog mowers and tractor, and an enclosed equipment trailer.

## **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 2007.

In addition to the standard water quality parameters, dissolved oxygen, nitrogen, and carbon dioxide continue to be monitored to assist canal grass carp survival studies and dissolved nitrogen reduction endeavors. This work is conducted in cooperation with Reclamation's Denver Technical Service Center personnel.

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.

The laboratory has the capability to culture and identify "iron related bacteria" to support salvage well rehabilitation and bio-fouling mitigation efforts. All salvage wells are currently monitored for the presence of these bacteria.

The laboratory has acquired a scanning double-beam spectrometer for the ultraviolet and visible spectral ranges (UV/Vis). This instrument will increase the laboratory's capability to quantify molecules, inorganic ions, and complexes in solution. The UV/Vis also has the capability of handling a wide range of samples including solids, pastes, and powders.

The laboratory has acquired an automated mercury preparation system. This instrument has the capability to fully automate the sample preparation for mercury analysis. This automation reduces chemical exposure for the technician, and allows for better reproducibility in analysis.

### **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 erosion to the berms from large precipitation events, and assisting Reclamation personnel in maintaining equipment. RGWCD continued its involvement in the ground water 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. Six wells have been replaced during 2007 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 2007. 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 in Figure 3.

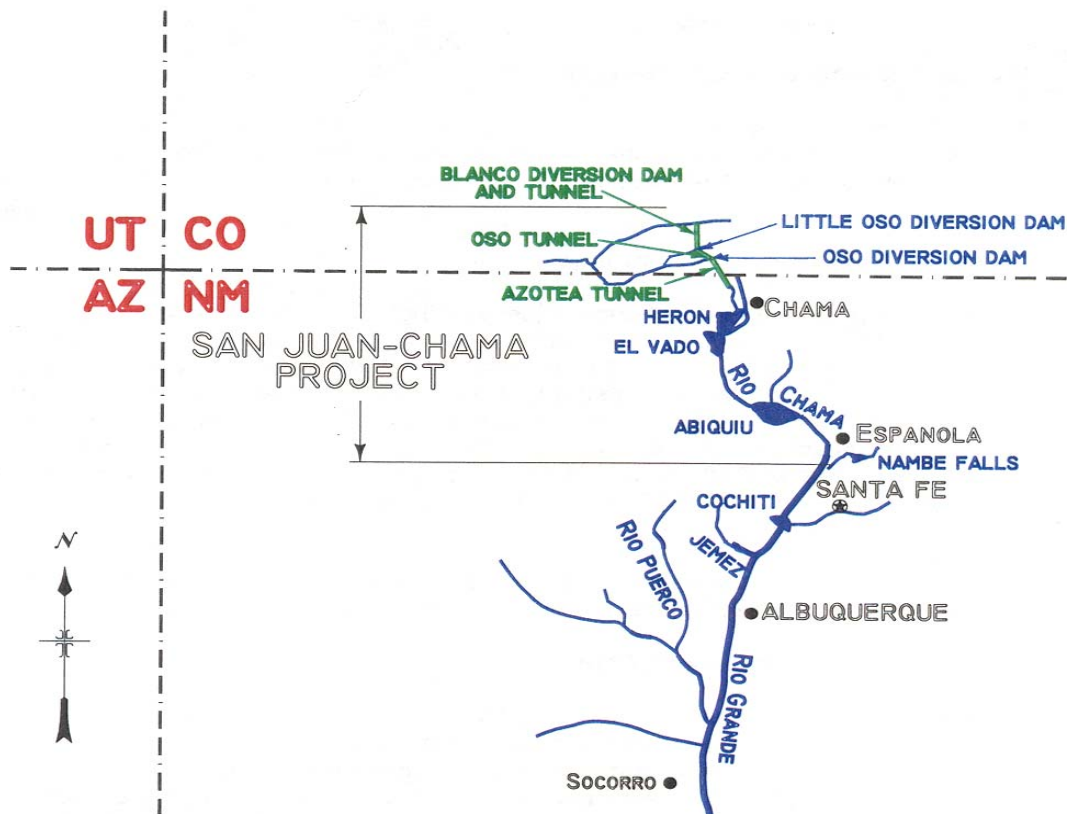


Figure 3: Area Map of the San Juan-Chama Project

## San Juan-Chama Diversion Dams

Work on the diversion dams included operation and maintenance of Blanco, Oso and Little Oso diversion dams and the associated tunnels. The Azotea Tunnel Repair contract was awarded in September, 19, 2007 for the Phase II repair work. Notice to proceed was issued for the contract on October 17, 2007. The Contract was award to DLM Enterprises of Albuquerque New Mexico. The Contract consisted of repairing a total of 16,000 feet of tunnel invert from Stations 920+00 to 1080+00. Work consists of placing 400 cubic yards of concrete for tunnel invert repair. Work is expected to be completed by March 1, 2008.

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.

## Heron Dam and Reservoir Operations

Diversions into the Azotea Tunnel began on February 21, and ended on October 1 during 2007. The total volume diverted through the tunnel was 105,086 ac-ft. The running 10-year average Azotea Tunnel diversion decreased slightly this year, from 89,909 ac-ft for the period 1997 through 2006 to 86,189 ac-ft for the period 1998 through 2007 (Table 2). Heron Reservoir began the year at an elevation of 7,140.76 ft (183,406 ac-ft) and finished the year at an elevation of 7,144.33 ft (196,689 ac-ft) Heron's lowest pool elevation and storage occurred on March 9, at elevation 7,134.99 ft (162,305 ac-ft). Storage peaked on August 10 at an elevation of 7155.20 (242,023 ac-ft)

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

Azotea											
MONTH	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	10 YEAR TOTAL
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
JANUARY	0	0	0	0	0	0	0	0	0	0	0
FEBRUARY	0	0	0	0	0	0	0	93	0	179	272
MARCH	2329	4152	536	1512	743	1170	11505	1931	706	12976	37560
APRIL	11516	12516	15864	19284	4499	11366	15427	31721	17799	17745	157737
MAY	41822	32806	20987	51092	865	26613	30164	45146	25674	33838	309007
JUNE	28598	39659	5019	29283	204	18816	20390	50210	7600	26679	226458
JULY	8846	12734	106	4643	0	669	2139	13347	3785	4302	50571
AUGUST	1668	13019	229	4455	0	487	237	3779	4868	7375	36117
SEPTEMBER	153	4015	0	313	0	3340	1973	3360	5567	1948	20669
OCTOBER	200	0	0	0	0	246	1821	4873	12795	33	19968
NOVEMBER	1188	0	0	0	0	0	1218	735	0	0	3141
DECEMBER	381	0	0	0	0	0	12	0	0	0	393
ANNUAL	96701	118901	42741	110582	6311	62707	84886	155195	78794	105075	861893
										TEN YEAR AVERAGE =	86189

The SJ-C contractors' 2007 and waived 2006 annual allocations were delivered as shown in Table 3, for a total delivery in 2006 of 83,771 ac-ft. The remaining 2007 allocations are being held in Heron according to waivers which grant an extension for the delivery date for several contractors into 2008. Table 4 presents actual monthly Heron water operations for the 2007 calendar year.

The February 2008 most probable streamflow forecasts at both Blanco Diversion on the Rio Blanco and Oso Diversion on the Navajo River are 162% and 152% of the 30 year average respectively. Heron inflow during the snowmelt runoff is projected to be 150,000 ac-ft based on preliminary model runs using the Natural Resources Conservation Service's February 1 streamflow forecast. Based on this same model run and forecast, Heron Reservoir is projected to achieve a maximum storage of 300,000 af during 2008. Reclamation will maximize diversions as water becomes available.

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

SJ-C Heron Rel	MARGCD	SANTA FE	COCHITI	CITY OF ALBUQUERQUE	POJO-AQUE UNIT	TAOS	COUNTY OF LOS ALAMOS	CITY OF ESPANOLA	TWINING SANITATION	VILLAGE OF LOS LUNAS	TOWN OF BERNALILLO	BELEN	RED RIVER	JICARILLA APACHE	SAN JUAN PUEBLO	UNCONTRACTED	TOTAL
MONTH	20900	5605	5000	48200	1030	400	1200	1000	15	400	400	500	60	6500	2000	2990	96200
JANUARY	0	0	1815	10436	0	0	0	115	5	101	0	44	0	0	0	0	12516
FEBRUARY	0	0	1203	7627	0	0	0	0	0	0	0	0	0	0	0	0	8830
MARCH	0	368	1548	4205	0	0	0	0	0	0	0	0	0	0	0	0	6121
APRIL	0	2987	0	0	0	400	0	36	0	256	400	199	0	0	0	0	4278
MAY	0	0	0	130	0	0	0	0	0	0	0	0	0	0	0	0	130
JUNE	0	0	0	3683	0	0	0	0	0	0	0	0	0	0	0	0	3683
JULY	0	0	0	2146	0	0	0	0	0	0	0	0	0	0	0	0	2146
AUGUST	0	0	0	5540	0	0	0	0	0	0	0	0	0	0	0	0	5540
SEPTEMBER	0	0	0	12711	0	0	0	0	0	0	0	0	0	0	0	0	12711
OCTOBER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NOVEMBER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DECEMBER	20900	1	1226	4394	1010	0	0	144	4	107	0	30	0	0	0	0	27816
2007 CY Total	20900	3356	5792	50872	1010	400	0	295	9	464	400	273	0	0	0	0	83771

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

Heron Storage	INFLOW		OUTFLOW		SAN	END-OF-MONTH CONTENT			ELEVATION (FEET)
	RIO GRANDE	SAN JUAN CHAMA	RIO GRANDE	SAN JUAN CHAMA	JUAN CHAMA LOSS	RIO GRANDE	SAN JUAN CHAMA	TOTAL	
MONTH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DEC. 2006						-33	183065	183032	7140.76
JANUARY	834	0	98	12516	0	703	170549	171252	7137.54
FEBRUARY	1481	179	85	8830	0	2099	161898	163997	7135.48
MARCH	7092	12950	9297	6121	0	-106	168727	168621	7136.80
APRIL	1132	17710	341	4278	409	685	181750	182435	7140.60
MAY	650	33770	1335	130	0	0	215390	215390	7148.98
JUNE	112	26626	112	3683	1682	0	236651	236651	7153.98
JULY	818	4293	118	2146	1621	700	237177	237877	7154.26
AUGUST	273	7360	470	5540	964	503	238033	238536	7154.41
SEPTEMBER	194	1948	560	12711	1238	137	226032	226169	7151.55
OCTOBER	114	33	114	0	1265	137	224800	224937	7151.26
NOVEMBER	110	0	110	0	551	137	224249	224386	7151.13
DECEMBER	150	0	31	27816	0	256	196433	196689	7144.33
SUB-TOTAL	12960	104869	12671	83771					
ADJUST.						-350 (A)			
ANNUAL		117829		96442	7730	-94	196783	196689	

## Heron Dam Facility Review and Safety of Dams Programs

The following work was completed for Heron Dam during 2007:

- Facility Reliability Rating.
- Annual Emergency Action Plan Review, Drill, and Communication Directory Update.
- 2007 Comprehensive Facility Review (CFR) civil examination.
- 2007 Visual Land Slide Survey.
- 2007 Dam Safety Advisory Team (DSAT) meeting.
- The 2007 CFR identified additional O&M recommendations
- 2007 Heron Dam Security Risk Assessment Comprehensive Security Review (CSR).

## Pojoaque Tributary Unit - Nambé Falls Dam and Reservoir

Nambé Falls began 2007 with the reservoir at elevation 6,816.46 ft providing a storage volume of 1,394 ac-ft. During the winter, releases averaged around 1 ft<sup>3</sup> to maximize conservation storage as agreed to by the Pojoaque Valley Irrigation District and Indian water users. The reservoir filled and spilled in 2007. The maximum elevation for the year was 6,826.81 ft (1,932 ac-ft) on June 11. The reservoir filled on March 16 and remained full until July 7 when irrigation releases began and reservoir storage and elevation started falling. Nambé Falls Reservoir ended 2007 at elevation 6,816.95 ft (1,417 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 ft is reached. Once an elevation of 6,825.60 ft is attained, the outlet gates are regulated weekly to stabilize the reservoir at 6,825.60 ft, or an elevation determined by 100 percent ice cover. An uncontrolled spill begins at elevation 6826.6 ft, 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 990 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 during December 2007. Table 5 provides a summary of Nambé Falls use above Otowi and the Pojoaque Unit return flow credit used to calculate depletions during 2007. A summary of 2007 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 @ 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	12516	0	0	12516	-9709	163	197	22	2469
FEBRUARY	8830	0	0	8830	-7344	111	224	20	1171
MARCH	6121	0	0	6121	-4282	84	116	18	1657
APRIL	4278	0	0	4278	-3886	51	19	17	339
MAY	130	0	0	130	-474	-2	17	15	-344
JUNE	3683	0	0	3683	1333	86	17	8	4921
JULY	2146	0	1523	3669	1111	83	85	3	4615
AUGUST	5540	0	305	5845	-2990	90	80	48	2733
SEPTEMBER	12711	3183	541	10069	-8190	128	65	69	1755
OCTOBER	0	0	2053	2053	-1234	30	59	60	790
NOVEMBER	0	0	832	832	-986	8	196	28	-330
DECEMBER	27816	24391	0	3425	-465	64	248	25	2673
ANNUAL	83771	27574	5254	61451	-37116	896	1323	333	22449

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

NF Monthly	INFLOW	OUTFLOW				RESER. LOSSES	TOTAL OUTFLOW + LOSSES	END OF MONTH		RELEASE AF from Table "Daily Res. Comps" BLUE BOOK	Mass Bal. Check
		BY PASSED	STORAGE	RELEASE	IRRIG.			CONTENT	ELEVATION		
MONTH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
DEC. 2006							1394	6816.46			
JANUARY	228	31	0	0	0	31	1591	6820.52	31	31	
FEBRUARY	261	37	0	0	-2	35	1817	6824.79	37	37	
MARCH	666	550	0	0	12	562	1921	6826.63	550	550	
APRIL	744	725	0	0	15	740	1925	6826.69	725	725	
MAY	2024	2007	0	0	12	2019	1930	6826.78	2007	2007	
JUNE	1703	1686	0	0	25	1711	1922	6826.64	1686	1686	
JULY	796	707	0	382	6	1095	1623	6821.15	1089	1089	
AUGUST	663	577	0	494	8	1079	1207	6812.23	1071	1071	
SEPTEMBER	302	232	0	331	8	571	938	6805.28	563	563	
OCTOBER	281	221	0	12	10	243	976	6806.33	233	233	
NOVEMBER	245	49	0	0	5	54	1167	6811.26	49	49	
DECEMBER	287	39	0	0	-2	37	1417	6816.95	39	39	
ANNUAL	8200	6861	0	1219	97	8177	1417	6816.95	8080	8080	

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

During 2007, Nambé Falls Dam had the following activities implemented or completed:

- Instrumentation drawings were rescheduled for completion in FY2008.
- The Comprehensive Facility Review was completed as scheduled in 2007, resulting in one new SOD and seven new Category two's with no Category one's.
- The Pojoaque Valley Irrigation District's (PVID) Nambé Falls dam tender completed the Dam Tender Security Training Workshop in 2007.
- The MOU concerning the water measurement agreement between PVID, the New Mexico Office of the State Engineer, and Reclamation is in place, with new equipment scheduled for installation this winter.
- The trash-rack repair is scheduled for October of 2008. The schedule changed a bit due to a funding allocation holdup.
- Reclamation's Denver Technical Service Center (TSC) is looking into changing surveying monitoring to a 6 year interval.
- TSC is also looking into instrumentation monitoring concerning access, safety, and funding.
- Foundation drains are scheduled for evaluation via video camera in March 2008.

## **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) are working with the U.S. Forest Service and the Bureau of Land Management on an EIS to address effects of the proposed Buckman Water Diversion Project. Reclamation is serving 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 Buckman FEIS and Record of Decision (ROD) are completed. The Notice of Availability for the ROD will be published in February, 2008. Forest Service appeal period is 30 days and BLM is 45 days; therefore any appeals during that time would affect the beginning date of the project. Construction may not begin until after appeals are settled if any.

Reclamation is assisting the City of Española, New Mexico with a potential drinking water facility that includes the conveyance of San Juan-Chama Project water from a point of diversion on the Rio Grande. A new Public Law (PL 108-354) was enacted that provides 25% federal funding for construction of a filtration facility and conveyance from a point of diversion (diversion structure). The Corps of Engineers, New Mexico Interstate Stream Commission, and the New Mexico Environment Department have additional funding from EPA and other federal sources for the City to construct the diversion structure. This funding triggers additional environmental review and compliance documentation. The project scope of work is being reviewed by the City and its consultants to consider an upgraded system that would provide water on a regional basis for several communities. The details of this project are in a new planning stage with the City of Española. Espanola Dykes FONSI and FEA were completed in 2005. The project subsequently was completed in July of 2006.

# 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.

## 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 below 400,000 ac-ft for much of 2007. 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.

During 2007 no Emergency Drought Water was captured by Reclamation for the benefit of the Middle Rio Grande Conservancy District under the Emergency Drought Water Agreement (EDWA) nor was any of Reclamation’s remaining Emergency Drought Water balance captured during 2007. The balance of Emergency Drought Water available for capture and storage by Reclamation and MRGCD during 2008 or later years is 16,479 ac-ft. Reclamation’s balance for use as supplemental water for endangered species is 4,934 ac-ft, and 11,546 ac-ft remains to be captured for the benefit of MRGCD.

Reclamation started 2007 with 9 ac-ft of Emergency Drought Water stored in El Vado Reservoir for use on behalf of listed endangered species. This small amount was due to late season accounting changes in 2006. The water was released for the benefit of the silvery minnow in June. MRGCD started 2007 with 10,895 ac-ft of Emergency Drought Water in El Vado Storage, and ended the year with a total of 10,578 ac-ft in storage.

## El Vado Dam and Reservoir Operations

El Vado reservoir began 2007 at an elevation of 6,854.03 ft (70,233 ac-ft) which was also the minimum level for the year. The reservoir peaked on May 22 at an elevation of 6900.25 (180,643 ac-ft). The reservoir finished the year at elevation 6887.54 (142,759 ac-ft).

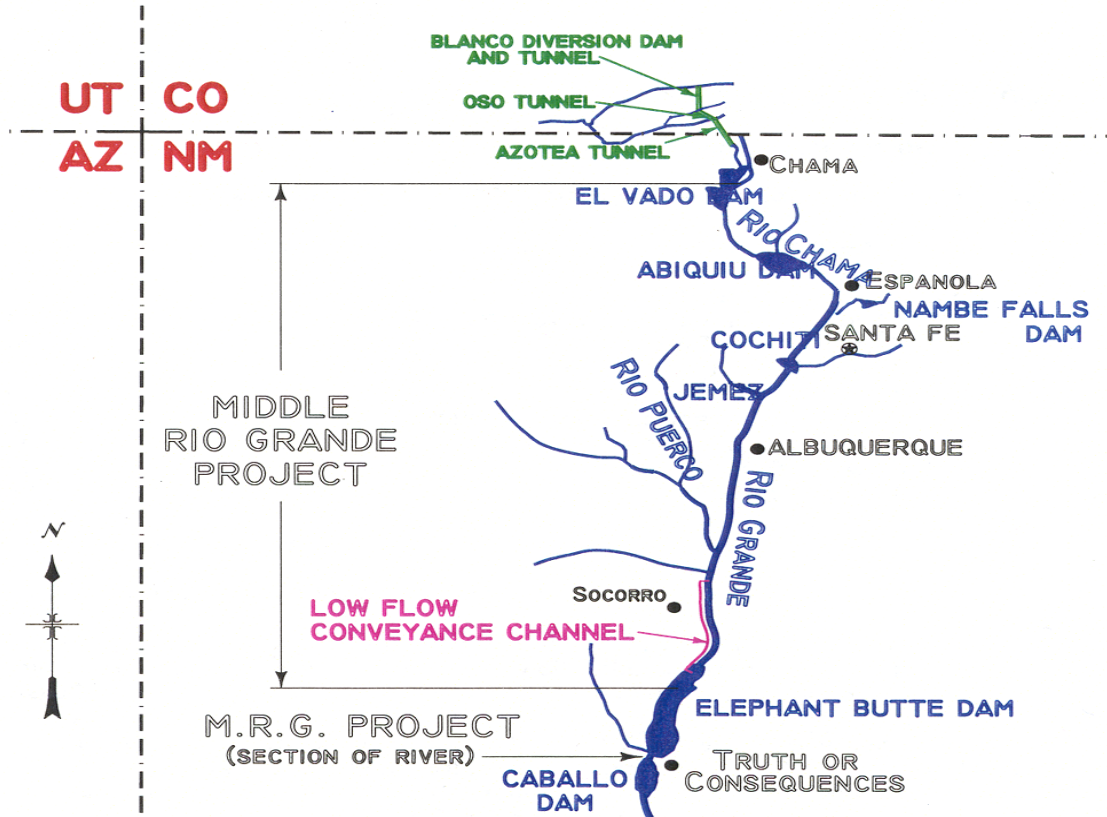


Figure 4: Area Map of the Middle Rio Grande Project

MRGCD began the year with 10,895 ac-ft of Emergency Drought Water, 35,580 ac-ft of general Rio Grande storage, and 21,898 ac-ft of SJ-C water in El Vado for Middle Valley irrigation. This was in addition to MRGCD's 20,900 ac-ft of 2007 SJ-C allocation in Heron, and a beginning year balance of 1,974 ac-ft of SJ-C stored in Abiquiu Reservoir. At the end of the year, MRGCD had 10,578 ac-ft of Emergency Drought Water, 88,805 ac-ft of general El Vado Rio Grande storage, and 40,680 ac-ft of SJ-C storage in El Vado reservoir. MRGCD also had 1,099 ac-ft of SJ-C stored in Abiquiu as of December 31, 2007.

Reclamation stored a total of 20,000 ac-ft for the Prior and Paramount needs of the six Middle Rio Grande Pueblos during 2007. 3,503 ac-ft of this water captured and stored while New Mexico was under storage restrictions required by Article VII of the Rio Grande Compact. The remaining 16,497 ac-ft of Prior and Paramount storage was captured outside of Article VII storage restrictions. Water captured outside of the Article VII storage restrictions reverted to the general El Vado Rio Grande account after the end of the irrigation season. A total of 3,383 ac-ft of water captured and stored for Prior and Paramount irrigation while under Article VII restrictions was released to Elephant Butte between November 7 and December 24.

The total SJ-C water in El Vado storage at the end of the year was 23,749 ac-ft. 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 Res. Op.	INFLOW		OUTFLOW		LOSSES		EOM CONTENT			RELEASE FROM STORAGE	
	RG	SJ-C	RG	SJ-C	RG	SJ-C	RG	SJ-C	TOTAL	RG	SJ-C
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		
DEC. 2006	3795	15036	7264	5320	84	4	46484	23749	70233	3469	-9716
JANUARY	3596	12516	54	12516	45	-14	49981	23763	73744	-3542	0
FEBRUARY	4166	8830	0	8830	0	0	54147	23763	77910	-4166	0
MARCH	36604	6121	313	6121	124	15	90314	23748	114062	-36291	0
APRIL	49924	4278	6101	4278	406	50	133731	23698	157429	-43823	0
MAY	88442	130	65238	130	488	42	156447	23656	180103	-23204	0
JUNE	18611	3683	23952	3683	995	107	150111	23549	173660	5341	0
JULY	5019	2146	25788	3669	589	92	128753	21934	150687	20769	1523
AUGUST	4513	5540	20688	5846	251	103	112327	21525	133852	16175	306
SEPTEMBER	3165	12711	11786	10069	276	2222	103430	21945	125375	8621	-2642
OCTOBER	4084	0	4324	2053	325	89	102865	19803	122668	240	2053
NOVEMBER	1407	0	3071	832	207	34	100994	18937	119931	1664	832
DECEMBER	5099	27816	6641	3425	69	-48	99383	43376	142759	1542	-24391
ANNUAL	224630	83771	167956	61452	3775	2692				-56674	-22319

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

The following work was completed for El Vado Dam during 2007:

- Facility Reliability Rating.
- Annual Emergency Action Plan Review, Drill, and Communication Directory Update.
- 2007 Comprehensive Facility Review (CFR) civil examination.
- 2007 Dam Safety Advisory Team (DSAT) meeting
- The 2007 CFR identified additional SOD and O&M recommendations that will need budgeting and scheduled completion dates.
- The 2007 Region landslide survey.
- The wet spot that was identified a few years ago continues to be monitored on a monthly basis, with no apparent changes.
- General Maintenance was done and completed some O&M recommendations.
- A sedimentation survey was conducted in 2007 the data was collected in June. The new capacity tables will not be completed until 2008.
- The cathodic protective system was evaluated in 2007 in preparation for a new design by conducting additional testing. The system is currently 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.

## 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 SJ-C water in Abiquiu Reservoir. Adjustments for sediment reduced the sum of the available storage allocations to 182,025 ac-ft at the start of 2007, which is calculated as the total capacity at the top of the SJ-C storage pool (elevation 6,220.00) less the total accumulated sediment in the reservoir at the end of 2006. The volume of SJ-C water in

storage in Abiquiu Reservoir peaked on October 2 at 180,434 ac-ft. Abiquiu ended 2007 with 180,428 ac-ft of SJ-C water in storage. Table 8 provides a summary of monthly operations and water accounting for Abiquiu Reservoir.

During 2007, 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 Albuquerque’s storage space in Abiquiu Reservoir. Over the course of the Summer, 11,353 ac-ft of leased water was released by Reclamation for silvery minnow purposes.

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

Abiquiu Res. Op.	INFLOW		OUTFLOW		LOSSES		EOM CONTENT				RELEASE FROM STORAGE		TOTAL RELEASE
	RG	SJ-C	RG	SJ-C	RG	SJ-C	SEDIMENT	RG	SJ-C	TOTAL	RG	SJ-C	
MONTH	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)			
DEC. 2006	7953	4859	8183	1310	0	-300	1852	62	155464	157378	230	-3549	9493
JANUARY	474	12378	459	2669	-0	45	1853	4	165128	166985	-15	-9709	3128
FEBRUARY	975	8933	1132	1589	-0	117	1854	-153	172355	174056	157	-7344	2721
MARCH	5058	6256	4129	1974	1	732	1855	778	175905	178538	-929	-4282	6103
APRIL	12912	3886	13256	0	5	1094	1860	438	178697	180995	344	-3886	13256
MAY	81252	474	79749	0	55	1077	1983	1996	178094	182073	-1503	-474	79749
JUNE	26874	3643	28871	4976	3	2353	1999	1	174408	176408	1997	1333	33847
JULY	28291	3628	28293	4739	-2	1527	2016	-1	171770	173785	2	1111	33032
AUGUST	22373	5370	22365	2380	-2	1917	2029	5	172843	174877	-8	-2990	24745
SEPTEMBER	14530	9968	14236	1778	-2	1058	2041	297	179975	182313	-294	-8190	16014
OCTOBER	3345	2821	3587	1587	-2	1830	2041	55	179379	181475	242	-1234	5174
NOVEMBER	3285	986	3335	0	-0	573	2041	4	179792	181837	50	-986	3335
DECEMBER	9951	3172	9708	2707	-5	-173	2043	242	180430	182715	-243	-465	12415
ANNUAL	209320	61515	209120	24399	51	12150							

## 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 included Elephant Butte Temporary Channel maintenance, other river maintenance projects with water salvage potential, and irrigation drain improvements.

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. A modification to the Agreement was executed at the end of fiscal year 2007 for carryover of funds to fiscal year 2008, in the amount of \$891,000.

### 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 a 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 7 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, beginning at Nogal Canyon (RM 51.5) and ending 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 has 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.

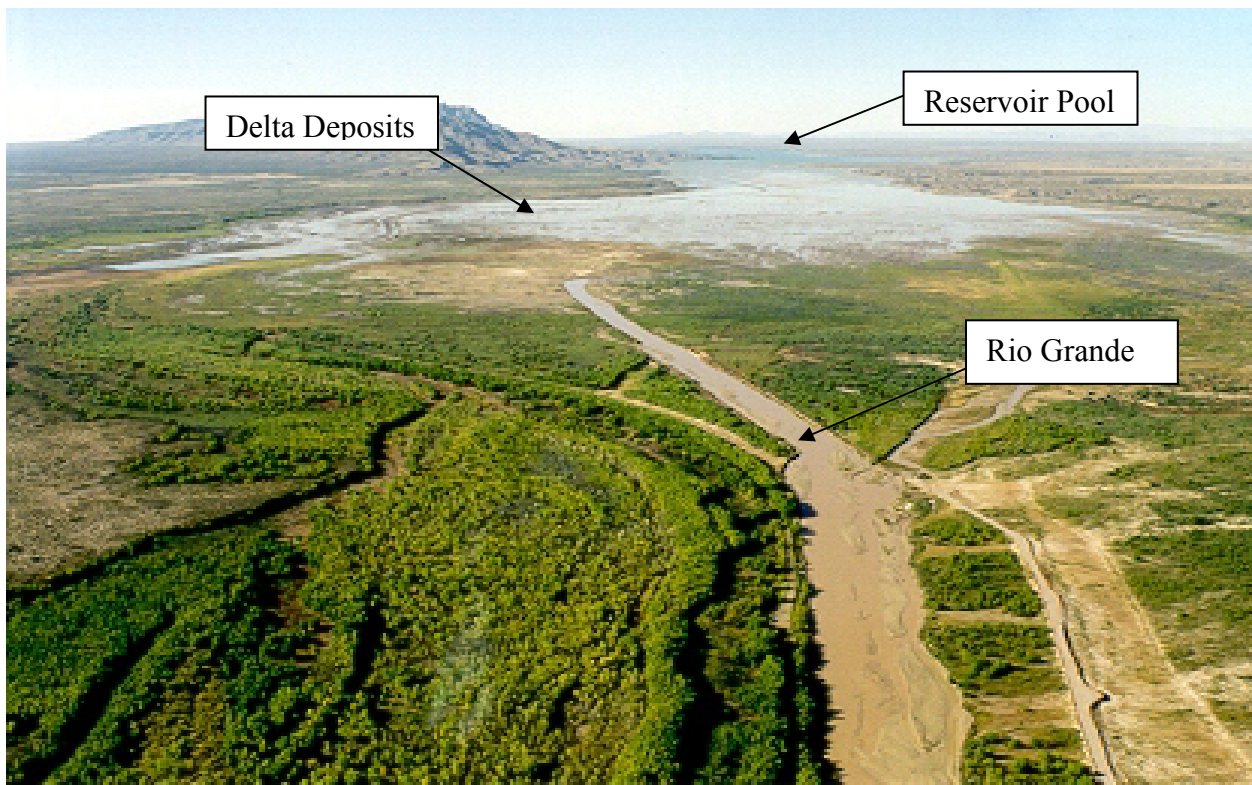


Photo 1. Headwaters of Elephant Butte Reservoir, prior to construction of the Temporary Channel (1998).

### **Elephant Butte Temporary Channel—2007 Maintenance**

General maintenance work was performed on the channel in the spring of 2007, as was substantial repair work and routine grading on access roads. Unusually severe monsoon rains in August and September of 2006 caused a significant amount of damage to the roads. Channel maintenance work focused primarily on removal of sediment and debris that had accumulated in the channel, and some minor repair work was performed on the constructed berms adjacent to the

channel. Maintenance was accomplished jointly by Reclamation and NMISC, with the upper approximately 10 miles maintained by Reclamation's Socorro Field Division crews (utilizing Agreement funds), and the lower 16 miles maintained by a contractor for NMISC (photo 2). A similar division of maintenance responsibilities is planned for 2008.

Reclamation also performed a significant amount of maintenance and repair work on the amphibious excavators used for maintenance of the Temporary Channel in 2007, utilizing Agreement funds. These repairs involve replacement of the wear plates and guides that secure the excavator tracks to the pontoons. The work was performed in the Socorro Field Division maintenance shop.



Photo 2. Temporary Channel 2000 to 2002 transition. Taken near RM 52, facing downstream (May 2007).

### **Irrigation Drain Improvements**

The following work was accomplished in 2007 under the Cooperative Agreement:

- Escondida Drain: Phase I improvements were completed in August and involved construction of rock gabions and earthwork at Arroyo de los Pinos to ensure that arroyo flows do not damage the drain (photo 3). Phase II work provides for removal of vegetation from the drain and reshaping of the drain prism from Arroyo de los Pinos to the outfall to the river. Phase II work is anticipated to begin in June 2008. These improvements are funded on a cost share basis by NMISC and Reclamation.



- Elmendorf South Extension Drain. Vegetation removal along 2.2 miles of drain was completed in October. Road repairs and drain prism reshaping at locations where recent arroyo flows have caused damage will be performed early in 2008. Funding for these improvements is from NMISC.



Photo 3. Completed Phase I work on Escondida Drain at Arroyo de los Pinos. Taken facing east (January 2008).

### **Other Projects—Cooperative Agreement Funding**

Agreement funding was utilized for modeling work associated with the Tiffany Sediment Plug. This work is described in the River Maintenance section below.

## **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 has identified numerous 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, and destruction of canals and drains.

Reclamation's efforts on addressing river maintenance work at these sites include contract administration, 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.

### **Salazar Pit**

In October 2005, Reclamation completed construction maintenance at the Salazar Pit site. This project involved stabilizing a riprap mine site that Reclamation utilized from the mid-1980s to the mid-1990s. Excess arroyo runoff and sediment deposition resulting from the disturbance caused by the mining operation were a problem at this site. The sediment deposition zone included a county road leading to a number of area residences and the driveway of the landowner.

The project provides for reduced material deposition and includes four energy dissipation weirs and two areas of channel widening. Approximately 6,600 cubic yards of riprap material were placed for the weir structures, and the channel work involved about 10,000 cubic yards of excavation earthwork. During the summer monsoon season of 2006, the arroyo experienced very large flows, probably in excess of the 25-year design event. Flow in the arroyo was sufficient to transport large boulders, and some of the weir structures sustained minor damage. Repairs were completed in June 2007 (photo 4), primarily using on-site material. The site was returned to design conditions, and has withstood several large storm events since construction was completed.



Photo 4. The arroyo downstream of the quarry area following recent repairs (June 2007).

### **Lyden Bankline Repairs**

Localized bank erosion was noted during a site visit in March 2006 along the western bankline of the Rio Grande, immediately south of the Lyden Wasteway. According to the Acequia Commissioner, the erosion occurred during the 2005 spring runoff. The erosion threatens the integrity of the Lyden Wasteway and also the Lyden Acequia, which extends to the south. Bank erosion is approximately 10 feet from the Lyden Acequia. Construction of a design to protect this bank, involving larger rock and a gabion retaining wall, was completed in February 2007. A final project walk-through, verifying that all punch list items had been completed, was performed in May 2007 with one of the Lyden Acequia Commissioners.

### **San Ildefonso Pond**

The primary concern at the San Ildefonso Pond priority site was that the east bank of the Rio Grande is very close to the berm surrounding the pond; the distance between the edge of the river channel and the toe of the berm is as little as 50 feet in some areas. Furthermore, the bend upstream of the pond was observed to be eroding very actively during the 2005 spring runoff. In May 2007, Reclamation constructed several buried rock vanes to prevent erosion at this site. All earthwork and rock placement is complete. The only remaining work is planting 150 tree poles, which will be done under a contract with the Pueblo of San Ildefonso.



### **Cochiti Priority Sites**

There are two priority sites on the Pueblo of Cochiti: one (at RM 231.3) is on the west side of the Rio Grande about 1 mile downstream of Cochiti Dam, and the other (at RM 228.9) is on the east side, about 3 miles downstream of the dam. At RM 231.3, the west bank of the channel has migrated beyond the jetty jack line and is very close to a road and some agricultural fields. At RM 228.9, the main channel is on the west side of a large island, and the secondary channel is on the east side. The secondary channel carries water year-round. The concern at this site is that the secondary channel is slowly, but steadily, migrating eastward toward the levee and riverside drain. Construction began on both sites in late 2007 and is currently underway (photo 5), with expected completion in spring 2008. Depending on the date of earthwork completion, it is possible that revegetation will be delayed until the winter of 2008–2009 to ensure that planting occurs during the dormant period.



Photo 5. Installation of a riprap toe on the bankline at River Mile 231.3 (January 2008).



## **Santo Domingo**

There are currently three priority sites on the reach of the Rio Grande passing through the Pueblo of Santo Domingo. At these three 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 (photo 6). 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. Hydrographic data collection was completed in December 2007, and collection of the remaining design data and preparation of preliminary designs is anticipated in early 2008.



Photo 6. Santo Domingo priority site No. 2, at the confluence of Galisteo Creek. Taken facing upstream (October 2006).

## **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. Hydrographic data collection occurred in spring 2007. A contract has been issued for geomorphic analysis, which is expected to begin in early 2008. However, the Pueblo of San Felipe has not yet approved the fieldwork required for geomorphic analysis, so the start date could be delayed. Priorities for maintenance at the nine sites will be determined after geomorphic analysis is complete.

## **Santa Ana**

A large scale river maintenance project at Santa Ana Pueblo is nearly complete. The major features, river realignment and construction of a gradient restoration facility, are complete. The primary activity during 2005 was redistributing piles of excess sediment to facilitate their removal during the high spring flows; approximately 60,000 cubic yards of sediment was removed. In spring 2007, a line of 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 erosion. Additionally, Reclamation has developed designs to redistribute the remaining sediment to best accomplish the project's goals. The sediment redistribution plan is currently awaiting approval from the U.S. Fish and Wildlife Service; construction is expected to begin after the 2008 spring runoff. The overall project design requires average or higher spring runoff flows to develop features to their final configurations. Therefore, the duration of ongoing activities is dependent on hydrologic conditions.

## **Bernalillo**

Work at the Bernalillo priority site began in August 2006 and concluded in December. The concern at this site was that a sharp bend had developed, causing the flow of water to be directed toward the levee in an area where the bankline was only about 50 to 70 feet from the toe of the levee. To address river maintenance issues, the main channel was moved westward, a secondary channel was excavated, and bendway weirs were installed in late 2007. Planting of native trees and shrubs for increased erosion resistance and habitat improvement occurred in early 2007 (photo 7). Work at this site is complete, except for reseeding disturbed areas.



Photo 7. Installation of native vegetation at the Bernalillo priority site (February 2007).



## **Sandia**

At the Sandia priority site, there is a 3,300-foot-long section of the river where the eastern bankline is only about 50 to 70 feet from the toe of the levee. Earthwork at this site began in December 2006. The project consists of realigning the channel further away from the east levee, increasing sinuosity to improve habitat, and installing bendway weirs to make the east bankline more resistant to erosion (photo 8). Earthwork will be completed in spring 2008.



Photo 8. Installation of bendway weirs at the Sandia priority site (September 2007).

## **Corrales Siphon**

The Corrales Siphon river maintenance site is located 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. Consequently, concerns have been raised about the stability of the wood pipeline when subjected to the loading and vibration of construction equipment. Reclamation is currently considering design modifications to reduce the potential for damage to the pipeline during construction. This has delayed the planned construction date.

### **Drain Unit 7**

This priority site is located approximately 500 feet upstream of San Acacia Dam, on the west bank of the Rio Grande (photo 9). The river is actively eroding an embankment levee that protects the Drain Unit 7 Extension irrigation structure. Pre-emergency action maintenance work was performed in May, 2005 to stabilize the eroding bankline. Approximately 900 cubic yards of riprap was placed along 200 feet of bankline at that time, but some of the riprap was displaced during the high flows of the 2006 monsoon season, and an additional 100 cubic yards of riprap was added prior to the 2007 spring runoff. A preferred alternative for a project was selected in 2007, and preliminary designs were completed for that alternative. It is anticipated that work will begin in November 2008.



Photo 9. Drain Unit 7 priority site, looking downstream (January 2008).



### San Acacia River Miles 114 and 113

Reclamation has completed earthwork at the River Mile 114 and 113 priority sites, approximately 2 miles downstream of San Acacia Diversion Dam. Channel incision, lateral channel migration, and bank erosion previously threatened the integrity of the levee system in this area. This project involved moving the levee and LFCC approximately 1,500 feet to the west, away from the river (photo 10).

Major items of work included clearing and grubbing vegetation, excavating a new LFCC channel (approximately 10,800 feet), constructing a spoil levee (lined with waste rock salvaged from the old LFCC) adjacent to new LFCC channel, constructing a sheetpile grade control structure and a pipe crossing at San Lorenzo Arroyo, filing the existing LFCC channel, creating new potential floodplain between the new levee position and the channel, and planting cottonwood poles and other native species within the project area. The only remaining work is seeding and weed control.



Photo 10. Looking downstream at the new LFCC in the area of River Mile 113/114 Priority Site (May 2006)

### **San Acacia River Mile 111**

The San Acacia River Mile 111 priority site is located on the west side of the Rio Grande, approximately 5.5 miles downstream of the San Acacia Diversion Dam. The priority site is located at an actively migrating bend in the river (photo 11). The concern at this site is river channel migration and bank erosion towards the levee which protects the Low Flow Conveyance Channel (LFCC). The distance between the active channel bankline and the levee has been decreasing rapidly with sustained flood flows. At the RM 111, the planned maintenance project is to relocate the LFCC and the levee to the west to allow the river more freedom to move within its historic floodplain. Work on the planned RM 111 levee setback project is expected to begin in March 2008.



Photo 11. Looking downstream at the River Mile 111 bend (April 2007).

### **Arroyo de las Cañas**

This site is located on the west bank of the Rio Grande, near the confluence of an unnamed arroyo upstream of Arroyo de las Cañas. The bankline is less than 100 feet from the levee toe at this site, and the thalweg is along the outside of the bend nearest the levee. Erosion of the bankline took place during the high 2005 spring runoff. There is a high probability that further erosion, and possible damage to the levee, will occur during future sustained high flows. In December 2006, a preferred project alternative, which included relocation of the main channel away from the levee and construction of a diversion berm and bio-engineered bankline, was selected for this site. Designs are complete, and construction is scheduled for fall 2008.

### **Bosque del Apache, Tiffany, and San Marcial Levees**

These three levees are located along the western edge of the Rio Grande floodplain, from RM 79 to RM 60, and serve to provide protection of the Low Flow Conveyance Channel (LFCC). The conveyance capacity of these levees is monitored closely because of concerns about overtopping. A target conveyance capacity of 10,000 cfs with a 3-foot freeboard allowance has been established for the Bosque del Apache levee, and 8,500 cfs with a 2-foot freeboard allowance for the Tiffany and San Marcial levees.

The 2006 hydraulic model analysis was updated in 2007, using cross-section data collected in 2007. Results of the analysis indicate that the capacity of the Tiffany and San Marcial levees has increased since the 2006 analysis, owing to river bed degradation in that area. However, there are still portions of the Tiffany Levee where the modeling indicated less than 2 feet of freeboard from the top of the levee to the target conveyance water surface (at 8,500 cfs). Therefore, the Tiffany Levee will be monitored closely during the 2008 spring runoff.

### **Tiffany Sediment Plug**

During the 2005 spring runoff, a sediment plug formed in the Tiffany area and completely blocked the main channel of the Rio Grande. The plug first formed about 1.5 miles upstream of the San Marcial railroad bridge, in the vicinity of River Mile 70, and eventually extended about 3 miles upstream. The plug caused the entire active river channel to completely fill with sediment and resulted in an alarming rise in water surface against the Tiffany Levee. In a joint effort between NMISC and Reclamation, the plug was removed in 2005. However, concerns remain that another spring runoff with sustained overbanking flows, similar to the 2005 spring runoff, could result in formation of another plug. Therefore, Reclamation is actively investigating potential river maintenance work which could reduce the frequency of sediment plugs.

NMISC/Reclamation Cooperative Agreement funding was utilized in 2007 to analyze the risk of a plug formation during the 2007 spring runoff and to analyze potential alternatives to reduce occurrence of sediment plugs. Modeling work was performed by Craig Boroughs, Ph.D. (through a Reclamation contract with Tetra Tech, Inc.) who has developed a model specifically designed to simulate sediment plug formation in the Tiffany area. The modeling work indicated a very low potential for plug formation during the 2007 spring runoff, due to the relatively low peak flows. The modeling predictions proved to be accurate, as no plug formation was observed in 2007.

Following this modeling work, Reclamation concluded that the most feasible alternatives appear to be those involving widening of the active channel, but some uncertainty remains as to the length of the channel that will require widening. Concerns also remain as to whether the San Marcial Railroad Bridge is contributing to the sediment plug formation problem. NMISC and Reclamation decided that additional analysis of the plug problem prior to selection of a preferred alternative would be prudent, and NMISC has contracted with Mussetter Engineering, Inc. for that analysis. Results are expected early in 2008.



Reclamation currently has environmental permits in place which will allow for the excavation of a pilot channel in this reach to reconnect main channel flows in the event that a sediment plug forms. The area (photo 12) will be monitored closely during the 2008 spring runoff.



Photo 12. Tiffany Sediment Plug area, taken near RM 71, facing upstream (May 2007).

### **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 less than 100 feet from the San Marcial Levee (photo 13), which protects the LFCC from the river. Hydrographic data was collected in 2007, and the alternative analysis process will begin in 2008.



Photo 13. Fort Craig Bend priority site, taken facing west (May 2007).



## River Mile 60

This site is located at River Mile 60, on the west bank of the Rio Grande, approximately 8.5 miles downstream from the San Marcial Railroad Bridge. The river makes two sharp bends at the site, and at the second bend is eroding the embankment of a maintenance road that provides access to 5.5 miles of river downstream of the site, including the upper 3.5 miles of the Elephant Butte Temporary Channel. The river has been aggressively eroding the bankline adjacent to the road in the last three years, and it is now eroding the road embankment (photo 14). Predictions are that a spring runoff greater than or equivalent to the 2005 runoff could breach a section of the road. Hydrographic data for this site was updated in 2007 and the alternative analysis process is currently in progress.



Photo 14. River Mile 60 priority site, taken facing west (January 2008)

## 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 at arroyo mouths and various reaches of the river channel occurred during fall 2007. The total volume of sediment removed in 2007 was approximately 6,000 cubic yards.

## **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. The first phase 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. The Phase 1 report was completed in May 2007. The second phase addresses future maintenance strategies, conditions, and needs and is scheduled for completion in late 2008. The combined two phases 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 2008 Spring Runoff**

As of January 2008, it appears likely that the spring runoff of 2008 will be above average on the Rio Grande, leading to increased probability of erosion damage to riverside facilities. In preparation, Reclamation is assessing riprap availability for potential emergency placement. 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. Discharge reported by gages on the Rio Grande and its tributaries will be monitored daily. If flow predictions remain high 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. The Program is comprised of Federal, State, local, and tribal governments, nonprofit institutions, and other nongovernmental entities working collaboratively to protect and improve the status of endangered listed species along the Middle Rio Grande 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 (BiOp), as amended, and additional activities that contribute to recovery of the Rio Grande silvery minnow (silvery minnow) and the Southwestern willow flycatcher (flycatcher).

During FY2007 on behalf of the Collaborative Program, Reclamation awarded \$14,151,000 to acquire and manage water, to plan, construct and monitor habitat restoration projects, to monitor the status of the minnow and the flycatcher, to conduct biological and hydrological studies, and to rescue silvery minnow during river drying. All of these activities meet BiOp requirements or address long-term recovery needs. In December 2007, the Program was authorized as part of Public Law 110-161, the Consolidated Appropriations Act, 2008.

## **I. Habitat Restoration Projects:**

Program-funded habitat restoration projects restore and enhance habitat in the Middle Rio Grande by increasing backwaters, oxbows, and overbank flooding to enhance native vegetation and regenerate stands of cottonwoods and willows for the flycatcher; producing shallow, low velocity habitats over a wide range of instream flows to increase habitat available for the silvery minnow; and providing for fish passage upstream of diversion dams. The following briefly describes habitat restoration work accomplished during FY 2007.

### **Albuquerque Riverine Restoration Project**

The Program funded portion of Phase II of this NMISC project is intended to modify islands and bars to improve silvery minnow adult and juvenile over-wintering habitat and increase the amount of egg retention and rearing habitat within the Albuquerque Reach of the Rio Grande. Restoration techniques include vegetated island modification, bar habitat modification, placement of large woody debris, bank scouring, bank lowering, and the establishment of ephemeral channels. This phase of the project, 75-90 acres in area, was initiated in spring, 2007.

### **Santo Domingo Pueblo Habitat Restoration Project**

Construction of Phase I of the Santo Domingo Pueblo habitat restoration project began in 2006 and was completed in early 2007. Phase I involved non-native vegetation removal at three sites to encourage additional sediment transport through the Galisteo creek, construction of embayments in an oxbow, and creation of a high flow side channel to increase silvery minnow habitat. Construction of Phase II, approximately 4.5 acres, which involved similar construction of embayments and creation of side channels, began in the fall of 2007.

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

This Reclamation project, a required activity per the 2003 BiOp, is presently in the planning stage. Several alternatives are being evaluated to facilitate upstream movement of the silvery minnow at San Acacia Diversion Dam. During 2007, as part of the planning stage, we began the preparation of environmental, biological, hydrologic and habitat assessment studies.

### **Rio Grande Nature Center (RGNC)**

The Corps of Engineers (Corps) completed construction of a habitat restoration project at the RGNC in fall, 2007. The project included the restoration of an ephemeral side channel and construction of embayments to provide habitat for the silvery minnow and the reconnection of the floodplain of the bosque to the river. This project encompasses about 15 acres and is anticipated to primarily benefit the silvery minnow with possible secondary benefits to the flycatcher.

### **City of Albuquerque (City) Habitat Restoration Project**

This project includes the clearing of non-native vegetation, planting of native vegetation, excavation of ephemeral side channels and embayments, jetty jack removal, and the development of a moist soil area. This project has sites that are both north and south of Rio Bravo bridge, on the east side of the river. It will provide refuge for aquatic organisms, including silvery minnow, and restoration of native riparian vegetation which was completed in the spring of 2007; construction at the north site, which includes 66 acres of bosque, has not started to date.

### **Development of Perennial Silvery Minnow Refugia at Drain Outfalls in the Albuquerque and Isleta Reaches of the Middle Rio Grande**

The MRGCD, along with its project partners HabiTech, New Mexico State University, and Reclamation's Denver Technical Service Center, installed large woody debris in three drain outfalls in the upper Isleta Reach of the Middle Rio Grande (Peralta Main Wasteway, Lower Peralta Drain Outfall #1, and the Los Chaves Wasteway) to increase perennially wetted pool habitat. The next phase of the project entails winter monitoring at these sites.

### **Rio Grande Silvery Minnow Sanctuary**

Reclamation, the U.S. Fish and Wildlife Service (Service), MRGCD, and the City are cooperating in the development of an off-channel sanctuary for the silvery minnow at a site in Albuquerque. The Corps and others are providing technical input and other assistance. The sanctuary will serve as one of the two additional refugia required by the 2003 BiOp. The first two phases of construction have been completed. Completed work includes the base for a pump station, a section of concrete lining in the Albuquerque Riverside Drain, and the channels and pools for the sanctuary itself. The final phase of construction, to be completed in fall 2008, will include completion of the pump station, fish screens, all required piping, mechanical, electrical, and utility work, and various water control structures. The Service will operate the sanctuary when it is completed. Initial test operations are scheduled to begin in late fall 2008. The MRGCD has obtained a permit from the New Mexico Office of the State Engineer for use of ground water required to operate the sanctuary.

### **Additional Habitat Restoration Projects Funded in 2007**

In addition to those projects mentioned above, the Collaborative Program provided funding for:

- Santo Domingo Pueblo Habitat Restoration Project, Phase III
- Pueblo of Sandia Habitat Restoration.
- Ohkay Owingeh, Southwestern Willow Flycatcher Habitat Restoration
- NMISC, Isleta Reach Habitat Restoration Improvements
- NMISC, Monitoring of Albuquerque Reach Habitat Restoration
- SWCA, Los Lunas Habitat Restoration Monitoring
- Parametrix, Velarde Reach Habitat Restoration Analysis and Recommendations
- Tetra Tech, Habitat Restoration Analysis and Recommendations, San Marcial to Elephant Butte Reach

## **II. Other Ongoing Water Management and Water Quality Related Projects:**

### **USGS Groundwater/Surface Water Interaction in the Middle Rio Grande Valley**

The monitoring network presently consists of 158 groundwater piezometers on both sides of the Rio Grande, from I-25 to the Paseo del Norte bridge crossings, and also includes 17 surface water stage gages. The project, which is currently in the fourth year of funding by the Program, has been successful in the collection of continuous data sets and the posting of data on the USGS website, <http://nm.water.usgs.gov/bosque.html>.

### **USGS MRG River Gage O & M**

This project has been funded by the Program since FY 2002 as a requirement of the 2003 BiOp. The USGS has installed four gages on the Rio Grande: at Escondida, NM Highway 346 bridge, below Isleta Diversion Dam, and above US Highway 380. In addition to installing the gages, there is a continuing cost for O&M for the collection of MRG stream flow information.

### **Decision Support System (DSS) for the Middle Rio Grande Conservancy District (MRGCD)**

This project is an on-going cooperative effort since FY03 to improve irrigation water use efficiency in the Middle Rio Grande. The project goals include reducing river water diversions while continuing to deliver water to MRGCD irrigators. It can also enable MRGCD managers to keep more water in upstream storage, and therefore potentially extend the irrigation season. The DSS model and data files for both Belen and Socorro Divisions are completed and will be used by MRGCD for planning the 2008 irrigation season.

### **New Mexico Environment Department Water Quality Monitoring**

This study, in its second year of funding by the Program, performed by New Mexico Environment Department – Surface Water Quality Bureau (NMED), will provide a comprehensive water quality monitoring and assessment program in the MRG to assess potential water quality relationships that may affect silvery minnow population and recovery. The integration of water column and sediment chemistry, with fish tissue contaminant concentrations, will complement on-going work on fish/silvery minnow health monitoring by the Service.

### **Rio Grande and Low Flow Conveyance Channel (LFCC) Modifications and EIS**

Reclamation released a Draft Environmental Impact Statement (EIS) on proposed realignment of the Rio Grande and the LFCC below San Marcial in September 2000. The project was proposed to alleviate some of the more critical channel maintenance problems in the San Marcial area. The Draft EIS evaluated alternatives for reconfiguring the channel system below San Marcial for continuing water conservation benefits, maintaining system elements for effective valley drainage, and minimizing costs while considering environmental needs and the protection of endangered species and their habitats. The Draft EIS did not address operation of the LFCC.

In May 2001, Reclamation submitted a Biological Assessment to U.S. Fish and Wildlife Service (USFWS) requesting formal Section 7 consultation on the proposed project. At a meeting on June 30, 2003, the USFWS informed Reclamation and NMISC that they could not complete consultation on the channel realignment unless operations of the LFCC were addressed.

With lowering of Elephant Butte Reservoir and the resulting upstream headcutting of the river channel, additional options for connecting the river and LFCC may now be possible. In August 2007, Reclamation issued a Record of Decision for Upper Rio Grande Basin Water Operations which specifically excluded addressing active diversions into the LFCC. Reclamation decided not to complete the LFCC EIS, and in September 2007 issued a notice of cancellation of the EIS in the Federal Register.

Reclamation is continuing preliminary investigation of a concept for connecting the LFCC to the river in the San Marcial area and establishing a single channel from that point to the reservoir. The concept would build on the success of the cooperative efforts of Reclamation and the NMISC in recent years to establish and maintain a channel into the reservoir.

## **Endangered Species**

### **Middle Rio Grande - Endangered Species Act Compliance**

The following is a summarizes Reclamation's compliance with the Endangered Species Act (ESA) in the Middle Rio Grande.

- Compliance with 2003 Biological Opinion: Reclamation remains in compliance with the 2003 Biological Opinion (BiOp). The Service provided an Incidental Take Statement (ITS) for take due to channel drying from April 1, 2007, through March 31, 2008, based on the October 2006 fish surveys and projected peak runoff flow. Take will be considered exceeded if observed mortality exceeds 13,949 minnows. During 2007 silvery minnow salvage operations, the U.S. Fish and Wildlife Service (Service) used a new salvage protocol. From June 30 to October 31, 2007, observed mortality totaled 78 minnows with 13,514 minnows salvaged. The Service will calculate an ITS for 2008, based on the October fish surveys and projected peak flow during runoff.
- Supplemental water program: The Rio Grande had continuous flow from the termination of the irrigation season on November 1, 2006, until the first week of July 2007. Reclamation ended the year with more than 38,000 acre-feet (ac-ft) in storage with the prospect of several thousand more in potential leases for 2008. In 2007 10,800 ac-ft of supplemental was released for endangered species purposes.
- Future Compliance: The MRG Endangered Species Collaborative Program has embraced the need for new Section 7 consultation to obtain a sustainable Biological Opinion (BiOp). The Program's Executive Committee has directed the Program to conduct studies to answer key questions in order to prepare a new Biological Assessment (BA). Signatories are expected to make significant contributions and commitments to the Proposed Action with the goal of obtaining a non-jeopardy BiOp.
- 7/10: The federal action agencies and the Collaborative Program are determining how to best move forward on future ESA compliance. A combination Section 7 for federal actions and Section 10 for non-federal actions is being contemplated. Representatives from the Lower Colorado Multispecies Conservation Program (MSCP) will attend the February meeting of the Executive Committee and will discuss their successful 7/10 approach.

### **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 remains in compliance with the 2003 BiOp. The Rio Grande was allowed to dry in isolated locations below Isleta Diversion Dam, and from San Acacia Diversion Dam downstream from Brown Arroyo to the south boundary of Bosque del Apache National Wildlife Refuge (refuge). Water pumped from the LFCC maintained flow in the river channel south of the refuge. Native flow reconnected the river following the end of irrigation season, and all LFCC pumping ceased on November 1, 2007, for the year.

The silvery minnow population fluctuated since 2003 with increases three of the four years (Figure 5). The increased Angostura silvery minnow numbers over Isleta probably results from increased upstream nursery habitat (from Collaborative Program restoration projects) and recruitment in the Angostura reach and high mortality from river drying in the Isleta and San Acacia reaches. Manipulation of spring runoff by the Corps of Engineers to produce an extended peak runoff flow resulting in 26 days above 2500 cfs and 10 days above 3000 cfs at Albuquerque (Figure 6) to inundate nursery habitats resulted in good recruitment in all reaches. Reclamation 2007 nursery habitat studies documented spawning adult silvery minnows and eggs on inundated pointbars and backwater. These data support the concept that floodplain habitat is essential for good recruitment. Flow above 3000 cfs inundated pointbars, islands, and floodplain in 2004 and 2005, also resulted in high recruitment due to the availability of nursery habitat (Figure 6).

Intermittency appears to have continuing adverse effects on downstream silvery minnow populations, based on lower numbers of minnows in the intermittent areas of the Isleta Reach. Recruitment is dependent on sufficient flows during spawning throughout reaches with stable summer flows.

Captive silvery minnow populations include Albuquerque Biopark, Dexter National Fish Hatchery, and New Mexico State University. Two additional silvery minnow propagation facilities are expected to initiate operations in 2008. The Service has initiated the process for re-introduction of the silvery minnow into Big Bend National Park, Texas. A sustainable population outside the Middle Rio Grande is essential for downlisting the species to threatened status.

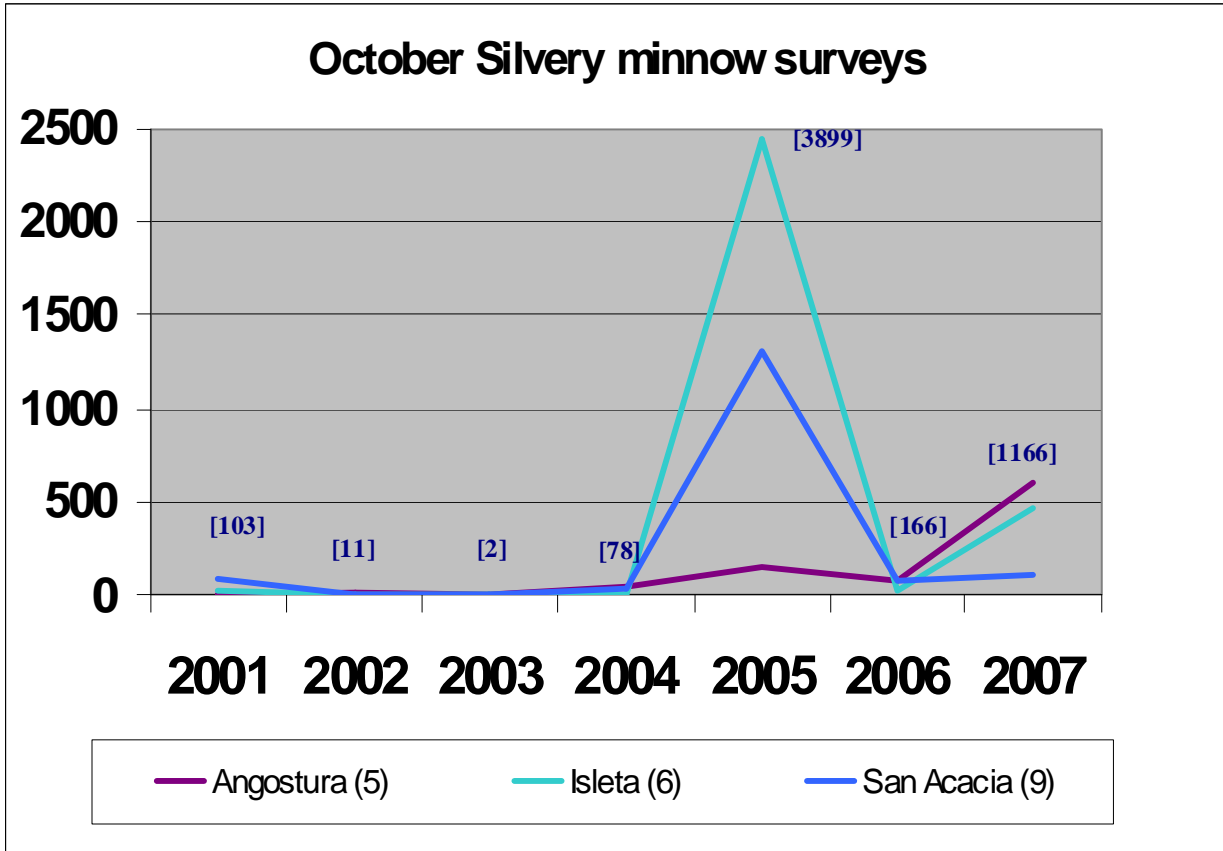


Figure 5: October Rio Grande silvery minnow survey results by reach with totals [ ] and number of sample sites ( )

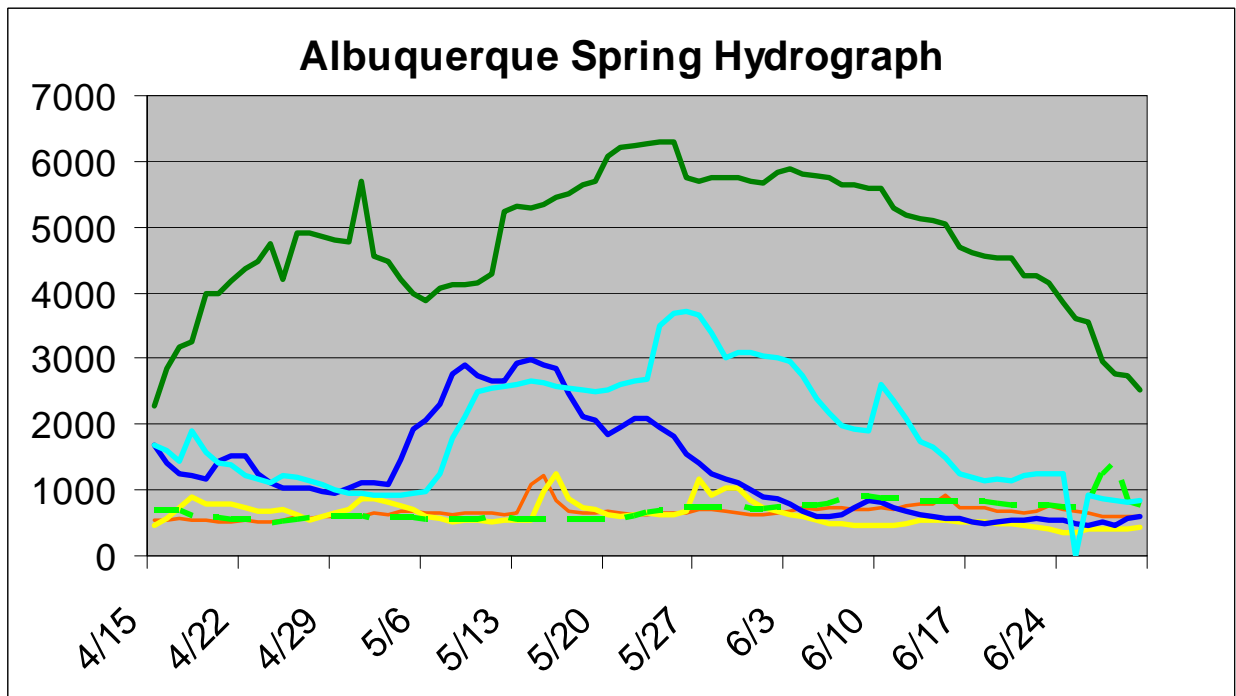


Figure 6: Albuquerque Hydrograph Comparison with flow volume in cubic feet per second (cfs).

## **Southwestern Willow Flycatcher**

The Southwestern Willow Flycatcher was listed endangered by the USFWS 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 Southwestern Willow Flycatcher at that time and the 1997 critical habitat proposal was later retracted. On October 13, 2004, under court order, the USFWS reissued a proposed designation for critical habitat for the Southwestern Willow 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. Though critical habitat is not proposed for every location where Southwestern Willow Flycatchers exist on the Rio Grande, Section 7 of the ESA requires all Federal agencies to consult with the USFWS on any action that "may affect" a listed species, regardless of whether critical habitat has been designated or not. Since 1995, Reclamation has been in consultation with the USFWS, pursuant to Section 7 of the ESA, over numerous actions, mainly operations and river maintenance activities along the Rio Grande.

Six primary breeding sites for Southwestern Willow Flycatchers have been documented during various survey efforts in the Middle Rio Grande between 1993 and 2007 and include the following: San Juan (Okay Owingeh) Pueblo, Isleta Pueblo, Sevilleta NWR and La Joya State Wildlife Management Area (WMA), the San Marcial area, and the Elephant Butte Reservoir delta.

Table displays the results of surveys for Southwestern Willow Flycatchers at these and other sites from 2001 through 2007.

Reclamation continues to conduct Southwestern Willow Flycatcher surveys and nest monitoring along the Middle Rio Grande between the south boundary of Isleta Pueblo and into the dry pool of Elephant Butte Reservoir. Between 2001 and 2007, the number of Southwestern Willow Flycatcher territories in the San Marcial reach has expanded from 25 to a maximum of 201. A majority of these territories are located in the recently-developed riparian vegetation within the uppermost levels of the conservation pool of Elephant Butte Reservoir. This area holds the largest breeding population of Southwestern Willow Flycatchers on the Middle Rio Grande to date, and the largest population of flycatchers in New Mexico. Flycatcher surveys and nest monitoring in this region of the Middle Rio Grande will continue in 2008.

Table 9: Estimate of Southwestern Willow Flycatcher Territories – Middle Rio Grande Project, 2000 - 2007 Breeding Seasons

River Reach	Number of Territories 2001	Number of Territories 2002	Number of Territories 2003	Number of Territories 2004	Number of Territories 2005	Number of Territories 2006	Number of Territories 2007 <sup>a</sup>
Velarde area	1	0	not surveyed	1	0	1	0
San Juan (Okay Owingeh) Pueblo	not surveyed	not surveyed	Unknown <sup>b</sup>	Unknown <sup>b</sup>	Unknown <sup>b</sup>	Unknown <sup>b</sup>	Unknown <sup>b</sup>
Isleta Pueblo	not surveyed	not surveyed	5	7	9	9	9 <sup>c</sup>
Belen reach	not surveyed	not surveyed	not surveyed	0	1	1	2
Sevilleta NWR/La Joya State WMA	11	13	17	19	20	21	22
Bosque del Apache NWR	2	4	3	1	0	4	7
San Marcial/Tiffany areas	3	12	34	16	3	16	7
Elephant Butte Reservoir delta	22	51	52	113	107	135	194
<i>Total</i>	39	80	111	149	131	186	241

(Ahlers et al. 2002; Ahlers and Moore 2003; Moore and Ahlers 2004, 2005, 2006a, 2006b; Smith and Johnson 2006)

<sup>a</sup> Reclamation unpublished data, except as noted.

<sup>b</sup> Surveys conducted by pueblo; results currently unavailable.

<sup>c</sup> Data preliminary.

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

During the *Minnow v. Keys* litigation, the District Court ordered Reclamation to reinstate Endangered Species Act consultation for 2003 water operations. This consultation was initiated by Reclamation in October 2002. On March 17, 2003, U.S. Fish and Wildlife Service issued the 2003 Biological Opinion (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.” In the 2003 BiOp, U.S. Fish and Wildlife Service analyzed the full spectrum of water management options described in the February 19, 2003, final biological assessment for March 10, 2003, through February 28, 2013, water operations and river maintenance proposed by Reclamation and the Corps of Engineers.

The U.S. Fish and Wildlife Service issued the 2003 BiOp with a Reasonable and Prudent Alternative (RPA) designed to alleviate jeopardy to the Rio Grande silvery minnow, adverse modification to Rio Grande silvery minnow critical habitat, and jeopardy to the southwestern willow flycatcher based on the biological needs of the species. The RPA elements address some of the long-term recovery needs of the Rio Grande 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 minimum water flows under different hydrologic scenarios that are needed to alleviate jeopardy to both species.

Reclamation remains in compliance with the 2003 BiOp which requires continuous winter river flow for the silvery minnow from Cochiti Reservoir to Elephant Butte Reservoir. Native flow will maintain river connectivity through the winter. The Conservation Breeding Specialist Group (CBSG) is conducting a silvery minnow population viability workshop with the U.S. Fish and Wildlife Service (Service). Habitat restoration with recruitment flows contributed to higher minnow densities in the Angostura Reach during 2007. Reclamation has demobilized the pumping stations for routine winter maintenance.

The Service provided an Incidental Take Statement (ITS) for take due to channel drying from April 1, 2007, through March 31, 2008, based on the October 2006 fish surveys and projected peak runoff flow. Take will be considered exceeded if observed mortality exceeds 13,949 minnows. The Service used a new protocol for 2007 silvery minnow salvage operations after the

river became discontinuous on June 30, 2007. From June 30 to October 31, 2007, observed mortality totaled 78 minnows with 13,514 minnows salvaged. The Service will calculate an ITS for 2008, based on the October fish surveys and projected peak flow during runoff augmentation."

## **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 to be 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 have appealed Judge Parker's November rulings to the 10th Circuit Court of Appeals. Reply briefs were filed by all parties in 2006 for this continuing litigation.

In MRGCD's cross-claim against the United States in the *Minnow v. Keys* lawsuit, MRGCD seeks to quiet title to certain Middle Rio Grande Project properties. The United States' position in this cross-claim is 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. The Federal defendants' motion to dismiss or abate MRGCD's appeal was denied. MRGCD's appeal of the quiet title decision has been consolidated with the *Minnow v. Keys* appeals described above. A hearing was conducted on May 22, 2007, in Oklahoma City for both the combined cases.

## **Temporary 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 potentially result in adverse impacts to the Rio Grande silvery minnow and southwestern willow 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 southwestern willow flycatchers. The Temporary Pumping Program also helps Reclamation comply with the continuous river requirements stipulated by Reasonable and Prudent Alternatives E, H, and L.

In an effort to help maintain a minimum flow within this reach of the Rio Grande and comply with the Reasonable and Prudent Alternatives of the 2003 BiOp and prior biological opinions, Reclamation has installed portable pumps with flow measurement devices at strategic locations to move water from the LFCC into the Rio Grande floodway. 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 portable pumps were effectively used to augment river flows during the 2007 irrigation season, allowing Reclamation to maximize the effectiveness of supplemental water releases made for Endangered Species Act purposes.

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. A total of approximately 6,439 af was transferred from the LFCC to the Rio Grande floodway through the Temporary Pumping Program during 2007.

# 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 8). 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.

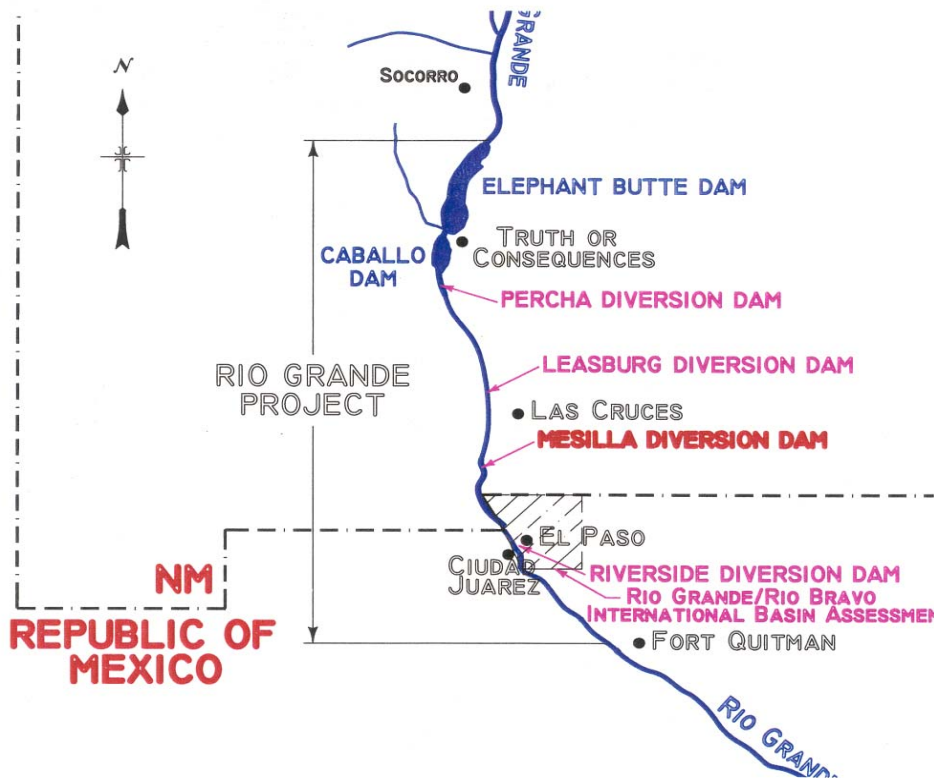


Figure 7: Area Map of the Rio Grande Project



## Water Supply Conditions

Inflow into Elephant Butte Reservoir during 2007 as measured at the Rio Grande Floodway (FW) plus the Low Flow Conveyance Channel (LFCC) at San Marcial (FW+LFCC) was 515,050 af which is 60.3% of the 96-year average annual flow at the San Marcial stations (FW+LFCC). The 96-year average annual flow at San Marcial (FW+LFCC) is 854,624 af. The actual 2007 March through July runoff, measured at San Marcial (FW+LFCC), was 316,979 af, which was 55.3% of the 30-year average of 573,000 af. Of the period 1996-2007, the spring runoffs (March-July) at the San Marcial gauging stations have consistently been below average, with the exception of 1997 and 2005, which were 120% and 129% of average respectively. The 1996, 2000, 2002, 2003, and 2006 spring runoffs have been near-record low volumes, with the 2003 spring runoff volume being the ninth lowest on record at the San Marcial gauging stations. During 2007, 642,060 af of water was released from Elephant Butte Reservoir. There was a release of 636,730 af 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 & NWS) coordinated forecasts received for the 2007 March through July runoff season are presented in Table 10.

Table 10: Summary of 2007 Rio Grande Coordinated Spring Runoff Forecasts

Month	Forecasted Otowi Runoff (af)	Percent of 30-Year Average	Forecasted San Marcial Runoff (af)	Percent of 30-Year Average
Jan 1	720,000	95	520,000	91
Feb 1	770,000	102	570,000	99
Mar 1	640,000	85	440,000	77
Apr 1	470,000	62	265,000	46
May 1	450,000	59	255,000	45
June 1	530,000	70	410,000	72
Actual Runoff	511,636	68	316,979	55

Combined total storage for Elephant Butte and Caballo Reservoirs was 432,545 af on December 31, 2007. This combined storage was 18.4% of the total capacity of both reservoirs, and 19.4% of the available storage. The available storage for both reservoirs during the winter months (October 1 to March 31) is equal to the capacity of Elephant Butte Reservoir, 2,023,358 af minus 25,000 af that Reclamation reserves for winter operational flood control space (50,000 af during the summer), plus the capacity of Caballo Reservoir, 326,672 af minus 100,000 af for flood control space, or 2,225,030 af during the winter (2,200,030 af 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 af on January 1, 2007. On January 29, 2007, Compact usable water in Project storage went above 400,000 af removing the Compact's Article VII restriction on upstream storage in post-1929 reservoirs.

However, Article VII of the Rio Grande Compact stipulates that when usable water in Project storage is below 400,000 af that 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. Due to waters stored in Platoro Reservoir by Colorado from November to December, 2006, Colorado relinquished 300 af of its credit waters on March 31, 2007 to Texas, and Texas accepted the relinquishment. The 300 af of relinquished credit waters was then allocated to the Rio Grande Project water users for the 2007 irrigation season.

The Compact usable water in Project storage stayed above 400,000 af until July 3, 2007, when the Compact usable water in Project storage went below 400,000 af invoking the Compact Article VII restriction. The Compact usable water in Project storage stayed below 400,000 af for the remainder of 2007.

On January 1, 2008, total Compact credit waters in Elephant Butte Reservoir for both Colorado and New Mexico decreased based on available data concerning deliveries in 2007. However, Compact usable water in Project storage remained below 400,000 af. On February 1, 2008, the State of New Mexico offered to the State of Texas a relinquishment of 125,000 af of its accrued Compact credit waters. The State of Texas accepted the relinquishment offer on February 5, 2008. With this sizeable reduction in Compact credit waters, the Compact usable water in Project storage went above 400,000 af on February 1, 2008.

A final allocation to the Rio Grande Project water users of 81.60% of a full supply was declared by Reclamation on September 20, 2007 for the 2007 irrigation season. The initial allocation to the Rio Grande Project water users (declared on January 25, 2007) started at only 39.65% of a full supply. After only a 50.70% of a full supply for irrigation was declared in 2006 for the Rio Grande Project, 2007 proved to be a much more generous irrigation water supply for the Project water users.

For the 2008 irrigation season initial allocation, a less than full allocation (only 24.20% of a full supply) was declared on January 18, 2008. Based on the February 1st NRCS/NWS spring runoff forecast at the San Marcial gauging stations and present hydrologic conditions, Reclamation anticipates a full supply for irrigation during 2008 for the Rio Grande Project.

The 2008 coordinated forecasts from the NRCS & NWS for the 2008 March through July runoff season is presented in Table 11.

Table 11: 2008 Rio Grande Coordinated Spring Runoff Forecasts

Month	Otowi Runoff (af) (Mar-Jul)	Percent of 30-Year Average	San Marcial Runoff (af) (Mar-Jul)	Percent of 30-Year Average
Jan 1	940,000	124	750,000	131
Feb 1	1,300,000	172	1,050,000	183

### **Project Irrigation and Drainage Systems and Title Transfer**

In 1992, Congress authorized the transfer of title to certain irrigation facilities to the Districts.

The official transfer of the irrigation and drainage rights-of-way and facilities to the Districts was completed on January 22, 1996. In 2007, 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 2007. 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 2007. The International Boundary and Water Commission (IBWC) continued to own, operate, and maintain the American Diversion Dam and the American Canal during 2007 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 74,730 af.

Water flows measured by IBWC on the Rio Grande at Fort Quitman Station, downstream of the Project and HCCRD boundaries, amounted to 125,948 af during 2007.

## **Elephant Butte Reservoir and Powerplant**

Elephant Butte Reservoir reached a minimum storage of 323,488 af (elevation 4,324.40 ft) on October 24, 2007. A maximum storage of 611,063 af (elevation 4,347.76 ft) was reached on March 26, 2007. Storage levels in Elephant Butte Reservoir did not enter into the 50,000 af prudent flood control space in 2007.

Net power generation for 2007 was 56,302,706 kilowatt-hours which was 76.6 percent of the 68-year average (1940 through 2007) of 73,546,191 kilowatt-hours.

The power plant releases were utilized to meet downstream irrigation demand and manage Caballo Reservoir storage levels. The balance valves were utilized to help meet peak releases during 2007 (March 24 - April 26, May 21 – 23, and June 29 - August 07). Reclamation

continues repair work on the power plant's lower No. 1 penstock guard gate, and anticipates completing this work by the spring of 2008. Therefore, Reclamation anticipates that all three turbines will be available for generation and discharge by the spring of 2008.

In 2007, monsoon rainstorms upstream of Elephant Butte Reservoir did not produce significant rainfall runoff flows into the Rio Grande and Elephant Butte Reservoir. Also, during 2007, no significant rainfall runoff flows occurred into the Rio Grande between Elephant Butte Dam and Caballo Reservoir.

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

During the FY2007, Elephant Butte Field Division implemented and completed the following recommendations:

- **Triathlon Event**-This event took place September 30, 2007. This was the first inaugural event and was very successful. Coordination for approval of this event went through the Albuquerque Area Office and the regional Safety Security and Law Enforcement office. Event security was provided by the New Mexico State Parks, local police and state police.
- **Sluice gate rehab completion** -EBFD personnel completed rehabilitation of the sluiced gates on Elephant Butte Dam, which was on the deferred maintenance list. The West waterway was rehabbed several years ago and the East waterway was completed this FY. Sand blasting of the interior surface of the waterway was done; removal of all rust buildup was completed. Cold tar was reapplied to the waterway to protect metal lining. Gates were removed blasted and painted. While gates were disassembled any maintenance on the gate and operator was completed as well. Area was cleaned up and is now in the best condition it has been for many years.
- **Foundation drain cleaning**-This project was performed over 2 FY; the Provo, Utah drill team completed the work. The foundation drains on the dam had not been cleaned for 50 years and needed a very aggressive cleaning. The drill team started on the East side of the dam and worked toward the center of the dam. Then moved over the West side of the dam and worked toward the center of the dam. As the drill team started work a 4 inch concrete veneer was expected. However the veneer was around 20-24 inches thick, this made it very difficult to find the foundation conduit from the crest of the dam. Other obstacles were the pins indicating where the foundation conduit should have been were inaccurate, at times several holes had to be drilled to find the conduit. Once the conduit was found a metal plated had to be cut to gain access. In the end funds were running low and EBFD made the decision to just clean out the drains that were full of silt. Using the 2005 CFR foundation drain profile map of drain depths EBFD determined which drains to clean. This was done with the acknowledgment of Dan Goins in Denver who approved the drains EBFD selected to clean.
- **Water tank lining**-This project has been on the drawing board for almost 20 years and is now being completed. The work on the tank is set to begin October 3, 2007. Shutdown of the water tank had to be coordinated with New Mexico State Parks since they obtain

water from EBFD tank. Valves had to be replaced to ensure the life of the tank and its system. New valve box covers were installed and rock work is being repaired.

- **Installation of unit 1 and 3 digital governors**-The new governor controllers were successfully commissioned by Denver TSC in coordination with L&S Electric and local EBFD staff. The governors have been operating reliably this entire season with no malfunctions.
- **Operated all three generators entire season without any forced outages**-For the first time in many years all three generators were operated the entire season with no forced outages.
- **River Channel test**- In MAY? of 2007 EBFD conducted a controlled increase in river channel flow to meet the maximum capacity according to river operations guidelines. This test had not been done since 2003, it was thought to be prudent to complete this test since in the 2007 season since the area had an increase in precipitation. With the increase in precipitation the Rio Grand's inflow areas deposited a large amount of sediment and changed the profile of the river. The test proved that EBFD could in fact pass 5,000 cfs of water down the river without any major flooding. The work done by EBDF in the river channel proved effective in returning the channel to its original profile.
- **EB and Caballo Sediment Surveys**- Denver's TSC surveyed the lakes of Elephant Butte and Caballo reservoirs. The survey will be used to calculate new storage capacities for use by the Bureau of Reclamation.
- **Elephant Butte Outlet Works**- After an annual preventive maintenance on the balance valve outlet works was performed, a recommendation and plan to further clean & flush the interior of the four Ensign design- balance vales was developed. This revealed that accumulated silt and fine sediment had solidified into a semi-solid material in the interior of the valves. After cleaning and reinstallation of the flush port and inlets a continuous pressure flushing of all four valves was performed. The guides and seats were repacked and lubricated. A wet/dry operation test was performed which resulted in a smooth/safe operation of the valves.
- **Power Plant Penstock Inspections**- The Powerplant penstock inspection was performed in January 2007. The final report was generated in February 2007 with no significant findings.

## **Caballo Dam and Reservoir**

Caballo Reservoir reached a minimum storage of 13,287 af (4,132.72 ft) on October 16, 2007. A maximum storage of 76,662 af (4,151.88 ft) was reached on May 23, 2007.

According to Court Order No. CIV-90-95 HB/WWD of October 17, 1996, which resulted from a negotiated settlement with the Districts, the Caballo Reservoir storage level is targeted not to exceed 50,000 af (4,146.11 ft) 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 af 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, 2007 was to maintain storage levels such that they would not exceed 50,000 af in February, not exceed 60,000 af in June, and not be less than 10,000 af by the end of September. Operating Caballo Reservoir at these storage levels during the 2007 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
- Serve as a reserve pool in case releases were interrupted from Elephant Butte Dam 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.

Caballo Reservoir's operating plan for October 1, 2007 through September 30, 2008 has not yet been finalized. However, Reclamation projects that Caballo Reservoir should not exceed 40,000 af during February, 2008, not exceed 55,000 af during June, 2008, and not be less than 20,000 af in September, 2008. Reclamation will finalize its operating plan in the spring of 2008. The plan will reflect accommodations for the minimization of evaporation differences between Elephant Butte and Caballo Reservoirs, and maintenance of some reserve water in Caballo Reservoir for emergency purposes.

## **Caballo Dam Facility Review and Safety of Dams Programs**

During the FY2007, Elephant Butte Field Division implemented and completed the following recommendations.

- **Caballo Balanced and Unbalanced Gate Test**- This was the last 2005 CFR recommendation, this gate test required the operation of both emergency and regulating gates. The hydraulic pressures for the East and West gates were recorded for both balanced and unbalanced conditions. The pressures seen are consistent with normal operation and no major concerns were found.
- **Yuma AZ**- Both Ron Hoskins and Doc Lanford went to Yuma Arizona for a detail that assisted the Department of Homeland security/ BLM with vegetation control on the boarder. Ron and Doc both worked extra time to complete the 600 Acres of land mowed.
- **River Channel test**- In MAY? of 2007 EBFD conducted a controlled increase in river channel flow to meet the maximum capacity according to river operations guidelines. This test had not been done since 2003, it was thought to be prudent to complete this test since in the 2007 season since the area had an increase in precipitation. With the increase in precipitation the Rio Grand's inflow areas deposited a large amount of sediment and changed the profile of the river. The test proved that EBFD could in fact pass 5,000 cfs of water down the river without any major flooding. The work done by EBDF in the river channel proved effective in returning the channel to its original profile.
- **Replacement of Rip Rap**- With the 2006 rainy season the banks of the Rio Grand had to be re-stabilized using existing rip rap the EBFD had in the storage rock pile. With the use of this rock the storage of the rock pile had to be restored as well. A contract was written



up to restock the pile and 6400 yards of material were delivered. The rip rap that was accepted was 16 inch nominal in size and will be used in future projects of EBFD.

- **EB and Caballo Sediment Surveys-** Denver's TSC surveyed the lakes of Elephant Butte and Caballo reservoirs. The survey will be used to calculate new storage capacities for use by the Bureau of Reclamation.

## **Data Automation and Instrumentation and Flow Monitoring System**

Reclamation's El Paso Field Division continued to maintain its internet web page for the Rio Grande Project during 2007. The current year's daily, weekly, and monthly data of the operations of Elephant Butte & Caballo Reservoirs, and the delivery of water to the two United States Rio Grande Project water users (Elephant Butte Irrigation District and El Paso County Water Improvement District No. 1), are available via the internet. To reach the web page, type the following URL into a web browser:

<http://www.usbr.gov/uc/elpaso/water/index.html>

Modifications and improvements to Reclamation's El Paso Field Division's internet web page began in 2007, as well as development of a Rio Grande Project historical database.

Modifications completed in 2007 included: addition of a link to review presentations at meetings concerning Rio Grande Project operations; addition of a link to review real-time data at Elephant Butte and Caballo Reservoirs, and gauging stations below each dam; and, addition of a weekly report concerning the Rio Grande Project reservoir/river advisory.

Modifications to be completed in 2008 include: addition of a table of daily water level surface area for Elephant Butte and Caballo Reservoirs; addition of the Rio Grande Project final water orders sheet; addition of a table to show adjustments to the NRCS/NWS spring runoff forecasts at San Marcial to compute apparent inflow to Elephant Butte Reservoir; addition of a table showing the status of the Rio Grande Compact credit waters and San Juan-Chama water in Elephant Butte Reservoir; addition of tables to show the monthly allocation to the Rio Grande Project water users and projected allocations based on the Rio Grande Project reservoirs operational plan; and, addition of a link to review the Rio Grande Project historical water data and the ability to choose a period of record and download the data.

In February, 2008, Reclamation will be purchasing an acoustical doppler velocity meter to be installed at the gauging station on the Rio Grande downstream of Caballo Dam. The meter will be installed by Reclamation at the end of 2008. The new meter will give Reclamation the ability to develop a rating curve of average velocity, gauge height, and discharge, and improve the accuracy of calculating daily flows for the record at this station.

## **Diversion Dam Facility Review and Safety of Dams Programs**

Reclamation conducted a field examination of the Rio Grande Project reserved works structures - Percha, Leasburg, Mesilla, and Riverside Diversion Dams, on January 23-24, 2003. The final examination report will be issued in 2008. The next scheduled operation and maintenance field

examination of the diversion dams is tentatively set for the fall of 2009, following the end of the irrigation season.

## **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 January 7, 2008 and February 19, 2008.

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.

## Elephant Butte and Caballo Reservoir Vegetation Management Cooperative Agreement

Under a Cooperative Agreement with the State of New Mexico, Reclamation performs maintenance of previously managed vegetation primarily by mowing to limit the nonbeneficial consumption of water by woody phreatophytes such as saltcedar (*Tamarix*). Herbicide treatments to both saltcedar and tornillo are also made to limit the amount of mowing necessary. Approximately 3,850 acres (primarily saltcedar) have been sprayed at both reservoirs over the past four years with varying amounts of success. Scientific investigations are being done concurrently with assistance from New Mexico State University with funding through Reclamation's Science & Technology programs.

During FY 2007 Reclamation completed mowing to maintain 2,859 acres of phreatophytic vegetation at Caballo reservoir. Approximately 600 acres of the mowing occurred in an area that had been treated with herbicides two years prior in an effort to reduce saltcedar densities. Mortality (death of plants) ranged from 50-70 %. Follow up treatments will be made utilizing appropriate application techniques until mowing can be reduced or even eliminated in the treatment area.

During 2007, significant advances occurred in the areas of treatment and monitoring on the project. A new herbicide application system was designed and constructed with assistance from NMSU and M-TEC which allows for treatments without damage to understory vegetation such as grasses.

Under a separate study for measuring water use by riparian vegetation at Caballo reservoir, Reclamation and NMSU College of Civil Engineering measured temporary reductions in evapotranspiration (ET) from saltcedar after mowing. The reductions were significant (30%), and it is estimated that ET may be reduced as much as 50% by either increases in mowing frequency or through the use of herbicides. A similar study at Elephant Butte showed saltcedar treated with herbicides had 57% less ET than untreated saltcedar (<http://wrri.nmsu.edu/publish/techrpt/abstracts/abs328.html>). These investigations will continue and results will be presented in technical reports and appropriate scientific journals.

# **EL PASO FIELD DIVISION PLANNING STUDIES AND INTERACTION WITH THE NEW MEXICO - TEXAS WATER COMMISSION**

The New Mexico-Texas Water Commission (Commission) was created as a result of the voluntary court settlement in the El Paso vs. Reynolds (563 F. Supp. 379 D.N.M. 1983) ground water appropriation case. The Commission seeks to implement the best management practices for the water resources of the west Texas and southern New Mexico area (Figure 9). The following sections summarize studies that are being performed through the cooperation of Reclamation and the Commission.

## **Elephant Butte and Caballo Reservoir Water Quality Assessments**

Reclamation and the USGS are partners in the reservoir water quality assessments of Elephant Butte and Caballo Reservoirs. These assessments consist of monitoring temperature, dissolved oxygen, and pH profiles throughout the year, in addition to investigations into the generation and potential mitigation of hydrogen sulfide gas (H<sub>2</sub>S) releases at the Elephant Butte power production facility. The release of H<sub>2</sub>S poses a potential health risk to the employees in the power plant, and falls under the purview of Occupational Safety and Health Act (OSHA) regulations. Dissolved H<sub>2</sub>S below Elephant Butte is also detrimental to the cold water trout population present in the tailwaters. This effort is being managed by Reclamation's Upper Colorado Regional Office. The actual measurements are being conducted by personnel from New Mexico State University.

## **Rio Grande/Rio Bravo International Basin Assessment / Border Regional Environmental Workgroup**

In July 2000, the Department of the Interior and Mexico's Secretariat of Environment and Natural Resources (SeMARNAT) agreed to conduct a binational water and natural resources assessment of a portion of the International reach of the Rio Grande / Rio Bravo. A Memorandum of Understanding was signed whereby an information exchange program was initiated. Data on cultural and natural resources was inventoried and exchanged with SeMARNAT under the leadership of the International Boundary & Water Commission. The focus is on data and reports for the Lower Rio Grande/Rio Bravo Basin.

Various groups have designated the subsections of the river differently. For the purposes of this assessment, the Lower Rio Grande / Rio Bravo is the Reach between El Paso, Texas and Amistad Reservoir. Major U.S. cities located along the Lower Rio Grande include El Paso, Laredo, Brownsville, and McAllen, Texas. Major Mexican cities along the Rio Grande are Juarez, Chihuahua, and Nuevo Laredo and Matamoros, Tamaulipas.

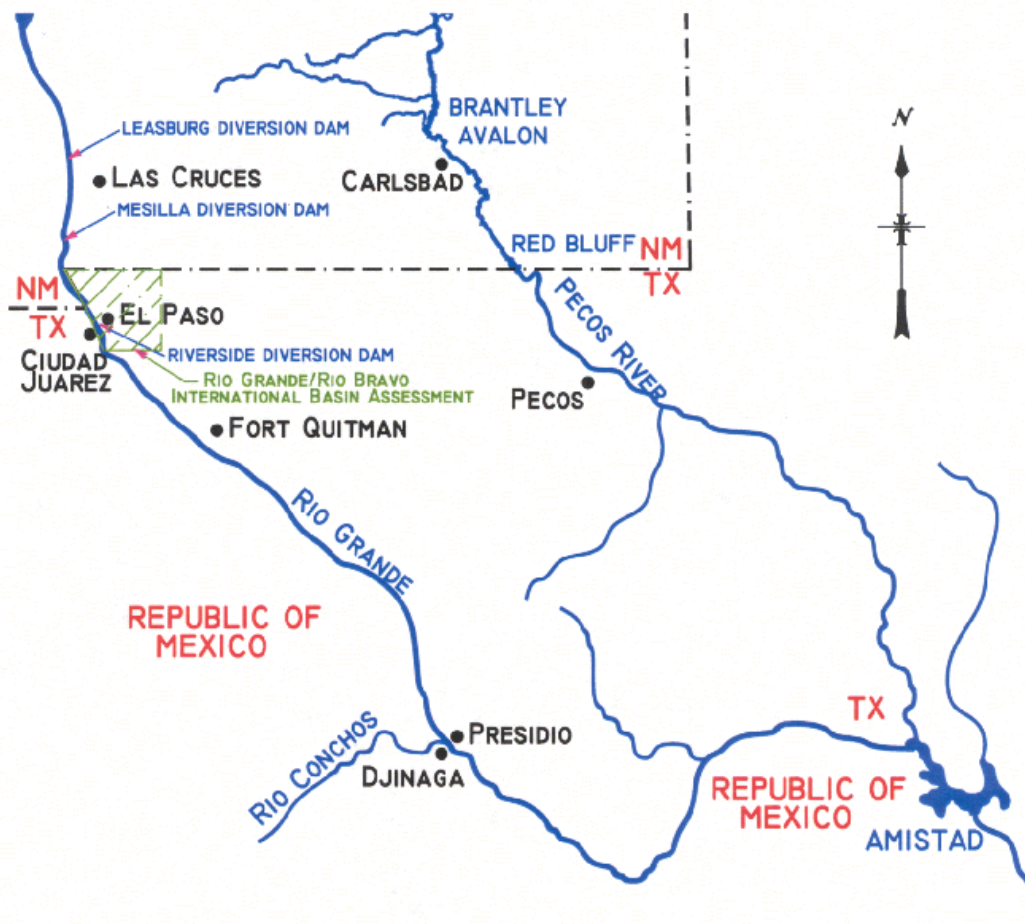


Figure 8: Area Map of the Rio Grande/Rio Bravo International Basin Assessment

The Joint Resolution signed at the Binational Rio Grande / Rio Bravo Symposium on June 14, 2000 listed eight objectives to be accomplished to protect the ecological integrity of the Rio Grande / Rio Bravo in the reach between Fort Quitman and Amistad Dam. Subsequently, meetings have been held between federal and state agency representatives (the organizing committee) to develop a strategy to move forward with initiatives to satisfy the intent of the Joint Declaration. Under a phased completion, Phase 1 enabled implementation of four of the eight objectives listed in the Joint Declaration, (1: Form a binational task force; 6: Undertake research on biological and hydrologic conditions of the region; 7: Develop and exchange compatible information systems; 8: Facilitate public participation in developing strategies for environmental sustainability).

## **Current Activities**

Under the leadership of the International Boundary & Water Commission, partnerships for funding are being formulated to focus on a common border riparian problem of saltcedar control. A partnership with the International Boundary & Water Commission, Bureau of Reclamation, National Park Service, U.S. Department of Agriculture – Agricultural Research Service, and the Texas Department of Agriculture exists to identify two pilot project sites for biological control of saltcedar.

## **Environmental Health in the US-Mexico Border Region**

Rapid population growth, economic development, and land-use changes are pushing the limits of environmental sustainability and quality in the US-Mexico border region. To allow for continued economic growth while protecting the area's natural resources and fostering a high quality of life, the United States and Mexico need an improved understanding of the threats posed by these anthropogenic changes. The USGS has initiated a project to provide an earth and biological resources database within a geographic framework using an Internet map service (IMS) to further our understanding of the condition of the physical environment in the border region. Although the project is planned to ultimately encompass the entire US-Mexico border, initial efforts have focused on the lower Rio Grande basin from Falcon Reservoir to the Gulf of Mexico. An IMS for that study area is now available via the internet at <http://borderhealth.cr.usgs.gov/>.

## **Reports**

A population study and observation of peregrine falcon nests in Big Bend National Park indicated that nest productivity rates were alarmingly low. This project evaluated the impacts of environmental contaminants on the Big Bend peregrine falcon during the 1997 breeding season by analyzing contaminants in potential avian and bat prey items. Preliminary research indicates that mercury; selenium and DDE may be contributing to low reproductive rates. The published report is available through the USGS.

*Survey of In-Stream and Riparian Zone Natural Resources and Ambient Water-Quality Conditions of the Rio Grande/Rio Bravo from Big Bend Ranch State Park near Redford, Texas, to the End of the Wild and Scenic River Segment at Foster's Ranch, Texas.*

## **Databases**

The report and database entitled *Standardized Watersheds Database for the Lower Rio Grande/Rio Bravo, Texas USGS Open-File Report 00-065* describes the creation of a large-scale watershed database for the lower Rio Grande/Rio Bravo Basin in Texas. The watershed database includes watersheds delineated to all 1:24,000-scale mapped stream confluences and other hydrologically significant points, selected watershed characteristics, and hydrologic derivative data sets.

## **Caballo Mercury Study**

Reclamation, in conjunction with the New Mexico State University's Department of Fishery and Wildlife Sciences and the USGS Biological Resources Division, has established the only



mercury deposition network site in the southwestern United States. Unique to this site is the measurement of both dry and wet deposition of atmospheric mercury.

Mercury is deposited on both a regional and global scale, and the inorganic mercury which lands in the watershed of the Rio Grande eventually washes into the river and reservoir areas. Under anaerobic conditions, bacteria may transform inorganic mercury into the toxic organic form, methylmercury (MMHg). MMHg has profound ecological effects because it is one of the few metals that is known to bioconcentrate, bioaccumulate, and biomagnify in aquatic food chains. The biomagnification is predominantly responsible for the elevated levels of mercury present in the fish populations at Elephant Butte and Caballo Reservoirs. The primary route of MMHg accumulation in wildlife and humans is through the ingestion of fish. The State of New Mexico has issued an advisory concerning the consumption of fish from these reservoirs. The long-term prognosis of mercury accumulation in our reservoirs is unknown, which is the primary reason for undertaking this project.

The goals of this study are to identify the transport, fate, and effects of mercury in an arid environment. Ultimately, the results of this investigation may lead to a better understanding of the potential for mercury contamination in lakes and reservoirs in both arid and wetter climates across the globe. The direct results of this research may expand this investigation to cover other Reclamation reservoirs throughout the Southwest, including Lake Powell, Lake Mead, Lake Havasu, and Roosevelt Lake.

## **Snow-Melt Runoff Modeling**

Monitoring snow-melt runoff within the Rio Grande Basin is critical to the management and operation of the Rio Grande Project. The Rio Grande Project system of dams and reservoirs is designed for flood control and for the storage and delivery of irrigation and municipal waters. The crucial factors for determining Rio Grande Project storages, diversions, and releases are the flows within the river, and expected flows from runoff predictions. Currently, this runoff assessment is made from specific NRCS Snowpack Telemetry (SNOTEL) sites coupled with information from the National Weather Service. A Snow-Melt Runoff (SMR) model, utilizing satellite imagery and data from SNOTEL points, could greatly enhance predictive capabilities for runoff forecasts. Implementation of this SMR model is an important step towards more effectively predicting the amount of runoff expected to drain into the Rio Grande Basin. Reclamation is partnering with the Center for Applied Remote Sensing in Agriculture, Meteorology, and Environment, a cooperative effort of the New Mexico State University, College of Agriculture and Home Economics and the U. S. Army Research Laboratory at White Sands Missile Range.

# OTHER RECLAMATION PROGRAMS

## Department of the Interior's Water 2025 Initiative

The Department of the Interior's Water 2025 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 Water 2025 is addressing. Water 2025 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 Water 2025 program.

Reclamation has awarded a total of \$3.3 million to MRGCD for system automation, water measurement, and canal lining. In addition, Reclamation provides technical assistance to MRGCD in support of the program. Recently completed Water 2025 funded work includes the installation of Langemann gates at Angostura Diversion Dam.

MRGCD is continuing work on concrete lining an 8,700 foot section of the Cochiti East Side Main Canal from Cochiti Dam to the Santa Fe River. The concrete lining will reduce seepage losses from the canal and help reduce operation and maintenance costs. An initial phase of construction was completed in April, 2007. The final phase will be completed by the spring of 2008.

Reclamation is working with MRGCD on designs and drawings to replace radial gate lifting drum assemblies, supports, and hoists at San Acacia and Isleta Diversion Dams.

Reclamation is also 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.

Elephant Butte Irrigation District installed 100 flow control meters to implement its metering and monitoring plan to meter all farm deliveries using telemetry. The total project cost was \$615,000, including a Water 2025 contribution of \$300,000. The project is estimated to save 8,000 af of water per year.

The City of Las Cruces will install pumps on the Elephant Butte Irrigation District water distribution system so that the city's Burn Lake can be used as a regulating reservoir for storm water runoff, operational spills, and irrigation water. The city also will install pumps so that EBID water stored in Burn Lake can be returned to the district as needed. The total project cost is \$174,889, including a Water 2025 contribution of \$86,350. The project is expected to save 3,750 af of water a year and is scheduled to be completed in 2008.

The City of El Paso Utilities Water Service Board installed four flow gaging stations and 15 electrical conductivity measurement stations on the Rio Grande and various drains. These stations are equipped with telemetry and will provide internet-based access to real-time and archived data on flows and water quality. The project is estimated to save 7,600 af of water per year and better manage 931,840 af of water. The total project will cost \$357,386, including a Water 2025 contribution of \$165,000.

## **Reclamation's Water Conservation Field Service 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 2007, implementation activities such as installation of water meters in Hatch and Anthony, New Mexico, and writing a water conservation plan for the Town of Taos. Irrigation water management workshops were cosponsored by Reclamation, the Office of the New Mexico State Engineer, and the New Mexico Water Conservation Alliance. Funding was provided to the New Mexico Association of Conservation Districts 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 has also been provided for children's water festivals in Albuquerque, Santa Fe, Artesia, Carlsbad, and Lovington, and will be expanded to the Las Cruces area.

Funding and technical assistance is being provided to the city of Las Cruces to promote and demonstrate a "Lush and Lean" garden. Las Cruces hopes this showcase activity will lead through example.

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

Under the authority of Public Laws 102-575 and 104-266, Reclamation is/was participating in water reclamation and reuse projects with the cities of Española, and Albuquerque in New Mexico, and El Paso, Texas.

### **City of Española**

The City of Española completed its Title XVI projects in 2006. Many of those activities associated with Title XVI were scheduled to be transferred to project activities authorized under P.L. 108-354. The City continued to investigate and consider its water supply options during 2007. The diversion project needed to supply the filtration facility authorized in P.L. 108-354 is on hold pending a final decision by the City on how to best divert and utilize its current San Juan-Chama Project contract allocation of 1,000 acre-feet.

## **City of Albuquerque**

In 1999 Reclamation entered into agreements with the City of Albuquerque that provide the framework for participation and cost sharing in their 45 million dollar arsenic demonstration project and non-potable water reclamation and reuse program. Reclamation cost sharing was approved for construction of the industrial recycling and non-potable water reuse portion of the project.

### North I-25 Industrial and Non-Potable Surface Water Project

The Albuquerque Bernalillo County Water Utility Authority (ABCWUA) has completed the construction of this project and all users are connected with the exception of Heritage Hills Park, which is scheduled for connection in March 2007. These two projects beneficially consumptively used approximately 2,000 af of the 3,000 af permitted for the facilities during 2006. In 2007, ABCWUA anticipates connecting the last user and establishing a pilot aquifer storage and recovery project on Bear Canyon arroyo starting in November. The combined consumptive use for these projects in 2007 will be the 3,000 af of SJ-C water, and all of the industrial reuse from the Sumitomo manufacturing plant.

### Southside Municipal Effluent Reuse Project

Design and permitting of this project is now complete. Construction is projected to take approximately one year to complete beginning in late summer of 2007. The project will be operational in summer of 2008, and will provide about 2,000 af of polished municipal effluent for irrigation and industrial needs.

### Arsenic Pilot Demonstration Project

The Arsenic Pilot Demonstration Project started construction in 2006 and will be completed and operational during 2008. The project will purify and remove arsenic from two wells on the west side of Albuquerque (College No. 1 and No. 2), and is anticipated to provide 5 million gallons per day of drinking water that meets or exceeds the EPA drinking water MCL for arsenic.

### Alameda Arsenic Project

The feasibility study and NEPA work will begin in 2008. Design and construction of the project are contingent on receiving federal matching funding. Request for this funding was submitted by ABCWUA to their Congressional Delegation.

## **City of El Paso**

The City of El Paso has been using recycled water since 1963. Reclamation has contributed to El Paso's efforts since 1996 through Title XVI. El Paso currently recycles 700 million gallons of water per year through 40 miles of purple pipe. This recycle program has cost the City \$36 million dollars with Reclamation's contribution of \$8 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 5 miles of pipe. There was no progress on the Fort Bliss extension during 2007.

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.

## **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). 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.

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.

The URGWOM accounting model has now completed its sixth year as the primary tool used by Reclamation for SJ-C and Rio Grande Compact accounting. The Nambé Falls Accounting Model was coded into the main Accounting Model, but was not linked and continued to be operated as a separate model independent of the main URGWOM Accounting Model during 2007.

URGWOM's water operations module was used to develop the 2007 Middle Rio Grande Annual Operating Plan, and to evaluate short-term operational scenarios for the ESA Collaborative Program.

URGWOM development during 2007 primarily concentrated on improving model performance related to achieving in-stream target flows, completion of new methods for modeling the groundwater and surface water interactions within the middle valley, completion of documentation and clean-up of the water operations ruleset, and improvements to the Accounting Model and HDB interface. The URGWOM Technical Team and Sandia National Laboratory continued to work cooperatively during 2007 on refinements of a monthly time step model using the Sandia Powersim simulation software.

Planned work for 2008 will concentrate on implementing in URGWOM the many new improvements and capabilities in RiverWare, including improvements to the user interface and model run setup, the shallow groundwater - surface water interaction simulation capability 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 anticipated for the ESA Collaborative Program and the new Biological Opinion, planned for March 2010. The Accounting Model improvements and documentation that were completed 2007 are expected to improve reporting efficiency and accuracy in 2008 – additional work to improve data storage, security and reporting efficiency is also anticipated. Reclamation anticipates linking the Nambé Falls Accounting Model to the main URGWOM accounting model in 2008.

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/>.

## **Water Accounting Reports Projects**

### **2007 Rio Grande Compact Water Accounting**

The current approved Compact Accounting process (RiverWare URGWOM Accounting Model→DSS→Lotus Spreadsheet) was used for all official water accounting during 2007. A new RiverWare URGWOM Accounting Model→Excel method is under technical review by the ISC – upon a favorable technical review report, approval will be sought for changes in official water accounting methods during 2008.

### **Excel Based Water Accounting Spreadsheet**

Reclamation completed the development and testing of a fully functional Excel Spreadsheet/DSS version of the current Lotus spreadsheet/DSS Annual Water Accounting Report. The two spreadsheets were operated in parallel all year to test the logic and import/export functions of the Excel spreadsheet in comparison to results generated using the current Lotus spreadsheet. The Excel version uses the same DSS generated text files that are used as input for the Lotus spreadsheet. Improved documentation in the form of internal notes were incorporated within the Excel spreadsheet as it was developed. This project helped achieve Reclamation's directive to make Excel the standard spreadsheet software.



While the new Excel version of the Lotus spreadsheet was comparable to the Lotus spreadsheet, additional development in the RiverWare URGWOM Accounting Model itself has yielded data objects which now allow all accounting to occur and be saved directly in the RiverWare URGWOM Accounting model. Excel is only used to format the data tables – no calculations are performed in Excel. An extensive written technical review of this new method was performed and is available as a separate document. The review documents the sources of minor discrepancies between the accounting model and the Lotus/Excel spreadsheets, mostly due to rounding in the spreadsheets

This new RiverWare URGWOM Accounting Model→Excel method is viewed by Reclamation as an interim step in a process to achieve a RiverWare URGWOM Accounting Model→HDB→Crystal Reports reporting method where accounting model data is stored in HDB and Crystal Reports is used to query HDB for the data, and format data tables for annual reports.

During 2008, Reclamation will seek approval from the Engineer Advisors to switch to the latest RiverWare URGWOM Accounting Model→Excel report production method for 2008.

### **Water Accounting Documentation**

Reclamation completed the documentation of the water accounting data sources and information used by both the RiverWare URGWOM Accounting Model →DSS→Lotus Spreadsheet process as well as the RiverWare URGWOM Accounting Model →DSS→ Excel Spreadsheet process during 2007. A copy of this documentation was provided to the Engineer Advisers to the Rio Grande Compact Commission at the annual meeting on February 26, 2007. A copy of the research and documentation for the new RiverWare URGWOM Accounting Model→Excel report production method was provided to the Engineer Advisors at the annual meeting on February 25-26, 2008.

### **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, DSS and models such as RiverWare. HDB was developed and is maintained at the University of Colorado Center for Advanced Decision Support for Water and Environmental Systems (CU-CADSWES). 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), host HDB installations for the purposes of evaluation and applications development.

Development of water accounting and reporting functionalities for the Albuquerque Area Office's HDB installation continued during 2007. Water accounting data is now directly transferred from the RiverWare URGWOM Accounting Model to HDB via a new HDB/RiverWare Direction Data Connection interface. The intricacies of SJ-C water accounting

such as contractor leases, transfers, loans, and deliveries are documented by annotating these transactions within HDB. The hand written “Green Book” and HDB water accounting annotations will be maintained in parallel while development and evaluation of the HDB water accounting functionalities continue. Other HDB developments completed during 2007 include completion of all water accounting report tables using the RiverWare URGWOM Accounting Model→HDB→Crystal Reports (version 9) process to duplicate tables now generated using the RiverWare URGWOM Accounting Model→DSS→Lotus Spreadsheet process.

Planned work for 2008 includes converting Crystal Reports (Version 9) accounting table reports of all water accounting tables that are currently generated using the Lotus spreadsheet/DSS (or RiverWare URGWOM Accounting Model→Excel ) process to Crystal Reports (version 11) reports. Reclamation’s contractors have provided detailed documentation of all calculations as well as the mapping of URGWOM and Nambé Falls Accounting Model data slots to the annual report tables. During 2008, all water accounting will continue to be maintained using the current Lotus spreadsheet/DSS process, unless permission is received to begin using the new interim RiverWare URGWOM Accounting Model→Excel method.

The generation of water accounting report tables using the RiverWare URGWOM Accounting Model→HDB→Crystal Reports method would allow data to be stored securely outside the model, and would open many potential new data distribution options, such as daily/weekly/monthly automated email/pdf and/or internet-based html-coded reports. The Engineer Advisors will be consulted prior to any deviation from the current water accounting process for official purposes.

Additional general information about Reclamation’s HDB development efforts can be found at this CU-CADSWES HDB web site: <http://cadswes.colorado.edu/hydrodb.com/>.

### **Other Proposed Work**

The use of the new RiverWare URGWOM Accounting Model Data Objects allows for all compact accounting and accounting report table data to be derived within and acquired directly from the RiverWare based URGWOM Accounting Model. Using Excel as the report table generator allows the report tables to exactly reflect the Accounting Model contents, but does not allow for secure data storage or automated data reporting. The URGWOM Accounting Model Data Objects do easily allow Reclamation to check the current status of individual or multiple accounts. Reclamation will continue to develop the RiverWare URGWOM Accounting Model→HDB→Crystal Reports method of data table report generation in 2008. Reclamation is also pursuing the movement of the Albuquerque Area Office (AAO) implementation of HDB (ALBHDB) to the Upper Colorado Regional Office in Salt Lake City, UT, for improved function (faster server), support and database management. In conjunction with the movement of ALBHDB to Salt Lake City, the AAO is investigating the use of the Upper Colorado Regional Office as the data source for its database instead of, or in addition to, the current practice of receiving hydrologic data from the Albuquerque District Office of the Corp of Engineers.

Reclamation used its contracted consultants to incorporate the RiverWare Nambé Falls Accounting Model code into the RiverWare URGWOM Accounting Model during 2007, without linking the Nambé Falls Accounting Model output. In 2008 Reclamation anticipates using its

contracted consultants to link the Nambé Falls Accounting Model output to the RiverWare URGWOM Accounting Model as one integrated accounting model.

CADSWES at CU-Boulder has developed functionalities that allow RiverWare to directly export data to an Excel spreadsheet, DSS or HDB through a new direct data connection. CADSWES is also developing capability to directly annotate and link to external documents within RiverWare, facilitating model documentation and annotation of water accounting transactions directly within RiverWare, eliminating the functional need for a paper document “Green Book”. These annotations may continue to be stored in HDB.

## **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>

The cumulative and river reach ET estimates are available daily for the URGWOM RiverWare models. RiverWare currently contains water accounting and ownership tools (objects) and peripheral water budget and flood routing tools (methods) that are configured for URGWOM. The ET Toolbox data, provided early every day for direct import into URGWOM, allows the model to more accurately reflect the physical conditions in the basin, and will allow daily water operation managers to make better water release decisions from upstream control structures

when the daily water operations URGWOM model goes online.

Write-in funding for URGWOM improvements resulted in ET research and development (open-water / wet-sand data collection) on river channel evaporation during the summer of 2006. Unfortunately, the extreme monsoonal activity provided above average flow and humidity conditions during the field research. Data analysis and interpretation may result in new models for incorporation in the ET Toolbox for open-water / wet-sand evaporation in 2008. Improvements in and extensions of National Weather Service prediction products in 2007 now allow 7 day ET predictions at 1-kilometer resolution under the QPESUMS model, which replaced the 4x4 kilometer HRAP model grid cells this year.

## **Upper Rio Grande Basin Water Operations Review**

Reclamation, the Corps, and the New Mexico Interstate Stream Commission entered in to a Memorandum of Agreement, in January of 2000, to cooperate as joint lead agencies in a review of their water operations activities in the Rio Grande basin above Fort Quitman, TX. The scope of the Upper Rio Grande Basin Water Operations Review and Environmental Impact Statement (Review and EIS) was limited to existing facilities and authorities. Because of ongoing litigation, water supply operations at El Vado, Elephant Butte, and Caballo Reservoirs were not included in the Review and EIS. However, flood control operations and their impacts down to Fort Quitman were considered.

The purpose of the Review and EIS was to develop a better understanding of how Corps and Reclamation facilities could be operated more efficiently and effectively as an integrated system and to formulate a plan for conducting future water operations. The review will support continued compliance with state, federal, and other applicable laws and regulations, including the Endangered Species Act. The Review may also result in improved processes for making decisions about water operations through better interagency communications and public input.

The review took place through the preparation of a programmatic EIS that describes and evaluates a range of alternative water operations plans. Each of the lead agencies will publish a separate Record of Decision on its future water operations following completion of the Final EIS. The process was officially started in March of 2000 with the NOI to prepare an EIS.

Extensive involvement of stakeholders and interested parties, including the Rio Grande Compact Commission, International Boundary Water Commission, Indian tribes, Congressional staff, and the general public, has been part of the Review and EIS, with five official cooperating agencies that include two state government agencies, two federal agencies and one Indian tribe. The URGWOM Planning Model was used together with modeling of overbank flooding (FLO-2D), an aquatic habitat model, and a groundwater – surface water hydrologic model (MODBRANCH), to evaluate alternative water operations and the interrelated effects of the various facilities. A range of hydrologic conditions from surplus to drought was considered using a synthetic combination of actual measured flows from 1975 to 2000 to create a 40-year planning hydrograph. The hydrologic variability of this 40-year sequence mimics the last 300 years of climatic variability documented in tree ring data.

Public scoping meetings began in June of 2000 and continued through October. Scoping meetings took place in nine locations from Alamosa, CO to El Paso, TX. Comments were received from various individuals and entities, and a scoping summary was prepared. One comment that was made frequently during the scoping process was that the public desired more input into the generation of alternatives. Therefore, another round of public meetings was held from January to May, 2002, in 10 locations in the project area. Modifications to the alternatives, as well as additions to the explanations of existing authorities, were made as a result of these meetings. In addition, outreach continued regarding the 23 Indian tribes, pueblos and nations whose lands are affected by alternative development.

Combined alternatives identified for this review include the following highlights:

- No changes to facilities in Colorado
- Administrative changes to two Reclamation facilities – Heron Reservoir’s waiver policy, and the Low Flow Conveyance Channel’s diversion policy
- Storage options at Abiquiu reservoir operated by the Corps
- Changes to channel capacity below the Corps’ reservoirs of Abiquiu and Cochiti Lake
- Improvements in communications at all facilities, including flood management protocol below Elephant Butte and Caballo, two Reclamation facilities.

In 2004, a suite of tools, including the URGWOM Planning Model, were used to assist in the preliminary screening of twenty-two alternatives and detailed analysis of impacts from six alternatives over the 40-year synthetic period of record. Evaluation of alternative impacts was guided by a two-tiered decision process. The first tier of analysis included a water operations review of alternative performance against an established set of weighted decision criteria. The initial twenty-two alternatives were narrowed down to six alternatives which were subsequently studied in detail to evaluate impacts and compare performance against the no action alternative. Interdisciplinary NEPA technical teams evaluated impacts using resource-specific performance criteria. Alternative performance was further evaluated using decision criteria, weighted in importance by the joint lead agencies and steering committee, leading to the selection of the alternative that best meets often-competing objectives. GIS and database tools were used to assess data quality and uncertainty, further assisting the decision-making process. Finally, a model developed by Sandia National Laboratories was refined to provide stakeholders access to a quick simulation tool that helps stakeholders understand the tradeoffs made between different types of alternatives and their resulting resource impacts using documented data and evaluation information from the URGWOM Planning Model and the Review and EIS.

The Draft EIS and technical resource reports were prepared in 2005. The joint-lead agencies participated in government-to-government consultations in 2005 and early 2006 with those Pueblos and Tribes willing to schedule such meetings. The Notice of Availability of the Draft EIS was published in the Federal Register on January 20, 2006. To present the results of the Draft EIS and to solicit public input, eight public meetings and two tribal workshops were conducted in February and March 2006. In addition to presentations concerning the tools used to evaluate alternatives and resource impacts for the Draft EIS, the decision analysis model developed by Sandia National Laboratories was used in these meetings and workshops to facilitate public understanding of the tradeoffs and resource impacts associated with the

alternatives considered. The 60-day public comment period culminated on April 22, 2006. The joint lead agencies reviewed the public comments, finalized the EIS, and decided on the actions to be taken by each agency.

The Final EIS was filed with the Environmental Protection Agency (FES-07-05) on April 20, 2007, and the Notice of Availability was published in the Federal Register on April 27, 2007. Reclamation received only a single “no comment” response during the 60-day waiting period which ended on June 20, 2007.

Each joint lead agency was responsible for issuing its own Record of Decision regarding actions at facilities under its jurisdiction. The Corps of Engineers published their Record of Decision on June 29, 2007. The New Mexico Interstate Stream Commission published its Record of Decision on October 17, 2007.

Reclamation published its Record of Decision on August 8, 2007. The joint lead agencies selected Alternative E-3 as the preferred alternative because it provides the greatest physical capacity to accommodate the wide range of hydrologic conditions in the basin. Reclamation actions under Alternative E-3 included the potential to grant waivers for San Juan-Chama project waters stored in Heron Reservoir extending as late as September 30 and operation of the LFCC with diversions ranging from zero to 2,000 cfs. Reclamation’s decision is to:

1. Consider waiver requests at Heron Reservoir with the potential to extend San Juan-Chama water storage through September 30 in accordance with Reclamation policy.
2. Continue operating the Low Flow Conveyance Channel as a passive drain only, with zero cfs diversion from the Rio Grande.

Improved communication and coordination of water operations at other federal facilities will continue to be refined and implemented. No proposed water operations changes were suggested for other Reclamation facilities including the Closed Basin Project, El Vado Dam, Elephant Butte Dam, or Caballo Dam.

## **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, the Water 2025 Program, water right settlements, and special projects funded through Congressional write-ins.

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. The Middle Rio Grande Conservancy District has obtained a Water 2025 grant from Reclamation to improve District facilities. One of their projects includes concrete lining about 8600 ft of the East Cochiti Main Canal through Cochiti Pueblo, an area with high seepage losses. Phase I of the project took place in 2006, and Phase II is taking place in the winter of 2007-2008. Work proceeded on technical studies in support of a negotiated settlement of the Abouselman



adjudication on the Rio Jemez involving Jemez, Zia, and Santa Ana Pueblos. Agreement has been reached at the local level on a proposed settlement of the Abeyta adjudication, which includes Taos Pueblo, and the Aamodt adjudication, which includes Pojoaque, Tesuque, Nambe, and San Ildefonso Pueblos. The local parties are working with the New Mexico Congressional delegation to develop settlement legislation.

## **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 is working through an interagency agreement with the U.S. Indian Health Service to relieve drought impacts by providing drinking water wells for the Pueblos of Acoma, Nambe, Isleta, and San Felipe. Wells will also be provided for community water systems in Regina and Brazos.

## **Rio Grande Silvery Minnow Sanctuary**

Reclamation, the U.S. Fish and Wildlife Service (Service), Middle Rio Grande Conservancy District (MRGCD), and the City of Albuquerque are cooperating in the development of an off-channel sanctuary for the Rio Grande silvery minnow at a site in Albuquerque. The sanctuary will be one of the refugia required by the Biological Opinion. The sanctuary can serve a number of needs for propagating and raising fish as well as being a place for research. The final phase of construction on the sanctuary is underway and will be completed in October 2008. The Service will operate the facility when it is completed.