2006

2006 Calendar Year Report to the Rio Grande Compact Commission

Hal D. Simpson
Colorado

John R. D'Antonio
New Mexico

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Texas

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Federal Chairman

RECLAMATION

Managing Water in the West

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

March 2006

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 – Removal of woody debris caught on San Acacia Diversion Dam following record monsoons.

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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 a 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.

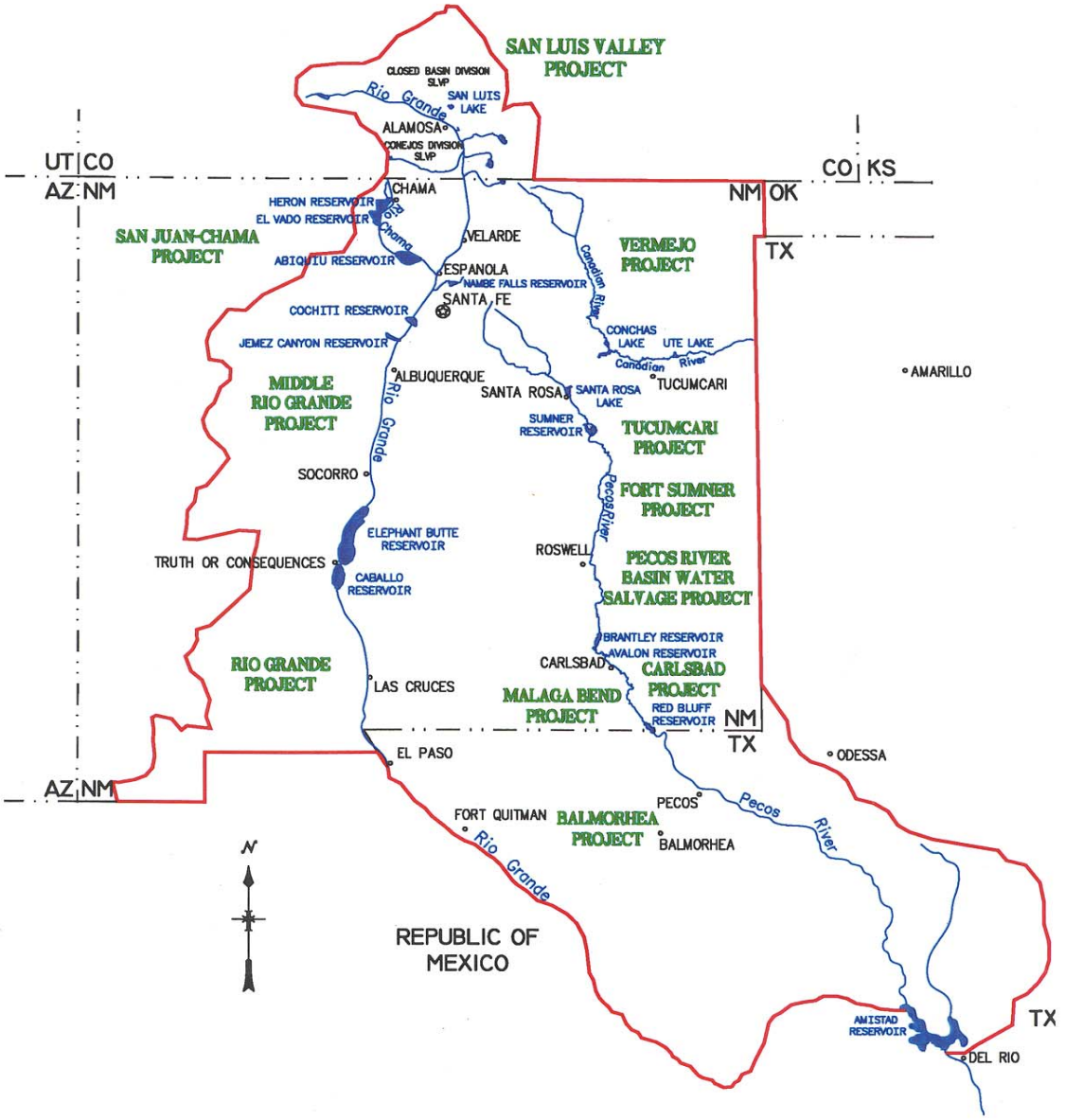

Figure 1: Project Map of Reclamation's Albuquerque Area Office

San Luis Valley Project, Colorado

Conejos Division, Platoro Reservoir

The Conejos Water Conservancy District operates Platoro Reservoir which provides storage for the San Luis Valley Project (Figure 2). Conejos Water Conservancy District's office is located in Manassa, Colorado, at 318 Main Street.

Platoro Reservoir began 2006 with an elevation of 9,961.42 and a content of 9,360 acre-feet (af). A total of 9,140 af of re-regulated water was stored and released prior to October 31. The system was closed for the winter on November 6 due to freezing temperatures.

Reclamation and the Conejos Water Conservancy District are developing a Memorandum of Understanding to clarify O&M responsibilities at Platoro Dam.

Platoro Dam Facility Review and Safety of Dams Programs

In 2006, the following activities were implemented for Platoro Dam:

- The Conejos Water Conservancy District, in collaboration with the Albuquerque Area Office and the Denver TSC Office has developed a plan for addressing O&M recommendation 1998-2-B 2001-2-C (recoating of the butterfly values and 40 feet of downstream outlet works). The water district plans on splitting the O&M into two separate phases. Phase I will focus on recoating only, and Phase II will focus on replacing the butterfly valves. Tentative start date is fall of 2007.
- Conejos Water Conservancy District is 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.

Closed Basin Division

The Alamosa Field Division of the Albuquerque Area Office operates and oversees the maintenance of a water salvage project constructed in the Closed Basin area of the San Luis Valley, Colorado (Figure 2). The purpose of the project is to salvage unconfined ground water from the Closed Basin that would otherwise be lost to evaporation and evapotranspiration. The salvaged water is pumped from 170 salvage wells and delivered through a conveyance channel to the Rio Grande to assist Colorado in meeting its commitment under the Rio Grande Compact. The project also provides for the delivery of mitigation water to the Alamosa National Wildlife Refuge and Blanca Wildlife Habitat Area, and stabilization of San Luis Lake. Reclamation continues to work under the guidance of the Closed Basin Division Operating Committee in management of Closed Basin operations and water deliveries. A Review of Operations and Maintenance Examination (RO&M) was conducted in October of 2005. The next RO&M examination is scheduled for 2011.

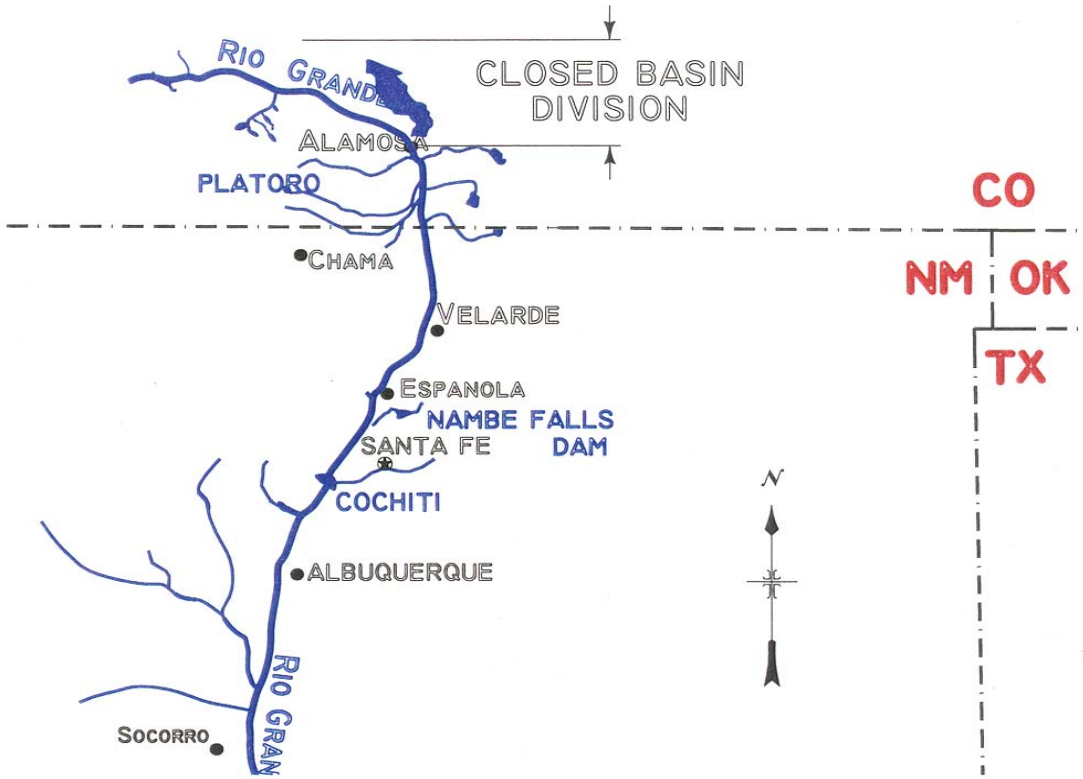

Figure 2: Area Map of San Luis Valley Project

Closed Basin – Operations and Maintenance

Operations

Closed Basin water deliveries in CY2006 included deliveries to the Rio Grande, Blanca Wildlife Habitat Area, Alamosa National Wildlife Refuge, and to provide for stabilization of San Luis Lake.

A total of 18,377 af of project water was delivered in Calendar Year (CY) 2006. Total deliveries of Compact water to the Rio Grande for CY2006 equate to 14,304 af.

Total water deliveries to the Bureau of Land Management's Blanca Wildlife Habitat Area for CY2006 equate to 800 af annual mitigation and 150 af of exchange water from the Division of Wildlife.

Total water deliveries to the Alamosa National Wildlife Refuge for CY2006 equate to 2,681 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 CY2006 totaled 197.4 af. Project delivery

to SLL through San Luis Lake Turnout was 441.8 af. No water was pumped from SLL through the San Luis Lake Pumping Plant.

Closed Basin Division water accounting for the 2006 calendar year is summarized in Table 1.

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

San Luis Valley - Closed Basin Division	Blanca Wildlife Habitat Area			Parshall Flume		Alamosa National Wildlife Refuge (ANWR)				Delivery to the Rio Grande			Project Totals
Month	Ch03 Station 730 + 00	Ch04 Station 798 + 00	Month Totals	Total Passing Flume	Creditable Amount at Flume	Ch01 Chicago Turnout	Ch02 Mum. Turnout	Pumping Plant	Month Totals	Total at Flume Minus Delivery at ANWR	Credit Amount Delivered to Rio Grande & Not Used by ANWR	Non-creditable at Lobatos	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
January	0	0	0	1476	1476	0	0	0	0	1476	1476	0	1476
February	0	0	0	1539	1539	60	149	35	244	1295	1295	0	1539
March	16	19	35	1728	1728	208	354	0	562	1166	1166	0	1763
April	117	130	247	1357	1357	0	25	0	25	1332	1332	0	1604
May	0	0	0	1406	1406	0	0	0	0	1406	1406	0	1406
June	4	3	7	1163	1163	0	0	0	0	1163	1163	0	1170
July	95	94	189	1051	1051	0	0	0	0	1051	1051	0	1240
August	127	115	242	1150	1150	0	0	0	0	1150	1150	0	1392
September	112	113	225	1130	1130	315	375	0	690	440	440	0	1355
October	2	3	5	1468	1468	415	462	0	877	591	591	0	1473
November	0	0	0	1615	1615	127	156	0	283	1332	1332	0	1615
December	0	0	0	1902	1902	0	0	0	0	1902	1902	0	1902
Annual	473	477	950	16985	16985	1125	1521	35	2681	14304	14304	0	17935

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.

On October 20, 2005 the Operating Committee made the recommendation to increase pumping in the areas previously throttled. On November 1, 2005 eleven wells that were previously throttled were opened to 75%. On February 1, 2006 eleven more wells that were previously throttled were opened to 75%. There has been some change in the water levels in this area but nothing outside of the Closed Basin boundaries. Reclamation continues to monitor these areas.

As of December 31, 2006 a total of 170 Remote Terminal Units (RTU) have been upgraded. New radios were installed at the 82 monitoring well sites. These are positive steps in data collection and data transmission.

The 2005 annual report on vegetation monitoring within the project boundary summarized that an average of 2,122 acres within the project boundary indicated a significant decrease in vegetation from the pre-project baseline. This amount is much less than the 8,460 acres that were predicted in the Final Environmental Impact Statement, and subsequently mitigated. An average of 585 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 2006 QA/QC program.

From June 6 through July 21 of 2006, Reclamation completed pilot holes at seven salvage well sites that were not being operated due to high levels of Total Dissolved Solids (TDS). Reclamation is sampling water quality at these wells to determine if there is a potential for re-drill. Four of these wells show the potential of producing water with lower levels of TDS. These wells will continue to be monitored.

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 11 replacement wells were drilled in 2006. These replacement salvage wells range from 100 gallons per minute (gpm) to 500 gpm. With the different well screen design and change in the gravel pack style, these wells continue to prove that the re-drills have been very successful to the project and commitment to the Rio Grande Compact, the Alamosa National Wildlife Refuge, and the Blanca Wildlife Habitat Area. A total of 41 salvage wells have been re-drilled from 2002 to 2006.

Repair and replacement of pumps and motors in the Salvage Wells vaults is an on going process. The maintenance crew will continue to chemically treat salvage wells in our rehabilitation efforts in 2007. Annual preventive maintenance of salvage wells is being performed. A total of 164 well sites were completed in 2006.

Equipment has also been updated with a new Truck Tractor Transport, and a 3,600 gallon self loading Water Truck that is capable of loading from a pond or canal.

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 2006. Seven pilot wells located in Stage 4 were sampled and tested for water quality.

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. The RGWCD in partnership with Reclamation obtained a $200,000 grant from the Colorado Water Conservation Board construction fund to assist Reclamation in well re-drilling activities that were planned as a multi-year effort aimed at regaining lost Project production. This grant expired at the end of June 2006. Eleven wells have been replaced during 2006 and several 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 2006. 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.

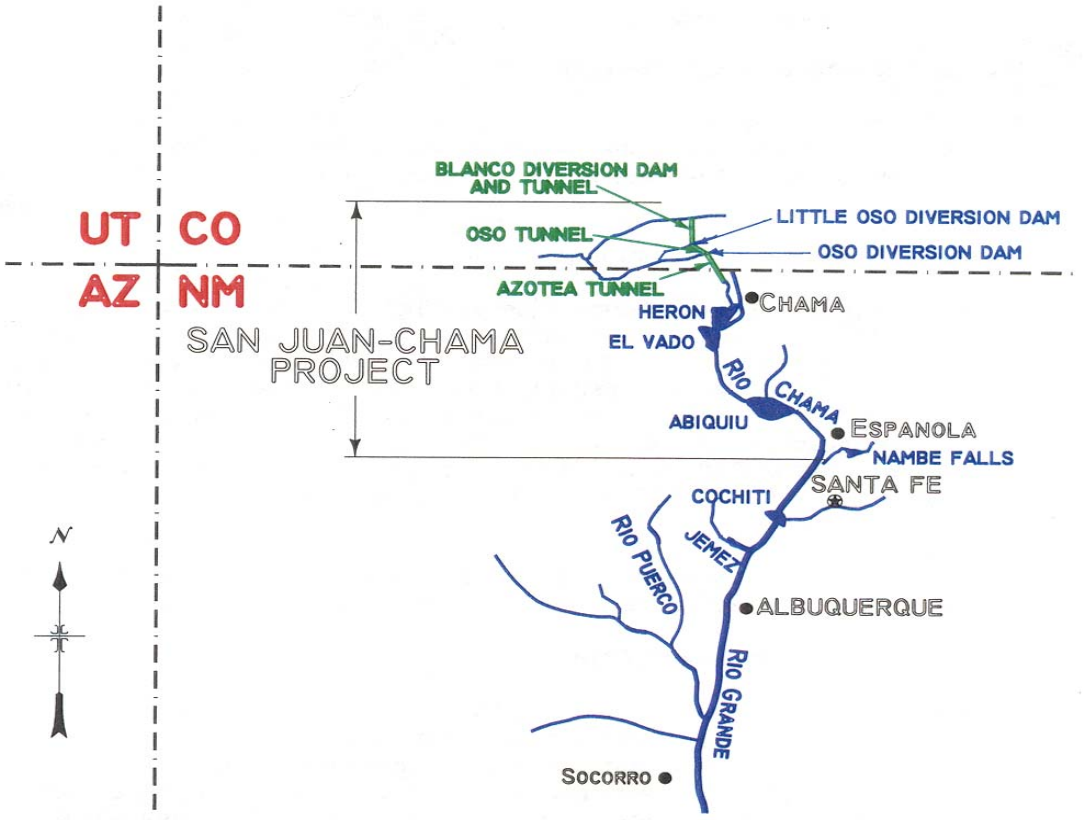

Figure 3: Area Map of the San Juan-Chama Project

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. A contract was awarded in September 2006 for the Phase I repair work on the Azotea Tunnel. Work began on October 31, 2006 and consisted of cleaning the existing invert and placing approximately 485 cubic yards of concrete within the

eroded tunnel invert. A flat bottom section approximately 33 inches wide was placed. Work should be completed by the end of January 2007 (Photo 1).

Photo 1: Concrete being discharged from agitator cart onto tunnel invert (2006)

As a requirement of the Corps of Engineers 404 program, permits for maintenance at the Blanco, Oso and Little Oso Diversion Dams were acquired and are available at the Albuquerque Area Office and Chama Field Division Office. The permits have a five year expiration date 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 March 1, and ended on October 24 during 2006. The total volume diverted through the tunnel was 78,794 af, with about 30% of these diversions occurring during summer monsoons and early fall storms. The running 10-year average Azotea Tunnel diversion increased again this year, from 87,883 af for the period 1996 through 2005 to 89,909 af for the period 1997 through 2006 (Table 2). Heron Reservoir began the year at an elevation of 7,144.85 ft (198,729 af) and finished the year at an elevation of 7,140.76 ft (183,032 af). Heron's lowest pool elevation and storage occurred on April 12, at elevation 7,131.58 ft (150,862 af).

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

Azotea MONTH	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	10 YEAR TOTAL
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
JANUARY	349	0	0	0	0	0	0	0	0	0	349
FEBRUARY	76	0	0	0	0	0	0	0	93	0	169
MARCH	9299	2329	4152	536	1512	743	1170	11505	1931	706	33883
APRIL	13890	11516	12516	15864	19284	4499	11366	15427	31721	17799	153882
MAY	43720	41822	32806	20987	51092	865	26613	30164	45146	25674	318889
JUNE	48442	28598	39659	5019	29283	204	18816	20390	50210	7600	248221
JULY	11634	8846	12734	106	4643	0	669	2139	13347	3785	57903
AUGUST	9108	1668	13019	229	4455	0	487	237	3779	4868	37850
SEPTEMBER	3406	153	4015	0	313	0	3340	1973	3360	5567	22127
OCTOBER	2350	200	0	0	0	0	246	1821	4873	12795	22285
NOVEMBER	0	1188	0	0	0	0	0	1218	735	0	3141
DECEMBER	0	381	0	0	0	0	0	12	0	0	393
ANNUAL	142274	96701	118901	42741	110582	6311	62707	84886	155195	78794	899092

The SJ-C contractors' 2006 and waivered 2005 annual allocations were delivered as shown in Table 3, for a total delivery in 2006 of 87,464 af. The remaining 2006 allocations are being held in Heron according to waivers which grant an extension for the delivery date for several contractors into 2007. Table 4 presents actual monthly Heron water operations for the 2006 calendar year.

The February 2007 most probable streamflow forecasts at both Blanco Diversion on the Rio Blanco and Oso Diversion on the Navajo River are 94% of the 30 year average. Heron inflow during the snowmelt runoff is projected to be 100,500 af based on preliminary model runs using the Natural Resources Conservation Service's February 1 streamflow forecast and the Upper Rio Grande Water Operations Model. Based on this same model run and forecast, Heron Reservoir is projected to achieve a maximum storage of 238,000 af during 2007. Reclamation will maximize diversions as water becomes available in 2007.

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

TABLE 4 SJ-C Heron Rel MONTH	MRGCD	SANTA FE	COCHITI	CITY OF ALBUQ-UERQUE	POJO-AQUE UNIT	TAOS	COUNTY OF LOS ALAMOS	CITY OF ESPAN-OLA	TWINING SANI-TATION	VILLAGE OF LOS LUNAS	TOWN OF BERNA-LILLO	BELEN	RED RIVER	JICARILLA APACHE	SAN JUAN PUEBLO	UNCON-TRACTED	TOTAL
	20900	5605	5000	48200	1030	400	1200	1000	15	400	400	500	60	6500	2000	2990	96200
JANUARY	0	0	1787	13585	0	0	0	0	0	0	0	0	0	0	0	0	15372
FEBRUARY	0	3471	680	9733	0	0	0	0	0	0	0	0	0	0	0	0	13884
MARCH	0	1759	598	12640	0	0	0	0	0	0	0	0	0	0	0	79	15076
APRIL	0	0	0	2328	0	0	1200	0	0	0	0	692	0	0	2000	2911	9131
MAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JUNE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
JULY	0	0	0	0	0	0	0	0	0	0	0	0	0	3747	0	0	3747
AUGUST	0	0	773	0	0	0	0	0	0	0	0	0	0	2253	0	0	3026
SEPTEMBER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OCTOBER	0	0	0	530	0	0	0	49	2	43	0	19	0	0	0	0	643
NOVEMBER	11364	0	0	185	0	0	0	0	0	0	0	0	0	0	0	0	11549
DECEMBER	9536	2250	346	1006	538	0	0	800	0	0	0	0	60	500	0	0	15036
2006 CY Total	20900	7480	4184	40007	538	0	1200	849	2	43	0	711	60	6500	2000	2990	87464

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

TABLE 3 Heron Storage MONTH	INFLOW RIO GRANDE (1)	INFLOW SAN JUAN CHAMA (2)	OUTFLOW RIO GRANDE (3)	OUTFLOW SAN JUAN CHAMA (4)	SAN JUAN CHAMA LOSS (5)	END-OF-MONTH CONTENT RIO GRANDE (6)	END-OF-MONTH CONTENT SAN JUAN CHAMA (7)	TOTAL (8)	ELEVATION (FEET) (9)
DEC. 2005						-380	199109	198729	7144.85
JANUARY	103	0	103	15372	810	-380	182927	182547	7140.63
FEBRUARY	88	0	88	13884	219	-380	168824	168444	7136.75
MARCH	125	706	388	15076	187	-643	154267	153624	7132.42
APRIL	87	17763	86	9131	607	-642	162292	161650	7134.80
MAY	581	25623	97	0	1566	-158	186349	186191	7141.60
JUNE	480	7585	100	0	1624	222	192310	192532	7143.26
JULY	389	3777	104	3747	547	507	191793	192300	7143.20
AUGUST	1274	4858	2024	3026	0	-243	193625	193382	7143.48
SEPTEMBER	844	5556	101	0	1110	500	198071	198571	7144.81
OCTOBER	804	12769	108	643	602	1196	209595	210791	7147.86
NOVEMBER	104	0	952	11549	295	348	197751	198099	7144.69
DECEMBER	531	0	562	15036	0	317	182715	183032	7140.76
SUB-TOTAL	5410	78637	4713	87464					
ADJUST.						-350	(A)		
ANNUAL		84047		92177	7567	-33	183065	183032	

Heron Dam Facility Review and Safety of Dams Programs

The following work was completed for Heron Dam during 2006:

- Facility Reliability Rating.
- Annual Emergency Action Plan Review, Drill, and Communication Directory Update.
- Emergency Management Functional Exercise.
- 2006 Visual Land Slide Survey.
- Mechanical Exam on all operators and gates in preparation for the 2007 Comprehensive Facility Review (CFR).
- Dive exam on the intake structure and outlet stilling basin in preparation for the 2007 CFR.
- Annual Site Exam.

Pojoaque Tributary Unit - Nambé Falls Dam and Reservoir

Nambé Falls began 2006 with the reservoir at elevation 6,825.80 ft providing a storage volume of 1,874 af. During the winter, releases averaged around 1 cfs to maximize conservation storage as agreed to by the Pojoaque Valley Irrigation District and Indian water users. The reservoir filled and spilled in 2006. The maximum elevation for the year was 6,826.59 ft (1,919 af) on April 15. The reservoir filled on March 12 and essentially remained full until April 24 when irrigation releases began and reservoir storage and elevation started falling. Nambé Falls Reservoir ended 2006 at elevation 6,816.46 ft (1,394 af).

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 cfs 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 527 af was calculated for Nambé Falls operations for the entire year. The depletion amount was released from Heron and Abiquiu reservoirs during December 2006. Table 5 provides a summary of Nambé Falls use above Otowi and the Pojoaque Unit return flow credit used to calculate depletions during 2006. A summary of 2006 Nambé Falls reservoir operations is provided in Table 6. A pilot program was implemented to test a new methodology for storage accounting at Nambé Falls Reservoir. The purpose of the Pilot Program is to improve communication and coordination, develop a more reliable methodology for storage accounting, and discontinue the practice of the “implied Indian over diversion”.

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

TABLE 8. SJ-C @ Otowi MONTH	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
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
JANUARY	15372	1416	0	13956	-11967	171	14	22	1826
FEBRUARY	13884	0	1047	14931	-14087	172	32	21	661
MARCH	15076	0	368	15444	-11456	206	34	19	3767
APRIL	9131	0	516	9647	-2873	167	16	17	6608
MAY	0	0	0	0	6433	58	4	33	6404
JUNE	0	0	2460	2460	7165	114	16	89	9584
JULY	3747	0	1034	4781	-3131	67	121	84	1546
AUGUST	3026	0	0	3026	-2994	34	152	34	-120
SEPTEMBER	0	0	0	0	1409	13	39	49	1406
OCTOBER	643	643	0	0	90	1	113	32	8
NOVEMBER	11549	11549	0	0	0	0	225	25	-200
DECEMBER	15036	9716	0	5320	-3549	74	209	23	1511
ANNUAL	87464	23324	5425	69565	-34960	1077	975	448	33001

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

TABLE 5 NF Monthly MONTH	INFLOW	OUTFLOW BY PASSED	STORAGE RELEASE OPER.	STORAGE RELEASE IRRIG.	RESER. LOSSES	TOTAL OUTFLOW + LOSSES	END OF MONTH CONTENT	END OF MONTH ELEVATION
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DEC. 2005							1873	6825.79
JANUARY	269	253	0	14	4	271	1871	6825.76
FEBRUARY	210	178	0	0	6	184	1897	6826.21
MARCH	245	212	0	0	13	225	1917	6826.56
APRIL	291	271	0	143	22	436	1772	6823.96
MAY	278	260	0	596	16	872	1178	6811.53
JUNE	122	97	0	440	13	550	750	6799.53
JULY	223	102	0	9	-0	111	862	6803.05
AUGUST	1036	885	0	169	-5	1049	849	6802.67
SEPTEMBER	583	543	0	33	1	577	855	6802.84
OCTOBER	393	278	0	3	3	284	964	6806.00
NOVEMBER	263	38	0	0	6	44	1183	6811.65
DECEMBER	241	32	0	0	-2	30	1394	6816.46
ANNUAL	4154	3149	0	1407	77	4633	1394	6816.46

Nambé Falls Dam Facility Review and Safety of Dams Programs

During 2006, Nambé Falls Dam had the following activities implemented or completed:

- Instrumentation drawings are in the final stages of drafting, and are scheduled for completion by the end of 2007.
- Scribe Marks were installed for dam monitoring.
- A Comprehensive Facility Review is scheduled to be completed in July of 2007.
- The Pojoaque Valley Irrigation District's (PVID) Nambé Falls dam tender completed the Dam Tender Training Workshop in early 2006.
- PVID has signed an agreement with the New Mexico Office of the State Engineer for upgrading water measurement equipment within the ditch system.
- The dive examination was completed. The inspections noted that the bolts and nuts holding the trash-rack are in very poor condition and replacement is necessary. PVID is seeking funding for the repairs. This project is expected to start during 2007.

M&I Water Use - National Environmental Policy Act Compliance

Reclamation served as the lead federal agency for the City of Albuquerque's Drinking Water Supply Project EIS which addressed the City of Albuquerque's plan to divert, treat, and directly use its SJ-C water for municipal and industrial purposes. The Record of Decision was signed June 1, 2004. The City is currently constructing the project.

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. Currently, the lead federal agencies are working with U.S. Fish and Wildlife Service and the project proponents to conduct endangered species consultation. A Final EIS and ROD are expected this year.

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.

During 2006, the environmental assessment (EA) process was completed for the proposal to amend multiple existing water service contracts to repayment contracts. The City and County of Santa Fe, City of Española, Village of Los Lunas, County of Los Alamos, Village of Taos Ski

Valley, and Town of Taos are the seven contractors that requested the contract conversions. A Finding of No Significant Impact (FONSI) was issued by Reclamation on May 22, 2006. Subsequently, all contract amendments were executed.

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 af for much of 2006. Article VII of the Rio Grande Compact stipulates that when usable water in Project storage is below 400,000 af, 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 2006, a total of 8,086 af of Emergency Drought Water was captured by Reclamation for the benefit of the Middle Rio Grande Conservancy District under the Emergency Drought Water Agreement (EDWA). This water was captured during October storm events when natural flows in the Middle Valley were in excess of irrigation demands. None of Reclamation's remaining Emergency Drought Water balance was captured during 2006. The balance of Emergency Drought Water available for capture and storage by Reclamation and MRGCD during 2007 or later years is 16,479 af. Reclamation's balance for use as supplemental water for endangered species is 4,934 af, and 11,546 af remains to be captured for the benefit of MRGCD.

Reclamation started 2006 with 16,062 af of Emergency Drought Water stored in El Vado Reservoir for use on behalf of listed endangered species. All but 9 af of this water was released prior to June 18. MRGCD started 2006 with 2,987 af of Emergency Drought Water in El Vado Storage, and ended the year with a total of 10,895 af in storage.

El Vado Dam and Reservoir Operations

El Vado reservoir began 2006 at an elevation of 6,873.05 ft and total storage of 106,637 af. The maximum peak total storage of 130,590 af (elevation 6,882.98 ft) was achieved on May 10, and the minimum total storage occurred on October 6 when the reservoir fell to elevation 6,842.65 ft (storage 52,691 af). On December 31, total El Vado storage was 70,233 af at elevation 6,854.03 ft.

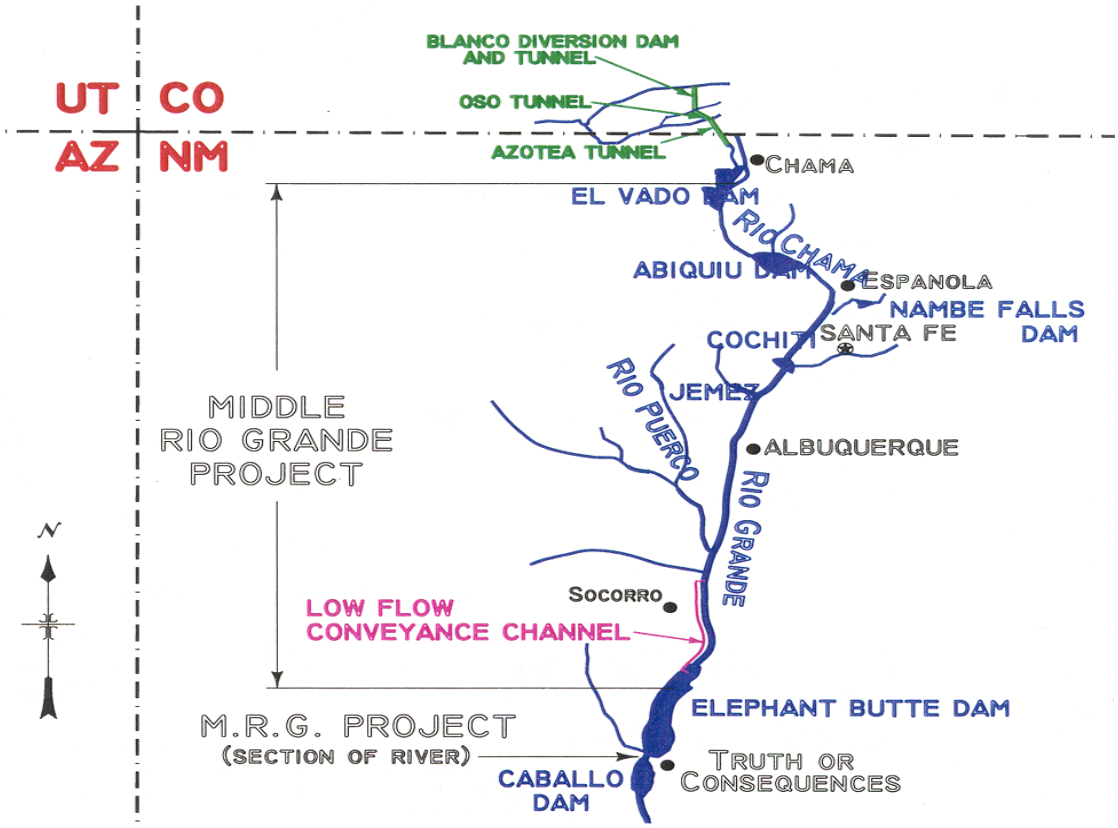

Figure 4: Area Map of the Middle Rio Grande Project

MRGCD began the year with 2,986 af of Emergency Drought Water, 81,321 af of general Rio Grande storage, and 4,148 af of SJ-C water in El Vado for Middle Valley irrigation. This was in addition to MRGCD's 20,900 af of 2006 SJ-C allocation in Heron, and a beginning year balance of 1,999 af of SJ-C stored in Abiquiu Reservoir. At the end of 2006, MRGCD had 10,895 af of Emergency Drought Water, 35,580 af of general El Vado Rio Grande storage, and 21,898 af of SJ-C storage in El Vado reservoir. MRGCD also had 1,974 af of SJ-C stored in Abiquiu as of December 31, 2006.

Reclamation stored a total of 27,000 af for the Prior and Paramount needs of the six Middle Rio Grande Pueblos during 2006, with 2,890 af of this water captured and stored while New Mexico was not under storage restrictions required by Article VII of the Rio Grande Compact. The remaining 24,110 af of Prior and Paramount storage was captured during Article VII storage restrictions, which became active on April 14. During the 2006 irrigation season, a total of 3,015 af was released for Prior and Paramount irrigation demands. Water captured prior to Article VII storage restrictions reverted to the general El Vado Rio Grande account after the end of the irrigation season. A total of 20,248 af of water captured and stored for Prior and Paramount irrigation was released to Elephant Butte between November 3 and December 18 of 2006.

Reclamation released 15,707 af of Emergency Drought Water from El Vado during 2006 on behalf of listed endangered species, essentially depleting Reclamation's Emergency Drought Water pool. Reclamation had 9 af of Emergency Drought Water remaining in El Vado Reservoir on December 31.

The total SJ-C water in El Vado storage at the end of the year was 23,749 af. 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	
MONTH	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. 2005	-1890	15372	1715	13708	114	4	100241	6196	106437	3605	-1664
JANUARY	1903	15372	0	13956	100	5	102044	7607	109651	-1903	-1416
FEBRUARY	1769	13884	0	14931	61	1	103752	6559	110311	-1769	1047
MARCH	4040	15076	3595	15444	315	13	103882	6178	110060	-445	368
APRIL	38654	9131	22318	9647	530	26	119688	5636	125324	-16336	516
MAY	22667	0	27268	0	945	42	114142	5594	119736	4601	0
JUNE	-6941	0	32943	2460	648	42	73610	3092	76702	39884	2460
JULY	1404	3747	20235	4781	222	192	54557	1866	56423	18831	1034
AUGUST	9884	3026	9537	3026	224	5	54680	1861	56541	-347	0
SEPTEMBER	7923	0	11435	0	164	2	51004	1859	52863	3512	0
OCTOBER	16932	643	8811	0	196	2	58929	2500	61429	-8121	-643
NOVEMBER	-6399	11549	2369	0	124	12	50037	14037	64074	8768	-11549
DECEMBER	-3436	15036	33	5320	84	4	46484	23749	70233	3469	-9716
ANNUAL	88400	87464	138544	69565	3613	346				50144	-17899

El Vado Dam Facility Review and Safety of Dams Programs

During 2006 the following work was completed for El Vado Dam:

- Facility Reliability Rating.
- Annual Emergency Action Plan Review, Drill, and Communication Directory Update.
- Annual Site Exam.
- A Risk Analysis on incomplete SOD recommendations associated with the steel plate system of the dam and spillway was conducted in the summer/fall of 2005. Additional meetings and decisions occurred in 2006. A final Decision Document will be delivered in early 2007.
- The 2006 Region landslide survey.
- On May 19, 2006, the excess shale material on the spillway was removed by sluicing. Due to low reservoir elevations in recent years the shale material had accumulated to an unmanageable condition. A discharge release rate of 375 cfs of water over the spillway was made, flushing approximately 80% of the accumulated material. Discussions with the Corps of Engineers determined that the sluicing of excess material would not require a Department of the Army permit pursuant to the Regulatory Guidance Letter 05-04. The Corps of Engineers encourages more frequent sluicing if adequate reservoir elevations allow it.
- The wet spot that was identified a few years ago continues to be monitored on a monthly basis, with no apparent changes.
- General Maintenance.
- Emergency Management Functional Exercise.
- Mechanical Exam on all operators and gates in preparation for the 2007 Comprehensive Facility Review (CFR).
- Dive exam on the intake structure and outlet stilling basin in preparation for the 2007 CFR.

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 af of SJ-C water in Abiquiu Reservoir. Adjustments for sediment reduced the sum of the available storage allocations to 182,154 af at the start of 2006, 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 2005. The volume of SJ-C water in storage in Abiquiu Reservoir peaked on April 19 at 171,565 af. Abiquiu ended 2006 with 155,465 af of SJ-C water in storage. Table 8 provides a summary of monthly operations and water accounting for Abiquiu Reservoir.

During 2006, Reclamation had a storage agreement with the Albuquerque Bernalillo County Water Utility Authority to store up to 20,000 af of supplemental water in Albuquerque's storage space in Abiquiu Reservoir. This agreement expired December 31, 2006, and was subsequently replaced by an agreement providing Reclamation with 10,000 af of storage space for supplemental water during 2007.

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

Abiquiu Res. Op.	INFLOW		OUTFLOW		LOSSES		EOM CONTENT			
MONTH	RG	SJ-C	RG	SJ-C	RG	SJ-C	SEDIMENT	RG	SJ-C	TOTAL
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DEC. 2005	6187	13496	5374	2888	2	243	1727	660	131732	134119
JANUARY	2301	13524	1400	1557	-0	290	1728	48	143409	145185
FEBRUARY	701	14794	442	707	-1	408	1732	305	157088	159125
MARCH	3605	15350	3619	3894	-0	823	1737	291	167721	169749
APRIL	23029	10033	22995	7160	6	1427	1755	331	169167	171253
MAY	34225	0	34187	6433	0	2131	1774	370	160603	162747
JUNE	45993	2433	46440	9598	4	2054	1818	-73	151384	153129
JULY	26135	4729	26196	1598	10	1329	1836	-123	153186	154899
AUGUST	15737	2994	15127	0	9	804	1843	495	155376	157714
SEPTEMBER	13468	-1	13575	1408	-2	969	1846	386	152998	155230
OCTOBER	9128	0	9277	90	-1	793	1847	236	152115	154198
NOVEMBER	15789	0	15736	0	-0	500	1851	289	151615	153755
DECEMBER	7953	4859	8183	1310	0	-300	1852	62	155464	157378
ANNUAL	198064	68715	197177	33755	25	11228				

Cooperative Programs with the State of New Mexico

Reclamation cooperates with the New Mexico Interstate Stream Commission on water salvage, drain improvement, and river maintenance activities. Elephant Butte Reservoir levels remained low in 2006. The State was unable to provide program funding in 2006, however they did conduct some work with their contractor. Reclamation was able to provide limited funding to continue a low level of effort on the Temporary Channel as described below. The State has proposed funding in 2007 with a draft agreement currently being circulated for signature. The draft agreement contemplates funding for water salvage drain maintenance, Temporary Channel work, and a study of the Tiffany Plug.

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 dry climactic 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 2). 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.

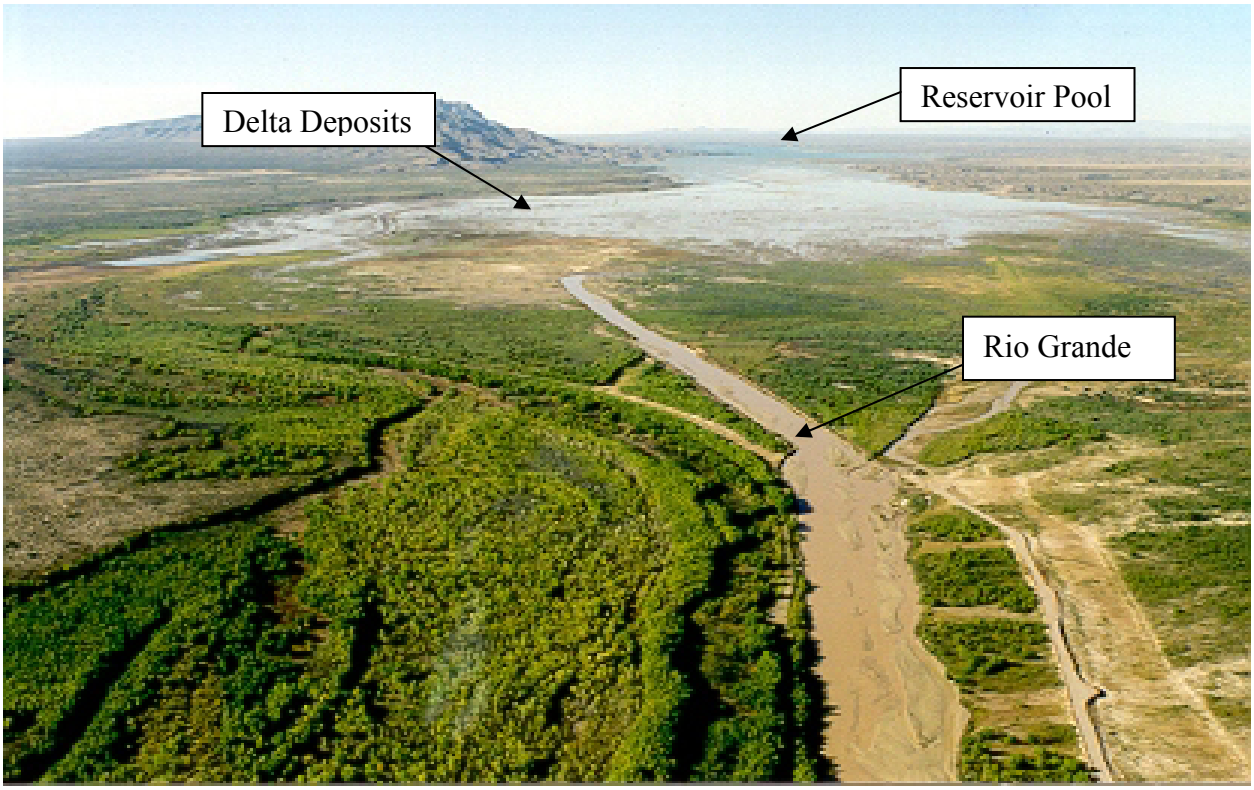

Photo 2: Headwaters of Elephant Butte Reservoir, prior to construction of the Temporary Channel (1998)

Elephant Butte Temporary Channel—2006 Maintenance

General maintenance work was performed on the channel in the spring of 2006, as well as completion of minor repair work required following the high flows during the 2005 spring runoff. 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.

Flows were well below normal during the 2006 spring runoff, but local rainstorms during the 2006 monsoon season produced high flows with several peaks in excess of 3,000 cfs. All three reaches of the Temporary Channel generally performed very well through these high flows, although the berms did sustain some damage (Photo 3). Much of the damage to berms occurred from water in arroyos flowing into the river.

Photo 3: Temporary Channel 2000—berm breach at Nogal Canyon (October 2006)

Maintenance activities on the channel during 2006 were accomplished jointly by Reclamation and the State of New Mexico. The Temporary Channel 2000 reach was maintained by Reclamation's Socorro Field Division crews and the 2002/2004 reaches were maintained by a contractor for the State. A similar division of maintenance responsibilities is planned for 2007.

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 was problematic at this site. The sediment depositional 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. The project involved placement of approximately 6,600 cubic yards of riprap material for the weir structures and about 10,000 cubic yards of excavation earthwork for the channel work. 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 that will be repaired in 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 (Photo 4) and also the Lyden Acequia, which extends to the south. Bank erosion is approximately 10 feet or so from the Lyden Acequia. A design to protect this bank involving larger rock and a gabion retaining wall is scheduled to be constructed in January or February 2007.

San Ildefonso Pond

The primary concern at the San Ildefonso Pond priority site is 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. Design work for a river maintenance project at this site is complete, and Reclamation is currently awaiting permission from the Pueblo of San Ildefonso to begin construction.

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. Designs were completed in 2006, and environmental compliance activities are currently underway. Construction maintenance is expected to begin in 2007.

Photo 4: Looking down at the bank erosion on the south side of the Lyden outfall facility (March 2006)

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. Preliminary investigations were conducted in 2006, and discussions were initiated with the Governor of the Pueblo of Santo Domingo regarding hydrographic data to be collected in 2007.

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 is expected to be complete in spring 2007, with alternative analysis to begin later in 2007. Priorities for maintenance at the nine sites will be determined after data collection 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 late 2006, Reclamation developed designs to redistribute the remaining sediment to best accomplish the project's goals. Additionally, a line of riprap at the upstream end of the gradient restoration facility, as well as a reinforced bankline at the Jemez River confluence will be extended to protect against erosion. This work will be completed in 2007. 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 (Photo 5). Work at this site is complete, except for revegetation.

Photo 5: Bendway weirs at the Bernalillo and Sandia priority site (November 2006)

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. Work will be completed in 2007.

Corrales Siphon

The Corrales Siphon 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). It is an inverted siphon that 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 (Photo 6). In late 2006, a preferred alternative, consisting of installation of a bio-engineered bankline with a rock toe and coir fabric encapsulated soil, was selected. Design work is in progress. Construction is tentatively scheduled to begin in September 2007.

Photo 6: Bank erosion at the Corrales Siphon priority site (July 2005)

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 7). The river is actively eroding a levee that protects the Drain Unit 7 Extension irrigation structure. 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 has already been displaced. Alternatives are currently being evaluated for a more permanent solution, and it is anticipated that work at the site will begin at the end of 2007.

Photo 7: Drain Unit 7 priority site (October 2006)

San Acacia River Miles 114 and 113

Reclamation has nearly completed construction 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 originally threatened the integrity of the levee system in this area. This project involved moving the levee and LFCC to the west approximately 1,500 lineal feet away from the river (Photo 8).

Major items of work included: 1) Clear and grub vegetation, and excavate for new LFCC channel (approximately 10,800 feet). Construct spoil levee adjacent to new LFCC channel and place riprap on side slopes of new LFCC. 2) Construct sheet pile grade control structure along San Lorenzo Arroyo. 3) Construct 10-foot diameter, 598 foot-long reinforced pipe crossing under San Lorenzo Arroyo. 4) Remove riprap from side slopes of the existing LFCC channel and fill in with material from existing levee. 5) Create new potential floodplain between the new levee position and the channel. 6) Plant cotton wood poles and other native species within the project area. Nearly all work, except for planting the cotton wood poles and other native species has been completed.

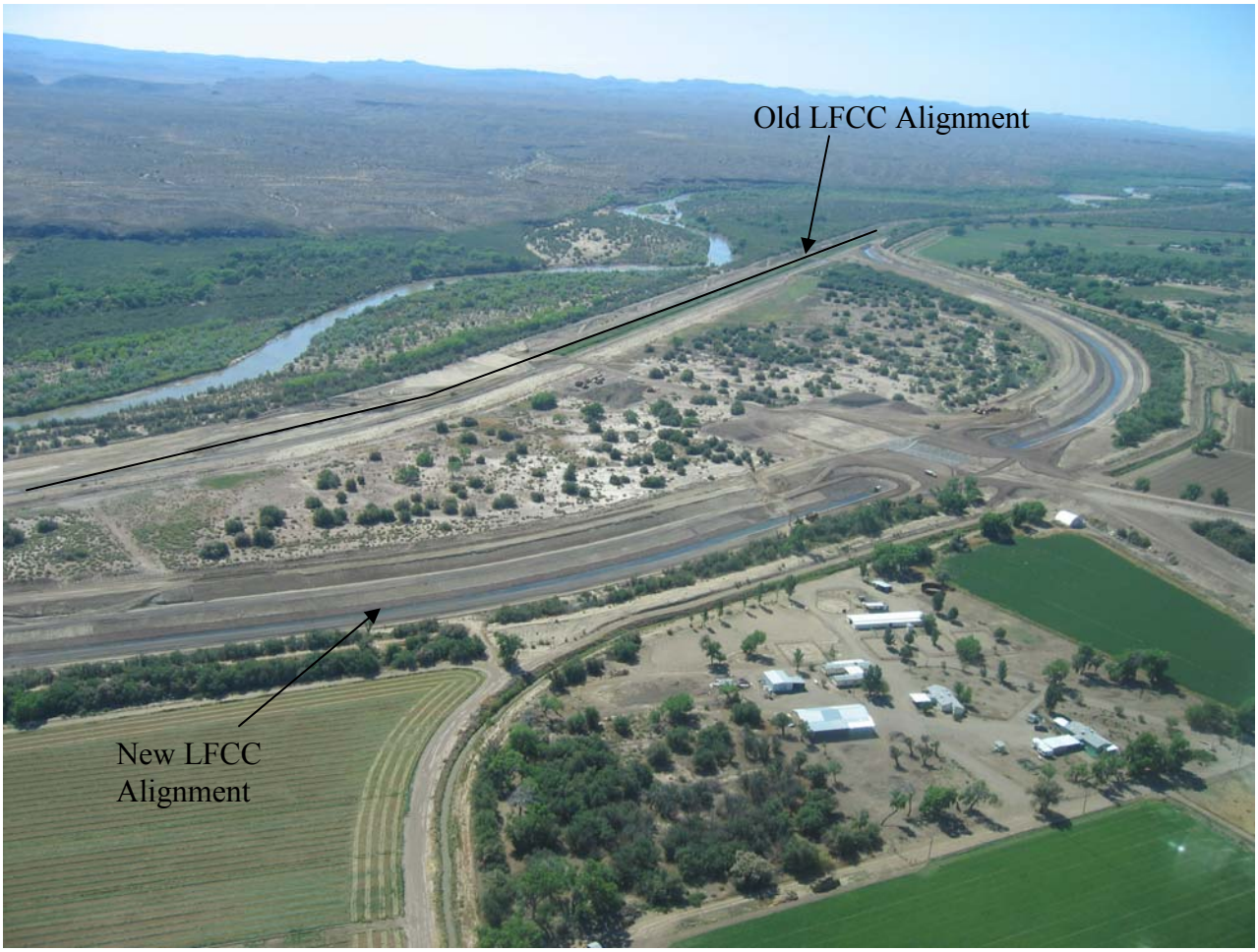

Photo 8: Looking downstream at the new LFCC in the area of River Mile 113/114 Priority Site (May 2006)

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 9). 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 action is to relocate the LFCC and the levee to the west to allow the river more freedom to move within its historic floodplain. Along the planned RM 111 levee setback alignment a vegetation control study is being performed by the United States Department of Agriculture, Agricultural Research Service and the Middle Rio Grande Conservancy District. This vegetation control study will delay the start of the RM 111 levee setback project until early 2008.

Owing to a perceived high probability of failure at the RM 111 priority site, a short term pre-emergency fix was installed at the site in early 2006. This fix was designed strictly as a temporary measure and was intended to provide protection up to a 5000-cfs flood event (approximate 2-year return flow for this reach) until the projected RM 111 levee setback project completion date in 2008. The short term pre-emergency fix consisted of installing a riprap windrow on the abandoned floodplain with a centerline about 30 feet from the toe of the existing

levee. To the extent possible, all riprap previously placed as part of the pre-emergency fix will be removed upon completion of the RM 111 levee setback.

Photo 9: Looking downstream at the River Mile 111 bend (July 2006)

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 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. Design work will begin in early 2007.

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 (Photo 10). A target conveyance capacity of 10,000 cfs with a three-foot freeboard allowance has been established for the Bosque del Apache levee, and 8,500 cfs with a two-foot freeboard allowance for the Tiffany and San Marcial levees.

A hydraulic model analysis was conducted in 2006, using cross-section data collected in 2005 and a channel profile collected in March 2006. Results of the analysis indicate that the levees will convey the target discharges without overtopping, but the desired freeboard between water surface and top of levee will not be maintained in all locations. The Tiffany Levee is of greatest concern, as it is predicted that during the target discharge the water surface will be less than two feet from the top of the levee over approximately half the length of the levee. Therefore, the Tiffany Levee will be monitored closely during the 2007 spring runoff, and raising/strengthening of a portion of the levee may be considered in 2007.

Photo 10: East toe of Bosque del Apache levee, at the south boundary of Bosque del Apache National Wildlife Refuge (August 2006)

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 and eventually extended about 3 miles upstream. The plug resulted in the entire channel filling with sediment and water flowing into overbank areas. In a joint effort between the New Mexico Interstate Stream Commission and Reclamation, the plug was removed in 2005. However, concerns remain that given the channel morphologic condition and spring runoff flows that produce overbank flows for an extended duration, another plug

could form. Sediment modeling work of the current potential for another plug to form, as well as potential long-term solutions to the problem, began in 2006. Reclamation has awarded a contract for Dr. Craig Boroughs to perform modeling of the plug area. Preliminary results of this modeling work are anticipated prior to the 2007 spring runoff.

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 will be monitored closely during the 2007 spring runoff.

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 11), which protects the LFCC from the river. Cross-section data will be collected in 2007 for analysis of alternatives.

Photo 11: Fort Craig Bend priority site (October 2006)

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 year, and it is now eroding the road embankment (Photo 12). Predictions are that a spring runoff greater than or equivalent to the 2005 runoff could breach a section of the road. The alternative analysis process is currently in progress, and it is anticipated that work will be performed at the site in the fall of 2007.

Photo 12: River Mile 60 priority site (October 2006)

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 2006. The heavy monsoon season of 2006 resulted in an unusually large volume of sediment that needed to be excavated (Photo 13); approximately 48,000 cubic yards of sediment were removed.

Photo 13: Large quantity of sediment accumulated at Cuchillo Negro Arroyo confluence near Truth or Consequences (September 2006)

2006 Monsoon Season

Rainfall was unusually high during the 2006 monsoon season, resulting in a succession of high flow events throughout the Rio Grande. As an example, daily average discharge at San Acacia exceeded 6,000 cfs (Figure 5), and instantaneous peaks were even higher. These high flows necessitated monitoring of erosion conditions at existing priority sites. On the Rio Grande, erosion damage and channel migration was observed at the Drain Unit 7 and San Acacia River Mile 114 and 111 priority sites; various riverside drains were also affected. Levee condition was also a concern, with respect to both overtopping and gullying caused by intense rainfall runoff. Gullies and other damage to the levees and maintenance access roads limited vehicular access to the levee top road and raised concern about levee integrity in many areas between Bernardo and Elephant Butte Reservoir.

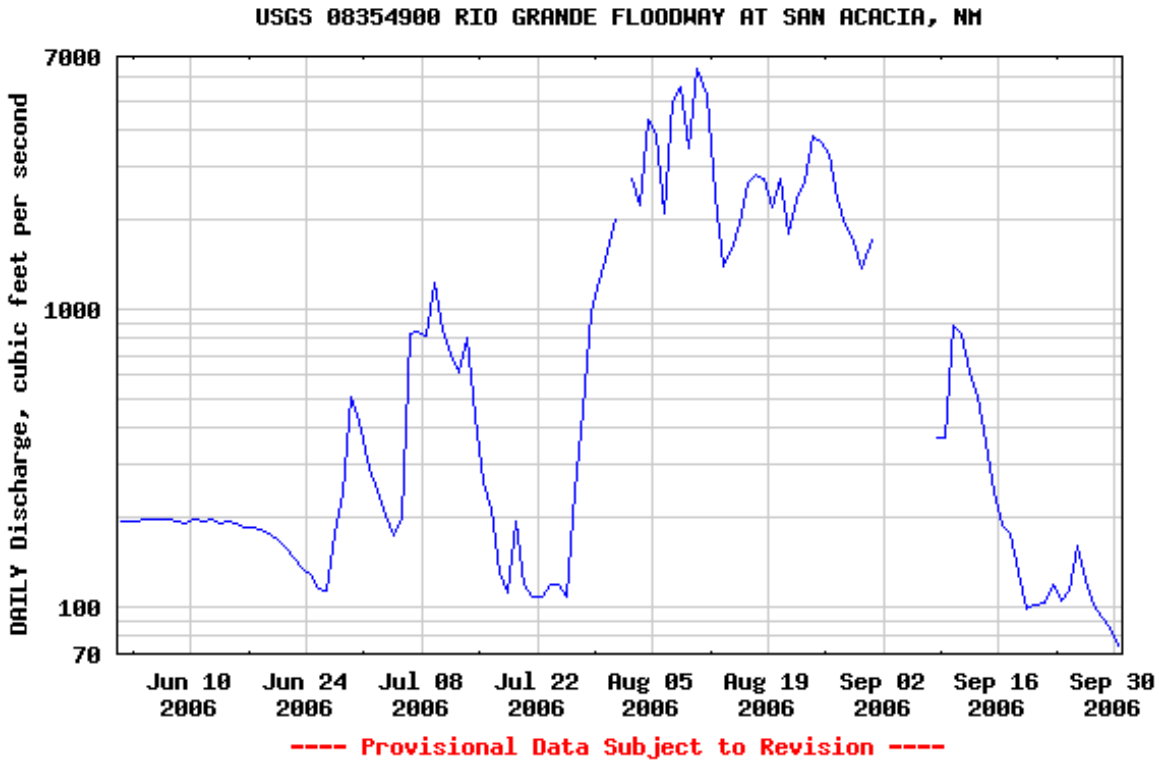

Figure 5: Average daily discharge at the USGS gate at San Acacia, June 2006 through September 2006.

San Acacia Diversion Dam – Debris Removal

MRGCD, in collaboration with Reclamation, provided resources to mechanically remove woody floating debris which accumulated upstream of the diversion dam as a result of high Rio Grande flows in the summer of 2006 (Photo 14).

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 is currently underway and is planned for completion in April 2007. This first phase will provide 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 second phase addresses future maintenance strategies and conditions/needs and is scheduled for completion in September 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.

Photo 14: Debris removal at San Acacia Diversion Dam

Middle Rio Grande Endangered Species Act Collaborative Program

The 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, as amended, and additional activities that contribute to recovery of the Rio Grande silvery minnow (silvery minnow) and the Southwestern willow flycatcher (flycatcher).

During FY2006 on behalf of the Collaborative Program, Reclamation contracted $14,639,000 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 Biological Opinion requirements and address long-term recovery needs.

Additional Program accomplishments in 2006 include preparation and Executive Committee adoption of Program by-laws; preparation and approval of the Program's Long-Term Plan; formation of an effective Program Management Team led by the Corps of Engineers' Interim Program Manager; and improvements to the contracting process and Program involvement.

During FY06, a decision was made to return the administrative function of the Collaborative Program to Reclamation. The Program Management Team will be housed at Reclamation and led by a Reclamation Program Manager.

Program legislation introduced by Senator Domenici in 2005 has not been acted on. New legislation may be drafted and introduced by Senator Bingaman.

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 2006.

Albuquerque Riverine Restoration Project

The Middle Rio Grande Endangered Species Act Collaborative Program (Collaborative Program)-funded portion of this project is intended to modify islands and bars to improve Rio Grande silvery minnow (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. Construction of Phase I of this project was completed in April, 2006 by the New Mexico Interstate Stream Commission, enhancing more than 74 acres of riverine and riparian habitat. Restoration techniques include three types of vegetated island modification, bar habitat modification, placement of large woody debris, bank scouring, bank lowering, and the establishment of ephemeral channels. Restoration techniques are being evaluated to determine which are the most effective. Silvery minnow, including one gravid female, were found in constructed embayments at the Alameda and South Diversion Channel sites during May, 2006 (SWCA, 2006). Environmental compliance activities for Phase II of this project have been completed and construction began in January, 2007.

I-40 Rio Grande Silvery Minnow Habitat Restoration Project

Reclamation completed a demonstration silvery minnow nursery habitat project in 2005 on a pointbar immediately south of the I-40 bridge. The project constructed shelves, inlets, side channels and berms to increase habitat complexity over a wide range of spring flows during the silvery minnow spawning season. Flows during the 2006 spawning season were not sufficient to inundate the constructed features.

Santo Domingo Habitat Restoration Project

Construction of Phase I of the Santo Domingo habitat restoration project began in 2006 and is expected to be completed in spring, 2007. Phase I involves 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.

Los Lunas Habitat Restoration Project

The Los Lunas Habitat Restoration Project is a joint project between the Corps of Engineers, Reclamation, and MRGCD funded through the Collaborative Program. Habitat restoration at the

Los Lunas project site was intended to improve habitat for the Rio Grande silvery minnow and the southwestern willow flycatcher.

Major construction was completed by December 2002. Biological monitoring continued in 2006. The high flow channel provided near-zero flow in many areas and thus provided spawning and nursery habitat for Rio Grande ichthyofauna (Magana, 2006). Adult silvery minnow were found during electrofishing surveys in the channel in August, 2006 (Porter, 2006). Cottonwood seedlings that germinated after the 2005 flood pulse have thrived all over the floodplain, in and among other vegetation, and measured up to four meters in height in October, 2006 (Magana, 2006). The monsoonal precipitation during summer 2006 also initiated germination of cottonwood seedlings that grew to approximately one meter in height by October (Magana, 2006).

Perennial Pools for Rio Grande Silvery Minnow in the Middle Rio Grande using Cottonwood Snags

This is a joint project between MRGCD and HabiTech, funded by the Collaborative Program. Three cottonwood snag structures to enhance silvery minnow habitat were installed in the Middle Rio Grande below Albuquerque's Bridge Boulevard in June 2004. The third year of physical and biological monitoring of the cottonwood snags was completed in 2006. The cottonwood snag structures have maintained their structural integrity and the bank anchoring systems have performed well. Periods of localized stream bed scour and fill around the structures have been documented in response to the river's changing hydrograph. The pools formed by the snags provide habitat for numerous fish species including both adult and young-of-year silvery minnow (Wesche, 2006).

Fish Passage at San Acacia Diversion Dam

A study of alternatives for implementing fish passage at San Acacia Diversion Dam was completed in August 2006. The report was prepared jointly by HDR/Fish Pro and Reclamation's Denver Technical Services and was funded by the Collaborative Program. The U.S. Fish and Wildlife Service, Reclamation, New Mexico Interstate Stream Commission, New Mexico Department of Fish and Game, and the MRGCD provided input to the study and comments on the draft report. Three additional alternatives were recommended with conceptual designs and preliminary cost estimates.

Other Habitat Restoration Activities

Environmental Assessment and Biological Assessment documents were completed for three additional Collaborative Program-funded habitat restoration projects during 2006. Construction on each project is expected to begin in 2007.

Rio Grande Nature Center

The Corps of Engineers is implementing a habitat restoration project at the Rio Grande Nature Center. The project will restore an ephemeral side channel and construct embayments to provide habitat for the silvery minnow and reconnect the floodplain of the bosque to the river. Non-native vegetation will be removed from the channel and its banks. Native trees, shrubs and grasses will be planted along the side slopes of the channel. This project is about 15 acres and will primarily benefit the silvery minnow with possible secondary benefits to the flycatcher.

City of Albuquerque 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. The north site includes 66 acres of bosque, the point bar portion of the south site is 20 acres, and the south site island is 6 acres.

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

Preliminary data suggest that drains and their outfalls into the Middle Rio Grande can function as refugia for silvery minnow during drought-induced periods of river channel dewatering and as important rearing habitat for species conservation. The MRGCD along with its project partners HabiTech, New Mexico State University, and the Bureau of Reclamation Denver Technical Service Center, propose to implement habitat enhancement measures using 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.

Rio Grande Silvery Minnow Sanctuary

Reclamation, the U.S. Fish and Wildlife Service, MRGCD, and the City of Albuquerque are cooperating in the development of an off-channel sanctuary for the silvery minnow at a site in Albuquerque. The Corps of Engineers and others are providing technical input and other assistance. The U.S. Fish and Wildlife Service has said that the sanctuary could serve as one of the two additional refugia required by the Biological Opinion. The first two phases of construction on the sanctuary are now complete. 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 the fall of 2007, will include completion of the pump station, fish screens, all required piping, mechanical, electrical, and utility work, and various water control structures The U.S. Fish and Wildlife Service will operate the sanctuary. Initial test operations are scheduled to begin in late fall 2007. The MRGCD has obtained a permit from the New Mexico Office of the State Engineer for use of water required to operate the sanctuary.

Other Habitat Restoration Projects Funded in 2006

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

- Santo Domingo Habitat Restoration Project, Phase II
- U.S. Army Corps of Engineers, Alleviating Rio Grande Silvery Minnow *Hybognathus amarus* Entrapment within Floodplain Habitats due to Anthropogenic Geomorphic Alterations, planning and design phase.
- SWCA Environmental Consultants, Pueblo of Sandia Habitat Restoration Analysis and Recommendations.
- Parametrix, Isleta Reach Restoration Analysis and Recommendations.
- Parametrix, San Acacia-San Marcial Restoration Analysis and Recommendations.

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Porter, Michael D. October 2006. Rio Grande Fish Community Surveys, Annual Report 2006. U.S. Bureau of Reclamation, Albuquerque Area Office, Environment Division.

SWCA Environmental Consultants. August 2006. Silvery Minnow Egg and Larval Monitoring in Constructed Embayments: Summary of Findings Report. Prepared for New Mexico Interstate Stream Commission.

Wesche, T.A., Cowley, D.E., Najmi, Y., Grogan, S.. November 2006. Development of Perennial Pools for Rio Grande Silvery Minnow in the Middle Rio Grande using Cottonwood Snags. Project Report on Grant Agreement No. 03-FG-40-2109-85. Submitted to Middle Rio Grande ESA Collaborative Program, U.S. Bureau of Reclamation, Albuquerque, NM.

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

Reclamation released a Draft Environmental Impact Statement (EIS) on the proposed realignment of the Rio Grande and the LFCC below San Marcial in September, 2000. The proposed project would alleviate some of the more critical channel maintenance problems in the San Marcial area. The Draft EIS evaluates 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 requesting formal Section 7 consultation on the proposed project. At a meeting on June 30, 2003, the U.S. Fish and Wildlife Service informed Reclamation and the New Mexico Interstate Stream Commission 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. Reclamation has begun 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 New Mexico Interstate Stream Commission in recent years to establish and maintain a channel into the reservoir.

Endangered Species

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 (U.S. 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. Summer monsoon rains maintained flow downstream of Isleta Diversion Dam through most of the 2006 irrigation season. 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, 2006, for the year.

The silvery minnow population decreased approximately 95% from 2005 to 2006 overall as indicated by the total number of fish recorded in the benchmark October monitoring (Figure 6). The lack of spring runoff shown in Figure 7 (less than 1,000 cfs at Albuquerque) resulted in poor recruitment. One definition of poor recruitment is when the number of offspring produced is significantly less than annual mortality, resulting in a decreasing population. Flow above 3,000 cfs inundated pointbars, islands, and floodplain in 2004 and 2005, resulting in high recruitment due to the availability of nursery habitat (see increases in Figure 6 of number of minnow from 2003 to 2004 and from 2004 to 2005). Reclamation's 2006 studies on egg retention in nursery habitat produced negative data due to the lack of suitable nursery habitat during April to June (prime spawning period).

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. Continuation of increased recruitment appears dependent on sufficient flows during spawning, and augmentation throughout reaches with stable summer flows.

The U.S. Fish and Wildlife Service released the Draft Rio Grande Silvery Minnow Recovery Plan (Plan) for public review. Comments are due April 18, 2007. Criteria for recovery identified in the draft plan include an assumed population size of 500,000 in each subpopulation in the three subreaches of the Middle Rio Grande and two additional sustainable populations beyond the Middle Rio Grande. Recent genetic research indicates that the current population size for the Rio Grande silvery minnow is around 100,000 individuals.

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 2007. The U.S. Fish and Wildlife 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.

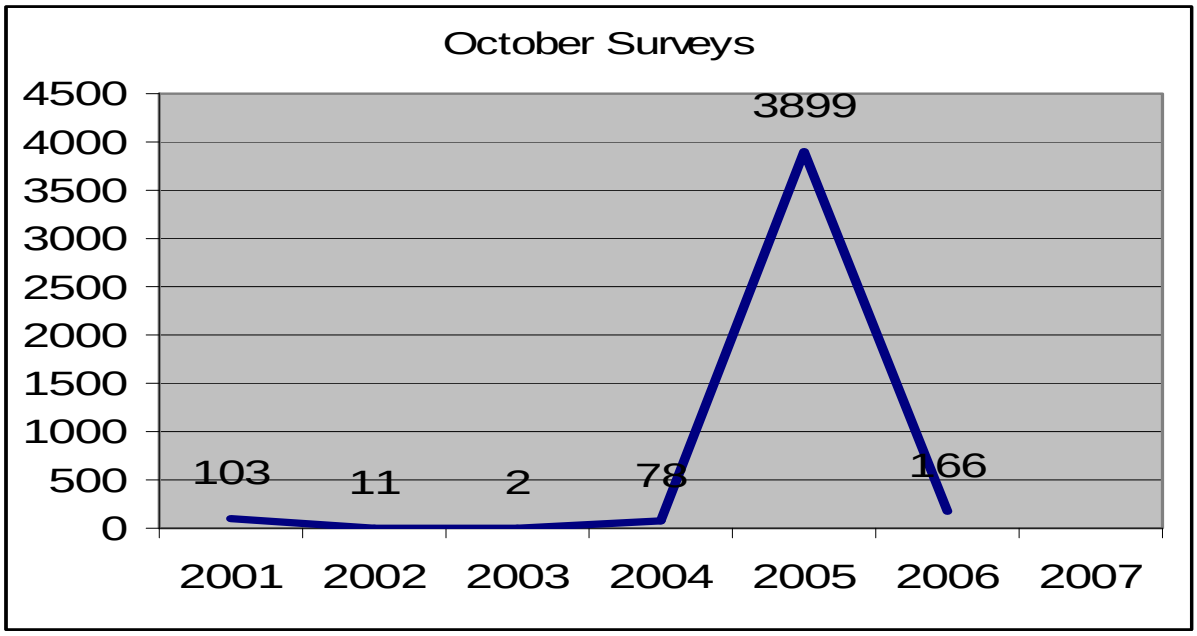

Figure 6: Total Rio Grande silvery minnows in the October fish population surveys

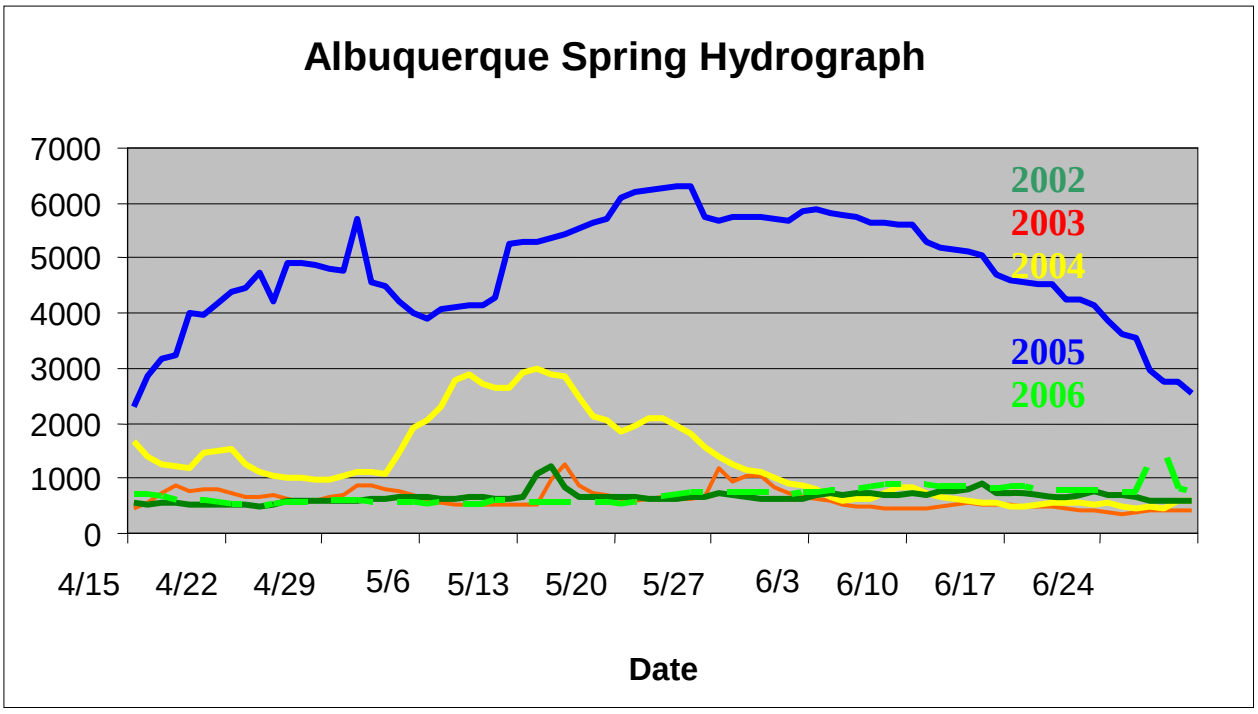

Figure 7: Albuquerque Hydrograph Comparison

Southwestern Willow Flycatcher

The Southwestern Willow Flycatcher was listed endangered by the U.S. Fish and Wildlife Service effective March 29, 1995. Critical habitat was designated, effective August 21, 1997 in some areas of New Mexico and other states throughout the species' range. The Rio Grande was not designated as critical habitat for the Southwestern Willow Flycatcher at that time and the 1997 critical habitat proposal was later retracted. On October 13, 2004, under court order, the U.S. Fish and Wildlife Service 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 Endangered Species Act requires all Federal agencies to consult with the U.S. Fish and Wildlife Service on any action that "may affect" a listed species, regardless of whether critical habitat has been designated or not. Reclamation has been in consultation with the U.S. Fish and Wildlife Service pursuant to Section 7 over numerous actions, mainly operations and maintenance activities along the Rio Grande, since 1995.

Six primary breeding sites for Southwestern Willow Flycatchers have been documented during various survey efforts in the Middle Rio Grande between 1993 and 2006 and include the following: San Juan Pueblo, Isleta Pueblo, Sevilleta NWR and La Joya State Wildlife Management Area, the San Marcial area, and the Elephant Butte Reservoir delta. Table 9 displays the results of surveys for Southwestern Willow Flycatchers at these and other sites from 2000 through 2006.

Reclamation continues to conduct Southwestern Willow Flycatcher surveys and nest monitoring along portions of the Middle Rio Grande. Between 2000 and 2006, the number of Southwestern Willow Flycatcher territories in the San Marcial reach has expanded from 23 to a maximum of 135. A majority of these territories are located in the newly-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. Flycatcher surveys and nest monitoring in selected areas of the Middle Rio Grande will continue in 2007.

Literature Cited

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Moore, D. and D. Ahlers 2006b. 2006 Southwestern Willow Flycatcher study results: selected sites along the Rio Grande from Velarde to Elephant Butte Reservoir, New Mexico. U.S. Department of the Interior, Bureau of Reclamation, Technical Services Center, Denver, CO.

Table 9: Estimate of Southwestern Willow Flycatcher Territories – Middle Rio Grande Project, 2000 - 2006 Breeding Seasons

River Reach	Number of Territories 2000	Number of Territories 2001	Number of Territories 2002	Number of Territories 2003	Number of Territories 2004	Number of Territories 2005	Number of Territories 2006
Velarde	2	1	0	not surveyed	1	0	1
San Juan Pueblo	16	not surveyed	not surveyed	unknown	unknown*	unknown*	unknown
Isleta Pueblo	14	not surveyed	not surveyed	6	7	6	8
Belen reach	not surveyed	not surveyed	not surveyed	not surveyed	0	1	1
Sevilleta NWR/La Joya State WMA	8	11	13	17	19	20	21
Bosque del Apache NWR	1	2	4	3	1	0	4
San Marcial/Tiffany areas	4	3	12	34	16	3	16
Elephant Butte Reservoir Delta	19	22	51	52	113	107	135
Total	63	39	80	111	149	131	186

(Ahlers et al. 2000, 2001, 2002, Moore and Ahlers 2004, 2005, 2006a, 2006b; Smith and Johnson 2004; Taylor 2000, 2001, 2002; Williams 2000)
* Surveyed by New Mexico Dept. of Game & Fish; results currently not available.

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

During the Minnow v. Keys litigation, the District Court ordered Reclamation to reinitiate 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.

In August 2005, Reclamation and the Corps of Engineers reinitiated consultation with the U.S. Fish and Wildlife Service seeking an amendment to the incidental take statement (ITS). The amended ITS reflects the effects that spring hydrologic conditions and silvery minnow population status have on the numbers of minnows that may be found in the river during low flow periods. The ITS is calculated using fall recruitment, spring flow, and the amount of augmentation. The level of allowable incidental take was increased from an observed mortality of 760 to 10,440 individuals. During 2006, the incidental take totaled approximately 2,400 minnows.

Rio Grande Silvery Minnow v. Keys Litigation

In November 1999, environmental groups collectively filed suit against Reclamation and the Corps of Engineers for alleged Endangered Species Act and National Environmental Policy Act (NEPA) violations. The Middle Rio Grande Conservancy District, 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 of Engineers 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 Endangered Species Act, 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 Endangered Species Act 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 have been 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 Middle Rio Grande 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. Subsequent reply briefs have been submitted by the plaintiffs and the defendants in 2006.

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/Nm/rg/RioG/gage/schematic/SCHEMATICsouth.html

The portable pumps were effectively used to augment river flows during the 2006 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 16,784 af was transferred from the LFCC to the Rio Grande floodway through the Temporary Pumping Program during 2006.

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 Coffer Dam, both in Texas. Riverside Diversion Dam had been inoperable since 1987, when flooding on the Rio Grande caused the structure to fail.

Water Supply Conditions

Inflow into Elephant Butte Reservoir during 2006 as measured at the Rio Grande Floodway (FW) plus the Low Flow Conveyance Channel (LFCC) at San Marcial (FW+LFCC) was 457,200 af which is 53.3% of the 95-year average annual flow at the San Marcial stations (FW+LFCC). The 95-year average annual flow at San Marcial (FW+LFCC) is 858,198 af. The actual 2006 March through July runoff, measured at San Marcial (FW+LFCC), was 92,463 af, which was 16.1% of the 30-year average of 573,000 af. Of the period 1996-2006, 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. Due to the unusually heavy monsoon rainstorms above Elephant Butte Reservoir during the summer of 2006, the amount of flow during August at the San Marcial stations was nearly 33% of the 2006 annual flow at San Marcial stations and over 345% of the long-term average flow for August. This August flow was nearly 152,000 af, and it was the seventh highest August flow on record at San Marcial stations since 1895. During 2006, 491,473 af of water was released from Elephant Butte Reservoir. There was a release of 434,228 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 2006 March through July runoff season are presented in Table 10.

Combined total storage for Elephant Butte and Caballo Reservoirs was 557,166 af on December 31, 2006. This combined storage was 23.7% of the total capacity of both reservoirs, and 25.0% 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) went above 400,000 af on December 27, 2005. 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 prior to Dec. 27, 2005, on March 31, 2006, Colorado relinquished 400 af of its credit waters to Texas, and Texas accepted the relinquishment. The 400 af of relinquished credit waters was then allocated to the Rio Grande Project water users for the 2006 irrigation season.

On April 14, 2006, the Compact usable water in Project storage went below 400,000 af. On November 6, 2006, the Compact usable water in Project storage went above 400,000 AF and remained above to the end of 2006. However, on January 1, 2007, usable water in Project storage went below 400,000 af again due to a large increase in Compact credit waters in Elephant Butte Reservoir for both Colorado and New Mexico due to over-deliveries in 2006. On January 30, 2007, the Compact usable water in Project storage went above 400,000 af, which removed the Compact Article VII restriction on upstream post-1929 reservoirs.

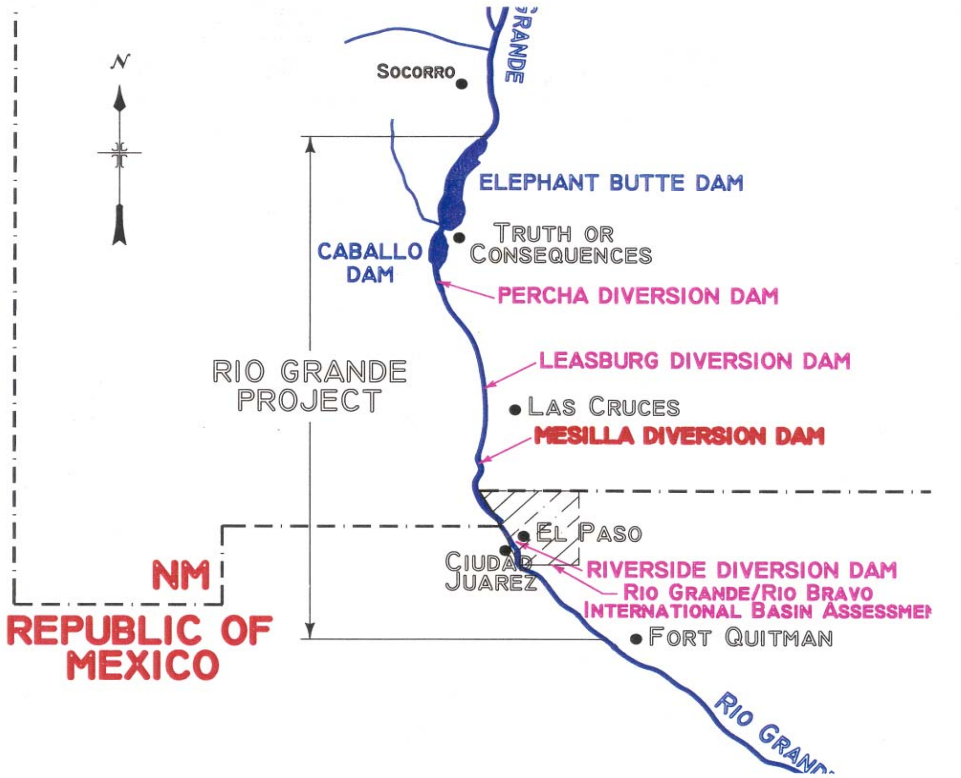

Figure 8: Area Map of the Rio Grande Project

Table 10: Summary of 2006 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	415,000	1. 55	255,000	45
Feb 1	300,000	2. 40	145,000	25
Mar 1	200,000	3. 26	57,000	10
Apr 1	265,000	4. 35	100,000	18
May 1	235,000	5. 31	65,000	11
June 1	190,000	6. 25	35,000	6
Actual Runoff	296,011	7. 39	92,463	16

A final allocation to the Rio Grande Project water users of 50.7% of a full supply was declared by Reclamation on November 21, 2006 for the 2006 irrigation season. The initial allocation to the Rio Grande Project water users (declared on December 16, 2005) started at only 37.73% of a full supply. After a full supply for irrigation was declared in 2005 for the Rio Grande Project, 2006 was not as generous for the Project water users for irrigation.

For the 2007 irrigation season initial allocation, a less than full allocation (only 39.65% of a full supply) was declared on January 25, 2007. Based on the January 1 NRCS/NWS spring runoff forecast at the San Marcial gauging stations and present hydrologic conditions, Reclamation anticipates close to a full supply for irrigation during 2007 for the Rio Grande Project.

The 2007 coordinated forecasts from the NRCS & NWS for the 2007 March through July runoff season is presented in Table 11.

Table 11: 2007 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	720,000	95	520,000	91
Feb 1	770,000	102	570,000	100

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 2006, 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 2006. 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 2006. The International Boundary and Water Commission (IBWC) continued to own, operate, and maintain the American Diversion Dam and the American Canal during 2006 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 50,296 af.

Water flows measured by IBWC on the Rio Grande at Fort Quitman Station, downstream of the Project and HCCRD boundaries, amounted to 150,644 af during 2006.

Elephant Butte Reservoir and Powerplant

Elephant Butte Reservoir reached a minimum storage of 183,875 af (elevation 4,308.50 ft) on July 28, 2006. A maximum storage of 514,029 af (elevation 4,340.72 ft) was reached on December 31, 2006. Storage levels in Elephant Butte Reservoir did not enter into the 50,000 af prudent flood control space in 2006.

Net power generation for 2006 was 32,642,234 kilowatt-hours which was 44.2 percent of the 67-year average (1940 through 2006) of 73,803,556 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 2006 (May 10 - July 7, and July 15 - July 28). In 1998, Reclamation determined that the hydraulic turbines of the power plant needed to be replaced because of severe stress fracturing. A new hydraulic turbine was installed in the power plant in the winter of 2001 to replace the No. 2 turbine. Another new hydraulic turbine was installed to replace the No. 3 turbine in June 2003. The last remaining turbine (No. 1 turbine) was completely replaced by early 2005. Reclamation

anticipates that all three turbines will be available for generation and discharge by the spring of 2007. Reclamation continues repair work on the power plant's lower No. 1 penstock guard gate.

In 2006, from July to October, unusually heavy monsoon rainstorms above Elephant Butte Reservoir caused flooding on the Rio Grande. Arroyo flooding occurred below Elephant Butte Dam and caused deposition of sediment in the main river channel between the dam and Caballo Reservoir. Discharge from Elephant Butte Dam was shut off completely from July 11-14, August 16-22, and August 23-September 2 to alleviate flooding in the main channel below the dam. From Elephant Butte Reservoir's low point on July 28, 2006 until the end of 2006, the reservoir gained 32.22 feet in elevation and 330,154 af in storage content.

Elephant Butte Dam Facility Review and Safety of Dams Programs

During the FY2006, Elephant Butte Field Office implemented and completed the following recommendations:

2001-2-D	Clean the foundation drains in the dam to the original depth. Effective drains increase the factors of safety for the dam and foundation and if maintained, provide an important defensive measure for ensuring the stability of the dam. *Status-Incomplete. Completed approximately half the drains in FY2006.*
2005-3-D	Repair erosion gullies on the downstream shoulder of the dike. *Status-Completed FY2006*
2005-3-E	Repair concrete damage along vertical joints on the upstream face of the dike, and remove vegetation growing in the joints. *Status-Completed FY2006.*
2005-2-O	Repair the cavitation damage to the service outlet works balance valves. *Status-Completed FY2006.*
2005-2-H	Install an OSHA required confined space sign at the entrance to the manhole located just downstream of the dike. *Status-Completed FY2006.*
2005-2-K	Investigate Spillway Gate 3 and return to operable condition. *Status-Completed FY2006*
2005-2-D	Remove vegetation growing in joints/cracks in the downstream face of the spillway ogee crest. *Status-Completed FY2006.*
2005-2-C	Remove all woody vegetation within 25 feet of the dam. *Status-Completed FY2006.*
2005-2-E	Repair damaged coating in the invert of the upper left service outlet works conduit just downstream of the balance valves. *Status-Completed FY2006.*
2005-2-G	Perform an inspection of the dam tailrace and document the inspection in a report with photographs. *Status-Complete FY2006.*

2005-2-R	Update the trilateration/triangulation surveys of the dam and dike target positions to provide acceptable tolerances in change in XYZ coordinates. *Status-Incomplete. Started in FY2006.*
2005-2-Q	Purchase and install a load bank on the engine generator, and perform the weekly startups using the load bank so the engine can warm up to operating temperature. *Status-Completed FY2006.*

Caballo Dam and Reservoir

Caballo Reservoir reached a minimum storage of 15,650 af (4,133.98 ft) on January 1, 2006. A maximum storage of 71,623 af (4,150.90 ft) was reached on August 26, 2006.

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, 2006 was to maintain storage levels such that they would not exceed 50,000 af in February, not exceed 56,000 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 2006 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 turbine runner replacement program.

Caballo Reservoir's operating plan for October 1, 2006 through September 30, 2007 has not yet been finalized. Due to current drought conditions and uncertainty of the 2007 spring runoff volume into Elephant Butte Reservoir, Reclamation will finalize its operating plan in the spring of 2007. 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.

Due to the unusually heavy monsoon rainstorms from July – October 2006, flooding occurred on arroyos and the Rio Grande downstream of Caballo Dam. Hardest hit areas were the town of Hatch, NM and the city of El Paso, TX. Releases from Caballo Dam were shut completely off

from August 4-8, August 16-18, August 20-24, and September 5-11. These release shut downs were due to a lack of irrigation orders from the Project water users, and also to alleviate flooding downstream on the Rio Grande. Caballo Reservoir peaked out on August 26, 2006 nearly 15,600 af above the plan's peak of 56,000 af due to the monsoonal flooding.

Caballo Dam Facility Review and Safety of Dams Programs

During the FY2006, Elephant Butte Field Office implemented and completed the following recommendations.

2001-2-D	Clean the foundation drains in the dam to the original depth. Effective drains increase the factors of safety for the dam and foundation and if maintained, provide an important defensive measure for ensuring the stability of the dam. *Status-Incomplete. Completed approximately half the drains in FY2006.*
2005-3-D	Repair erosion gullies on the downstream shoulder of the dike. *Status-Completed FY2006.*
2005-3-E	Repair concrete damage along vertical joints on the upstream face of the dike, and remove vegetation growing in the joints. *Status-Completed FY2006.*
2005-2-O	Repair the cavitation damage to the service outlet works balance valves. *Status-Completed FY2006.*
2005-2-H	Install an OSHA required confined space sign at the entrance to the manhole located just downstream of the dike. *Status- Completed FY2006.*
2005-2-K	Investigate Spillway Gate 3 and return to operable condition. *Status- Completed FY2006.*
2005-2-D	Remove vegetation growing in joints/cracks in the downstream face of the spillway ogee crest. *Status- Completed FY2006.*
2005-2-C	Remove all woody vegetation within 25 feet of the dam. *Status- Completed FY2006.*
2005-2-E	Repair damaged coating in the invert of the upper left service outlet works conduit just downstream of the balance valves. *Status- Completed FY2006.*
2005-2-G	Perform an inspection of the dam tailrace and document the inspection in a report with photographs. *Status- Completed FY2006.*
2005-2-R	Update the trilateration/triangulation surveys of the dam and dike target positions to provide acceptable tolerances in change in XYZ coordinates. *Status-Incomplete. Started in FY2006.*
2005-2-Q	Purchase and install a load bank on the engine generator, and perform the weekly startups using the load bank so the engine can warm up to operating temperature. *Status-Completed FY2006.*

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 2006. 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/index.html

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

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 2007. The next scheduled operation and maintenance field examination of the diversion dams is tentatively set for the fall of 2008, 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. The most recent status conference was held on November 10, 2005. 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 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.

On August 17, 2005, TCEQ issued an Order adopting a Preliminary Determination in the Adjudication of All Claims of Water Rights in the Upper Rio Grande (Above Fort Quitman, Texas) Segment of the Rio Grande Basin. No contests to the determination were filed.

Elephant Butte and Caballo Reservoir Vegetation Management Cooperative Agreement

Under a Cooperative Agreement with the State of New Mexico, Reclamation has continued maintenance on lands within the Caballo Reservoir and Elephant Butte Reservoir projects. During 2006, 3,189 acres of woody phreatophytes were controlled at Caballo Reservoir including herbicide treatments to 544 acres. In addition Reclamation has obtained funding under DOI Science and Technology Invasive Species Initiative to continue cooperative studies of saltcedar control methods, pesticide monitoring and Evapotranspiration (ET) measurements.

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_2S) releases at the Elephant Butte power production facility. The release of H_2S 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_2S 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.

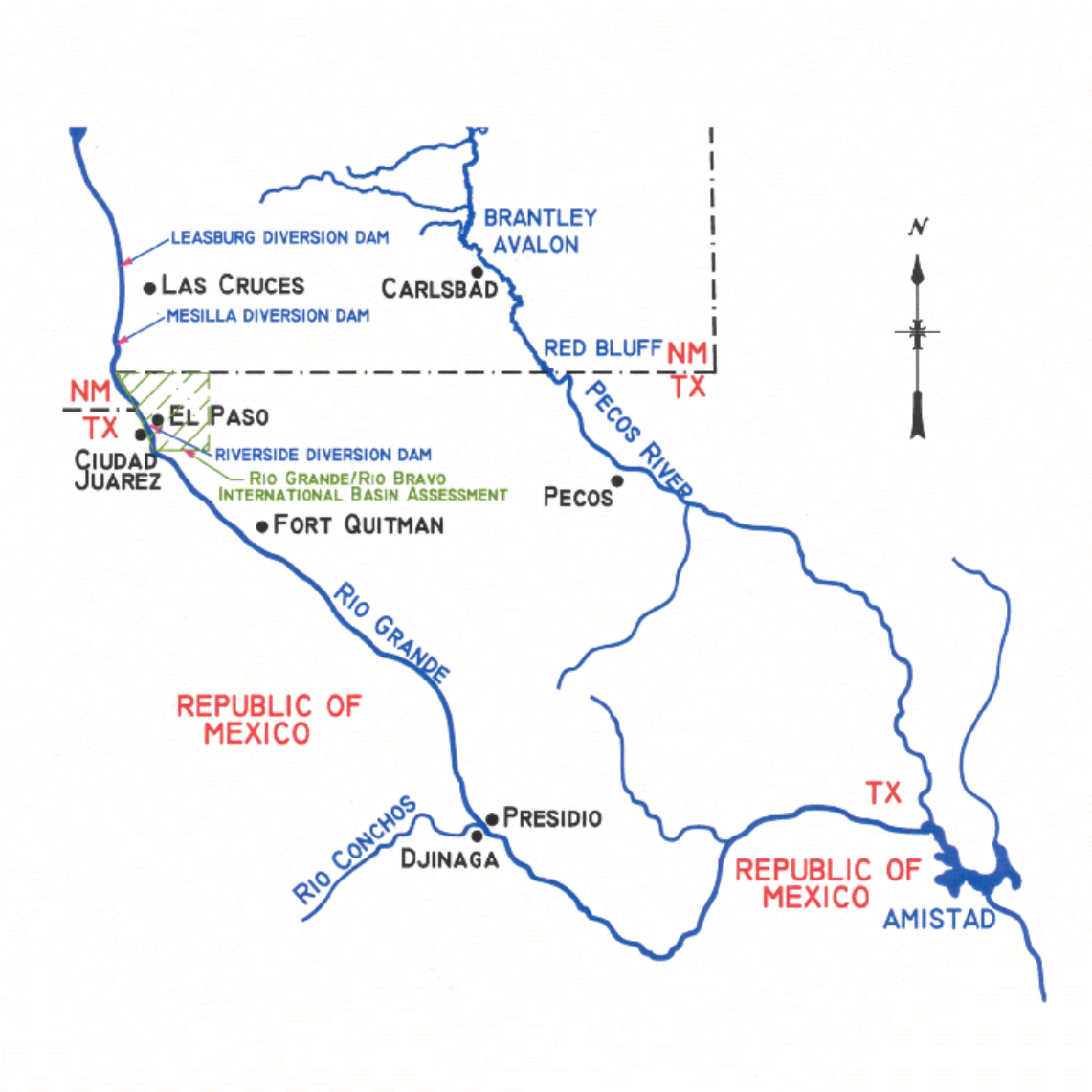

Figure 9: Area Map of the Rio Grande/Rio Bravo International Basin Assessment

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 in Fiscal Years 2004 through 2006 for system automation, water measurement, and canal lining. Reclamation, in collaboration with MRGCD, provided designs and drawings for installation of Langemann gates with metal catwalk platform at Angostura Diversion Dam. MRGCD will complete installation of the gates. Reclamation is working on designs and drawings with MRGCD to replace radial gate lifting drum assemblies, supports, and hoists at San Acacia and Isleta Diversion Dams. MRGCD will complete the installation which is planned for 2007.

The MRGCD is using Water 2025 funding for concrete lining an 8,700 foot section of the Cochiti East Side Main Canal from Cochiti Dam to the Santa Fe River. The project will reduce seepage losses from the canal and help reduce operation and maintenance costs. Construction began in January, 2007 and the contractor expects to complete the project during the winter of 2007-2008.

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. Reclamation continues to provide technical assistance to MRGCD in support of the program.

In support of Water 2025 objectives, Reclamation's Native American Program has provided $400,000 to the Pueblo de Cochiti for upgrades to MRGCD facilities on pueblo lands.

Elephant Butte Irrigation District will install 100 flow control meters to implement its metering and monitoring plan to meter all farm deliveries using telemetry. The project is estimated to save 8,000 af of water per year, with 75,000 af better managed. The total project cost is $615,000, including a Water 2025 contribution of $300,000.

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 project is expected to save 3,750 af of water a year. The total project cost is $174,889, including a Water 2025 contribution of $86,350.

The City of El Paso Utilities Water Service Board will install four flow gaging stations and 15 electrical conductivity measurement stations on the Rio Grande and various drains. These stations will all be equipped with telemetry and 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 providing technical assistance to water users.

Reclamation continued to support conservation outreach aimed at increasing public and industrial awareness of water issues during 2006. Institutional and industrial 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. 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.

Reclamation is continuing to work with staff of the Elephant Butte Irrigation District and New Mexico State University to develop and implement well and ground water monitoring systems for the Mesilla Bolson.

Funding and technical assistance is being provided to the New Mexico communities of Hatch, Anthony, and Bernalillo for development of water conservation plans and to the city of Las Cruces to promote and demonstrate a "Lush and lean" garden. Las Cruces hopes to showcase this activity by showing through example.

Title XVI Water Reclamation and Reuse Projects

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

City of Española

The City of Española completed an appraisal study in 2000. In late 2001, Española initiated work on a feasibility study under Public Law 102-575, Section 1604. The feasibility study covered NEPA requirements and was originally going to investigate a subsurface horizontal radial collector well diversion and treatment of Española's SJ-C water rights. The project has since shifted to a surface water diversion and treatment study, with only the filtration facility coming under Title XVI. The proposed project would mix treated surface water with existing Española well water to dilute the City's wells with naturally high fluoride levels and comply with drinking water standards. Work is now proceeding independently on the construction of the necessary diversion with the Albuquerque Corps of Engineers and Reclamation's Albuquerque Area Office. Española extended its agreement with Reclamation that was due to expire December 31, 2005, to allow for additional arsenic removal study with remaining funds. The filtration facility Feasibility Study report was completed in 2005. The diversion project needed to supply the filtration facility remains in progress due to continuing NEPA investigation, access negotiations and point of diversion design work. Española completed an arsenic abatement study and the Title XVI contract ended December 31, 2006. Work continues on the filtration facility with State, EPA and P.L. 108-354 funds.

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 2007. 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 2007 and will be completed 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.

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 is working with the El Paso Water Utilities-Public Service Board 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.

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 URGWOM accounting module 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

continued to be operated as a separate model independent of the main URGWOM Accounting Model during 2006. URGWOM's water operations module was used to develop the 2006 Middle Rio Grande Annual Operating Plan, and to evaluate short-term operational scenarios of up to a year in duration. Several long-term planning runs were completed with the URGWOM planning module to evaluate the potential impacts of implementing alternative water operations within the basin.

URGWOM development during 2006 primarily concentrated on improving model performance related to achieving in-stream target flows, developing new methods for modeling the groundwater and surface water interactions within the middle valley, and continued documentation and clean-up of the water operations ruleset. The URGWOM Technical Team and Sandia National Laboratory worked cooperatively during 2006 on the development of a monthly time step model using Powersim simulation software. This monthly timestep model builds off the past work and research efforts of URGWOM.

Planned work for 2007 will concentrate on improving the simulation of the middle valley to better model the interactions with shallow groundwater, surface water, and the relationship between MRGCD diversions and surface water returns. Work is also continuing toward improving URGWOM's ability to model operations to achieve in-stream flow targets. The ruleset documentation and clean-up project is anticipated to be complete by mid-year 2007. Reclamation is investigating the potential benefits and practicality of incorporating the Nambé Falls Accounting Model and other additional water accounting reporting functionalities within the larger URGWOM accounting module.

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

2006 Rio Grande Compact Water Accounting

The current approved Compact Accounting process (URGWOM RiverWare Accounting Model→DSS→Lotus Spreadsheet) was used for all official water accounting during 2006. The current approved method will be used for all official water accounting during 2007.

Excel Based Water Accounting Spreadsheet

Reclamation completed the development 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 was incorporated within the Excel spreadsheet as it was developed. This project helped achieve Reclamation's directive to make Excel the standard spreadsheet software.

During 2007, Reclamation will continue to use the current URGWOM RiverWare Accounting Model→DSS→Lotus Spreadsheet process while concurrently operating the URGWOM RiverWare Accounting Model →DSS→ Excel Spreadsheet process. The Engineer Advisors will be consulted prior to any deviation from the current water accounting process.

Water Accounting Documentation

Reclamation completed the documentation of the water accounting data sources and information used by both the URGWOM RiverWare Accounting Model →DSS→Lotus Spreadsheet process as well as the URGWOM RiverWare Accounting Model →DSS→ Excel Spreadsheet process during 2006. A copy of this documentation was provided to the Engineer Advisers to the Rio Grande Compact Commission at the annual meeting on February 27, 2007.

Oracle / Hydrologic Database (HDB) Water Accounting

The Hydrologic Database (HDB) is a generalized relational database management system for storing and using hydrologic data used by Reclamation in management of river and reservoir systems. It is built on Oracle and includes connections to data sources such as Reclamation's Hydromet, and models such as RiverWare. HDB is developed and maintained at the University of Colorado Center for Advanced Decision Support for Water and Environmental Systems (CU-CADSWES), and also by independent Reclamation consultants. 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, host HDB installations for the purposes of evaluation and applications development.

Development of water accounting and reporting functionalities for the Albuquerque Area Office's test HDB installation continued during 2006. Water accounting data is now ported from the RiverWare URGWOM Accounting Model to HDB. 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 2006 include completion of additional water accounting tables using the URGWOM RiverWare Accounting Model →HDB→Crystal Reports process to duplicate tables now generated using the URGWOM RiverWare Accounting Model →DSS→Lotus Spreadsheet process.

Planned work for 2007 includes completing develop of Crystal Reports/HDB versions of all water accounting tables that are currently generated using the Lotus spreadsheet/DSS process. Reclamation's contractors are providing 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 2007, all water accounting will continue to be maintained using the current Lotus spreadsheet/DSS process in parallel to generation of water accounting reports using Crystal Reports/HDB. 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

Reclamation will evaluate the potential for using recently completed and proposed RiverWare enhancements that could make many aspects of the proposed URGWOM RiverWare Accounting Model →HDB→Crystal Reports process obsolete. The use of RiverWare Expression Slots could allow for all compact accounting and accounting report tables to be completed within the RiverWare based URGWOM Accounting Model. Reclamation would likely continue to pursue the implementation of HDB as an archive and/or data reporting tool. This project will be investigated by Reclamation's contracted consultants during 2007.

Reclamation anticipates using its contracted consultants to incorporate the RiverWare Nambé Falls Accounting Model into the RiverWare URGWOM Accounting Model during 2007.

CU-CADSWES is currently developing functionalities that could allow RiverWare to directly export data to an Excel spreadsheet. Reclamation must evaluate the feasibility and potential benefits of completing Rio Grande Compact accounting within RiverWare as described previously, and then exporting this data directly to an Excel spreadsheet to generate presentation tables for the Annual Water Accounting Report. CU-CADSWES is also currently developing functionalities that could allow the annotation of water accounting transactions directly within RiverWare, eliminating the need for the "Green Book" portion of the current Oracle / HDB Water Accounting Project.

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 goal of the ET Toolbox project is to supply water managers within and outside of Reclamation with accurate, real-time ET data 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 primary purpose of the ET Toolbox is to accurately determine, and predict, daily rainfall and water depletions along the Rio Grande. These daily ET estimates and summary year-to-date cumulative ET estimates are already available to users and water managers via the Internet at:

http://www.usbr.gov/pmts/rivers/awards/Nm/riogrande.html

The daily cumulative river reach ET estimates are incorporated into 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, now available 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 2007. Improvements in and extensions of National Weather Service prediction products in 2006 will allow 5-7 day ET predictions in 2007.

Upper Rio Grande Basin Water Operations Review

Reclamation, the Corps of Engineers, 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, Texas. The scope of the Upper Rio Grande Basin Water Operations Review and Environmental Impact Statement (Review and EIS) is limited to existing facilities and authorities. Because of ongoing litigation, water supply operations at El Vado, Elephant Butte and Caballo Reservoirs are not included in the Review and EIS. However, flood control operations and their impacts down to Fort Quitman will be considered.

The purpose of the Review and EIS is to develop a better understanding of how Corps of Engineers 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 will take 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 the completion of a Final EIS. The process was officially started in March of 2000 with the notice of intent 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 continues 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 of Engineers
- Changes to channel capacity below the Corps of Engineers' 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 will be used to assess data quality and uncertainty, further assisting the decision-making process. Finally, a model developed by Sandia National Laboratories will be 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 are reviewing public comments, finalizing the EIS, and deciding on the actions to be taken by each agency. The Final EIS is expected to be released later in 2007.

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, and special projects funded through Congressional write-ins.

As part of Reclamation's Native American and other programs, assistance was given to various Pueblos improve irrigation system efficiency. Some of the items funded or purchased included drip irrigation systems, concrete lining of farm ditches, terracing, laser leveling, check structures, pipes, and gates. Some of the assistance will be used as a cost share with the Middle Rio Grande Conservancy District's Water 2025 funding to improve District facilities through Pueblo land. Windmills were repaired at one Pueblo through the Native American Program.

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 by the parties on a proposed settlement of the Abeyta adjudication, which includes Taos Pueblo.

Emergency Drought Program

In 2005, two New Mexico locations received drought funds. The City of Española, and the Town of Chimayo through the Greater Chimayo Mutual Domestic Water Consumers Association, received $221,594 and $177,275, respectively. Contracts were issued at the end of the fiscal year. There was no progress to report for 2005.

In 2006, Chimayo drilled two wells and researched water rights for additional water/wells. A third well is planned for early 2007. Española completed a hydro-geological study in 2006.