2002

2002 Calendar Year Report to the Rio Grande Compact Commission

Hal D. Simpson
Colorado

John R. D'Antonio
New Mexico

Joe G. Hanson
Texas

Bill Ruth
Federal Chairman

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UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

Upper Colorado Region
Albuquerque Area Office
February 28, 2003

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U.S. Bureau of Reclamation
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2002 Calendar Year Report to the Rio Grande Compact Commission

INTRODUCTION

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

The *San Luis Valley Project* consists of the Conejos and Closed Basin Divisions. The Conejos Division, which includes Platoro Dam and Reservoir, provides water for approximately 86,000 acres within 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 that would otherwise be lost through evapotranspiration.

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 Nambe 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 the Middle Rio Grande Conservancy District (MRGCD) which supplies water to between 50,000 to 90,000 acres of land in any given year.

The *Rio Grande Project* includes Elephant Butte and Caballo Reservoirs and Percha, Leasburg, Mesilla, and Riverside Diversion Dams in the lower Rio Grande valley of southern New Mexico to just south of El Paso, Texas. The 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. 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.

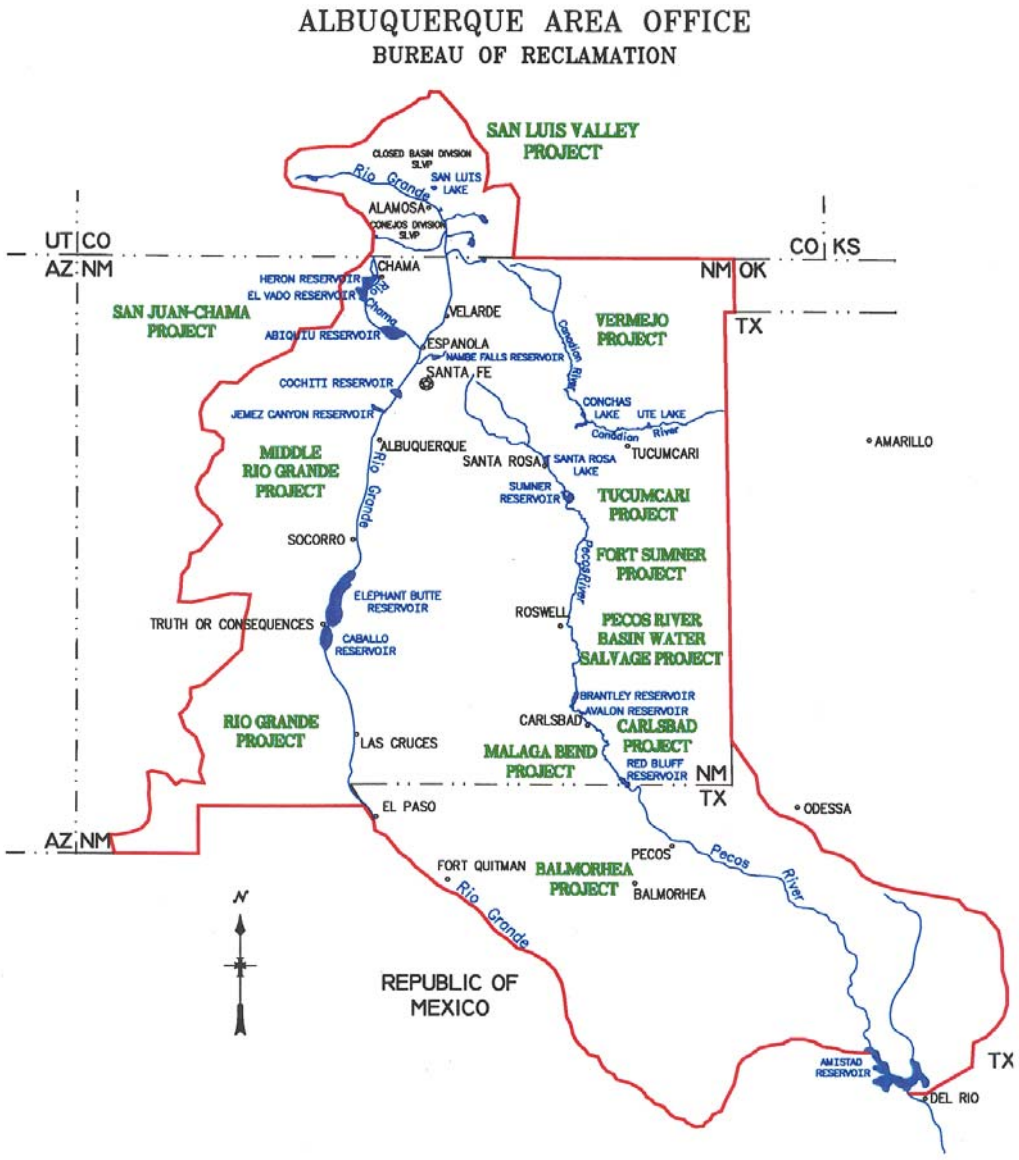

Figure 1: Project Map of Reclamation's Albuquerque Area Office

SAN LUIS VALLEY PROJECT, COLORADO

Conejos Division, Platoro Reservoir

The Conejos Water Conservancy District operates the Conejos Division portion of the San Luis Project (Platoro Dam and Reservoir, see Figure 2) of the San Luis Valley Project. Platoro Reservoir began 2002 with 17,113 acre-feet (af) in storage, and ended the year with a total content of 10,801 af. Inflow to the reservoir was estimated to be approximately 0.5 cfs in late August. Supplemental releases were attempted in 2002 with only limited success, as much of the released project water was lost to groundwater recharge. Conditions were so severe that the Conejos River bed dried in late summer, approximately 8 miles below the Mogote gage. There were no flood operations during 2002.

Platoro Dam Facility Review and Safety of Dams Programs

A Comprehensive Facility Review (CFR) is a review performed on a high or significant-hazard dam every 6 years, which includes a field examination and a state-of-the-art review of a structure's design assumptions, construction practices, and integrity under various loading conditions. A CFR includes a detailed examination performed by a senior dam engineer. Comprehensive facility reviews are designed to gather together appropriate technical disciplines for a brief, but intensive assessment of a dam's performance history, the dam safety analyses that have been performed to date, and the current condition of the dam and damsite. The comprehensive facility review covers both operation and maintenance and dam safety issues.

A Periodic Facility Review (PFR) is a review performed on a high or significant-hazard dam every 6 years that entails a thorough examination from both operation and maintenance and dam safety perspectives. A PFR is generally completed without the involvement of a senior dam engineer. The periodic facility review covers both operation and maintenance and dam safety issues. The regional office has primary lead responsibility for these reviews. A PFR is on a schedule that is staggered from the CFR schedule, such that either a CFR or PFR is scheduled every 3 years. The last CFR for Platoro Dam was completed in 2001, and the next PFR is scheduled for 2004.

During 2002 the following work was completed for Platoro Dam:

- The Annual Examination and Report was completed
- Settlement points were placed atop the crest of the Dam and new benchmarks will be installed during the spring of 2003
- New inundation maps have been completed for the drainage below the Dam

- Reclamation's Denver TSC visited Platoro in September of 2002 to evaluate a new flood detection Early Warning System. The system is scheduled for completion in late 2003

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 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.

Closed Basin - Operations and Maintenance

Operations

A total of 15,574 af of project water was delivered to various points, including 11,607 af creditable to the Rio Grande pursuant to the Rio Grande Compact. Closed Basin water deliveries in 2002 included deliveries to; the Blanca Wildlife Habitat Area, Alamosa National Wildlife Refuge, San Luis Lake, and the Rio Grande.

The project continued stabilization and flow-through operations at San Luis Lake during 2002 with 353 af delivered to the lake through the San Luis Lake Feeder Canal. Natural inflows to San Luis Lake were measured at the San Luis Lake Parshall flume or estimated at the spillway and culverts. Natural inflow to San Luis Lake during 2002 totaled 40 af. During the 2002 water year, 179 af was pumped from the lake through the San Luis Lake Pumping Plant.

Deliveries to the Blanca Wildlife Habitat Area included the 2002 annual mitigation delivery of 800 af. Total deliveries to the Blanca Wildlife Habitat Area of 854 af included 54 af of San Luis Lake water that was pumped to test the feasibility of pumping down the lake as requested by the Division of Wildlife for their fishery reclamation activities.

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SAN LUIS VALLEY PROJECT

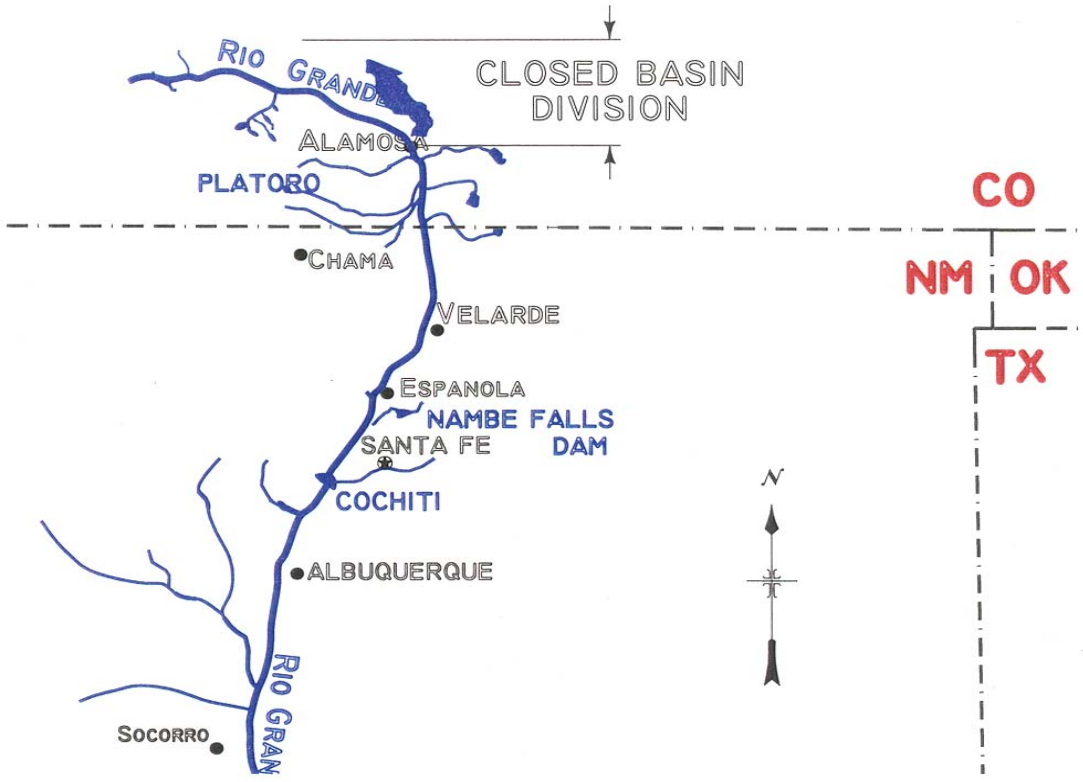

Figure 2: Area Map of San Luis Valley Project

Deliveries to the Alamosa Wildlife Refuge included the 2002 annual mitigation delivery of 2,739 af. Total deliveries to the Alamosa Wildlife Refuge of 3,113 af include 42 af of storage in the canal to lower the water surface and allow replacement of the slide gate stem at the River Outlet and 332 af of San Luis Lake water that was pumped to test the feasibility of pumping down the lake as requested by the Division of Wildlife for fishery reclamation activities. Closed Basin Division water accounting for the 2002 calendar year is summarized in Table 1.

Table 1: San Luis Valley Project - Closed Basin Division Water Accounting

(UNIT = ACRE-FEET)

SLV CBD	BLANCA WILDLIFE HABITAT AREA			PARSHALL FLUME		ALAMOSA NAT'L WILDLIFE REFUGE (ANWR)				DELIVERY TO THE RIO GRANDE			
MONTH	CH03 STA. 730+00	CH04 STA. 798+60	MONTH TOTALS	TOTAL PASSING FLUME	CREDIT-ABLE AMOUNT AT FLUME	CH01 CHICAGO TURN-OUT	CH02 MUM TURN-OUT	PUMPING PLANT	MONTH TOTALS	TOTAL AT FLUME MINUS DEL. @ ANWR	Credit. Amt. del. to RGrande & not used by ANWR	NON-CREDIT-ABLE @ LOBATOS	PROJECT TOTALS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
JAN	0	0	0	1,765	1,765	0	0	0	0	1,765	1,765	0	1,765
FEB	0	0	0	1,539	1,539	0	0	10	10	1,529	1,529	0	1,539
MAR	0	0	0	1,700	1,700	403	403	50	856	844	844	0	1,700
APR	35	52	87	1,557	1,557	3	20	10	33	1,524	1,524	0	1,644
MAY	0	0	0	1,323	1,323	1	6	2	9	1,314	1,314	0	1,323
JUN	0	0	0	1,053	1,053	0	0	0	0	1,053	1,053	0	1,053
JUL	106	113	219	954	954	301	310	0	611	343	343	0	1,173
AUG	122	114	236	1,210	1,210	322	329	0	651	559	559	0	1,446
SEP	104	137	241	1,400	1,400	352	278	0	630	770	770	0	1,641
OCT	29	42	71	909	909	34	26	0	60	849	849	0	980
NOV	0	0	0	670	670	0	0	0	0	670	670	0	670
DEC	0	0	0	640	640	83	170	0	253	387	387	0	640
ANNUAL	396	458	854	14,720	14,720	1,499	1,542	72	3,113	11,607	11,607	0	15,574

Flow meter installation at San Luis Lake culverts was completed in 2002. Due to minimal natural inflows to San Luis Lake (40 af) this installation was not as critical as in years with normal runoff. This installation will serve as an enhancement to water accounting in the San Luis Lake area.

Salvage operations continued to be modified in 2002 to reduce the amount of flow of 34 project wells in Stages 3, 4 and 5 as recommended by the Operating Committee for hydrologic impact analysis. This change in operation began in 1999. In 2002, five (5) of the thirty-four (34) wells have been shut off for impact study as recommended by the Operating Committee in the April 2002 meeting.

U.S. Geological Survey's (USGS) Pueblo Colorado Office continues to provide quality assurance/quality control of the observation well network data for Reclamation. Reclamation received an excellent rating through the 2002 quality control/quality

assurance program.

Design changes to the observation well vaults were completed in 2002 to improve the overall safety of personnel working at these sites. The work on the observation well vaults was completed as a cooperative effort between Reclamation and the Rio Grande Water Conservation District.

Reclamation began an intensive program in 2002 to identify, re-survey, and verify observation well measuring points throughout the project area. This activity will continue in 2003.

The 2001 annual report on vegetation monitoring within the project boundary summarized that much of the decrease in vegetation, although far less than the 8,460 acres predicted in the Final Environmental Impact Statement (EIS) and mitigated by the project, was attributed to factors other than project pumping.

Maintenance

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

Excessive algae growth along the canal continues to be a problem. The algae have been identified as blue-green algae called *Oscillatoria* (non-branching filamentous algae). In the summer of 2000 a treatment utilizing barley straw, which creates hydrogen peroxide as it rots, was applied to a 6-mile stretch of the canal with limited success. Barley straw treatment was continued in 2001. Barley straw treatment was not utilized in 2002 as part of an ongoing study. At present, the effectiveness of these treatments cannot be determined.

In 2001 chemical and mechanical treatments were used on the bio-fouling problem that exists in the project wells, all of which showed minimal improvement. In-house treatments along with new treatment processes continue to be a priority in dealing with the bio-fouling problems. Replacement well drilling was completed at 6 sites (with each replacement well producing about 500 gallons per minute (gpm) in 2002. Additional replacement wells are scheduled in 2003.

Problems continue with poor health conditions of the grass carp, which are used to control aquatic weed growth in the canal system. Super-saturation levels of dissolved nitrogen in the canal are a serious threat to the success of the grass carp program. Pumping water into the air is reducing dissolved nitrogen to tolerable levels and appears

to be a viable solution. To prevent the movement of the fish to the southern end of the canal, drum screen fish barriers were installed. These barriers in association with favorable water quality conditions improved the situation.

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 2002. 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, in cooperation with Reclamation's Denver TSC personnel.

The Water Quality Laboratory participated in the Spring and Fall USGS Evaluation Program for Standard Reference Water Samples. The overall laboratory rating for these audits was between good and excellent.

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 will be cooperating with Reclamation's Denver TSC Earth Sciences and Research Laboratory to determine acceptable bio-fouling mitigation strategies. In addition, the laboratory is developing the ability to quantitate "sulfate-reducing" bacteria.

The "student volunteer" program with Adams State College (ASC), Alamosa, Colorado, is currently suspended while the ASC professor administering the program is on sabbatical leave.

Rio Grande Water Conservation District

The Rio Grande Water Conservation District (RGWCD) continues to perform civil maintenance on the project. Canal berms were maintained along with resurfacing some sections of the canal berms. Other work included maintenance of lateral access roads, mowing of canal berms and rights-of-way, removal of aquatic weeds from structures, repair of fences, and assisting Reclamation personnel with equipment maintenance.

The RGWCD, with Reclamation's concurrence, has embarked on a program to reconfigure the inside slopes of the conveyance channel to reduce erosion and sloughing that has caused the canal liner to be exposed in certain areas. These slopes are being faced with "potato rock" to inhibit any further erosion and sloughing.

The RGWCD continued its involvement in the ground water monitoring program and continues maintenance of the irrigation systems for shelterbelt areas.

The RGWCD also assisted Reclamation in the salvage well rehabilitation efforts. The RGWCD in partnership with Reclamation applied for a $200,000 grant from the Colorado Water Conservation Board Construction Fund to assist Reclamation in well re-drilling activities that are being planned as a multi-year effort aimed at regaining lost project production.

SAN JUAN-CHAMA PROJECT, COLORADO-NEW MEXICO

Reclamation's Albuquerque Area Office Water Resources Division continued to maintain its Internet Web Page for Middle Rio Grande Water Operations during 2002. This web site provides the current year's weekly and monthly data for the operation and water accounting of the San Juan-Chama Project. To reach the Internet Web Page, type the following URL into a web browser:

http://albuq.uc.usbr.gov/info/wo/index.html

San Juan-Chama Diversion Dams

Work on the diversion dams included operation and maintenance of Blanco, Azotea, Oso and Little Oso diversion dams (Figure 3). Sediment and debris were removed from the diversion dams and the inlets and outlets of the tunnels. Additional repairs completed during 2002 included the repair and filling of pot holes inside the tunnels, and the installation of rubber baffles to the Azotea drop structure. Riprap was added to the channel where erosion has occurred.

Heron Dam and Reservoir Operations

Diversions into Azotea Tunnel began on March 21 and ended on June 13 during 2002. The total volume diverted through the tunnel was 6,311 af (Table 2). This amount is the lowest ever recorded since Heron Reservoir began filling in 1971. The running 10-year average was reduced from last year's value of 92,406 af to 84,331 af. Heron reservoir began the year at an elevation of 7,165.76 ft, (291,416 af) and finished the year at an elevation of 7,134.54 ft (160,759 af). The January 2003 most probable streamflow forecasts for the Blanco and Navajo River Basins are 66% and 70% respectively of the 30 year average. Based on the current forecast for below average runoff this Spring, it is unlikely that Heron Reservoir will fill for the eighth straight year. Reclamation will maximize diversions as water becomes available in 2003.

Table 3 provides the SJ-C water deliveries from Heron Reservoir to each contractor during 2002, and Table 4 presents actual Heron Reservoir water operations. Column 5 of Table 4 presents the balance between the end-of-month contents using the operational inflow and outflow data. Heron Reservoir end-of-month native Rio Grande, SJ-C, and total storage volumes are tabulated in columns 6, 7, and 8.

The SJ-C contractors' 2002 and waivered 2001 annual allocations were released for a total 2002 delivery of 127,719 af. The remaining 2002 allocation of 82 af is being held in Heron according to a waiver to the Town of Belen that grants an extension of the delivery date from December 31, 2002 to April 30, 2003. An additional 2,213 af of SJ-C

water allocated to the Cochiti Recreation Pool in 2002 remains in Heron, and is being released in a manner to provide a secondary benefit to the fishery below Abiquiu Reservoir.

Table 2: SJ-C Project - Diversions Through Azotea Tunnel

(UNIT = ACRE-FEET)

Azotea MONTH	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	10 YEAR TOTAL
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
JANUARY	0	0	0	0	349	0	0	0	0	0	349
FEBRUARY	0	0	0	0	76	0	0	0	0	0	76
MARCH	0	0	0	1,400	9,299	2,329	4,152	536	1,512	743	19,971
APRIL	7,430	21,060	10,010	16,370	13,890	11,516	12,516	15,864	19,284	4,499	132,439
MAY	46,170	48,050	36,090	30,760	43,720	41,822	32,806	20,987	51,092	865	352,362
JUNE	37,050	12,320	37,200	5,820	48,442	28,598	39,659	5,019	29,283	204	243,595
JULY	3,050	780	1,900	2,620	11,634	8,846	12,734	106	4,643	0	46,313
AUGUST	3,430	0	1,050	70	9,108	1,668	13,019	229	4,455	0	33,029
SEPTEMBER	1,670	0	0	210	3,406	153	4,015	0	313	0	9,767
OCTOBER	10	0	0	270	2,350	200	0	0	0	0	2,830
NOVEMBER	0	0	0	980	0	1,188	0	0	0	0	2,168
DECEMBER	0	0	0	30	0	381	0	0	0	0	411
ANNUAL	98,810	82,210	86,250	58,530	142,274	96,701	118,901	42,741	110,582	6,311	843,310

TEN YEAR AVERAGE = 84,331

Table 3: SJ-C Project - Water Deliveries from Heron Reservoir

(UNIT = ACRE-FEET)

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
	20,900	5,605	5,000	48,200	1,030	400	1,200	1,000	15	400	400	500	60	6,500	2,000	2,990	96,200
JANUARY	0	0	2,079	9,286	0	0	0	0	0	0	0	0	0	0	0	0	11,365
FEBRUARY	0	0	1,043	9,975	0	0	0	0	0	0	0	0	0	0	0	0	11,018
MARCH	0	0	230	12,069	0	0	0	0	0	0	0	0	0	0	0	0	12,299
APRIL	0	0	0	685	0	0	1,200	0	0	100	0	300	60	6,500	2,000	2,391	13,236
MAY	83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	599	682
JUNE	20,817	0	0	7,725	419	0	0	450	0	0	0	160	0	0	0	0	29,571
JULY	0	0	0	28,744	0	0	0	0	0	0	0	0	0	0	0	0	28,744
AUGUST	0	0	0	11,731	0	400	0	165	0	0	303	58	0	0	0	0	12,657
SEPTEMBER	0	1,553	0	0	0	0	0	0	0	66	0	0	0	0	0	0	1,619
OCTOBER	0	2,225	0	0	0	0	0	0	0	234	0	0	0	0	0	0	2,459
NOVEMBER	0	1,569	649	0	0	0	0	50	15	0	97	0	0	0	0	0	2,380
DECEMBER	0	258	1,009	0	87	0	0	335	0	0	0	0	0	0	0	0	1,689
2002 CY Total	20,900	5,605	5,010	80,215	506	400	1,200	1,000	15	400	400	518	60	6,500	2,000	2,990	127,719

Table 4: SJ-C Project - Monthly Water Storage in Heron Reservoir

(UNIT = ACRE-FEET)

Heron Storage / MONTH	INFLOW RIO GRANDE	INFLOW SAN JUAN CHAMA	OUTFLOW RIO GRANDE	OUTFLOW SAN JUAN CHAMA	SAN JUAN CHAMA LOSS	END-OF-MONTH CONTENT RIO GRANDE	END-OF-MONTH CONTENT SAN JUAN CHAMA	END-OF-MONTH CONTENT TOTAL	ELEVATION (FEET)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DEC. 2001						-135	291,551	291,416	7,165.76
JANUARY	131	0	141	11,365	202	-145	279,984	279,839	7,163.38
FEBRUARY	116	0	116	11,018	69	-145	268,897	268,752	7,161.05
MARCH	151	743	125	12,299	0	-119	257,341	257,222	7,158.57
APRIL	119	4,490	118	13,236	747	-118	247,848	247,730	7,156.48
MAY	121	865	121	682	2,109	-118	245,804	245,804	7,156.05
JUNE	113	204	113	29,571	3,149	-118	213,406	213,288	7,148.47
JULY	105	0	105	28,744	1,287	-118	183,375	183,257	7,140.82
AUGUST	97	0	97	12,657	1,306	-118	169,412	169,294	7,136.99
SEPTEMBER	366	0	409	1,619	0	-161	167,793	167,632	7,136.52
OCTOBER	94	0	94	2,459	412	-161	164,922	164,761	7,135.70
NOVEMBER	219	0	90	2,380	0	-32	162,542	162,510	7,135.05
DECEMBER	92	0	92	1,689	62	-32	160,791	160,759	7,134.54
SUB-TOTAL	1,724	6,302	1,621	127,719					
ADJUST.						-350	(A)		
ANNUAL		8,026		129,340	9,343	-382	161,141	160,759	

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SAN JUAN-CHAMA PROJECT

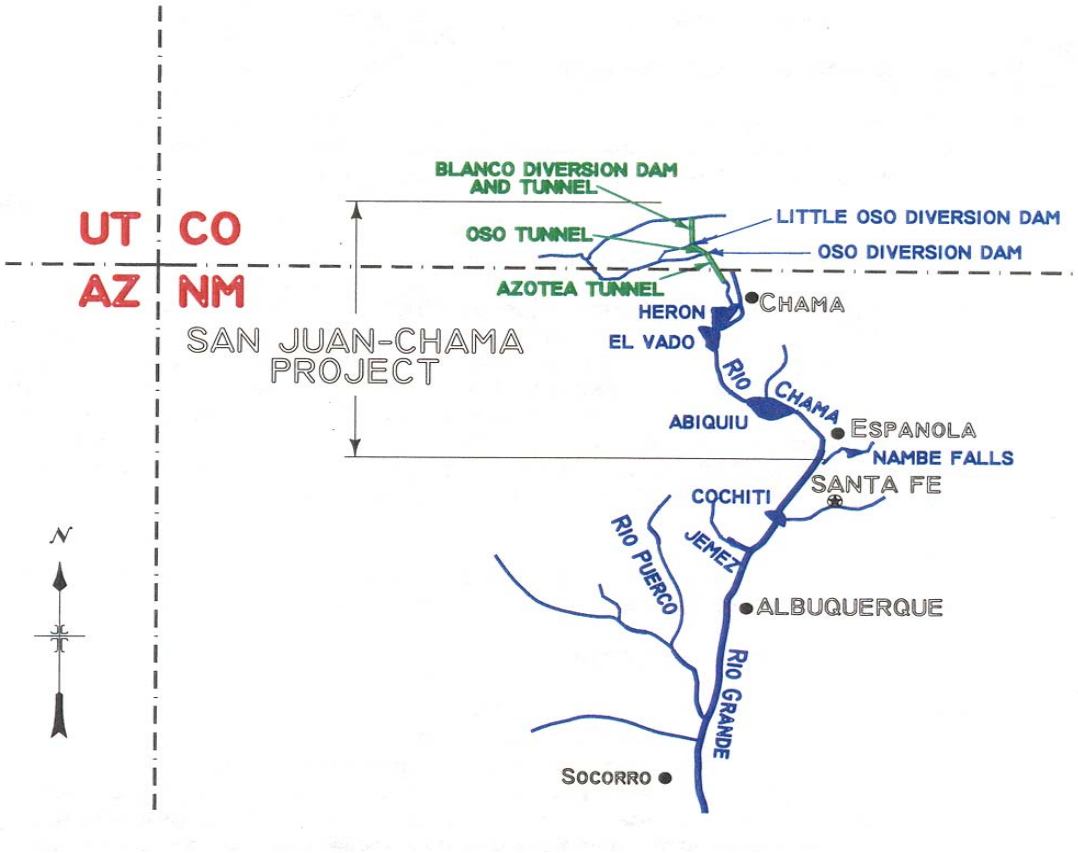


Figure 3: Area Map of the San Juan-Chama Project

Heron Dam Facility Review and Safety of Dams Programs

Work at Heron Dam included considerable non-normal and short-notice operations that were required due to extreme drought conditions and court orders related to endangered species issues. The last CFR was completed in 2001, and a PFR is scheduled for 2004. The Heron Dam Standing Operating Procedures (SOP) is scheduled for a complete revision in 2003.

During 2002 the following work was completed for Heron Dam:

- Guard rails were installed around the exposed propane tank to enhance security
- The elevator shaft was completely repainted
- The hydraulic gate controls for operation were replaced
- An Internal Vertical Movement Survey was completed
- The Annual Examination and Report was completed

Pojoaque Tributary Unit - Nambe Falls Dam and Reservoir

Nambe Falls Reservoir began 2002 with the reservoir at an elevation 6,807.83 ft providing a storage volume of 1,112 af. During the winter, releases averaged around 1 to 2 cfs to maximize conservation storage as agreed to by the Pojoaque Valley Irrigation District (PVID) and Indian water users. The reservoir did not fill in 2002.

The maximum elevation for the year was 6,819.37 ft (1,630 af) which occurred on May 2. The reservoir then began a steady decline as irrigation releases commenced. The reservoir reached the low point of the year on November 26 at an elevation of 6,794.41 ft (873 af).

A depletion of 496 af was computed at the USGS Rio Grande at Otowi Bridge near San Ildefonso (Otowi) gage. Cyclical operations of Nambe 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 6826.60 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. The depletion of 496 af was below the 1,030 af PVID Heron allocation set aside to offset depletions from the Unit. A release of 506 af of SJ-C replacement water to offset the depletions for Nambe Falls operations was needed at Heron which is the depletion of 496 at Otowi plus a transportation loss of 10 af. Two releases of 419 af and 87 af were made from Heron in June and December respectively to cover the depletion plus losses. Figure 5 provides a summary of Nambe Falls use above Otowi and the Pojoaque Unit return flow credit used to calculate the depletions during 2002. Nambe Falls Reservoir ended 2002 at elevation 6,799.10 ft (810 af). A summary of the reservoir operation is provided in Table 6.

Nambe Falls Dam Facility Review and Safety of Dams Programs

The last CFR for Nambe Falls Dam was completed in 2001. A PFR is now scheduled for 2004. During 2002 the following work was completed for Nambe Falls Dam:

- New log booms were installed
- The Annual Examination and Report was completed.

Table 5: SJ-C Project - San Juan-Chama Water at Otowi

(UNIT = ACRE-FEET)

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	11,365	0	1,695	13,060	-10,945	163	129	26	1,849
FEBRUARY	11,018	0	89	11,107	-9,932	133	100	24	966
MARCH	12,299	0	0	12,299	-7,718	177	113	22	4,313
APRIL	13,236	0	7,483	20,719	19,181	587	196	20	39,137
MAY	682	682	19,842	19,842	-924	389	13	18	18,534
JUNE	29,571	0	444	30,015	9,861	689	6	100	39,281
JULY	28,744	0	0	28,744	6,885	637	110	38	34,920
AUGUST	12,657	0	572	13,229	27,743	514	17	29	40,470
SEPTEMBER	1,619	66	0	1,553	12,816	146	31	49	14,241
OCTOBER	2,459	234	0	2,225	5,308	92	28	29	7,442
NOVEMBER	2,380	0	0	2,380	-1,536	34	52	20	778
DECEMBER	1,689	0	0	1,689	-702	27	108	32	884
ANNUAL	127,719	982	30,125	156,862	50,037	3,588	903	407	202,815

Table 6: SJ-C Project - Monthly Water Storage in Nambe Falls Reservoir

(UNIT = ACRE-FEET)

NF Monthly MONTH	INFLOW	OUTFLOW			RESER. LOSSES	TOTAL OUTFLOW + LOSSES	END OF MONTH	
		BY PASSED	STORAGE RELEASE					
			OPER.	IRRIG.			CONTENT	ELEVATION
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DEC. 2001							1,112	6,807.83
JANUARY	192	63	0	0	0	63	1,241	6,810.91
FEBRUARY	163	63	0	0	1	64	1,340	6,813.20
MARCH	184	71	0	0	7	78	1,446	6,815.54
APRIL	279	82	0	1	18	101	1,624	6,819.25
MAY	163	138	0	699	15	852	935	6,802.98
JUNE	89	75	0	39	10	124	900	6,801.88
JULY	207	95	0	30	-1	124	983	6,804.36
AUGUST	109	88	0	231	4	323	769	6,797.72
SEPTEMBER	187	156	0	49	-2	203	753	6,797.14
OCTOBER	196	168	0	6	1	175	774	6,797.87
NOVEMBER	234	164	0	117	19	300	708	6,795.56
DECEMBER	140	30	0	6	2	38	810	6,799.10
ANNUAL	2,143	1,193	0	1,178	74	2,445	810	6,799.10

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

Abiquiu Dam and Reservoir is a U.S. Corps of Engineers (Corps) facility. Public Law 97-140 authorized storage of up to 200,000 af of SJ-C water in Abiquiu Reservoir. Adjustments for sediment reduced the sum of the available SJ-C storage allocations to 183,246 af in 2002. The amount of SJ-C water in storage peaked on March 31 at 131,175 af and ended the year at 42,962 af. Table 7 provides a summary of monthly operations and water accounting for Abiquiu Reservoir.

A resolution was passed by the Rio Grande Compact Commission that allowed for the temporary storage of native flows in Abiquiu and Jemez Reservoirs for the benefit of the Rio Grande silvery minnow. This water is referred to as the Conservation Water Agreement Pool, or the Conservation Pool. Under the terms of the agreement, up to 100,000 af could be stored over a 3 year period in both Abiquiu and Jemez Reservoirs and releases up to 30,000 af per year are allowed to maintain flows in the Rio Grande as specified in the "Programmatic Biological Opinion on the Effects of Actions Associated with the U.S. Bureau of Reclamation's, U.S. Army Corps of Engineers', and Non-Federal Entities' Discretionary Actions Related to Water Management on the Middle Rio Grande, New Mexico (BO)." Losses on this water would be calculated the same as native storage.

The Conservation Pool began the year with 26,945 af. Releases began on March 14 and continued until mid-April when water leased by Reclamation from SJ-C contractors in Heron was released. Releases from the Conservation Pool continued through May at an average rate of 300 cfs. The Conservation Pool release was increased from May 11 through May 14 to provide a spawning spike for the silvery minnow. The last Conservation Pool release occurred on May 29, depleting all remaining stored Conservation Water. Because El Vado did not fill in 2002, there was no additional storage to the Conservation Pool. As a result of Article VII storage restrictions, it is unlikely that there will be any water captured and stored within the Conservation Pool in 2003. The last year that the Conservation Water Agreement remains active is 2003.

M&I Water Use - National Environmental Policy Act Compliance

Reclamation is serving as the lead federal agency for the City of Albuquerque's Drinking Water Supply Project EIS which is addressing the City of Albuquerque's plan to divert, treat, and directly use its SJ-C water for municipal and industrial purposes. During 2002, the Draft EIS was released for public review and public hearings were held in Española, Albuquerque, and Socorro. Written and verbal comments were received and will be addressed in the Final EIS. A Biological Assessment of the preferred alternative (a new inflatable diversion dam) was submitted to the United States Fish and Wildlife Service (USFWS) to initiate formal consultation regarding impacts to endangered species. The Final EIS is expected to be completed in summer 2003.

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 BLM on an EIS to address effects of the proposed Buckman Water Diversion Project. Reclamation is serving as a cooperating agency on the Buckman EIS. During 2002, public scoping meetings were held and EIS teams worked on descriptive sections of the EIS.

An environmental assessment process for a proposal to amend six existing water service contracts that would convert them to repayment contracts is on-hold pending legal and other developments. Repayment contracts have no expiration dates. 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 requested the proposed change.

Table 7: Reservoir Operation for Abiquiu Dam

(UNIT = 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. 2001	-175	13,635	612	2,094	65	123	635	27,263	103,260	131,158
JANUARY	-1,284	12,969	612	2,024	63	126	636	26,884	114,079	141,599
FEBRUARY	309	10,986	495	1,054	78	165	637	26,776	123,846	151,259
MARCH	77	12,162	4,112	4,444	259	635	638	23,000	130,929	154,567
APRIL	-234	19,250	3,331	38,431	413	1,262	646	19,851	110,486	130,983
MAY	25,881	21,256	45,826	20,332	255	1,990	684	160	109,420	110,264
JUNE	27,336	27,880	27,489	37,741	-7	1,985	737	1	97,574	98,312
JULY	14,979	29,498	14,969	36,383	-6	1,766	769	4	88,923	89,696
AUGUST	9,873	13,818	9,867	41,561	-7	1,480	780	4	59,700	60,484
SEPTEMBER	8,681	1,457	8,678	14,273	-2	446	782	5	46,438	47,225
OCTOBER	3,845	2,201	3,761	7,509	-2	269	782	86	40,861	41,729
NOVEMBER	2,156	2,354	2,238	818	-1	120	782	3	42,277	43,062
DECEMBER	1,926	1,711	1,928	1,009	0	17	782	1	42,962	43,745
ANNUAL	93,545	155,542	123,306	205,579	1,043	10,261				

RG REFERS TO RIO GRANDE WATER.
SJ-C REFERS TO TRANSMOUNTAIN WATER IN ABIQUIU.

MIDDLE RIO GRANDE PROJECT, NEW MEXICO

El Vado Dam and Reservoir Operations

The State of New Mexico began 2002 with an accrued credit per the Rio Grande Compact, which allowed for a portion of the total Rio Grande inflow into El Vado (Figure 4) to be captured during spring runoff to benefit the MRGCD. The total SJ-C water in storage at the end of the year was 6,071 af. Table 8 provides a summary of monthly operations and water accounting for El Vado Reservoir.

El Vado Reservoir did not come close to filling in 2002. The maximum content was 112,012 af, or 62% of the full capacity, which occurred on April 18.

The MRGCD began the year with 28,571 af of SJ-C water in El Vado. This was the maximum volume of SJ-C water contained within El Vado Reservoir at any time during 2002. The MRGCD began taking delivery of their 2002 Heron allocation starting June 11. MRGCD's irrigation demand required that the entire release pass directly through El Vado. The release of MRGCD's 2002 SJ-C allocation from Heron was completed on June 27.

Irrigation releases from El Vado Reservoir for both Indian and non-Indian irrigators ended on September 6. However, the Six Southern Pueblos continued to receive irrigation through direct run-of-the-river diversions through November 4, 2002.

As a result of extremely low native Rio Grande flows on the Rio Chama associated with the severe drought, flows out of El Vado were reduced to levels similar to typical winter operation flows by September 6. An agreement was made between the cities of Albuquerque and Santa Fe to allow for the storage of SJ-C water in Abiquiu Reservoir above the normal Abiquiu storage volume allocated to Santa Fe. This allowed for the release of water between Heron and Abiquiu, to keep some water flowing in the Rio Chama until the end of the year.

El Vado Dam Facility Review and Safety of Dams Programs

Considerable non-normal and short-notice operations were required at El Vado Dam due to extreme drought conditions and court orders related to endangered species issues. The last CFR was completed in 2001, and a PFR is scheduled for 2004. The El Vado Dam Standing Operating Procedures (SOP) is scheduled for a complete revision in 2003.

During 2002 the following work was completed for El Vado Dam:

- The wire ropes on the spillway radial gate were replaced
- Los Alamos County installed additional chain link fence downstream of the power plant
- Log booms were purchased. The log booms will be installed when higher reservoir elevations occur.
- The wet spot that was identified a few years ago continues to be monitored on a monthly basis, with no apparent changes
- The Annual Examination and Report was completed.

Table 8: Reservoir Operation for El Vado Dam

(UNIT = ACRE-FEET)

El Vado Res. Op.	INFLOW		OUTFLOW		LOSSES		EOM CONTENT		
MONTH	RG	SJ-C	RG	SJ-C	RG	SJ-C	RG	SJ-C	TOTAL
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DEC. 2001	1,240	21,609	0	13,793	87	14	62,819	36,302	99,121
JANUARY	2,128	11,365	10	13,061	57	8	64,880	34,598	99,478
FEBRUARY	1,541	11,018	56	11,107	0	1	66,365	34,508	100,873
MARCH	3,031	12,299	0	12,299	103	45	69,293	34,463	103,756
APRIL	10,449	13,236	0	20,718	528	422	79,214	26,559	105,773
MAY	1,364	682	26,784	19,842	566	107	53,228	7,292	60,520
JUNE	-240	29,571	23,246	30,014	255	334	29,487	6,515	36,002
JULY	-450	28,744	13,224	28,744	91	47	15,722	6,468	22,190
AUGUST	347	12,657	11,020	13,229	-41	64	5,090	5,832	10,922
SEPTEMBER	2,482	1,619	5,314	1,553	169	30	2,089	5,868	7,957
OCTOBER	1,731	2,459	1,730	2,224	84	19	2,006	6,084	8,090
NOVEMBER	3,112	2,380	795	2,380	31	17	4,292	6,067	10,359
DECEMBER	1,885	1,689	956	1,689	97	-4	5,124	6,071	11,195
ANNUAL	27,380	127,719	83,135	156,860	1,940	1,090			

RG REFERS TO RIO GRANDE WATER.
SJ-C REFERS TO TRANSMOUNTAIN WATER IN EL VADO.

Middle Rio Grande Diversion Dam Facility Review and Safety of Dams Programs

Reclamation conducted a field and aerial examination of the Rio Grande Project from the Velarde reach down to Socorro in September 2001. The report was finalized and distributed to the appropriate personnel during 2002.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

ALBUQUERQUE AREA OFFICE

MIDDLE RIO GRANDE PROJECT

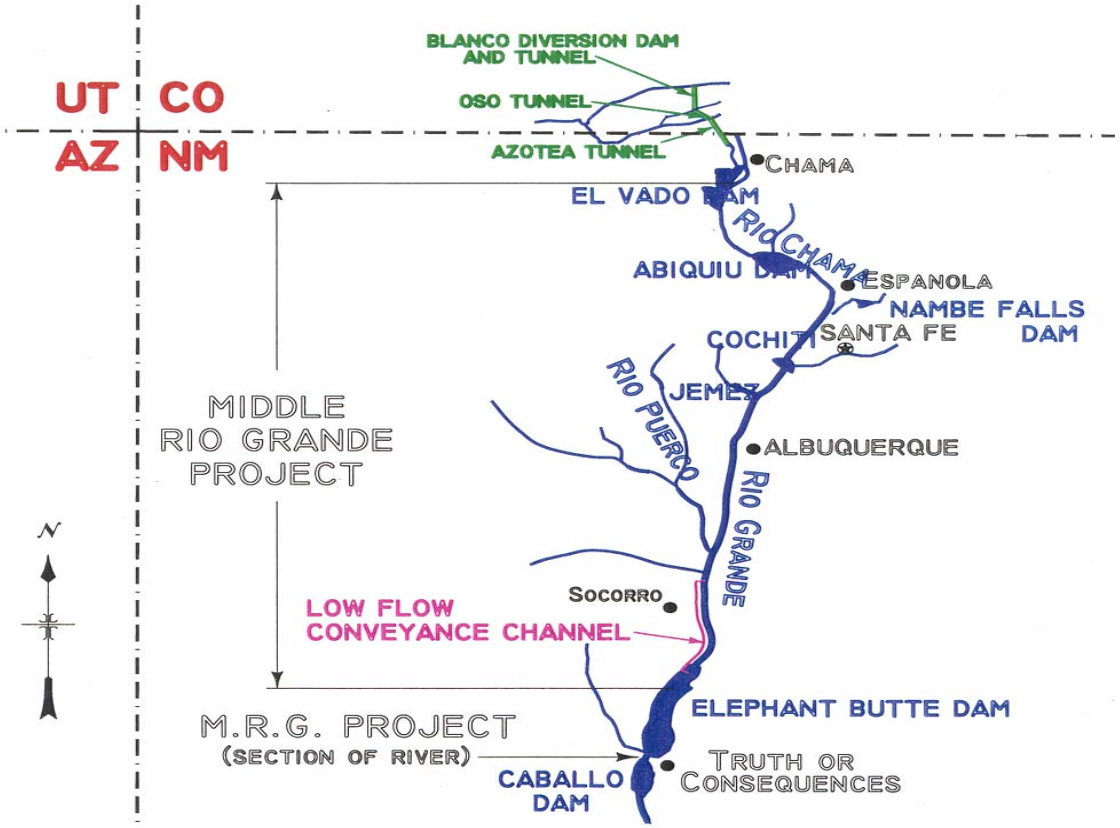


Figure 4: Area Map of the Middle Rio Grande Project

Cooperative Program with the State of New Mexico

Reclamation cooperates with the New Mexico Interstate Stream Commission (NMISC) on water salvage, drain improvement, and river maintenance activities. During 2002, State funds were used for equipment operation and maintenance, as well as various construction efforts.

In an effort to improve information sharing and coordination, regularly scheduled meetings were held with NMISC staff to review on-going projects funded by the State of New Mexico (State) through the Cooperative Program.

Reclamation performed vegetation mowing along a significant portion of Escondida Drain, east side of La Joya Drain, and the entire reach of Drain Unit 7. A portion of State funds were used towards Reclamation's 10-year interval aggradation/degradation rangeline aerial photography surveys of the river channel and floodplain. The resulting data will be key to making future predictions regarding river hydraulics and morphology and how best to plan future river maintenance projects. Such projects benefit the State in its continuing effort to meet compact deliveries.

The State provided significant cost share funds to aid in continuation of construction of the Temporary Channel into Elephant Butte Reservoir for the 7 mile reach upstream of Nogal Canyon. The funds were vital to the operation and maintenance of the amphibious excavators and support equipment. Details regarding the Temporary Channel project are provided in the following section.

As an alternative to receiving additional fund from the NMISC to support additional amphibious excavators and operators for the Temporary Channel Project, the NMISC elected to award their own contract to do the work for a 3.5 mile reach from Nogal Canyon south. A brief summary regarding that phase of work are found in the section entitled "Temporary Channel into Elephant Butte 2002".

Temporary Channel into Elephant Butte 2000

The reach of the Rio Grande above Elephant Butte Reservoir continues to undergo long-term aggradation (rise of riverbed due to sediment accumulation) as a result of sediment loads that are higher than can be transported with the mild valley slope. Additionally, the river is restricted to the eastern edge of the valley from San Acacia to Elephant Butte Reservoir. Problems that arise from this situation include loss of water delivery and flow reduction past the San Marcial Railroad Bridge.

A river channel tends to adjust its length entering a reservoir as the pool rises and falls, thus maintaining a continuous channel into the reservoir pool. In the case of the headwater area above Elephant Butte Reservoir, the clay deposits and mild valley slope prevent the river from maintaining a connection as evidenced in Figure 5. It is therefore necessary to construct a channel to maintain a connection between the reservoir pool and the Rio Grande. As the reservoir pool increases, the channel will be inundated. As the pool drops, additional work will be required to maintain a connection.

Figure 5: Photograph showing Rio Grande's inability to maintain a channel through the delta (1998)

The Temporary Channel 2000 was designed for a length of approximately 7 miles, ending at Nogal Canyon and having an average width of 250 ft and depth of 2 ft. The excavated material is being placed on either side of the constructed channel to form 3 ft high berms. The upper 0.5 miles of the channel has already been constructed. To date, the entire length of channel has been constructed to a minimum width of 50 ft. Approximately 1.5 miles of the channel is constructed to the full design width, about 4.0 miles has been constructed to a width of about 120 ft, about 0.5 miles is at a width of roughly 75 ft, and the remaining 0.5 miles is at the 50 ft width.

As a result of LFCC spillage waters, the downstream half of the project site has highly saturated clays and silts making for difficult construction conditions. A variance was sought and granted from the New Mexico Environmental Department to work in flowing water so as to ease the construction difficulties and reduce the maintenance on the equipment. Figure 6 illustrates the confluence of LFCC spillage and the Temporary Channel.

Figure 6: Upstream view of the confluence of LFCC spillage and the Temporary Channel (1/2003)

During 2002, approximately 21,200 ft (4 miles) was constructed to the 50 ft width which resulted in a constructed channel along the entire 7 mile length. Roughly 7,200 ft (1.4 mi.) was widened from a 50 ft channel to a 75 ft channel and about 16,700 ft (3.2mi.) was constructed from a 50 ft channel to a 100 ft wide channel. Approximately 250 days were worked this past year with the length of the day varying with the daylight. During the longer days, two work shifts were utilized to maximize construction time. There were four amphibious excavators on-site during the 2002 construction season. The Linkbelt 3400 was down a total of 83 work days, the Linkbelt 4300 was down about 134 works days, the Kori 2800 was down 99 days, and the Cat 322 was down 45 days. In order to reduce the amount of downtime, the equipment will be rotated out of service for routine maintenance. Figure 7 is a photograph of construction activities within the Temporary Channel.

Figure 7: Downstream view of an Amphibious Excavator working in the Temporary Channel (4/2002)

Some of the environmental features which fulfill mitigation requirements outlined in the Elephant Butte Temporary Channel 2000 Biological Assessment have been constructed. One of the environmental features is located at the 2001 breach site. The old channel was blocked to force all of the water to pass into the new alignment but the channel itself remains intact and therefore permits higher flows to pass along the old channel. Of the 6 low discharge crossings, 5 have been incorporated into the channel. These are typically located at arroyo mouths where flows currently enter the Elephant Butte Reservoir area. These areas are also currently being used as equipment access points. The two main channel island features have been located. One will be located just upstream of Nogal Canyon where saturated conditions are making construction extremely difficult. In constructing a main channel island feature, the secondary channel that would be created would act in part as a drain and the berm that would prevent flows from flowing parallel to the constructed river channel. The second main channel island is located in an area where there was an old natural channel. The Bosque Del Apache Channel Widening environmental feature is close to being finished with only some filling of the old channel remaining.

A rough estimate of open water evaporative losses was made for the existing conditions and for the Temporary Channel with environmental features using 1999, 2000, 2001 hydrographs. There is a savings in depletions of about 5,400 af per year with the construction of the Temporary Channel. As part of the dredged channel analysis in the early 1950's, the net depletion savings were estimated to be 40,700 af per year. The expectation is that the actual net depletion savings will range between the 1950's value and the savings from evaporative losses with the Temporary Channel in place.

Temporary Channel into Elephant Butte 2002

This project is an extension of the Temporary Channel 2000 project, which ends at Nogal Canyon. The Temporary Channel 2002 project consists of construction of a channel from Nogal Canyon through the Narrows to convey water through the currently dry portion of Elephant Butte Reservoir. This portion of the channel will be constructed by the contractor hired by NMISC, Wilco Marsh Buggies. The current schedule anticipates construction of a continuous channel from Nogal Canyon to the upstream end of the Narrows in spring 2003, except in an area where water is currently ponded. The existing channel through the Narrows will likely be adequate to convey water to the reservoir pool with minimal additional maintenance. Sediment deposition during spring runoff in 2003 and future years may clog or obliterate portions of the channel, requiring subsequent maintenance to maintain adequate channel functionality.

River Maintenance

River Maintenance Priority Sites

The Middle Rio Grande River Maintenance Program currently has efforts to address river problems related to 26 sites where levee failure due to bank erosion or reduced channel capacity could cause shallow overland flooding, reduction of water deliveries, and destruction of canals and drains. Work is being performed at the highest 8 priority sites where there is a low level public health and safety risk. Elephant Butte Reservoir is at the lowest level in 20 years, resulting in a need to continue construction of a channel through the delta to effectively deliver water for about 178,000 acres of irrigated land, approximately 50% of the water supply for the City of El Paso, and for generating electric power for the communities and industry in the area.

Bernalillo and Sandia Priority Sites

There are two river maintenance priority sites located approximately 0.5 and 1.5 miles downstream of the U.S. Hwy. 550 Bridge in Bernalillo. There exists a low level threat to public safety and health at both of these sites due to the proximity of the river channel to the east levee system. The active river channel in this reach is incising, yet is higher than the lands outside of the levee. At both sites, the main channel is actively eroding toward the levee and is currently less than 50-70 ft away.

At the Bernalillo Priority Site (0.5 miles downstream of US Hwy 550), Reclamation has completed providing pre-emergency short-term bankline erosion protection for a length of approximately 350 ft involving approximately 800 cubic yards (cy) of riprap material.

At the Sandia Priority Site (1.5 miles downstream of US Hwy 550), Reclamation, in cooperation with Sandia Pueblo, is in the process of providing pre-emergency short-term bank erosion protection for a length of approximately 1,000 ft of bankline involving approximately 1,200 cy of riprap material.

Actions identified at these sites are short-term pre-emergency measures to protect public safety and health. Reclamation is also planning a long-term, reach wide, maintenance solution for this location. Currently, geomorphic and sediment studies are being conducted together with data collection activities in preparation for evaluation of different alternatives.

San Acacia to Escondida Priority Site Reach

Reclamation is currently developing plans to address river maintenance needs at three locations in the 11.0-mile reach between San Acacia Diversion Dam and the Escondida Bridge located north of the community of Socorro, New Mexico. Reclamation is in the process of developing a 90 percent design at these locations to begin environmental compliance of a possible project. At the three locations, channel incision, lateral channel migration, and bank erosion threaten the integrity of the levee system. Erosion of the levee would result in significant loss of water deliveries to Elephant Butte Reservoir. Reclamation is considering the use of gradient restoration facilities, channel re-alignment, and bio-engineering features to protect theses sites.

Low Flow Conveyance Channel Experimental Operations

Reclamation conducts experimental operations on the LFCC in a 12-mile reach from San Acacia to Escondida. The operations are part of a study that Reclamation is conducting to evaluate the LFCC for future use. The data gathered from this study will help Reclamation evaluate the LFCC in the San Marcial and Elephant Butte Reaches, which have filled with sediment because of past full reservoir conditions. A suitable outfall into Elephant Butte Reservoir has not existed since 1985. The major objective of the study is to develop prototype channel design for varying energy slopes and channel widths, so that high sediment loads can be transported effectively.

Reclamation's environmental staff completed and submitted a Biological Assessment for continued operational studies on the LFCC through 2006. The USFWS is currently reviewing the Biological Assessment and will issue a Biological Opinion at an

unspecified date in the future. Operations during spring 2003 are dependent on water availability during spring runoff.

Santa Ana

A large scale river maintenance project at Santa Ana Pueblo is mostly complete. The major features, river realignment and construction of a gradient restoration facility (GRF), are complete. Remaining activities consist of management of sediment excavated and stockpiled during earlier phases of the project, floodplain grading, and native vegetation planting. The project design requires average or higher spring runoff flows to develop features to their final configurations, so the duration of on-going activities is dependent on hydrologic conditions.

Truth or Consequences River Maintenance Priority Site

To maintain the authorized 5,000 cfs capacity in the reach of the Rio Grande between Elephant Butte Dam and Caballo Reservoir, Reclamation annually excavates sediment from the river channel. 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 on 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. Because of the interaction between the river and the hot spring aquifer, the increased stage within the river floodway increases the flow of water at hot spring sites.

Activities in late 2002 through early 2003 include the usual sediment excavation at arroyo mouths, temporary dike installation, and sediment excavation in the Williamsburg Bend area.

Rio Grande River Restoration Projects

Los Lunas Habitat Restoration Project

The Los Lunas Habitat Restoration Project is a joint project between the Corps, Reclamation, and MRGCD. The Project began as a result of the need to perform habitat restoration in the Belen reach of the Rio Grande. This directive was outlined in the Biological Opinion (BO) issued by USFWS on June 29, 2001. The Los Lunas Habitat Restoration Project is the BO project for the Belen Reach of the Rio Grande.

The project area was burned in a fire during the spring of 2000. Nearly all of the vegetation in the area was destroyed and there were very few surviving pockets of vegetation. Due to the uncertainty in the value of the surviving vegetation, the site was selected as a good location for habitat restoration. Habitat restoration at the Los Lunas project site is intended to improve habitat for the Rio Grande silvery minnow and the Southwestern willow flycatcher. The restoration project includes lowering the floodplain and widening the active channel so that there is inundation at nearly all flow discharges. The excavated floodplain will be entirely inundated at flows higher than 2,500 cfs, promoting the regeneration of vegetation in the restoration area. A wide active river channel with a shallow, low velocity overbank region will benefit the endangered Rio Grande silvery minnow.

Several activities took place in order to accomplish the goals of the Los Lunas Habitat Restoration Project. Jetty jack removal was completed in late spring of 2002 and vegetation clearing began shortly thereafter. The floodplain was lowered, the levee was reinforced using material from the excavated floodplain, a berm with root wads was constructed, and two side channels were constructed. In addition, a number of variable width microhabitat inlets designed to create low velocity areas in order to retard downstream transport of Rio Grande silvery minnow eggs and larval fish during runoff flows were constructed. Approximately 70,000 cy of material were excavated from the floodplain and used to construct the berm with root wads and to reinforce the existing levee. Dead cottonwood trees were mulched and this resulted in approximately 15,000 cy of wood chips that will be removed from the site in 2003.

After construction completion, native vegetation including willow and cottonwood trees will be planted in the disturbed areas. Monitoring will take place to evaluate the success of the revegetation. Individual habitat features will be monitored to evaluate hydrographic changes caused as a result of the habitat restoration construction and endangered species re-colonization will also be analyzed.

Rio Grande and Low Flow Conveyance Channel Modifications and EIS

In September 2000, Reclamation released a Draft EIS on proposed realignment of the Rio Grande and the LFCC below San Marcial. 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.

On May 3, 2001, Reclamation submitted a Biological Assessment (BA) to USFWS requesting formal consultation on the proposed project pursuant to Section 7 of the Endangered Species Act. Consultation with USFWS on potential effects of the proposed project on the southwestern willow flycatcher and the Rio Grande silvery minnow is continuing.

As reported in Reclamation's June 8, 2001 letter to the Engineer Advisers, Reclamation has elected to consult on the "bottom up" realignment alternative described in the Draft EIS. This is the more flexible of the two proposed realignment alternatives and can better encompass the range of possible outcomes from the Upper Rio Grande Basin Water Operations Review, Section 7 consultations, ESA collaborative program decisions, and ongoing court proceedings.

The bottom up alternative allows construction of new segments of the LFCC below San Marcial to be phased by first building channel segments to carry drainage flows of up to 500 cfs. Provisions will be made to enable later enlargement of the channel, if necessary, to accommodate water diverted at San Acacia. Reclamation believes that, at present, satisfactory completion of Section 7 consultation would be far more difficult to complete on a 2,000 cfs capacity channel than on a smaller channel because of the greater effects on endangered species and the uncertainties regarding future conveyance system operations. Fully completing the channel realignment will take a number of years. If a decision to resume diversions is reached within the next few years and all permitting and compliance requirements are completed, work on a larger channel could begin in the early stages of the realignment transition. On the other hand, if diversions do not resume in the reasonably near future, Reclamation could not view building a 2,000 cfs capacity channel to carry 500 cfs of water to be prudent. Reclamation anticipates significant reductions in future budgets. Phasing of LFCC construction will allow spreading of construction costs over a longer period of time.

One particular concern with the realignment project relates to the numerous southwestern willow flycatcher territories at the upper end of the reservoir. Surveys in 2002 identified 51 territories in this area. These habitats are dependent on the outflow from the LFCC which runs along the west side of the floodplain. Reclamation has proposed to avoid impacts to this area by ending the new LFCC above the flycatcher habitat area and continuing it further downstream, leaving the hydrology in the habitat area undisturbed. The channel could be connected in the future as the vegetation ages and becomes less suitable for the birds.

Reclamation and the Corps have had some discussions relating to the proposed raising of the San Marcial railway bridge. Coordinating the channel realignment and bridge raising would offer some advantages. Increased flexibility for routing future river alignments would result from locating the bridge to cross a new river channel more centrally in the floodplain, rather than cross the existing channel on the extreme eastern

edge as currently proposed. A new bridge could be built in the dry at reduced cost then have the river diverted to a new channel under it once complete. Lack of funding and scheduling problems may not allow this approach to work.

Reclamation's current work includes issuing a delivery order under Reclamation's Survey Contract to obtain more ground survey information in the area. However before ground surveys can be taken, environmental approval must be obtained to clear and brush the land for the surveys. A preliminary alignment for the Rio Grande and the LFCC is currently being determined on paper to obtain the necessary environmental approval to perform the ground surveys.

A Final EIS will be released following completion of the current ESA consultation. Reclamation's near-term ability to fund construction under the Middle Rio Grande Project presently appears questionable.

Endangered Species

Rio Grande Silvery Minnow

The USFWS listed the Rio Grande silvery minnow (silvery minnow) as endangered in 1994 under the Endangered Species Act (ESA). The silvery minnow was formerly one of the most widespread and abundant species in the Rio Grande basin of New Mexico, Texas, and Mexico. 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 Bernalillo to the headwaters of Elephant Butte Reservoir.

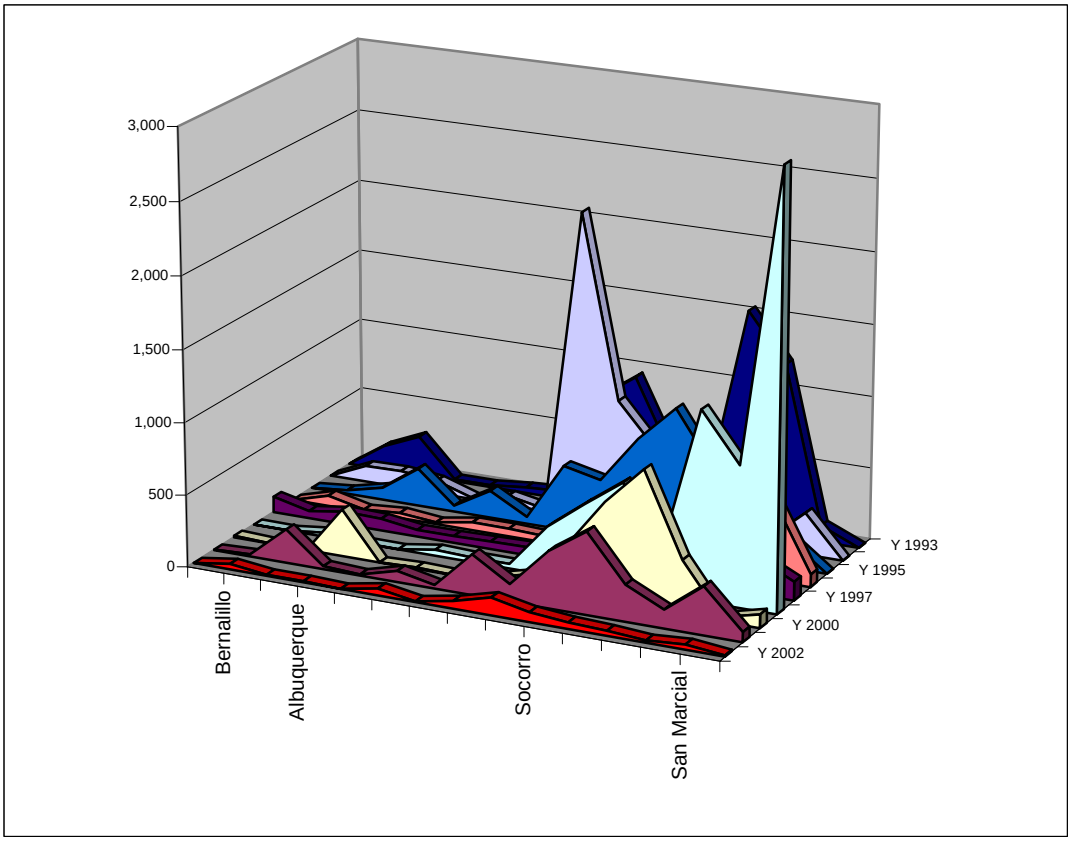
During 2002, extreme drought conditions prevailed in the Rio Grande Basin of New Mexico, resulting in the worst spring runoff on record. To continue to meet the June 29, 2001 BO standards of flow, Reclamation leased approximately 48,400 af of supplemental water from willing SJ-C contractors and managed nearly 26,000 af of water stored by the State of New Mexico under the Conservation Water Agreement. Reclamation did not anticipate being able to meet the June 29, 2001 BO standards of flow by late September 2002. It was anticipated that MRGCD would run out of irrigation water in early September 2002. Likewise, it was anticipated that Reclamation's supplemental water supply would be depleted by late September. However, late season precipitation allowed a more parsimonious use of supplemental water to remain in compliance with the June 29, 2001 BO.

Channel drying occurred in the Rio Grande from Jarales to Bernardo, Louis Lopez (downstream of Socorro) to Tiffany (including the reach of river adjacent to Bosque del Apache Refuge), and at numerous shorter "spot" segments south of San Marcial within

Elephant Butte Lake State Park. The documented incidental take of silvery minnow was limited to 248 adults during 2002. Intensive monitoring and salvage efforts led to the successful rescue of silvery minnow from critical reaches. Salvage efforts have transferred over 3,500 silvery minnows to upstream areas and several hundred thousand eggs to rearing facilities.

Spawning was stimulated by a surge release of conservation water. Results of the 2002 population monitoring efforts indicate poor recruitment of silvery minnow following spawning. The low number of age-0 silvery minnows (n = 14) in July through September indicates that the summer low flow conditions and river drying in the Middle Rio Grande further reduced survival. Figure 8 displays silvery minnow abundance within various reaches of the Rio Grande based on surveys conducted from 1993 through 2002. Additional silvery minnow monitoring information is available on the Reclamation web page: http://www.uc.usbr.gov/progact/rg/rgm/index.html.

Figure 8: Rio Grande Silvery Minnow Abundance



Southwestern Willow Flycatcher

The southwestern willow flycatcher (flycatcher) was listed as endangered by USFWS effective March 29, 1995. Critical habitat was designated effective August 21, 1997 in some areas of New Mexico and other states throughout the species range. The Rio Grande was not designated as critical habitat for the flycatcher. However, Section 7 of the ESA requires all Federal agencies to consult with USFWS 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 USFWS pursuant to Section 7 over numerous actions, mainly operations and maintenance activities along the Rio Grande, since 1995.

Table 9: Estimate of Southwestern Willow Flycatcher Territories

Middle Rio Grande Project, 2000 - 2002 Breeding Seasons (Reclamation 2002)

River Reach	Number of Territories 2000	Number of Territories 2001	Number of Territories 2002
Velarde *(Ahlers et al 2000-2002)*	2	1	0
San Juan Pueblo *(Williams 2000)*	16	not surveyed	not surveyed
Isleta Pueblo *(Johnson and Smith, 2000)*	14	not surveyed	not surveyed
Sevilleta NWR *(Ahlers et al 2001,2002)*	8	11	13
Bosque del Apache NWR *(Taylor 2000-2002)*	1	2	4
San Marcial *(Ahlers et al 2001,2002)*	23	25	63
S. boundary of Bosque del Apache to Butte Delta*	4	3	12
Elephant Butte Reservoir Delta	19	22	51
Total	63	39	80

* *private lands were surveyed on a limited bases in 2002 for a specific project*

Six core breeding sites for willow flycatchers have been established and documented during various survey efforts in the Middle Rio Grande between 1993 and 2002 and include the following: Velarde, San Juan Pueblo, Isleta Pueblo, Sevilleta National Wildlife Refuge (NWR) and La Joya State Wildlife Management Area (WMA), Bosque del Apache NWR, and San Marcial. The following table presents the results of surveys for flycatchers at these sites from 2000 through 2002.

Reclamation continues to conduct flycatcher surveys and nest monitoring along portions of the Rio Grande. Surveys for flycatcher breeding territories and nest monitoring have been conducted from 1994 to 2002 and the results are presented in Table 9. Between 2001 and 2002, the number of flycatcher territories in the San Marcial reach has expanded from 25 to 63. A majority of these territories are located within the newly developed riparian vegetation within the conservation pool of Elephant Butte Reservoir. This area is the largest breeding population of flycatchers on the middle Rio Grande to date. Flycatcher surveys and nest monitoring in selected areas of the Middle Rio Grande will continue in 2003.

Middle Rio Grande Endangered Species Act Collaborative Program

The Middle Rio Grande Endangered Species Act Collaborative Program (Collaborative Program) is a cooperative effort by Reclamation and other Federal and non-Federal partners to preserve, protect, and improve the status of endangered species while also protecting existing water uses and ensuring compliance with all applicable laws. On April 23, 2002, the ESA Work Group signed an Interim Memorandum of Understanding (MOU) to formalize the Collaborative Program, develop a long-term Cooperative Agreement, Program document, cost sharing agreement, draft authorizing legislation, secure funding, comply with environmental regulations, and fulfill federal trust responsibilities. Signatories of the MOU include Reclamation, USFWS, the Corps, U.S. Forest Service, State of New Mexico, MRGCD, Alliance for Rio Grande Heritage, City of Albuquerque, National Association of Industrial and Office Properties, University of New Mexico, and New Mexico State University. An Interim Steering Committee was also established to guide activities described in the MOU such as defining the proposed actions for National Environmental Policy Act (NEPA) review, including but not limited to near-term and long-term water acquisition elements and habitat restoration elements, and related scheduling and reporting. To accomplish these activities, the Interim Steering Committee established subcommittees, as needed.

Congress identified $11.2 million in additional funding for Reclamation in fiscal year 02 to support the efforts of the Collaborative Program. A detailed spending plan was developed and submitted to Congress describing activities to be funded. Program activities included water acquisition and management, habitat restoration, research and monitoring, and Rio Grande silvery minnow relocation and propagation supportive of ESA Section 7 consultation requirements and the listed species recovery plans.

Reclamation is committed to continuing these efforts and actively collaborating with other federal and non-federal stakeholders on the middle Rio Grande to develop and implement solutions that will provide for the continued delivery of water for agriculture,

municipal and industrial uses, the river and the bosque, and the protection of threatened and endangered species.

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

On June 6, 2001, Reclamation and the Corps submitted to USFWS a BA for proposed federal discretionary actions related to water management operations and river management activities on the Middle Rio Grande and non-federal depletions and related actions. The USFWS issued a final biological opinion (BO) on June 29, 2001. The BO found that the proposed actions were likely to jeopardize the continued existence of listed species and contained a reasonable and prudent alternative and reasonable and prudent measures which the federal agencies continue to implement.

Although the consultation was to be effective through December 31, 2003, Reclamation in June 2002 predicted it would not be possible to meet the 2001 BO flow requirements for the remainder of the water year because of extreme drought. On August 2, 2002, Reclamation submitted a request for re-initiation of Section 7 consultation. This request was further amended by an August 30, 2002 letter. On September 12, 2002, USFWS issued a new BO addressing proposed water management through December 31, 2002. The new BO found that Reclamation's proposed action was likely to jeopardize the continued existence of the silvery minnow and that there was no reasonable and prudent alternative to the proposed action. The District Court in *Minnow v. Keys* found the September 2002 BO to be arbitrary and capricious.

A prerequisite for the September 2002 BO to go into effect was Reclamation's notification to the USFWS that it would not be able to continue to comply with the June 2001 BO. This never occurred because late season rains enabled Reclamation to use its remaining supplemental water consistent with the June 2001 BO and incidental take statement it contained. Therefore, the June 2001 BO remained in effect throughout the 2002 water year, and the September 2002 BO was never adopted.

During the *Minnow v. Keys* litigation, the District Court ordered Reclamation to re-initiate ESA consultation for 2003 water operations. This consultation was initiated by Reclamation in October 2002 and is scheduled to be completed prior to March 1, 2003, the onset of irrigation season. The flow requirements of the June 2001 BO will remain in place until the 2003 consultation is completed.

Rio Grande Silvery Minnow v. Keys Litigation

In 1999, environmental groups represented by the Land and Water Fund of the Rockies ("Plaintiffs") sued Reclamation and the Corps for alleged violations of the ESA and the National Environmental Policy Act. The MRGCD, State of New Mexico, City of Albuquerque, and Rio Chama Acequia Association subsequently intervened. As this litigation has progressed, Reclamation's authorities have been interpreted and defined by the federal District Court of New Mexico in two rulings. Among other things, the District Court held that Reclamation has authority to restrict diversions by the MRGCD through the Middle Rio Grande Project and to use water from the SJ-C and/or Middle Rio Grande projects directly for endangered species purposes, even where shortages to project contractors would result.

Aspects of the District Court's ruling have been appealed by the United States and other parties and oral arguments were heard by the Tenth Circuit Court on January 14, 2003. During this process, the Department of Justice agreed that the Federal agencies would consult on two "tracks" for 2003. The first would assume that the Tenth Circuit agreed with appellants that Reclamation's discretion is limited, and the second track would assume that the Tenth Circuit Court upholds the District Court's ruling regarding Reclamation's discretion over Project water.

In the MRGCD's cross claim against the United States in the *Minnow v. Keys* lawsuit, MRGCD seeks quiet title to all Middle Rio Grande Project properties (which MRGCD claims to have never conveyed to the United States), a reconveyance of state water permit 1690 (regarding storage in El Vado Reservoir), and a declaration that the 1951 repayment contract is no longer in effect. The United States' position in this cross claim is that the MRGCD conveyed all Middle Rio Grande Project properties to the United States and that those 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. The District Court is expected to decide this case by the summer of 2003.

Temporary Pumping Program – San Acacia to Fort Craig Reach

During the irrigation season, flows in the Rio Grande between the San Acacia Diversion Dam and the headwaters of the Elephant Butte Reservoir can drop to a level that may potentially result in adverse impacts to the Rio Grande silvery minnow. In an effort to help maintain a minimum flow in the Rio Grande, Reclamation has installed portable pumps with flow measurement devices at strategic locations along the river to move water from the LFCC into the Rio Grande floodway. The Temporary Pumping Program fulfills Reasonable and Prudent Alternative H of the Programmatic Biological Opinion related to Water Management on the Middle Rio Grande, which states that Reclamation shall pump water from the LFCC to the river when intermittency is likely.

During the 2002 irrigation season, the portable pumps were effectively used to augment

river flows, allowing Reclamation to maximize use of conservation water releases from Abiquiu, Heron and El Vado. An additional pump site was constructed near the middle section of the Bosque Del Apache National Wildlife Refuge in August 2002. The total available pumping capacity for all pump locations is now approximately 200 cfs, although the maximum total combined rate is limited to 150 cfs by the Emergency Authorization granted by the New Mexico State Engineer.

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 9). 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 and EPCWID operate and maintain Reclamation's diversion dams on the Rio Grande, including Percha Diversion Dam, Leasburg Diversion Dam, and Mesilla Diversion Dam in New Mexico, and the Riverside Diversion Cofferdam in Texas. EBID operates and maintains the three diversion dams in New Mexico under a contract with Reclamation. EPCWID operates and maintains the diversion into the Riverside Canal in Texas under a contract with Reclamation.

Water Supply Conditions

Inflow into Elephant Butte Reservoir during 2002, measured at the Rio Grande Floodway (FW) plus the LFCC at San Marcial (FW+LFCC), was 240,684 af, the seventh lowest on record (107 years of record dating back to 1896). The 91-year average annual inflow, measured at San Marcial (FW+LFCC) is 873,423 af. The actual 2002 March through July runoff, measured at San Marcial (FW+LFCC), was 61,095 af, which was 10.7 percent of the 30-year average of 573,000 af. Of the period 1996-2002, the spring runoffs (March-July) at the San Marcial gauging station have consistently been below normal, with the exception of 1997, which was 120 percent of normal. The 1996, 2000, and 2002 spring runoffs have been near-record low volumes, with 2002 the spring runoff volume being the eighth lowest on record at the San Marcial gauging stations. During 2002, 825,331 af of water was released from Elephant Butte Reservoir. There was a release of 801,147 af to meet the irrigation requirements of Project water users from Caballo Reservoir.

The January through June National Weather Service and Natural Resources Conservation Service coordinated forecasts received for the 2002 March through July runoff season are presented in Table 10.

Combined storage for Elephant Butte and Caballo Reservoirs was 387,545 af on December 31, 2002. This combined storage was 16.5 percent of the total capacity of both reservoirs, and 17.4 percent 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

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

ALBUQUERQUE AREA OFFICE

RIO GRANDE PROJECT

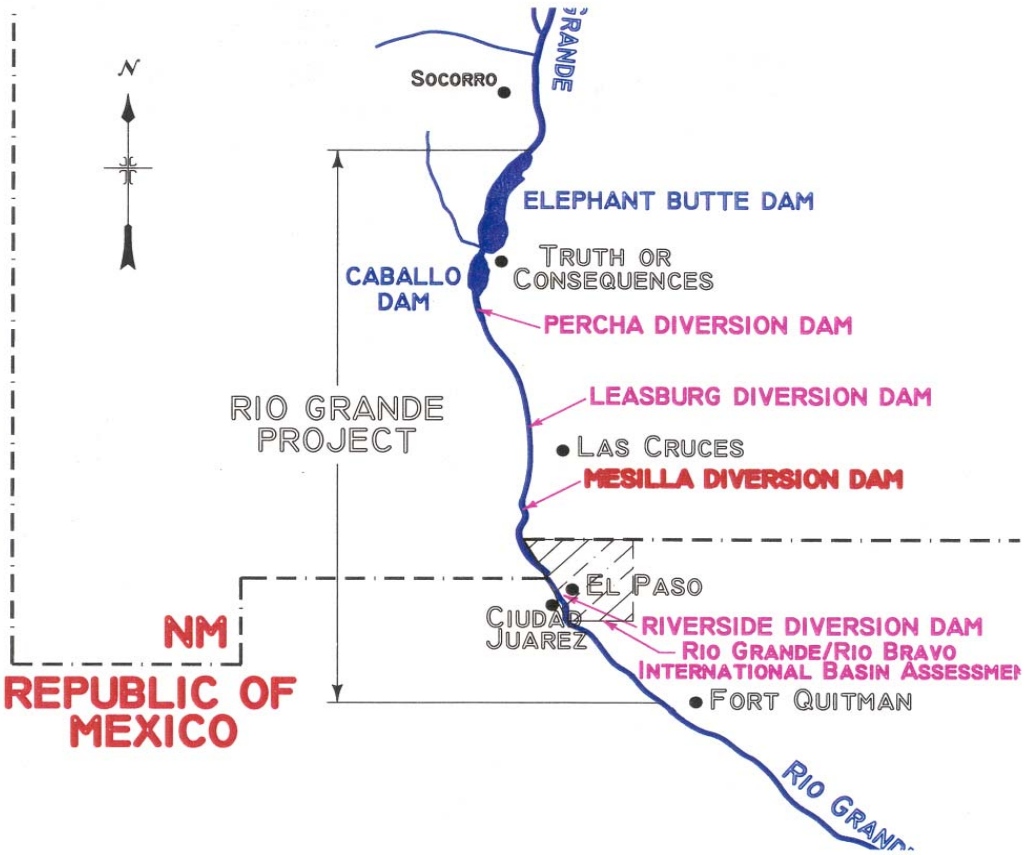


Figure 9: Area Map of the Rio Grande Project

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).

In July 2002, the usable water in Project storage (Elephant Butte and Caballo Reservoirs together) was below 400,000 af for the first time since 1979. 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.

Table 10: Summary of 2002 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	425,000	56	270,000	47
Feb 1	350,000	46	190,000	33
Mar 1	258,000	34	100,000	18
Apr 1	170,000	23	10,000	2
Apr 15	105,000	14	10,000	2
May 1	100,000	13	10,000	2
Actual Runoff	307,695	41	61,095	11

A full allotment was declared by Reclamation in April 2002 for the 2002 irrigation season. However, the initial allotment to the Rio Grande Project water users (declared in December 2001) started at a less than full supply (79.21 percent of a full supply). This was the first year since 1979 that the Rio Grande Project began the allocation process with a less than full supply. The Rio Grande Project has enjoyed a full supply for the last 24 years.

For the 2003 irrigation season, a less than full allotment (only 8.03 percent of a full supply) was declared in December 2002. This was an initial allotment, and the allotment was revised in January 2003, but was still less than a full allotment (only 10.4 percent of a full supply) based on inflow to the Rio Grande Project reservoirs during December 2002. Due to the large amount of Rio Grande Compact credit waters existing in Elephant Butte Reservoir, a majority of the water in Project storage (Elephant Butte and Caballo Reservoirs together) is not available for allocation at the beginning of the 2003 irrigation season. Therefore, based on the January 1 NRCS/NWS spring runoff forecast at the San Marcial gauging stations, Reclamation projects that the Rio Grande Project will not have a full supply for irrigation during 2003.

The February 2003 coordinated forecast from the National Weather Service and the Natural Resource Conservation Service for the 2003 March through July runoff season is presented in Table 11.

Table 11: 2003 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	533,000	70	370,000	65
Feb 1	415,000	55	260,000	45

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. Therefore, in 2002, 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 2002. 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 2002. The International Boundary and Water Commission (IBWC) continued to own, operate, and maintain the American Diversion Dam and the American Canal during 2002 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 head gates 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, through the Hudspeth Feeder Canal, Tornillo Canal at Alamo Alto, and Tornillo Drain were 144,559 af during 2002. Under the Warren Act contracts, HCCRD was charged for drainage water from the Project between March 1 and September 30 which amounted to 106,350 af.

Water flows measured by IBWC on the Rio Grande at Fort Quitman Station, downstream of the Project and HCCRD boundaries, amounted to 166,213 af during 2002.

Elephant Butte Reservoir and Powerplant

Elephant Butte Reservoir reached a maximum storage of 916,681 af (elevation 4,365.90 ft) on January 27, 2002, and February 12-14, 2002. A minimum storage of 280,622 af (elevation 4,320.08 ft) was reached on October 10, 2002. The last time Elephant Butte Reservoir was at this low storage level was February 1979. Storage levels in Elephant Butte Reservoir did not enter into the 50,000 af prudent flood control space in 2002.

Net power generation for 2002 was 82,540,860 kilowatt-hours which was 108.2 percent of the 63-year average (1940 through 2002) of 76,276,513 kilowatt-hours.

The balance valves were utilized to meet downstream irrigation demand and manage Caballo Reservoir storage level from May 15 – September 5, 2002. 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. A new hydraulic turbine is presently being installed to replace the No. 3 turbine and is anticipated to be ready for operation late this spring 2003. The power plant will have only two turbines available for operation in 2003. The last remaining turbine will be replaced over the next two years.

Elephant Butte Dam Facility Review and Safety of Dams Programs

A PFR was completed in April of 2002 by the Albuquerque Area Office and the Elephant Butte Field Division. The 2002 PFR resulted in the following number and category of recommendations: one Category 1 (completed in January 2003), one Category 2, and seven Category 3 recommendations. There were no new Safety of Dams recommendations. The next Elephant Butte CFR is scheduled to occur in 2005.

The spillway bridge inspection was not completed this year due to the increase security implemented following the attack on the Twin Towers on September 11, 2001. The access road crossing Elephant Butte is now closed to the public until further notice.

The risk assessment completed in 2000-2001 concluded that foundation pressures may not be in compliance with Reclamation guidelines. The need for uplift pressure monitoring wells will be reviewed during the 2005 CFR.

During 2002 the following additional work was completed for Elephant Butte Dam:

- Encroachments occurring between Elephant Butte Reservoir and Caballo Dam are still a concern. Personnel from the Albuquerque Area Office and the Elephant Butte Field Office are working on solving boundary lines. Most of the encroachments appear to be fencing issues.
- The power plant was still operating at reduced plant discharges due to continued work on the turbine runners. This resulted in more frequent use of the balance valves to meet downstream requirements.
- Trilateration Surveys were completed in June of 2002
- The Annual Examination and Report was completed

Caballo Dam and Reservoir

Caballo Reservoir reached a maximum storage of 90,762 af (4,154.44 ft) on March 12, 2002. A minimum storage of 24,698 af (4,138.12 ft) was reached on September 26, 2002.

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, 2002 was to maintain storage levels such that they would not exceed 100,000 af in February and not be less than 29,000 af by the end of September. Having higher storage levels earlier in the irrigation season allowed Reclamation to:

1. Reduce evaporative losses between Elephant Butte and Caballo Reservoirs
2. Provide sufficient operational hydraulic head at Caballo Reservoir for irrigation

demand releases
3. Serve as a reserve pool in case releases were interrupted from Elephant Butte Dam and minimize changes to release rates from Elephant Butte Dam; and,
4. 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, 2002 through September 30, 2003 has not been finalized yet. Due to current drought conditions and uncertainty of the 2003 spring runoff volume into Elephant Butte Reservoir, Reclamation will finalize its operating plan in the spring of 2003. The plan will reflect accommodations for the Elephant Butte turbine runner replacement program, minimization of evaporation differences between Elephant Butte and Caballo Reservoirs, and maintenance of some reserve water in Caballo Reservoir for emergency purposes.

On March 23, 2000, at the Rio Grande Compact Commissioners' annual meeting in El Paso, TX, Reclamation officially announced the temporary restriction on the Caballo Reservoir pool level due to safety concerns of operating the spillway gates under static and dynamic loading. Under this restriction, Reclamation was not allowed to exceed the elevation of 4161.00 ft (the spillway crest) for normal conservation storage operation. Reclamation still allowed a functional flood control pool (100,000 af) from elevation 4,161.00 ft to 4,173.17 ft.

At the February 28, 2001 Rio Grande Compact Commission Engineer Advisors annual meeting in Santa Fe, NM, the Engineer Advisors recommended the temporary loss of 93,244 af of Project storage in Caballo Reservoir for Rio Grande Compact accounting purposes due to the safety of dams restriction. At the March 22, 2001 Rio Grande Compact Commissioners annual meeting in Alamosa, CO, the Commissioners approved the temporary loss of Project storage due to the reservoir operating restriction.

With the completion of the rehabilitation of the Caballo Dam spillway gates in early 2002, Reclamation officially removed the temporary restriction on Caballo Reservoir on May 15, 2002. The temporary loss of 93,244 af of Project storage for Rio Grande Compact purposes has now been fully restored as follows:

<u>ELEPHANT BUTTE RESERVOIR</u>
Top of Conservation Pool (Winter: Oct. 1 – Mar. 31) 1,998,358 af *
[elevation – 4406.30 ft.]
Top of Conservation Pool (Summer: Apr. 1 – Sep. 30) 1,973,358 af *
[elevation – 4405.60 ft.]

<u>CABALLO RESERVOIR</u>
Top of Conservation Pool 226,672 af *

[elevation – 4172.44 ft.]

TOTAL RIO GRANDE COMPACT PROJECT STORAGE AVAILABLE

Winter: Oct. 1 – Mar. 31	2,225,030 af *
Summer: Apr. 1 – Sep. 30	2,200,030 af *

* *derived from Reclamation's new reservoir area-capacity tables dated April, 1999. New tables were implemented on January 1, 2001.*

Caballo Dam Facility Review and Safety of Dams Programs

A PFR was completed in April of 2002 by the Albuquerque Area Office and the Elephant Butte Field Division. The 2002 PFR resulted in the following number and category of recommendations: zero Category 1, two Category 2, and one Category 3 recommendation. There were no new Safety of Dams recommendations. The next Caballo Dam CFR is scheduled to occur in 2005.

The Dam crest was resurfaced with asphalt during the summer of 2002. The spillway bridge was excluded from re-surfacing and the existing asphalt was removed exposing the concrete decking, following the determination that the bridge was not design for the additional weight and the asphalt surfacing was unnecessary.

The following work was completed associated with modification of the Caballo Dam radial gates:

- The gates were completed early in April of 2002.
- The gates were tested during the PRF review on April 23, and found to be working properly
- The Caballo Safety of Dam operating restriction was lifted and the Dam was returned to normal operational status on May 15, 2002
- The Caballo construction report was completed in September 2002

During 2002 the following additional work was completed for Caballo Dam:

- Encroachments above and below Caballo Dam continue to be a concern, as described previously for Elephant Butte.
- Trilateration Surveys are in progress
- The Annual Examination and Report was completed

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 2002. The current year's daily, weekly, and monthly data on 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://elpaso.uc.usbr.gov

In 2003, Reclamation plans to install a PC-based computer program which will poll, as needed, to its gauging stations and reservoirs of the Rio Grande Project. This will provide instantaneous data to assist in making daily operational decisions on the delivery of irrigation water to the Rio Grande Project water users.

Elephant Butte and Caballo Reservoirs Resource Management Plan

The Resource Management Plan (RMP) for Elephant Butte and Caballo Reservoirs was initiated in late 1995 and is presently in its final stage of development. The intent of the RMP is to produce a guide for Reclamation and other relevant agencies for use in the management of Elephant Butte and Caballo Reservoirs land and associated resources. The Final EIS has been completed and the Record of Decision (ROD) is presently awaiting Region approval. The RMP is currently under review and is anticipated to be completed in May of 2003. Among the primary issues being discussed and evaluated are grazing management practices, lease lot ownership and management, threatened and endangered species, water quality, and recreation development. The public and related agencies are kept informed throughout the planning process by way of newsletters, planning workgroup meetings, periodic public workshops, and informational open houses.

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 2003. The next scheduled operation and maintenance field examination of the diversion dams is tentatively set for the fall of 2007, following the end of the irrigation season.

Rio Grande Project Adjudications

The United States filed this 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 furthered 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. There is a pending motion by EBID to be allowed to change the point and purpose of diversion without the approval of the State Engineer; this would seem to indicate we are years away from an end to this case. Also, the State of New Mexico continues to attempt to serve all the members of EBID and any other water users in the area of the Lower Rio Grande Basin found during the course of the hydrographic survey. This, too, would suggest that we are years away from resolution of this case. A status hearing was held in Las Cruces before Judge Valentine on November 13, 2002. Rather than a simple status update, the judge turned this hearing into an opportunity for the parties to state their positions on the United States' Motion to Amend the Complaint (to include Elephant Butte Reservoir). The United States filed a Supplemental Brief to the Motion for an Amended Complaint on November 22, 2002.

The Texas Commission on Environmental Quality (formerly, the Texas Natural Resources Conservation Commission (TNRCC)) 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, particularly jurisdictional, have been briefed. Initial briefs were filed October 25, 2002. Response briefs were submitted November 20, 2002. An oral argument was conducted on December 6, 2002 in Austin. Dispositive motions and briefs are due on February 17, 2003.

Elephant Butte and Caballo Reservoir Vegetation Management Cooperative Agreement and Status of Environmental Compliance

Under a Cooperative Agreement with the State of New Mexico, Reclamation has continued maintenance on Caballo reservoir lands and began mowing again at Elephant Butte Reservoir due to low storage conditions. The work involved treating 200 acres with herbicides at Caballo, and there is an anticipation to treat 1,000 acres during August and September 2003. Discussions are underway with Sierra Soil and Water Conservation District to include removal of some monotypic saltcedar stands in the Elephant Butte Reservoir pool by aerial spraying with helicopters beginning in September 2003. The areas to be treated may include some vegetation maintained under this agreement. Reclamation plans to complete all necessary environmental compliance activities including an Environmental Assessment of the proposed work. The State of New Mexico plans to obtain the appropriate label for arsenal application. The label will likely include consideration for endangered species.

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 10). The following sections summarize the studies that Reclamation and the Commission are cooperating on.

Aquifer Storage and Recovery

A pilot aquifer storage and recovery (ASR) project is investigating possible storage regimes and methods for excess surface water flows in the Hueco bolson (aquifer) via recharge zones for later extraction to augment water supplies during drought and shortages conditions. This study is a cooperative effort of the American Water Works Association, the El Paso Water Utilities Public Service Board, and Reclamation. The excess water for ASR will be a by-product of the El Paso-Las Cruces Regional Sustainable project utilizing surface waters of the Rio Grande/Rio Bravo as the primary source of Municipal and Industrial potable water. The latest pilot test investigates the feasibility of utilizing shallow infiltration basins (as opposed to direct injection wells) along the eastern front of the Franklin Mountains. A one-acre basin was excavated below the surface layer of caliche, approximately 20' deep. Treated sewage was pumped into the one-acre basin at rate of 1,000 gpm over a period of one year. The initial results look very promising as the rate of infiltration has been so high that the entire one-acre surface was never to be inundated. A second basin is currently being considered for use as an actual recharge facility as opposed to a pilot project.

Delivery of Surface Water on a Year-Round Basis

This is tied to the El Paso-Las Cruces Regional Sustainability Project which is “on-hold” at this time. There are no indications that year-round release of project storage water is being pursued by the El Paso Water Utilities.

Elephant Butte and Caballo Reservoir Water Quality Assessments

Reclamation and the USGS are partners in these reservoir water quality assessments. In addition to measuring temperature, dissolved oxygen, and pH profiles throughout the year, the source and potential solution to the release of hydrogen sulfide (H_2S) gas at

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

ALBUQUERQUE AREA OFFICE

RIO GRANDE / RIO BRAVO INTERNATIONAL BASIN ASSESSMENT

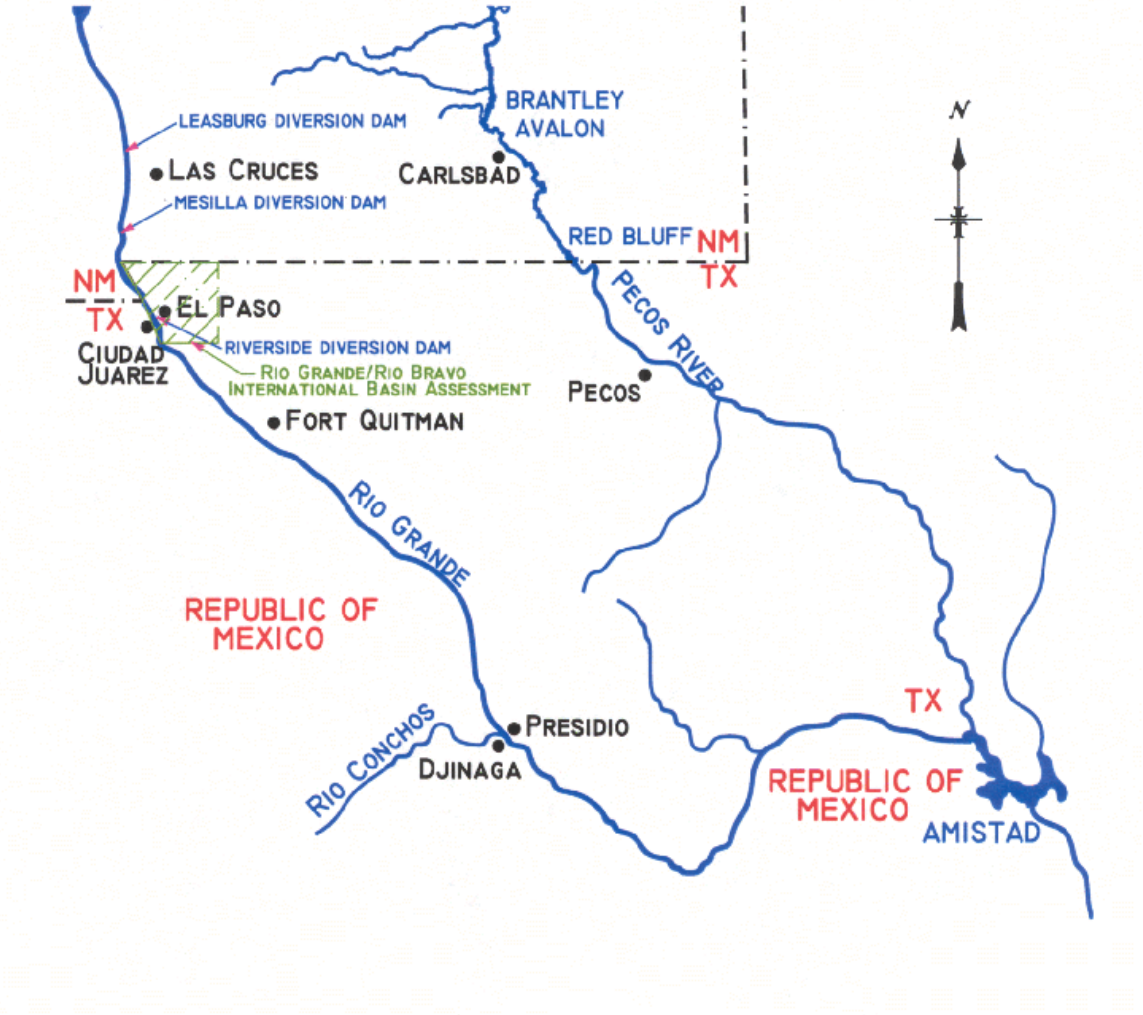


Figure 10: Area Map of the Rio Grande/Rio Bravo International Basin Assessment

the Elephant Butte power production facility is being investigated. 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. This investigation will continue through 2001 and the data collected will be used to develop reservoir water quality models for the Elephant Butte and Caballo Reservoirs. For 2002, this effort will be continued.

El Paso-Las Cruces Regional Sustainable Water Project

The New Mexico - Texas Water Commission is the appointed oversight group for the planning and technical investigations required to meet the objectives of this Sustainability Project. Specifics of this effort include the transfer of Rio Grande Project waters from the El Paso County Water Improvement District No. 1 to the El Paso Water Utilities (EPWU) through a third-party agreement with Reclamation. Contingent upon the transfer of the use of this water is the withdrawal of surface waters on a year-round basis by the EPWU to provide 100 percent of El Paso's drinking water during non-drought years. Excess waters available from the Rio Grande could potentially be stored in an Aquifer Storage and Recovery Project. The U.S. section of the IBWC is the lead federal agency for NEPA requirements with Reclamation providing assistance in the form of NEPA expertise. Reclamation has provided funding to EPWU through cost-sharing reimbursements and line-item Congressional write-ins. The Draft EIS was developed in 1999 and the Final Draft EIS and Record of Decision was issued on January 18, 2001, by the IBWC. Various alternatives and strategies for withdrawal of waters from the Rio Grande and site selections for Water Treatment Plants were evaluated during this EIS process and public comments were provided on these alternatives through public scoping meetings.

To date, a third-party agreement has yet to be reached for implementing transfer of water from the El Paso County Water Improvement District No. 1 to the El Paso Water Utilities via the 1920 Sale of Water for Miscellaneous Purposes Act of Feb. 25, 1920, 41 Stat. 451, which provides for the conversion of Reclamation Project water from irrigation to miscellaneous purposes. Currently, this project has been greatly scaled-back, and with the drought conditions present in the Rio Grande Basin, the likelihood of utilizing surface waters for M&I purposes is slim. The El Paso Water Utilities have concentrated on developing more wells in the Mesilla Valley, desalination of the Hueco Bolson, and the importation of groundwater east of El Paso to meet future demands.

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

In July 2000, the Department of the Interior (DOI) 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.

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 initiatives to satisfy the intent of the Joint Declaration. Under a phased completion, phase 1 will seek implementation of four of the eight objectives listed in the Joint Declaration, (#1. Form a binational task force; #6. Undertake research on biologic and hydrologic conditions of the region; #7. Develop and exchange of compatible information systems; #8. Facilitate public participation in developing strategies for environmental sustainability.)

Current Activities

Due to declining budgets for natural resource investigations in SeMARNat and the Mexican section of IBWC (CILA), there are limited resources allocated to continue binational studies in this reach of the Rio Grande. Under the leadership of the International Boundary & Water Commission partnerships for funding are being formulated. Currently the United States section of IBWC has had discussions with members of the U S / Mexico Border Coalition of Resource Conservation & Development districts regarding possible support.

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 evaluates 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.

In May of 2002, Reclamation and USGS collaborated in providing a literature search and building a database of water quantity and quality, habitat, flora & fauna studies for the reach between Fort Quitman and Amistad Dam.

USGS and Mexico's National Ecological Institute (INE) conducted studies of contaminants in Biota, and Invertebrates in the Big Bend / Maderas del Carmen region.

Reclamation - El Paso Field Division, compiled base line hydrologic information for the Ft. Quitman to Presidio reach, including Rio Conchos tributary flows.

DOI agencies provided and distributed Digital Orthophoto Quads for this reach of the Rio Grande / Rio Bravo.

Caballo Mercury Study

Reclamation, in conjunction with New Mexico State University's Department of Fishery and Wildlife Sciences and the USGS/Biological Resources Division, has established the only mercury deposition network (MDN) 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). Methylmercury 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. Currently, 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, and 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 runoff within the Rio Grande Basin is critical to the management and operation of the Rio Grande Project. The Rio Grande Project's system (dams and reservoirs) is designed for flood control and for the storage and delivery of irrigation and/or 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 working 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

Reclamation's Water Conservation Field Service Program

Reclamation continues to provide cost share funding and technical assistance to several water management entities through the Water Conservation Field Services Program to promote water use efficiencies throughout the State of New Mexico. The Water Conservation Field Service Program seeks to promote water use efficiency through support of educational efforts and research projects, and through providing technical assistance to the water users of New Mexico. Some of the projects supported during 2002 are summarized in the following paragraphs.

Reclamation continued to support conservation education and public and industrial awareness of water issues during 2002. Institutional and industrial water management workshops were co-sponsored 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 educational activities.

Reclamation provided technical support to several water conservation districts that operate within the Rio Grande Basin during 2002. Continued support was provided to the MRGCD water measurement program to obtain the operational data required to improve water transport and distribution efficiencies. A working agreement was developed with El Paso County Water Improvement District No. 1 to expand irrigation system water measurement and telemetry to provide data for increased operation efficiencies. Reclamation is working 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.

Reclamation continued to participate in the drip irrigation research and demonstration project in cooperation with the Socorro Soil and Water Conservation District and the Natural Resources Conservation Service. The project will carry over into the 2003 calendar year. Agreements were executed with New Mexico State University and the Texas Water Resource Institute to perform canal seepage and aquifer interaction studies.

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, Albuquerque, and Española in New Mexico, and El Paso, Texas.

The Santa Fe Program consists of three parts. The first part is Santa Fe's Treated Effluent Management Program which may reclaim a portion of Santa Fe's secondary effluent for irrigation and Santa Fe River surface flows. A "Treated Effluent Management Plan" was completed in 1998. The second part is the Santa Fe River Augmentation Project which may deliver water upstream on the Santa Fe River to augment the city's supply wells through indirect recharge of the aquifer and enhance the recreational use of the Santa Fe River corridor in the downtown area. A "Water Management and River Restoration Strategy" was also completed in 1998. The third part is the Rio Grande Diversion Demonstration Pilot Project which diverted a small amount (300 af/yr) of ground water from Rio Grande alluvium through a subterranean horizontal radial collector for pilot testing to determine future treatment needs for a full-scale surface water diversion on the Rio Grande, with the discharge returned to the Rio Grande. In 2001, an Environmental Assessment was completed for the Rio Grande Infiltration Collector Well Demonstration Project and a contract was signed to define water management alternatives for the NEPA process. The subsurface horizontal collector well was constructed in 2001 and the final report of engineering and water quality data is due out in 2003. The City has expended all previous federal feasibility study funding, and is finalizing a Feasibility Study Report.

The City of Española completed an appraisal study in 2000. In late 2001, the City initiated work on a feasibility study under Public Law 102-575, Section 1604. The feasibility study will cover NEPA requirements and was originally going to investigate a subsurface horizontal radial collector well diversion and treatment for the City of Española's SJ-C water rights. The project has since shifted to a surface water division and treatment study. The treated water would be mixed with existing City of Española well water to dilute naturally high fluoride levels in groundwater to drinking water standards. Work is now proceeding independently on the construction of the necessary diversion with the Albuquerque Corp of Engineers and the Albuquerque Area Office of the Bureau of Reclamation.

The City of Albuquerque program will develop wellhead arsenic removal technology, and apply it to a production well currently out of service due to high arsenic levels. Another aspect of the program will be the development of non-potable water distribution systems for the irrigation of turf grass in public areas. The north Albuquerque area water source will be from impaired Rio Grande surface water infiltration galleries, and industrial effluent. The south area source of water will be the City's treated effluent. In 1999 Reclamation entered in to agreements with the City of Albuquerque which

provides the framework for the participation and cost sharing in their arsenic demonstration project and reclamation and reuse program. Under one of these agreements, Reclamation cost sharing was approved for construction of the industrial recycling portion of the City's reclamation and reuse program and construction began on that project. In 2001, an Environmental Assessment was completed for two of the reclamation and reuse projects. The industrial recycling project was completed in 2001 and construction of the subsurface collectors to divert a small portion of the City of Albuquerque's SJ-C water began in January of 2003 and is expected to be completed in the spring of 2004.

Upper Rio Grande Water Operations Model

The year 2002 was a time of challenges and change for URGWOM. Early in the year, a large share of input data collected from partners and stakeholders, was made available to the general public on the web. This is available under "Model Data" at:

http://www.spa.usace.army.mil/urgwom/

RiverWare, the modeling software of URGWOM, became available through a license/maintenance fee, in a PC version, to serve a much broader customer base. Recognizing the need to understand some fundamental operations in compliance with the Rio Grande Compact, the Technical Team began gaining approval for and developing some Compact-driven rules for operation of Elephant Butte and Caballo, to use in the Planning Model. Through WaRSMP (Watershed and River Systems Management Program), URGWOM collaborated with the developers of USGS' "Modular Modeling System" or "MMS" software, to gain improved forecasting of hydrologic runoff on sub-basins above Otowi. MMS takes snowpack conditions, adds spacial modeling and ground conditions, to predict runoff volume and timing with greater accuracy than is possible by the simpler regression-analysis of past years. The dismal 2002 spring runoff made comparisons difficult, and some of the sub-basins did not align with URGWOM delineations very well, but high hopes continued as did coordination and co-development.

Although the Accounting Model for Heron, El Vado, Abiquiu, Cochiti, Jemez Canyon, and Elephant Butte, has been in use for a couple of years now, Nambe Falls accounting has continued separately in the old "daily programs" on Reclamation's SUN computer. Nambe Falls accounting was developed to add to URGWOM, and was being tested and debugged at the end of the year for approval and use in 2003. For Abiquiu and Jemez Canyon, special, apportioned Rio Grande accounting was developed and implemented (for "Rio Grande Conservation Pools"), per a 3-year (temporary) agreement designed to provide consistent middle valley flows for preservation of Silvery Minnow habitat.

Maybe the most significant development and testing of the year was in the Water Operations Model, and particularly the "Rules", or coded-logic representing all facets of operations. Highly anticipated, but perpetually delayed, these rules have been a great challenge to make functional and accurate. They were used during numerous late summer and fall "ESA" model runs to predict future reservoir conditions based upon preserving endangered species, in this poorest year-on-record spring runoff in the Upper Rio Grande. The results were both promising in showing the power and knowledge of modeling, and frustrating in some of the bugs that compromised results and limited flexibilities of operations. Nevertheless, the results demonstrated and plotted total and coordinated operations of all the accounting reservoirs, in detail never before possible. Testing and debugging continued past the year-end.

The Planning Model is intended as a key component in the development of the URGWOPS-EIS, and is a takeoff from the Water Operations Model, but with fewer SJ-C (hence, simpler accounting). Scheduled for use in the first half of 2003, much more development was slated for 2002 than the team was able to accomplish. However, the Planning Model and Ruleset is substantially built from a functional and debugged Water Operations Model and Ruleset, which the team has done much work on.

In another WaRSMP supported effort, URGWOM collaborated with a team contracted by Reclamation to build the next-generation database system "Hydrologic DataBase", or "HDB". This system, targeted to be the improved and query-friendly data management system shared by partners of URGWOM and others, has been delayed numerous times, but in 2002, underwent development in earnest. Finally, during the year, of four full-time Tech-Team members, one retired, one was promoted out, and one became part-time. Their services were being replaced only by part-time assistance of another, representing an overall substantial-reduction in team resources over the year.

Evapotranspiration Toolbox (ET) 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 Evapotranspiration Toolbox (ET Toolbox) for estimating these daily water use requirements at a resolution useful for implementation in the 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 the 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 currently accounts for an estimated 60 percent of the water depletions over this reach of the Rio Grande, including riparian vegetation, irrigated crops, and open water evaporation. Efforts are underway to extend the coverage to Elephant Butte Reservoir.

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 the URL:

http://www.usbr.gov/rsmg/nexrad/Nm/riogrande.html

The daily cumulative river reach ET estimates are being automatically input into RiverWare, the modeling software basis of the URGWOM. RiverWare currently contains water accounting and ownership tools and peripheral water budget and flood routing tools that are being configured for the URGWOM. The ET Toolbox data, now directly retrievable 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 URGWOM model goes online.

The Interstate Stream Commission provided $233,750 in funding for ET research and development in their fiscal year 2002. These funds are being utilized to complete some open-water evaporation research at Elephant Butte Reservoir begun previously with other funding, and to update the base GIS dataset in the Toolbox to improve the accuracy of ET estimates. Additional funding for improvements in fiscal year 2003 is still unknown, leaving the future viability of the ET Toolbox in question. Without the Toolbox, the URGWOM will have difficulty achieving sufficient accuracy to be useful for planning studies and daily water operations.

Upper Rio Grande Basin Water Operations Review

Reclamation, the Corps, and the New Mexico Interstate Stream Commission entered in to a Memorandum of Agreement in January of 2000, to cooperate as joint lead agencies in a review of their water operations activities in the Rio Grande basin above Fort Quitman, TX. The scope of the Upper Rio Grande Basin Water Operations Review (URGWOPS) will be limited to existing facilities and authorities. Because of ongoing litigation, water supply operations at Elephant Butte and Caballo Reservoirs will not be included in the URGWOPS, at least for the present time. However, flood control

operations and their impacts down to Fort Quitman will be considered.

The purpose of the URGWOPS is to develop a better understanding of how Corps and Reclamation facilities could be operated more efficiently and effectively as an integrated system and to formulate a plan for conducting future water operations. The review will support continued compliance with state, federal, and other applicable laws and regulations, including the ESA. 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 an 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, IBWC, Indian tribes, Congressional staff, and the general public, has been part of the Review, with five official cooperating agencies that include two state government agencies, two federal agencies and one Indian tribe. The URGWOM planning model will be used in cooperation with FLO2D modeling of overbank flooding, an aquatic habitat model, and a groundwater – surface water hydrologic model, to evaluate alternative water operations and the interrelated effects of the various facilities. A range of hydrologic conditions from surplus to drought will be considered using actual measured flows from 1975 to 2000, which were then synthetically combined to create a 40-year cycle of these conditions. The variability mimics the last 300 years of climate variability (measured from tree ring data). The project is projected to continue through 2004, and is on schedule for completion of a Draft EIS in late 2003.

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 and Jemez Canyon reservoirs operated by the Corps
- Changes to channel capacity below the Corps' reservoirs of Abiquiu and Cochiti Lake
- Improvements in communications at all facilities, including flood management protocol below Elephant Butte and Caballo, two Reclamation facilities.

Rio Grande Compact Accounting Documentation Project

During 2002, Reclamation and the signatory states (States) to the Rio Grande Compact entered into a MOU to formally state the duties, roles, and responsibilities of each agency with regards to the water accounting, reporting, and documentation of the waters of the Rio Grande Basin above Fort Quitman, Texas in accordance with the Rio Grande Compact.

Section 4.2 of the MOU states that Reclamation and the States will cooperatively conduct a water accounting documentation project during the 2002 calendar year. The project is intended to concurrently review and document the basis for both native Rio Grande and SJ-C Project water accounting, calculated values and constant values, and approved methods that are involved in the water accounting. Final products of the MOU will include a bibliography of Rio Grande Compact water accounting reference material, and a report on the documentation of the history and methodology of Rio Grande Compact Accounting.

Although the project was not completed during 2002, significant progress was made toward completing the Rio Grande Compact Accounting and Documentation Project. Drafts of the bibliography were assembled and distributed among Reclamation and the Engineer Advisers to the Rio Grande Compact Commission. The bibliography will essentially remain a "living document" that will continue to be updated as the water accounting process evolves in response to changing conditions within the Rio Grande Basin.

Reclamation produced a draft of the report *Documentation of the History and Methodology of Rio Grande Compact Accounting* that includes those sections of the report assigned to Reclamation through the course of several conference calls and meetings held with the Engineer Advisers during 2002. This draft report was distributed for review in December 2002. Work on this project is continuing into the 2003 calendar year.

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 Drought Relief Program, the Planning Program, and special projects funded through Congressional write-ins.

Funding was obtained through a congressional write-in for the three Pueblos involved in the Abouselman adjudication: Jemez, Zia, and Santa Ana. These Pueblos will use these funds for studies and planning to help in a negotiated settlement of the Abouselman adjudication.

The subsurface drainage project scheduled for the Isleta Pueblo for the winter of 2001-2002 is slated for construction in 2003.

Under the Drought Relief Program, Jemez Pueblo has received funding for a new agricultural well.

Under the Planning Program, well drilling in the Taos area has been underway since late 1999 to help quantify water availability in a deep aquifer. These water sources could then be used to facilitate a negotiated settlement among the parties in the Abeyta adjudication. Well drilling and almost all aquifer testing were completed in 2002. A small amount of aquifer testing and significant computer modeling remain to be done.

Negotiations are still underway between the Department of Interior (represented by the Bureau of Indian Affairs and Reclamation as primary and secondary leads, respectively) and the MRGCD for a new Operation and Maintenance Agreement for District facilities on lands of the six Middle Rio Grande Pueblos. The six Middle Rio Grande Pueblos have also proposed updating the El Vado Storage Agreement between the Pueblos and Reclamation for storage of Prior and Paramount waters in El Vado Reservoir.

Releases from El Vado Indian storage to benefit the six Middle Rio Grande Pueblos of Cochiti, Santo Domingo, San Felipe, Santa Ana, Sandia, and Isleta were made in 2002. Releases were required this year because of extreme drought conditions. Although water is stored or set aside for these Pueblos yearly, the last time a release was required was in the early 1980's. Because Indian rights are not to be affected by the Rio Grande Compact as described in Article XVI, storage at El Vado for these Pueblos began on Nov. 1, 2002 in preparation for the 2003 irrigation season.

Needs assessments to help tribes investigate their surface water, groundwater, wastewater, and water quality needs and issues are underway with six tribes: the Mescalero Apache tribe, Jemez Pueblo, Picuris Pueblo, San Ildefonso Pueblo, and Taos Pueblo. Funding is being provided through the Native American Program. Taos

Pueblo will be able to use some of the funding for water infrastructure improvement.

Also through the Native American program, two agricultural wells at Jemez Pueblo were repaired in 2002.