

2006 - 2007 Report  
Middle Rio Grande  
Endangered Species Collaborative  
Program



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by  
**The Program Management Team**  
**February 2009**

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## Summary

The Middle Rio Grande (MRG) Endangered Species Collaborative Program (Program) is a collaborative effort consisting of federal, state, and local governmental entities, Indian Tribes and Pueblos, and non-governmental organizations. The intent of Program participants is two-fold: first, to prevent extinction, preserve reproductive integrity, improve habitat, support scientific analysis, and promote recovery of the listed species within the Program area in a manner that benefits the ecological integrity, where feasible, of the Middle Rio Grande riverine and riparian ecosystem; and, second, to exercise creative and flexible options so that existing water uses continue and future water development proceeds in compliance with applicable federal and state laws. Listed endangered species in the region, upon which the Program is focusing its activities, include the Rio Grande silvery minnow and the southwestern willow flycatcher.

The intent of this report is to highlight the Program accomplishments made using Federal Fiscal Year 2006 and Fiscal Year 2007 funding. This report is available on the following website: [www.mrgesa.com](http://www.mrgesa.com)

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Front cover: Aerial view of the San Acacia Diversion Dam.

Picture above: “Minnow gate” at the San Acacia Diversion Dam, a specialized, automated gate which allows precise metering of Program-acquired water for the minnow into the San Acacia reach.

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## 1.0 INTRODUCTION

The Middle Rio Grande Endangered Species Collaborative Program (Program) is a collaborative effort consisting of federal, state, and local governmental entities, Indian Tribes and Pueblos, and non-governmental organizations. The intent of Program participants is two-fold: first, to prevent extinction, preserve reproductive integrity, improve habitat, support scientific analysis, and promote recovery of the listed species within the Program area in a manner that benefits the ecological integrity, where feasible, of the Middle Rio Grande riverine and riparian ecosystem; and, second, to exercise creative and flexible options so that existing water uses continue and future water development proceeds in compliance with applicable federal and state laws. Listed endangered species in the region, upon which the Program is focusing its activities, include the Rio Grande silvery minnow (*Hybognathus amarus*) and the Southwestern Willow Flycatcher (*Empidonax traillii extimus*).

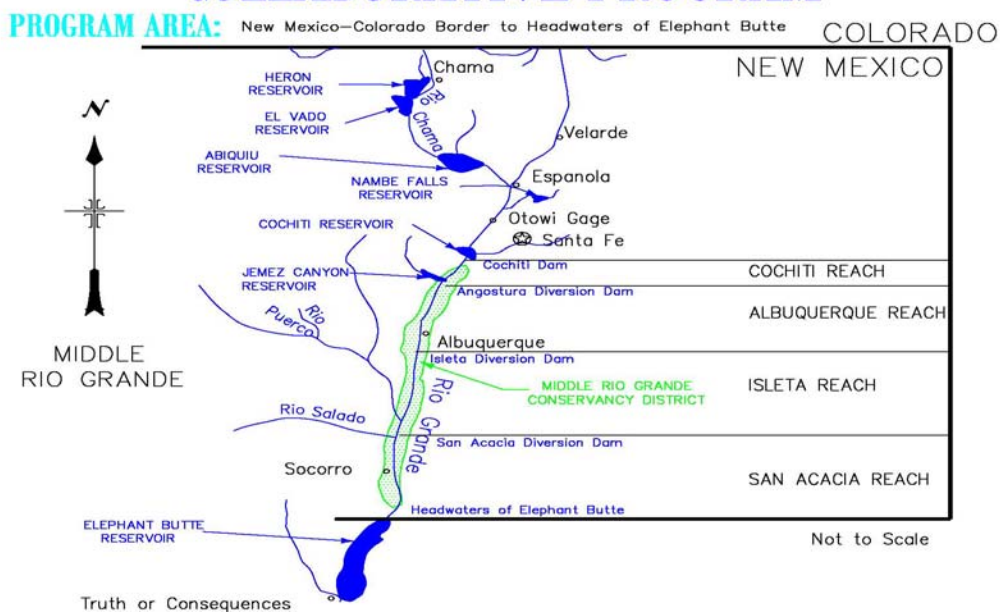
The intent of this report is to highlight the accomplishments of the Program during 2006 and 2007. This report is available on the following website: [www.mrgesa.com](http://www.mrgesa.com)

As of November 2007 the Program signatories consisted of:

- U. S. Department of Interior, Bureau of Reclamation (Reclamation),
- U. S. Fish and Wildlife Service (Service),
- U. S. Army Corps of Engineers (Corps),
- New Mexico (NM) Attorney General's Office,
- NM Interstate Stream Commission (NMISC),
- NM Department of Game and Fish,
- NM Department of Agriculture,
- NM Environmental Department (NMED),
- U.S.D.A. Forest Service – Rocky Mountain Research Station,
- City of Albuquerque,
- University of New Mexico,
- Middle Rio Grande Conservancy District (MRGCD),
- National Association of Industrial Properties/New Mexico Chapter,
- Assessment Payers Association of the MRGCD,
- Rio Grande Water Rights Association,
- Bureau of Indian Affairs,
- Pueblo of Santa Ana,
- Pueblo of Isleta,
- Pueblo of Sandia,
- Albuquerque Bernalillo County Water Utility Authority, and
- The Santo Domingo Tribe.

The Program area includes the Rio Grande basin, and the Rio Chama basin, from the Colorado/New Mexico state line downstream to elevation 4,450 feet mean sea level which is the elevation of the spillway crest of Elephant Butte Reservoir, New Mexico shown in the map below.

## **MIDDLE RIO GRANDE ENDANGERED SPECIES COLLABORATIVE PROGRAM**



The Program Goals are stated broadly in the Program’s Long Term Plan as:

- Alleviate jeopardy to the listed species in the Program area
- Conserve and contribute to the recovery of the listed species
  - Stabilize existing populations
  - Develop self-sustaining populations
- Protect existing and future water uses

The March 17, 2003 “Biological and Conference Opinions on the Effects of Actions Associated with the Programmatic Biological Assessment of Bureau of Reclamation’s Water and River Maintenance Operations, Army Corps of Engineers’ Flood Control Operation, and Related Non-Federal Actions on the Middle Rio Grande, Albuquerque, New Mexico”, as amended (BiOp) (USFWS 2003b, 2005a, 2006) serves as a guidance document for the steps required to alleviate

jeopardy to the listed species. Program activities are selected to support continuous progress toward these goals.

This report describes the current Program governance and organization, presents a summary of the Program's 2006 and 2007 expenditures, and highlights the Program's accomplishments using funds allocated during those fiscal years.

## **1.1 Program Governance and Organization**

The Program adopted by-laws (Ref. 3) in October 2006 and finalized a Long Term Plan in November 2006. The by-laws describe the Program's governance structure, decision making processes, roles and responsibilities. The Program's Long Term Plan provides the basis for prioritizing activities, schedules and budget estimates for Program activities proposed for fiscal years (FYs) 2007-2014, and an adaptive management strategy.

In August 2007 the Executive Committee, the governing body of the Program, approved the charters for the following groups, which carry out the business of the Program:

- The Coordination Committee: The Coordination Committee is responsible for informing the Executive Committee regarding Program activities, identifying concerns associated with Program activities, working to resolve those concerns, and developing consensus recommendations to the Executive Committee.
- Program Workgroups: The Program workgroups consist of representatives from each of the Program signatories, as listed below:
  - The Habitat Restoration Work Group: This work group's primary objective is to develop plans for and fund the restoration of endangered-species habitat in the Middle Rio Grande (MRG).
  - The Species Water Management Work Group: This work group's primary objective is to evaluate various strategies to improve water management in the MRG, fund modeling of potential water management alternatives to meet water supply and acquisition goals, and assist with implementation of Program projects that require water, such as habitat restoration activities.
  - The Science Work Group: The primary objective of this work group is to fund scientific studies characterizing the listed species in the MRG and their populations, behavior, and needs, and to provide scientific recommendations and technical assistance and expertise to the Program for the benefit of listed species in the MRG.
  - The Public Information and Outreach Work Group: This work group assists the Executive Committee in educating and informing the general public, stakeholders, and State and Federal Legislators of Program activities and accomplishments.
  - Ad hoc Workgroups: Ad hoc workgroups are established as needed to accomplish discrete tasks.

These committees and workgroups are supported by the Program Management Team. The Program Management Team is led by the Program Manager and provides management and technical support to the Executive Committee, Coordination Committee, and the Work Groups listed above. It includes representatives from Reclamation, the Corps, the Service, and the NMISC.

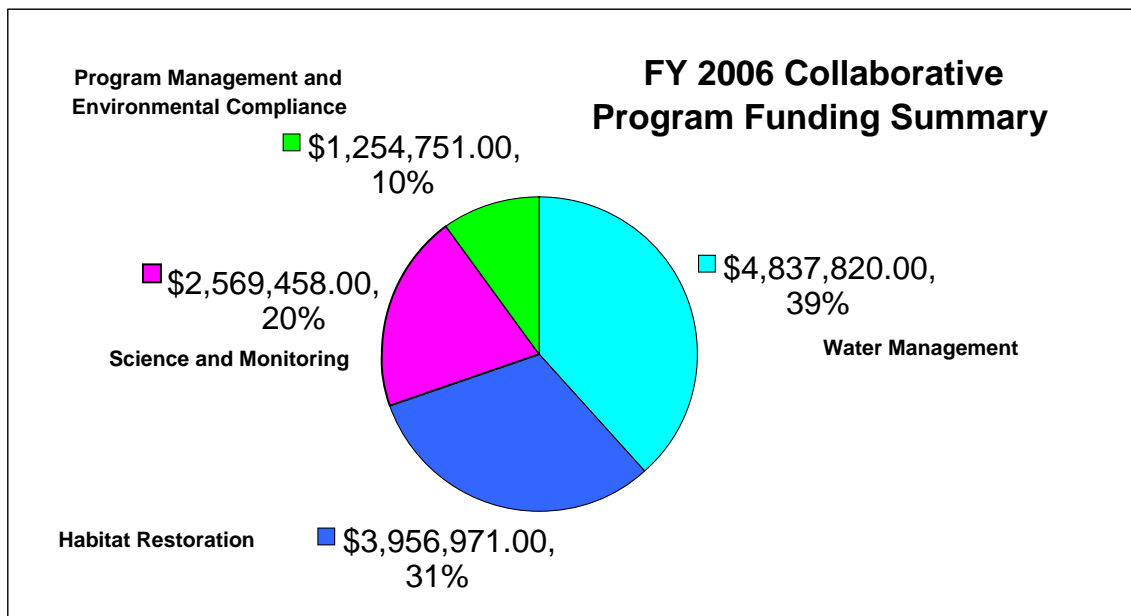


## 2.0 FINANCIAL REPORT

Congress appropriated \$12,619,000 in fiscal year (FY) 2006 and \$14,180,000 in FY 2007 for Program activities that enable progress toward the Program's goals. After rescission and under-financing, a total of \$26,343,250 was allocated to specific Program projects for the two-year period covered by this report. These Federal appropriations were supplemented by both financial contributions and in-kind services, including personnel time, equipment, and land access, from non-Federal Program signatories. Although these funding levels were less than the Program's estimated funding requirements, the Program succeeded in funding a number of important projects, including several innovative habitat restoration projects, acquisition of supplemental water through voluntary leases, and expansion of its captive silvery minnow propagation and augmentation program. Detailed descriptions of the program's funded projects and accomplishments are described in the following sections.

In FY 2006 Congress provided funding for water acquisition, population management, habitat restoration, water management studies, fish passage and river connectivity, minnow management, water quality, science and monitoring, biological opinion monitoring, and program management. Figure 2.1.1 illustrates how funds allocated by Congress were distributed among the various categories. In this diagram, water acquisition and water management costs are grouped into a single category called Water Management. The habitat restoration category includes habitat restoration, fish passage and river connectivity activities. The science and monitoring category includes endangered species monitoring and population management, water quality, research activities, fish rescue and biological opinion monitoring.

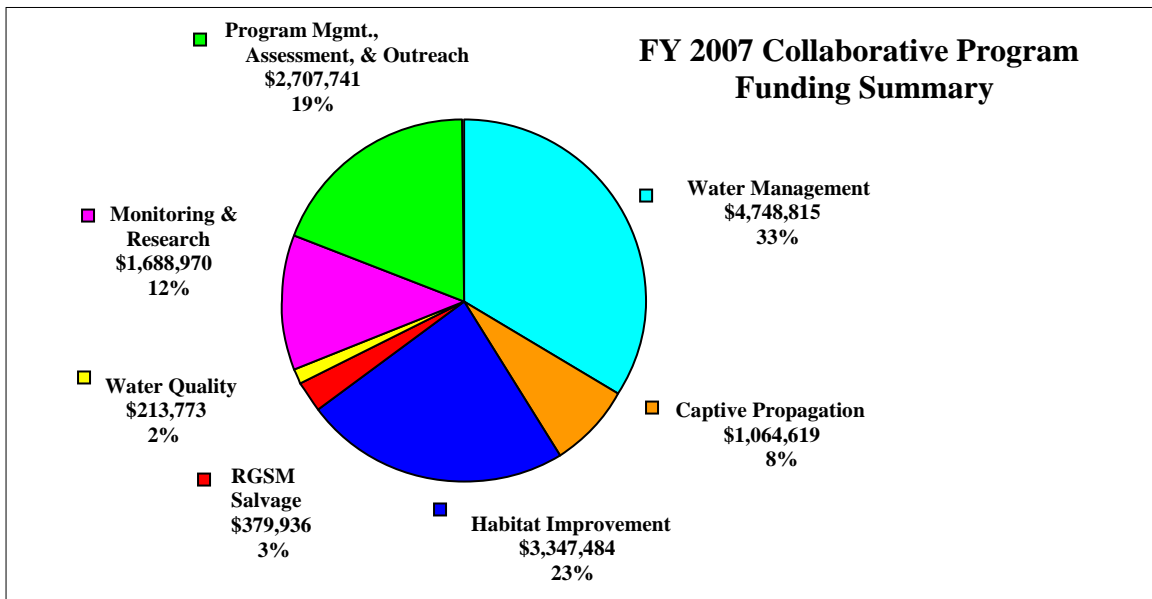
**Figure 2.1.1 Fiscal Year 2006 Collaborative Program Funding**



In FY 2007 Congress provided funding for water acquisition, population management, habitat restoration, water management studies, fish passage and river connectivity, minnow management, water quality, science and monitoring, biological opinion monitoring, program management and public outreach. Figure 2.2.2 illustrates how funds allocated by Congress were distributed among the various categories. In this diagram, water acquisition and water management costs are grouped into a single category called Water Management. The habitat restoration category includes habitat restoration, fish passage and river connectivity activities. The monitoring and research category includes endangered species monitoring and population management, research activities, and biological opinion monitoring.

The captive propagation category includes silvery minnow rearing and breeding, facility expansion, and genetic monitoring activities.

**Figure 2.2.2 FY 2007 Collaborative Program Funding**



### 3.0 PROGRAM ACCOMPLISHMENTS, 2006 AND 2007

Since its inception in 2001, the Program has developed a governance structure, bylaws, and a long-term plan, and has made tangible accomplishments in the understanding of native endangered species in the MRG and their needs, in improving water operations to support these species, and in making on-the-ground habitat improvements. The Program has also funded a diversified breeding, rearing, and river-augmentation program for the silvery minnow, which provides an insurance of species survival, and therefore allows greater freedom for innovation in the improvements to the river operations and habitat. Specific accomplishments include:

- The contribution of approximately \$8 million of non-Federal money and in-kind services in partial match of approximately \$83 million of federal funding for the Program to date.
- The acquisition (by Reclamation) of 191,992 acre-feet of supplemental water from willing lessors from 2001 through October 2007 to comply with the flow requirements of the 2003 Biological Opinion and alleviate “take” of the silvery minnow under the Endangered Species Act.
- Maintenance of continuous compliance with the March 2003 Biological Opinion (BiOp) for the Middle Rio Grande valley.
- The restoration of over 600 acres of river and riparian habitat for the listed species. The program is on track to meet the restoration goals of the current BiOp within its lifetime.
- The performance of numerous activities that have contributed to the achievement of recovery goals for the flycatcher. The goal of maintaining over 100 nests in the MRG Recovery Unit has been exceeded continuously since 2003.
- Funding of the construction, operation, and maintenance of two rearing and breeding facilities for the silvery minnow in the Middle Rio Grande, as well as expansion, operation, and maintenance of the U.S. Fish & Wildlife Service's Dexter National Fish Hatchery. The rearing and breeding facilities in the Middle Rio Grande region include the City of Albuquerque's BioPark Refugium, and the NMISC's Los Lunas Silvery Minnow Refugium. These facilities significantly aid in reestablishing, stabilizing, and enhancing populations of the minnow within its historic range of the Rio Grande Basin.
- The release of more than 1 million minnows to the Rio Grande, celebrated on May 29, 2007. .
- Funding of the USGS to install, operate and maintain a groundwater/surface-water monitoring network. The network consists of 158 groundwater piezometers and 17 surface-water stage gages. The project has been collecting continuous data, which is posted on the USGS website.
- Funding of the USGS to install, operate and maintain four new stream flow gages on the Rio Grande. The information collected is posted on the USGS website and is used for water management.
- Completion of preliminary studies evaluating alternatives for implementation of a fish passage at San Acacia diversion dam, to allow upstream movement of silvery

minnow, and minimize the effects of the habitat fragmentation caused by this dam.

- The development and application of specific hydrologic modeling tools to evaluate reservoir storage options, river operations, surface-water/groundwater interactions and river system depletions under both existing conditions and conditions proposed with habitat restoration efforts or future changes in river operations.
- The development of a demand-based modeling system to support the implementation of efficient rotational water delivery in the MRG irrigation system, which will allow irrigation demands to be met with reduced diversions from the Rio Grande, and in water-short years, could extend the irrigation season, and therefore the proportion of the season during which irrigation flows can support river flows.

The Program has developed and annually funds a set of basic activities key to meeting the requirements of the 2003 BiOp, avoiding jeopardy and working toward the recovery of the listed species in the MRG, and monitoring of progress toward Program goals. These ongoing activities include water acquisition and pumping to support river flows, flow and water-quality monitoring, water operations modeling, species population and habitat monitoring, operations and maintenance at three silvery minnow rearing and breeding facilities, silvery minnow augmentation activities in the river, and silvery minnow salvage activities during episodes of river intermittency. Ongoing activities also include Program management and environmental compliance by the Federal agencies, as well as public outreach, database and website development and maintenance, which make the results of Program activities accessible both to Program signatories and to the public. These continuing activities form the backbone of the Program's current success.

In addition, the Program funds a large number of single-year and multi-year activities that advance our understanding of the species and the river system, provide tools for more efficient water management, and develop plans that guide future Program activities.

Shorter term activities also include habitat restoration efforts in the river and the floodplain being undertaken by Program signatories. These actions are being undertaken to rehabilitate the river and riparian systems so they support the various life stages of native species. It is hoped that, over time, these habitat restoration activities will minimize the need for some of the ongoing activities listed above.

The monies provided to the Program have been used to support monitoring of environmental and hydrologic conditions within the Middle Rio Grande, research to better understand the Middle Rio Grande ecosystem and its listed species, the development of modeling tools to allow evaluation of the impact of proposed system improvements and water operations changes, and on-the-ground improvements to the habitat of listed species. Together, these activities have formed a comprehensive program that has significantly improved the population and chances of success of listed species in the Middle Rio Grande. Population monitoring has shown that the numbers of both minnow and flycatcher have increased significantly during the life of the Program, and the monies spent on constructive improvements have helped to avoid costly

litigation. Program accomplishments during 2006 and 2007 are described in detail in the remainder of this report.

### 3.1 Water Management

The Program seeks to develop and implement creative water use and development alternatives that will satisfy water needs for threatened and endangered species while protecting existing uses. Language in the FY06 Energy and Water Appropriations Act (Public Law 109-275), assigned responsibility for water acquisition, administration, and management to the Bureau of Reclamation (Reclamation), to be conducted at full federal expense. The purpose of other Program-funded water management activities is to provide assistance and expertise to accomplish the goals of the program. The Program works with Reclamation to secure potential supplies of water and storage space and implement management strategies to meet Program goals. Table 3.1.1 is a summary of water acquisition and management activities funded by the Program in Fiscal Years 2006 and 2007. In addition to water acquisition, the Program funds water monitoring and data collection activities that support water management. Water modeling activities are described in the next section.

**Table 3.1.1 Collaborative Program FY 2006 and FY 2007 Funded Projects: Water Management and Acquisition**

Funded Projects – Funded Entity	Entity Performing Work	Continuing Activity or Distinct Project	BiOp Requirement	Sponsoring Workgroup	Grant/ Contract #	Amount Appropriated	Year of Allocation
<b>Water Management</b>							
Water Acquisition	Bureau of Reclamation	ongoing	yes	N/A	Various	\$4,300,128	FY 2006
					Various	\$3,908,425	FY 2007
MRG River Gages Operations and Maintenance	U.S. Geological Survey	ongoing	yes	Species Water Mgmt.	02-AA-40-6360	\$20,000	FY 2006
					07-AA-40-2622	\$57,320	FY 2007
Data Collection to Better Define the Interaction of the Surface and Ground Water Systems in the Middle Rio Grande Valley	U.S. Geological Survey	multi-year project	no	Species Water Mgmt.	04-AA-40-2246	\$55,725	FY 2006
					04-AA-40-2246	\$190,067	FY 2007
Monitor Flows in Southwestern Willow Flycatcher Territories	University of New Mexico	multi-year project (first year of 4-years)	yes	Species Water Mgmt.	06-CR-40-8147	\$38,039	FY 2006
Assessment of Irrigation Efficiencies through Piezometer Installation and Monitoring	URS, Inc.	one-year project	no	Species Water Mgmt.	06-CR-40-8128	\$10,158	FY 2006

### 3.1.1 Water Acquisition

Water acquisition funding in 2006 and 2007 made possible releases of supplemental water to meet the flow requirements of the 2003 Biological Opinion and benefited the Rio Grande silvery minnow (RGSM) and southwestern willow flycatcher (SWFL). Program and other Reclamation funds in the amount of \$6,606,634 were used to secure leases of San Juan-Chama Project water from willing lessors to provide for releases of supplemental water into the Rio Grande (Ref. 5). In addition, funds in the amount of \$3,750,480<sup>1</sup> were used for Low Flow Conveyance Channel (LFCC) pumping, in which water is pumped from the LFCC into the Rio Grande to enhance river flows to benefit the RGSM and SWFL (Ref. 5). Shown in Table 3.1.2 is a summary of water leases for 2006 and 2007.

**Table 3.1.2 2006 and 2007 FUNDING for the SAN JUAN-CHAMA PROJECT (SJCP) SUPPLEMENTAL WATER LEASE AGREEMENTS**

<b>SJCP CONTRACTOR</b>	<b>LEASED ACRE-FEET</b>	<b>2006 FUNDING</b>	<b>LEASED ACRE-FEET</b>	<b>2007 FUNDING</b>
Uncontracted Allocation	2,990	\$76,587	2,990	\$52,496
Albuquerque Bernalillo County Water Utility Authority (ABCWUA)	48,200	\$3,820,000 <sup>2</sup>	0	\$1,000,000
Jicarilla Apache Nation	6,000	\$450,000	2,948	\$232,965
City of Santa Fe	5,487	\$390,407	0	0
San Juan Pueblo (Ohkay Owingeh)	2,000	\$89,934	2,000	\$96,226
County of Los Alamos	1,200	\$56,400	1,200	\$61,200
City of Espanola	800	\$37,600	856	\$43,656
City of Belen	649	\$30,503	470	\$23,970
Town of Bernalillo	400	\$18,800	320	\$16,320
Town of Taos	400	\$18,800	400	\$20,400
Santa Fe County	375	\$17,625	375	\$19,125
Village of Los Lunas	256	\$12,032	293	\$14,943
Town of Red River	60	\$2,820	60	\$3,060
Village of Taos Ski Valley	0	0	15	\$765
<b>Total</b>	<b>68,817</b>	<b>\$5,021,508</b>	<b>11,927</b>	<b>\$1,585,126</b>
<b>TOTAL 2006 and 2007</b>	<b>LEASED ACRE-FEET</b>	<b>80,744 AF</b>	<b>FUNDING</b>	<b>\$6,606,634<sup>3</sup></b>

<sup>1</sup> \$500,000 of this total was provided with Reclamation Emergency Drought Assistance funds.

<sup>2</sup> Total amount of agreement with ABCWUA was for 48,200 ac-ft costing \$4.82 million. Remaining \$1M funded in FY-07.

<sup>3</sup> \$1,901,071 of this total was provided with Reclamation Emergency Drought Assistance and other Reclamation funds.

### 3.1.2 Middle Rio Grande River Gages Operations and Maintenance

With funding from the Program, the U. S. Geological Survey (USGS) operates and maintains a network of 24 streamflow gages in the Middle Rio Grande, including 12 in the mainstem of the Rio Grande and 12 in tributaries or distribution features. Four of these mainstem gages were initiated in late 2005 or early 2006, under funding from the Program. The data from these gages are critical for efficient management of flows in the MRG. Data from the river gages help Middle Rio Grande water management agencies meet the needs of water users, fulfill the requirements of the Rio Grande Compact, maintain sufficient water in storage for future needs, and maintain adequate water in the river to support the silvery minnow. The resulting data is available to the public on web pages operated by several Federal agencies, as listed below:

Bureau of Reclamation Webpage:

<http://www.usbr.gov/uc/albuq/water/SanJuanChama/sgages.html>

United States Geologic Survey:

<http://waterdata.usgs.gov/nm/nwis/current/?type=flow>

United States Army Corps of Engineers:

<http://www.spa.usace.army.mil/wc/adbb/basinrpt.htm>

As part of the operations and maintenance program, the USGS performs manual stream flow measurements regularly at each gage. The manual measurements are used for calibration and generation of ratings curves for each station. The ratings curves convert gage height into stream discharge and allow the USGS to update their webpage with information on flows and provide accurate up-to-date information for water management. The gage apparatus located on the Highway 346 Bridge is shown in Figure 3.1.2.1.



Figure 3.1.2.1. Gage apparatus located on the Highway 346 Bridge. The equipment is: A Design Analysis H-522 high-baud DCP housed in a steel Knaack box mounted on the downstream side of guardrail. A solar panel charges the battery that powers the gage. The DCP is linked to a DA H-360 radar transmitter/receiver stage sensing device. A wire-weight gage (WWG) located on the bridge guardrail near the radar unit is used as reference (Photo provided by George Sieber, USGS)



### 3.1.3 Data Collection to Better Define the Interaction of the Surface and Ground Water Systems in the Middle Rio Grande Valley

The U. S. Geological Survey, with funding from the Program, has been installing and monitoring a large network of monitoring wells and associated surface-water staff gages along the Middle Rio Grande corridor, to better define the interaction of surface water and groundwater in this system. The monitoring network presently consists of 162 groundwater piezometers and 14 surface water stage gages on both sides of the Rio Grande, along six transects between the I-25 and the Paseo del Norte bridge crossings in the Albuquerque area. The majority of these monitoring components are equipped with data loggers, which monitor water level and temperature at regular time intervals. The project has been successful in the collection of continuous data sets and the posting of data on the USGS website, <http://nm.water.usgs.gov/bosque.html>.

Progress made in this project in 2006 included the installation of 31 monitoring wells and 3 surface-water gages in two transects located just upstream and just downstream of the Paseo del Norte bridge crossing. In addition, the USGS continued to operate and maintain the existing monitoring network. Each of the transects was visited quarterly for data downloading and equipment maintenance; the data were processed and the web page (<http://nm.water.usgs.gov/projects/riograndesections/>) was updated.

In 2007, the Collaborative Program's Species and Water Management Committee (SWM) approved funding for continued transect maintenance and data collection and analysis. In addition, the USGS was funded to publish a Scientific Investigation Report to summarize the data collection program and the collected data, and present analyses, including calculations of river leakage based on water levels measured in wells and gages. The effects of water temperature on groundwater viscosity and flow are also being evaluated. Publication is planned for 2009.

Shown in figure 3.1.3.1 is a groundwater monitoring well from the USGS's-network.



Figure 3.1.3.1. USGS Groundwater monitoring well in the riparian area of the Middle Rio Grande, Albuquerque reach. (Photo provided by USGS)

### 3.1.4 Monitoring of Flows in Southwestern Willow Flycatcher Territories

In an effort to improve habitat quality and encourage more flycatchers and other riparian-obligate bird species to breed, surface water has been introduced to traditional breeding habitat in the Pueblo of Isleta. This project is designed to monitor inundation, water levels, and vegetation in the flycatcher habitat and to determine the water volumes and delivery timing needed to produce and maintain optimal habitat.

After five years of monitoring flycatcher nesting and three years of studying habitat preferences, the Program can tentatively conclude that flycatchers prefer to establish territories in two vegetation types: coyote willow and Russian olive. Strong preference for these two types is mitigated somewhat if there is abundant surface water in other habitat types. Conversely, in dry years, the birds seem to gravitate toward the wettest areas of these two habitat types. Within preferred habitats, they tend to nest on the edge of clumps, near open meadow habitat. Nests are typically placed in vegetation that is denser from 0 to 6 meters above the ground than at other spots in the territory. Nests with low-density vegetation above the nest appear to be at increased risk of nest parasitism.

Figures 3.1.4.1 and 3.1.4.2 show the Isleta Return Channel at a time of average water levels in 2004, and a time of high water levels in 2005.



Figures 3.1.4.1 and 3.1.4.2 respectively. Isleta Return Channel 2004 (left) 2005 (right), showing extreme fluctuations in water levels between average and wet years. An identified flycatcher nesting area is left of the road. The photos were taken from the report, "Water Requirements for Southwestern Willow Flycatcher Habitat and Nesting at the Pueblo of Isleta."

### **3.1.5 Assessment of Irrigation Efficiencies through Canal Seepage Studies and Piezometer Installation and Monitoring**

In 2006, the Program funded two studies related to irrigation efficiency and water balance across the irrigated MRG valley—a canal seepage study, and a groundwater monitoring study.

The seepage study was undertaken to evaluate seepage loss rates in key main canals within the irrigation system, to assess whether efficiency improvements could be made through modifications of these canals. Seepage tests were performed on the San Juan Main Canal and the Albuquerque Main Canal. Seepage rates from both unlined canals were found to be low relative to the national average, but the seepage rate from the Albuquerque Main Canal was found to be high relative to others in the MRG system.

It has generally been assumed that diverting water from the Rio Grande for irrigation reduces the surface water available in the river to support the silvery minnow. However, diverted water may enter bank storage along canals, where it would be protected from evapotranspiration losses. This water could augment in-stream flow during dryer times. Therefore, the Program has funded an assessment of the interactions between the river, canals, drains and groundwater through the installation and observation of piezometers. Groundwater elevation data were collected at fifteen-minute intervals over the course of one year (August 2006 through August 2007) from two piezometer transects, located respectively near Los Lunas and near Belen. Each transect extends from the east highline canal west across the Rio Grande valley to locations beyond the levee on the west side of the river. Nested piezometers are included in each transect in order to evaluate vertical flow components and facilitate use of the data to assess canal leakage, bank storage, and return flow to the river. Results from the assessment will be used to better understand surface water/groundwater interactions in relation to irrigation efficiencies.

### 3.2 Water Modeling

The Program has been involved in the development and application of computer models that simulate various aspects of MRG water operations, and support efforts to make those operations more efficient and maximize the benefit of system operations to listed species. Specific hydrologic modeling tools have been developed to evaluate reservoir storage options, river operations, surface-water/groundwater interactions and river system depletions under both existing conditions and conditions proposed with habitat restoration efforts or changes in river operations. An additional modeling system is under development to improve irrigation system efficiencies by implementing rotational water deliveries. Water modeling efforts being employed to benefit the Program are described in the following sections.

**Table 3.2.1 Collaborative Program FY 2006 and FY 2007 Funded Projects:  
Water Modeling**

Funded Projects – Funded Entity	Entity Performing Work	Continuing Activity or Distinct Project	BiOp Requirement	Sponsoring Workgroup	Grant/Contract #	Amount Appropriated	Year of Allocation
<b>Water Modeling</b>							
Assess Storage and Operations with Upper Rio Grande Water Operations Model	multi-agency	ongoing	no	Species Water Mgmt.	06-AA-40-2545	\$63,770	FY 2006
					06-AA-40-2545	\$100,000	FY 2007
Development of New Riparian Groundwater Models for the Lower Middle Valley Reach, Highway 380 Bridge to Elephant Butte Delta, and Refinement of Existing Models	New Mexico Interstate Stream Commission and S. S. Papadopoulos & Assoc., Inc.	multi-year	no	Species Water Mgmt.	07-CS-40-8209	\$339,529	FY 2007
Water Management Decision Support System for Efficient Irrigation in the Middle Rio Grande (Albuquerque Reach)	MRGCD and Colorado State University	multi-year	no	Species Water Mgmt.	07-CS-40-8208	\$153,474	FY 2007

### 3.2.1 Assessment of Storage and Operations Options with Upper Rio Grande Water Operations Model

The goal of this ongoing work is to use the Upper Rio Grande Water Operations Model (URGWOM), a basin-scale water-routing model, to evaluate reservoir storage options, potential water savings, and operations that would assist in meeting the requirements of the 2003 BiOp. A final report was submitted in September 2007 summarizing the potential benefits of conservation storage at Abiquiu Reservoir to meet BiOp and Rio Grande Compact (Compact) requirements. This report presents an evaluation of the maximum storage space needed to meet BiOp requirements under a variety of reservoir storage conditions and water-year types. Model results indicated that hydrology and Compact Article VII restrictions on reservoir storage are limiting factors to conservation storage.



Heron Reservoir; photo courtesy of Kevin Flanigan, NMISC.

### **3.2.2 Decision Support System for Middle Rio Grande Irrigation, Albuquerque Reach**

Since Fiscal Year 2003, the Program has been supporting efforts to develop a decision support system to support the implementation of efficient rotational water delivery in the MRG irrigation system, which will allow irrigation demands to be met with reduced diversions from the Rio Grande, and in water-short years, could extend the irrigation season, and therefore the proportion of the season during which irrigation flows can support river flows. The decision support system is a network of interlinked models that compute demand information at the farm level, and use that information to prioritize water delivery.

The first two years of the project, with FY 2003 - 2004 funding from the Program, primarily focused on the Belen Division, where the work also included district-wide introductory workshops on rotational water delivery. In years 2006 and 2007, with financial support from the NMISC, project activities were extended to include the Socorro Division. The Decision Support System and data files for both Belen and Socorro Divisions are completed and were used by the Middle Rio Grand Conservancy District (MRGCD) as a preliminary planning tool for the 2008 irrigation season. In 2007, the Program funded expansion of the Decision Support System to the Albuquerque Division, where data collection and model development are currently underway. Future work is intended to allow the MRGCD to use this system to facilitate system operations throughout the irrigation season.

### 3.2.3 Riparian Groundwater Models

Since 2003, the Program has been funding the development of a suite of riparian groundwater models along the MRG corridor. These models have been developed to simulate shallow groundwater conditions and exchanges between surface water and shallow groundwater within the floodplain of the Rio Grande from Cochiti Dam to Elephant Butte Reservoir. They improve our ability to assess shallow groundwater conditions important to water supply reliability in specific river reaches and to evaluate the feasibility of habitat restoration strategies, as well as the effectiveness of specific habitat restoration projects.

In FY 2007, the Program Funded continued development and refinement work on this riparian groundwater model network through the development of two additional riparian-zone groundwater models for the Bosque del Apache and Fort Craig reaches; and refinement of the existing six riparian models, Cochiti, Upper Albuquerque, Lower Albuquerque, Belen, Bernardo, and Socorro. Development of the Bosque del Apache and Fort Craig models, representing the reach of the Rio Grande between the North Boundary of Bosque del Apache and the northern end of the Elephant Butte Reservoir, New Mexico (Figure 3.2.3.1) has been completed.



Figure 3.2.3.1. Suite of Riparian Groundwater Models for the Middle Rio Grande.

### 3.3 Species Monitoring and Salvage

The Program is engaged in ongoing population monitoring programs for both listed species of concern, the silvery minnow and the flycatcher, as well as a rescue and salvage program for silvery minnow during periods of river drying and intermittency. The population monitoring programs track both population numbers and distributions and can support evaluation of the success of river operations changes and habitat restoration efforts. An additional population estimation program for silvery minnow attempts to correlate the monitoring numbers to actual fish population numbers in the Rio Grande. Table 3.3.1 summarizes the Program-funded projects related to species monitoring and salvage.

**Table 3.3.1 Collaborative Program FY 2006 and FY 2007 Funded Projects:  
Species Monitoring and Salvage**

Funded Projects – Funded Entity	Entity Performing Work	Continuing Activity or Distinct Project	BiOp Requirement	Sponsoring Workgroup	Grant/ Contract #	Amount Appropriated	Year of Allocation
<b>Species Monitoring and Salvage</b>							
Southwestern Willow Flycatcher Surveys	Bureau of Reclamation	ongoing	yes	Science	05-PE-811079	\$187,711	FY 2006
					05-PE-811079	\$235,174	FY 2007
Southwestern Willow Flycatcher Monitoring at Isleta Pueblo	University of New Mexico, "Natural Heritage New Mexico"	multi-year project	no	Science	06-CR-40-8147	\$38,001	FY 2007
Rio Grande Silvery Minnow Population Monitoring	American Southwest Ichthyological Researchers, L.L.C.	ongoing	yes	Science	03-CR-40-8029	\$168,647	FY 2006
					03-CR-40-8029	\$248,802	FY 2007
Rio Grande Silvery Minnow Population Estimation	American Southwest Ichthyological Researchers, L.L.C.	five-year project	no	Science	05-CR-40-8119	\$89,458	FY 2006
					05-CR-40-8119	\$144,774	FY 2007
Evaluation of Impacts of Canal Entrainment of eggs on Rio Grande Silvery Minnow	US Fish & Wildlife Service / New Mexico Fish and Wildlife Conservation Office.	ongoing	yes	Science	06-AA-40-2556	\$24,766	FY 2006
					06-AA-40-2556	\$27,035	FY 2007
Rio Grande Silvery Minnow Rescue and Salvage	U.S. Fish & Wildlife Service	ongoing	yes	Science	06-AA-40-2491	\$590,509	FY 2006
					06-AA-40-2491	\$352,901	FY 2007



### 3.3.1 Southwestern Willow Flycatcher Surveys

Reclamation conducts annual Southwestern willow flycatcher (flycatcher) presence/absence surveys within 5 specified reaches of the Middle Rio Grande. The surveys provide continuous documentation of local breeding populations of the endangered flycatcher in those reaches. Continuation of annual monitoring allows for an assessment of population trends and is essential for evaluation of the effectiveness of efforts implemented to support the recovery of this species.

During the FY 2006 monitoring season (Ref. 26) 179 territories were found, including 21 in the Sevilleta National Wildlife Refuge (NWR)/La Joya State Wildlife Area; one in the Belen reach, one in the Escondida reach, four in the Bosque del Apache NWR, and nine within the Tiffany reach (a subset of the San Marcial reach). The remaining territories were identified in the San Marcial area.

In the FY 2007 monitoring season, 232 flycatcher territories were detected by Reclamation in the above reaches of the Rio Grande, including 22 in the Sevilleta NWR/La Joya State Wildlife Area; one in the Belen reach, in the Escondida reach, seven in the Bosque del Apache NWR, and three within the Tiffany reach. The remaining territories, 197, were identified in the San Marcial area.

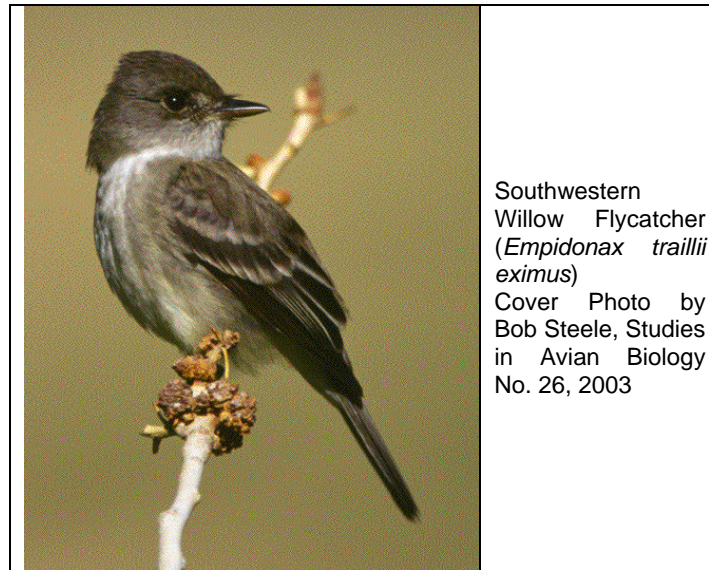
All associated data from the willow flycatcher survey are incorporated into the Southwestern willow flycatcher range-wide database. The New Mexico flycatcher data is compiled annually and submitted to the State of Arizona – Partners in Flight Program for incorporation into the range-wide database. This information is retained by all participating state wildlife agencies and the Service. The data are scaled to account for survey intensity, and then are analyzed to determine range-wide population trends and distribution, as well as habitat use.



Southwestern Willow Flycatcher nest ( photo courtesy of Darrel Ahlers and Dave Moore)



Southwestern Willow Flycatcher chicks ( photo courtesy of Darrel Ahlers and Dave Moore)



### 3.3.2 Southwestern Willow Flycatcher Monitoring at Isleta Pueblo

The Program has undertaken a five-year effort of monitoring flycatcher and flycatcher habitat in Isleta Pueblo. The general goals of this project are to: (1) understand surface water requirements for territory establishment, nesting, and habitat development/maintenance at the Pueblo of Isleta, (2) develop plans for water management to benefit nesting SWFL at the Pueblo, and (3) implement these plans, while monitoring associated SWFL reproductive success. This effort has included five years of monitoring of flycatcher nesting, three years of studying habitat preferences, and two years of mapping water distribution and vegetation.

It has been concluded from these surveys that flycatchers at the Pueblo of Isleta fit the typical flycatcher habitat profile. Flycatchers at this study site commonly establish territories in three vegetation types, all of which contain a cottonwood overstory and coyote willow and/or Russian olive understory. Within territories, flycatchers tend to nest on the edges of clumps, near open meadow habitat, and over wet soil. Nests are typically placed in the densest vegetation in the territory. Nests with low-density vegetation above the nest appear to be at increased risk of nest parasitism.

Soil moisture patterns were found to be spatially associated with development of native shrub structure, as evidenced by the increasing height and density of willows in the wetter southern map units. Nesting success appears to vary with the temporal and spatial distribution of standing water. Success has been highest in years when soils are wet during territory establishment and dry by mid-June. Successful nests, however, were only slightly more common over wet than over dry soil, possibly because birds sometimes choose nest sites with a preference for vegetation structure over soil saturation.

### **3.3.3 Rio Grande Silvery Minnow Population Monitoring**

Population monitoring of the silvery minnow and the associated Middle Rio Grande fish community has been systematically conducted since 1993. In FY 2006 and FY 2007, the Program funded continuation of population monitoring, through monthly to quarterly sampling of the entire ichthyofaunal community at 20 different sites along the MRG. This long-term sampling program allows for documentation of silvery minnow population trends, and provides a measure of the success of habitat restoration efforts.

Population monitoring showed a decline in silvery minnow populations in 2006, but a strong recovery in 2007. However, the October 2006 density of silvery minnow was still significantly higher than it was in 2003. The San Acacia Reach yielded most of the silvery minnow in 2006, followed by the Isleta Reach and the Angostura Reach. In 2007, the Angostura Reach yielded most of the Rio Grande silvery minnow, followed by the Isleta Reach, and the San Acacia Reach. Shoreline pool habitats, backwaters, and debris piles comprised the most frequently occupied habitats by Rio Grande silvery minnow in all reaches.

High silvery minnow reproduction rates have been found to correlate with favorable hydrologic conditions. Evaluation of population trends documented in this study strongly suggest that silvery minnow populations decrease during years with low spring discharge, especially when combined with prolonged summer low-flow/drying conditions, but consistently increase following years with extended high spring flows.

### 3.3.4 Rio Grande Silvery Minnow Population Estimation

Population estimation supplements the current population monitoring program by providing a rigorous yearly estimate of the silvery minnow population during a single time-period (October). Population size is estimated through the application of rigorous statistical analyses of the October population monitoring data.

Data obtained from 20 sites were used to calculate the annual population estimates. These included six sites in the Angostura reach, five sites in the Isleta reach, and nine sites in the San Acacia Reach. Shown in figure 3.3.4.1 are the 20 sample sites selected. The total population estimate for 2006, which includes marked and unmarked fish, was highest in the Angostura reach (N=12,833) and lowest in the Isleta reach (N=6,177). The overall population estimate (N=33,223) had a reasonably low associated standard error. The unmarked silvery minnows showed a population estimate of N=6,711 in the Angostura reach, N=5,827 in the Isleta reach, and N=10,673 in the San Acacia reach, for a total of 24,469 silvery minnows. The population estimates from October 2006 data were generated following a period of poor Rio Grande silvery minnow spawning and recruitment. These monitoring efforts indicated that the silvery minnow population had declined more than an order of magnitude between 2005 and 2006.

As explained above, the silvery minnow populations experienced recovery in 2007, with population estimates increasing by over an order of magnitude. The 2007 population estimate was highest in the Isleta Reach (N = 417,099) and lowest in the San Acacia Reach (N = 5,800). The overall population estimate (N = 613,638) had a standard error [SE] of 259,983.21. The total population estimate for unmarked Rio Grande silvery minnow was 609,712.

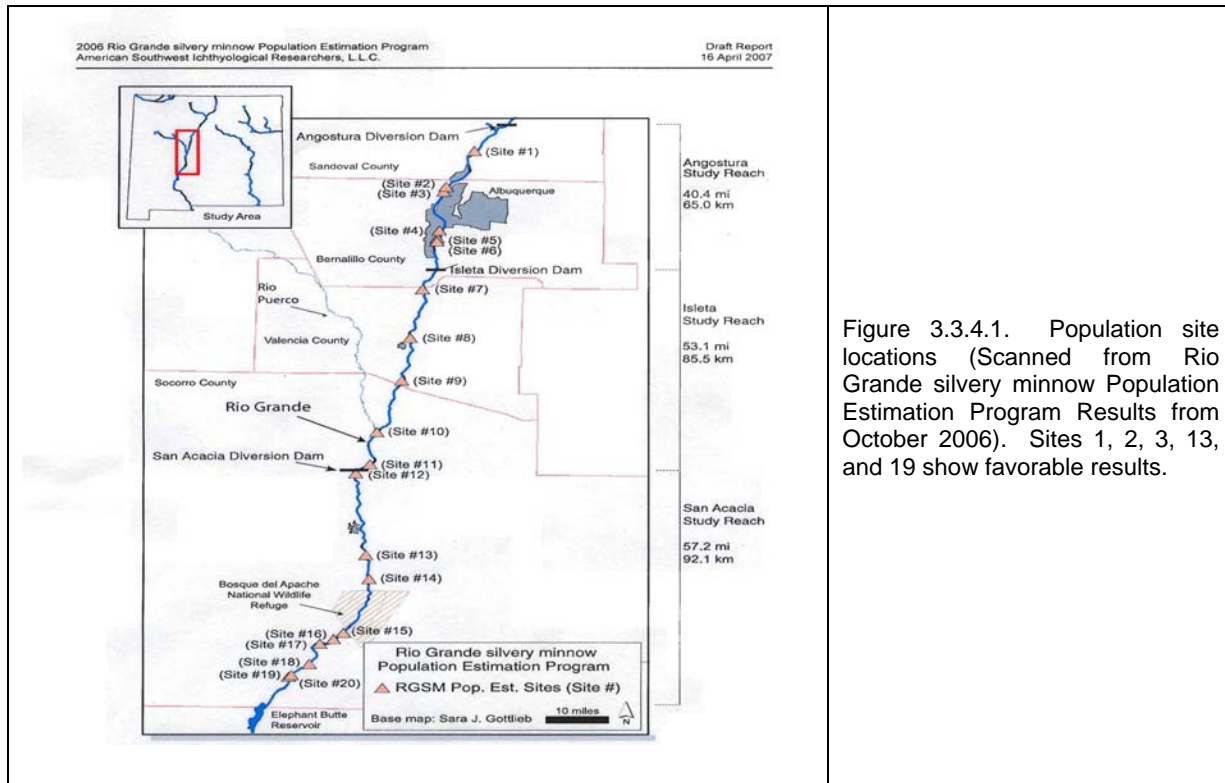


Figure 3.3.4.1. Population site locations (Scanned from Rio Grande silvery minnow Population Estimation Program Results from October 2006). Sites 1, 2, 3, 13, and 19 show favorable results.

### **3.3.5 Canal Entrainment Impacts**

During irrigation season (March to November), the diversion dams pose a specific threat to fish and fish eggs as they become entrained (transported through the canal system along with irrigation water) and are unable to return to the river. During the silvery minnow spawning period (May 1 – May 31), the number of silvery minnow eggs entrained into main canals associated with the Angostura, Isleta, and San Acacia diversion dams is documented annually. Egg entrainment monitoring in irrigation canals is required as part of the 2003 BiOp requirements Reasonable and Prudent Measures (RPM). Daily notification of the numbers of fish and eggs entrained are provided to action agencies so that they might minimize silvery minnow incidental take due to diversions.

### **3.3.6 Rio Grande Silvery Minnow Rescue and Salvage**

The 2003 BiOp requires that the Fish & Wildlife Service perform fish rescue and salvage operations to reduce the mortality of Rio Grande silvery minnows when flow in the Middle Rio Grande became intermittent. The Middle Rio Grande rescue and salvage program seeks to salvage silvery minnow from intermittent reaches of the Rio Grande between Angostura Dam and Elephant Butte Reservoir that, without management intervention, would likely result in substantial silvery minnow mortality. The silvery minnow are rescued from isolated pools and transported to upstream perennial reaches.

The 2006 silvery minnow rescue and salvage program was conducted by the U. S. Fish & Wildlife Service's New Mexico Ecological Services Field Office. The amended incidental take limit that applied during 2006 was 265,935 silvery minnows (at least 30 mm standard length) observed dead. The death of 2,400 silvery minnows was attributed to water operations in the Middle Rio Grande during the 2006 irrigation season. This level of incidental take was within legal limitations established under the 2003 BiOp.

New Mexico Fish and Wildlife Conservation Office (FWCO) has responsibility for salvage operations for Rio Grande silvery minnow. FWCO formulated a new salvage protocol in 2007 to more effectively manage the salvage activities. The new protocol defined how and when silvery minnow would be salvaged. These criteria were developed based on field experience, and were defined in terms of such parameters as air temperature and fish health.,

In 2007, an estimated total of 13,953 silvery minnow were salvaged from isolated pools, transported, and released alive in the Middle Rio Grande. The death of 92 silvery minnow was attributed to water operations in the Middle Rio Grande during the 2007 irrigation season and assigned as incidental take. This level of incidental take was well below the legal limitations established under the BiOp for 2007, 1,112,109 silvery minnow, which is considered equivalent to 22,242 silvery minnow observed dead. The death of 2,902 silvery minnow was attributed to U.S. Fish and Wildlife Service permit activities. The implementation of a new salvage protocol in 2007 likely resulted in fewer numbers of silvery minnow being rescued than would have been otherwise, but in greater confidence in the survival of the rescued fish.



Figure 3.3.6.1. Fish Rescue Operations in the Isleta Reach, Mike Hatch center (Photo by S.C.Gonzales, Reclamation, Socorro)



Figure 3.3.6.2. Fish Rescue Operations in the Isleta Reach, Pauletta Dodge, on right (Photo by S.C. Gonzales, RECLAMATION Socorro)



Figure 3.3.6.3. Juvenile Minnow Salvage at Los Lunas Habitat Restoration Site.



### 3.3.7 Monitor Reproductive Periodicity of Rio Grande Silvery Minnow

In this study, which supports a number of the recovery goals for the silvery minnow, reproductive output of silvery minnow was monitored in each of the three Middle Rio Grande reaches still known to provide habitat for silvery minnow (the Albuquerque, Isleta/Belen, and San Acacia reaches). This work builds on research begun in 1999, and continued in 2002 through 2004. The 2006 effort was specifically designed to provide insight into the success of recent silvery minnow stocking efforts. The 2006 effort was structured to monitor the spatial and temporal reproductive output of the silvery minnow in the MRG and was focused near the downstream-most portion of each of the three reaches.

Spawning was found to correlate most closely with sharp increases in flow, rather than with the highest river discharge. The highest numbers of eggs relative to volume sampled were found in the furthest downstream sampling location, San Marcial. The researchers interpreted the concentration of eggs at the bottom end of the reach to indicate the continuing effects of the downstream displacement of drifting fish eggs and larvae.

### 3.4 Captive Propagation and Population Augmentation

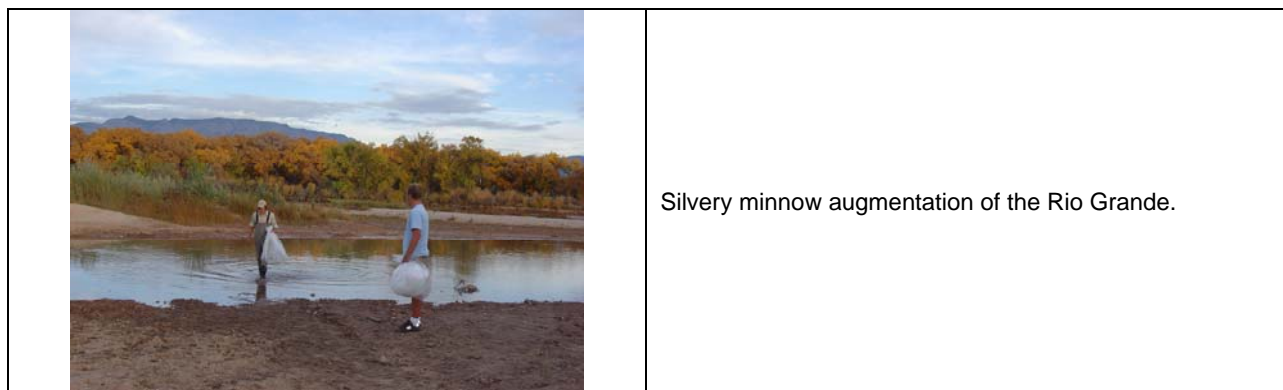
The Program has funded the construction, operation, and maintenance of two rearing and breeding facilities for the silvery minnow in the Middle Rio Grande, as well as expansion, operation, and maintenance of the U.S. Fish & Wildlife Service's Dexter National Fish Hatchery. The rearing and breeding facilities in the Middle Rio Grande region include the City of Albuquerque's BioPark Refugium, and the NMISC's Los Lunas Silvery Minnow Refugium. These facilities significantly aide in reestablishing, stabilizing, and enhancing populations of the minnow within its historic range of the Rio Grande Basin. A ceremony was held on May 29, 2007 to commemorate the release of the one millionth silvery minnow into the Middle Rio Grande from the propagation facilities funded by the Program. Table 3.4.1 summarizes the captive propagation and population augmentation projects funded by the Program in Fiscal Years 2006 and 2007. The projects are described in the following sections.

	
Rio Grande Silvery Minnow	Tom Udall speaking at celebration of the release of the millionth silvery minnow into the Rio Grande.

**Table 3.4.1 Collaborative Program FY 2006 and FY 2007 Funded Projects:**

**Captive Propagation**

Funded Projects – Funded Entity	Entity Performing Work	Continuing Activity or Distinct Project	BiOp Requirement	Sponsoring Workgroup	Grant/ Contract #	Amount Appropriated	Year of Allocation
<b>Captive Propagation and Population Augmentation</b>							
Rio Grande Silvery Minnow Rearing & Breeding Operations and Maintenance (Albuquerque BioPark facility)	City of Albuquerque	ongoing	yes	Science	03-FG-40-2123	\$82,755	FY 2006
					03-FG-40-2123	\$156,800	FY 2007
Rio Grande Silvery Minnow Propagation & Facility Expansions (Dexter facility)	U. S. Fish & Wildlife Service	three-year facility expansion	yes	Science	06-AA-40-2508A	\$200,000	FY 2006
					06-AA-40-2508A	\$200,000	FY 2007
Propagation of the Rio Grande Silvery Minnow, and operations and maintenance of Dexter facility.	U. S. Fish & Wildlife Service	ongoing	yes	Science	02-AA-40-8350	\$231,103	FY 2006
					07-AA-40-2634	\$349,012	FY 2007
Experimental Augmentation & Monitoring	U.S. Fish & Wildlife Service	multi-year project	yes	Science	02-AA-40-8780	\$202,907	FY 2006
					02-AA-40-8780	\$174,016	FY 2007
Rio Grande Silvery Minnow Rearing & Breeding Operations and Maintenance (Los Lunas naturalized refugium)	New Mexico Interstate Stream Commission	ongoing	yes	Science	07-PG-43-0099	\$37,780	FY 2007
Genetic Monitoring of the Rio Grande Silvery Minnow: Genetic Status of Wild and Captive Stocks in 2007	University of New Mexico (Department of Biology and Museum of Southwestern Biology)	ongoing	indirect	Science	02-FG-40-8120	\$74,990	FY 2006
Assessment and Monitoring of Rio Grande Silvery Minnow Genetics					07-FG-40-2662	\$147,011	FY 2007





### 3.4.1 Rio Grande Silvery Minnow Rearing & Breeding Operations and Maintenance (Albuquerque BioPark)

This project provides funding for the operation and maintenance of the City of Albuquerque’s silvery minnow Rearing and Breeding Facility located at the Albuquerque Biological Park. The continued operation of the facility promotes the recovery of the silvery minnow and increases silvery minnow numbers in the wild through captive propagation and augmentation. The Rearing and Breeding facility is designed as a practical breeding and rearing center, as well as a research center. The facility includes indoor culture systems, outdoor culture systems, and the Naturalized Refugium. The indoor systems are used for quarantine, breeding, egg hatching, and rearing larvae. The outdoor systems are used for raising larvae to sub-adult age as well as holding large numbers of broodstock. The Naturalized Refugium is an outdoor system that creates a river-like environment with controllable flow, variable depth, variable habitat, and natural substrate.

In 2006, the estimated number of silvery minnow in the Naturalized Refugium was 22,963, and the number in the indoor holding tank farm was 47,834, for a total of **70,922**. The estimated numbers of silvery minnow transferred in 2006 are as follows: 138,039 stocked to river, 220,000 sent to other facilities, 250 received from other facilities, and zero received from the river.

In 2007, the estimated number of silvery minnow in the Naturalized Refugium was 3,647, and the number in the indoor holding tank farm was 20,073, for a total of **24,295**. The estimated numbers of silvery minnow transferred in 2007 are as follows: 48,308 stocked to river, 14,640 sent to other facilities, 1,700 received from other facilities, and zero received from the river.

The age group breakdown for the estimated number of silvery minnow in the Naturalized Refugium in 2006 and 2007 can be seen in the table below:

AGE	2006	2007
0 to 2 months	0	0
2 to 10 months	56,330	5,147
older than 10 months	14,592	19,148
<b>TOTALS</b>	<b>70,922</b>	<b>24,295</b>

The estimated numbers of silvery minnow eggs in the Naturalized Refugium in 2006 and 2007 can be seen in the table below. Approximately half of the 2006 eggs were transferred to the FWS Dexter National Fish Hatchery and Technology Center (Dexter Hatchery) in Dexter, New Mexico.

<b>TYPE</b>	<b>2006</b>	<b>2007</b>
Wild caught	817,259	20,492
Generated in refugia by paired matings	10,106	0
Generated in refugia by group matings	30,247	15,390
Generated in refugia by environmental spawning cue *(flow and turbidity modification in 2007)	9,813	*11,970
<b>TOTALS</b>	<b>867,425</b>	<b>47,852</b>

The Albuquerque BioPark provides tours to school groups and other interested parties and staff gives presentations to various professional organizations.



Figure 3.4.1.1. Filtration system in the Albuquerque BioPark Rearing and Breeding Facility.



Figure 3.4.1.2. Seining of minnows to check health progress, Albuquerque BioPark.



Photo by Craig Fritz Tribune  
The Albuquerque Tribune, by Sue Vorenberg (Point of Contact)  
Saturday, December 1, 2007, Internet search.

Figure 3.4.1.3. Adam DeGroot (right) and Kim War sweep a net through the natural refugium of the Rio Grande Silvery Minnow Rearing and Breeding Facility at the Albuquerque BioPark. The facility's staff take a monthly survey of the silvery minnows.

### 3.4.2 Rio Grande Silvery Minnow Rearing & Breeding Operations and Maintenance, Propagation & Facility Expansions (Dexter Hatchery)

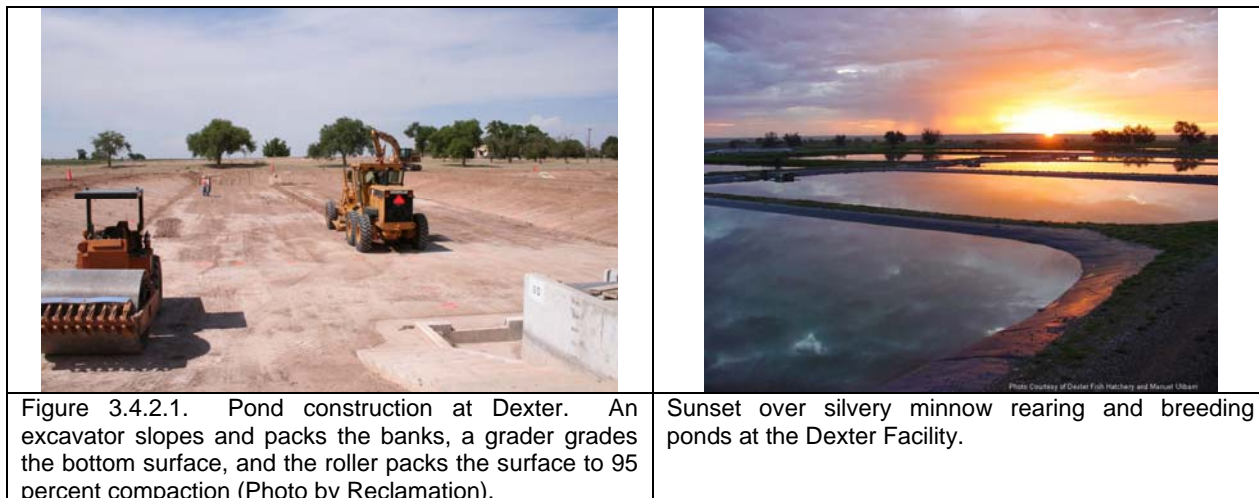
The cooperative project at the Service's Dexter National Fish Hatchery utilizes the joint expertise of federal, state and educational institutions to significantly aid in reestablishing, stabilizing, and enhancing populations of the silvery minnow within its historic range of the Rio Grande Basin. The Dexter Facility produces 250,000-300,000 Rio Grande silvery minnow annually for river augmentation. The facility holds an additional 80,000-100,000 silvery minnow over winter and 16,000-20,000 captive broodstock year-round.

The Program funds both the operation and maintenance activities for silvery minnow propagation at the Dexter Hatchery. In 2006, four new ¼ acre earthen ponds were constructed, which enabled the facility to double its silvery minnow rearing capacity. Additionally, 2007 funds have been applied to the construction of a new 3,000 square foot silvery minnow Isolation/Quarantine room adjacent to the new Dexter Fish Health Unit labs. The isolation area will be used to house wild caught silvery minnow sub adults, adults, and as many as 250,000 eggs collected during the annual egg salvage operations on the Rio Grande.

The Dexter Hatchery utilizes the following facilities to spawn rear and maintain silvery minnows:

- 34 ea. 4-foot circular 230-gallon tanks
- 20 ea. 10-foot rectangular 500-gallon tanks
- 4 ea. 4,000 gallon 60-foot raceways
- 40 ea. 3-foot circular 125-gallon tanks
- 72 ea. earthen and lined ponds
- 3 ea. recirculating systems (4,000-gallon, 3,000-gallon, and 2,000-gallon)
- 1 ea. 2,000-gallon water reuse system

Water is supplied to the fish culture units from a shallow water aquifer using pumps with a capacity of up to 2,000-gallons per minute. A total of 280,812 young-of-year fish produced at Dexter were stocked into the Middle Rio Grande in 2006. During 2007, a total of 89,876 silvery minnow sub-adults produced at Dexter were stocked into the Middle Rio Grande. The facility conducts research for fish health assessments, maintains captive broodstocks, and utilizes it's facility to rear and maintain larvae and adults.



### 3.4.3 Rio Grande Silvery Minnow Rearing and Breeding Operations and Maintenance (New Mexico Interstate Stream Commission's Los Lunas Refugium)

The NMISC has constructed and begun operations at a new silvery minnow refugium in Los Lunas, New Mexico. The new facility was built to help the federal government comply with the 2003 BiOp, through:

- Spawning and propagation of silvery minnow to augment existing populations in the MRG, as well as other stretches of Rio Grande
- Housing of a refugial population, so the species will not go extinct in the case of river disasters
- Housing of an additional “insurance” captive population in case a disease affects other silvery minnow breeding and propagation facilities

The new Silvery Minnow Refugium consists of a 1,500 square-foot indoor hatchery, and 0.5-acre outdoor refugium, 700 square feet of office space, and a 2,000 square-foot storage building. The indoor hatchery houses tanks, aquaria and three recirculating systems that filter and purify the water. The outdoor refugium mimics the Rio Grande and has all habitats critical for different life stages of silvery minnow; it also produces hydrologic conditions that mimic the Rio Grande hydrograph, including the spring snowmelt runoff. The facility cost \$1.7 million, including costs for design, engineering, and construction. Funding was provided by the NMISC and two grants from New Mexico Water Trust Board. This funding provides non-federal cost share to Middle Rio Grande Endangered Species Collaborative Program.



NMISC staff pose with shovels at groundbreaking ceremony for the Los Lunas silvery minnow refugium.



Construction of naturalized habitat at the Los Lunas silver minnow refugium.

### **3.4.4 Experimental Augmentation & Monitoring**

This program evaluates the effectiveness of silvery minnow population augmentation into the Middle Rio Grande and monitors the temporal and spatial movements of released silvery minnow. Specific objectives include (1) determining survival of released silvery minnow, (2) determining temporal and spatial dispersal of released silvery minnow, (3) identifying and characterizing river reaches where survival of released silvery minnow is maximized, (4) evaluating the effects of augmentation on future recruitment, (5) developing protocols for stocking and (6) increasing the density of silvery minnow.

In response to declining distribution and abundance trends, New Mexico Fish and Wildlife Conservation Office has released over 1,000,000 hatchery-raised Rio Grande silvery minnow into the Rio Grande since 2002.

In 2007, 133,154 Rio Grande silvery minnow were released into the Middle Rio Grande. Along with favorable spring snowmelt flows for spawning and recruitment in 2004 and 2005, these efforts resulted in increased catch rates of young-of-year Rio Grande silvery minnow initially in the Angostura Reach, but increases have been seen in all reaches since.

Results indicate that hatchery-raised individuals can be released back to the wild with adequate retention in or near original release sites; can experience survival of at least 2 years after release; and ultimately can contribute to future spawning efforts. Future efforts in 2008 will include continuing augmentation efforts in the Middle Rio Grande and eventual reintroductions in the Big Bend region of Texas.

### **3.4.5 Genetic Monitoring of the Rio Grande Silvery Minnow: Genetic Status of Wild and Captive Stocks**

This project is a genetics study of monitoring wild silvery minnow to determine levels of genetic variability. The study also includes genetic screening of captivity-propagated silvery minnow and subsequent comparisons of genetic diversity among fish from alternative hatchery breeding practices and to wild stocks. Eggs are collected from the Middle Rio Grande in the Angostura, Isleta and San Acacia reaches. The eggs are hatched in captivity and later released to the Rio Grande. Captive and wild adults contribute progeny (offspring) to each river reach. Some yearly production is retained in each reach to which releases are made, but some upstream fish move downstream with river currents from the Angostura reach to the Isleta and San Acacia reaches. In low flow years, fewer fish may be lost to downstream transport, but mortality due to river drying can cause loss of diversity in these lower reaches.

In 2007, the wild Rio Grande silvery minnow stock declined in all measures of genetic diversity when compared to diversity values obtained in 2005 and 2006. This decrease in genetic diversity correlates with an order-of-magnitude decrease in adult silvery minnow density in the Middle Rio Grande. Lowered adult densities in 2007 suggest that Rio Grande silvery minnow suffered poor recruitment in 2006. Another potential explanation for the reduced genetic diversity in 2007 is that all fishes repatriated to the river in 2006 were derived from captive-bred parents, rather than wild-caught eggs reared in captivity. In previous studies it has been documented that fishes derived from wild-caught eggs exhibit higher genetic diversity than captive-bred fishes.

### 3.5 Habitat Restoration Planning

Habitat restoration planning activities funded in FY 2006 and FY 2007 were intended to systematically analyze the best opportunities for habitat restoration to benefit listed species in each reach of the MRG. More specifically, Reach-Specific Analysis and Recommendation reports are intended to: 1) serve as a “step down” (more detailed) habitat restoration plan using the information contained in the *Habitat Restoration Plan for the Middle Rio Grande*, prepared for the Collaborative Program in September, 2004; (2) provide a description of the physical and biological environment for the Reach; (3) identify and analyze existing data; (4) identify data gaps within existing data; (5) assess current habitat availability and conditions for the silvery minnow and flycatcher; (6) identify habitat needs; (7) identify opportunities and constraints for habitat restoration projects in the Reach; (8) identify appropriate restoration practices and specific restoration projects; (9) identify appropriate project evaluation criteria, monitoring plans, and adaptive management procedures; and (10) describe anticipated future conditions after recommended habitat restoration projects are completed. An additional planning project was undertaken to support environmental compliance for fish passage at San Acacia diversion dam. Habitat restoration planning activities funded by the program in Fiscal Years 2006 and 2007 are listed in table 3.5.1 and described in the following sections.

**Table 3.5.1 Collaborative Program FY 2006 and FY 2007 Funded Projects:  
Habitat Restoration Planning**

Funded Projects – Funded Entity	Entity Performing Work	Continuing Activity or Distinct Project	BiOp Requirement	Sponsoring Workgroup	Grant/ Contract #	Amount Appropriated	Year of Allocation
<b>Habitat Restoration Planning</b>							
Velarde Reach Habitat Restoration Analysis and Recommendations	Parametrix, Inc.	one-year	no	Habitat Restoration	07-CS-40-8188	\$390,024	FY 2007
Isleta Reach Habitat Restoration Analysis and Recommendations	Parametrix, Inc.	multi-year project	no	Habitat Restoration	06-CR-40-8146	\$387,203	FY 2006
San Acacia Reach Habitat Restoration Analysis and Recommendations	Parametrix, Inc.	one-year project with one-year extension	no	Habitat Restoration	06-CR-40-8127	\$208,594	FY 2006
					06-CR-40-8127	\$49,229	FY 2007
San Marcial to Elephant Butte Reach Habitat Restoration Analysis and Recommendations.	Parametrix, Inc.	one-year project	no	Habitat Restoration	07-CS-40-8189	\$202,321	FY 2007
San Acacia Fish Passage	Bureau of Reclamation	multi-year project	yes	Habitat Restoration	06-PE-40-0211	\$284,596	FY 2006
					Various	\$146,200	FY 2007
2005 Overbank Flooding Data Collection	U.S. Army Corps of Engineers	one-year project	no	Habitat Restoration	05-AA-40-2384	\$19,894	FY 2006



### **3.5.1 Velarde Reach Habitat Restoration Analysis and Recommendations**

The objective of this study, which is currently underway, is to evaluate and recommend projects aimed at improving habitat for the silvery minnow and flycatcher in the Velarde reach of the Middle Rio Grande. The area under study is along the mainstem Rio Grande from the Colorado state line to the Otowi gauge (Velarde Reach) and along the Rio Chama between Abiquiu Dam and the confluence of the Rio Grande. In 2007, hydrology, vegetation and GIS information was compiled and analyzed.

### **3.5.2 Isleta Reach Habitat Restoration Analysis and Recommendations**

In Fiscal Year 2006, the Program funded a project to develop scientifically-based restoration recommendations to improve the habitat and population status for the silvery minnow and the flycatcher in the 48-mile long Isleta reach, which was defined for purposes of this project to extend from the south boundary of the Isleta Pueblo to the San Acacia Diversion Dam. The project involved review, analysis and interpretation of existing data and reports, as well as general project site reconnaissance toward the development of conceptual-level recommendations for habitat improvements.

Several restoration conceptual designs and techniques were hypothesized in the resulting report to improve habitat conditions for the silvery minnow and flycatcher in the Isleta Reach. The recommended restoration techniques include:

- Reworking stable, accreted islands and vegetated bars to enhance the active channel and improve hydraulic conditions for silvery minnow habitat at moderate and high flows.
- Destabilizing channel bank-lines to stimulate channel migration and facilitate the deposition of large woody debris into the channel. By increasing channel bank erosion and encouraging the introduction of large woody debris into the channel, more low-velocity, deep pool habitat for the silvery minnow may be created during low-flow conditions in proximity to the woody debris piles.
- Constructing Gooding's and coyote willow habitat and backwater channels in areas near existing flycatcher breeding sites. These projects are intended to facilitate expansion of breeding territories in the project reach. The backwater channels are also intended to provide low-velocity refuge habitat for the silvery minnow during moderate and high flows.

### **3.5.3 Restoration Analysis and Recommendations for the San Acacia Reach of the Middle Rio Grande**

Also in Fiscal Year 2006, the Program funded a project to develop scientifically-based restoration recommendations aimed at improving habitat and population status for the silvery minnow and the flycatcher in the San Acacia reach of the Middle Rio Grande. The San Acacia Reach is between the San Acacia Diversion Dam and the San Marcial Railroad Bridge. Like the Isleta reach restoration analysis and recommendations project, the project involved review, analysis, and interpretation of existing data and reports, as well as general project site reconnaissance, toward the development of conceptual-level recommendations for habitat improvements.

The final project report recommended a number of locations where improvements to the river system could be made to enhance habitat for native species. The recommended habitat improvements include:

- Mowing and plowing of active channel bars (“island destabilization”) to remove vegetation and roots from accreted islands that no longer inundate or inundate infrequently. The researchers hypothesize that destabilizing these islands will improve aquatic habitat for the silvery minnow by reversing channel narrowing processes and promote reactivation of otherwise stabilized sand bars.
- Destabilization of terrace bank-lines through vegetation and root removal. This technique could be applied to areas where the river channel is poised to undercut and erode the paleo-floodplain and is hypothesized to promote channel widening and migration, and deposition of large woody-debris into the channel.
- Relocation of the active channel away from the Low Flow Conveyance Channel (LFCC), to mitigate channel-drying conditions in project locations by reducing the groundwater gradient between the LFCC and the river channel. This technique is hypothesized to be best applied in areas where the channel has a natural tendency to migrate onto the east floodplain, where there is evidence that the new channel location may be in more direct contact with shallow groundwater, and where channel movement is currently restricted by dense floodplain vegetation.
- Construction of willow swales where natural willow establishment is prevented by the absence of overbank flooding. This restoration technique is specifically recommended as a flycatcher habitat improvement.

#### **3.5.4 San Marcial to Elephant Butte Reach Habitat Restoration Analysis and Recommendations**

This study analyzed and developed recommendations for habitat restoration projects to benefit the silvery minnow and the flycatcher in the reach of the MRG between San Marcial and Elephant Butte Reservoir. As part of this project, hydrology, vegetation and land ownership in this reach was reviewed and mapped. Requirements for restoration site selection were developed and improvements were made to the GIS database for the reach. This reach has been found to be prime flycatcher habitat, but no recommendations were made for habitat improvements to benefit the silvery minnow.

#### **3.5.5 San Acacia Fish Passage**

Environmental studies of Fish Passage at the San Acacia Diversion Dam are ongoing. These studies are evaluating the most appropriate methods to allow upstream movement of silvery minnows and to address fragmentation of silvery minnow populations (Ref. 12). One of these studies has been undertaken at the City of Albuquerque BioPark to test a lock and lift alternative that was developed during a value engineering study. In addition, 2006 and 2007 funding has been applied towards environmental compliance activities for the project.

### **3.5.6 2005 Overbank Flooding Data Collection**

In April and June 2005, the US Fish and Wildlife Service (FWS) flew the Rio Grande corridor and collected high-resolution imagery of the exceptionally high spring runoff in the Rio Grande from Cochiti Dam downstream approximately 187 miles to Elephant Butte Reservoir. Using Fiscal Year 2006 funding from the Program, the resulting photographs were interpreted and ortho-rectified to create a set of digitized maps of the inundation patterns during this runoff event. These digitized maps are being used as a guide for habitat restoration projects.

### **3.6 Habitat Restoration Design, Permitting, and Construction**

Habitat restoration activities include physical manipulations of the Rio Grande channel (riverine restoration) and adjacent bosque (riparian restoration) to benefit the listed species. For FY 2006 and FY 2007, habitat restoration priorities included: planning, design, construction and monitoring of habitat restoration projects that would benefit the silvery minnow and flycatcher in various locations throughout the Middle Rio Grande. Table 3.6.1 summarizes the status of the projects described under Habitat Restoration Design, Permitting and Construction.



Bankline and native vegetation growing at the site of the habitat restoration project in Albuquerque. (Photo courtesy of the NMISC)

**Table 3.6.1 Collaborative Program FY 2006 and FY 2007 Funded Projects:  
Habitat Restoration Design, Permitting and Construction**

Funded Projects – Funded Entity	Entity Performing Work	Continuing Activity or Distinct Project	BiOp Requirement	Sponsoring Workgroup	Grant/ Contract #	Amount Appropriated	Year of Allocation
Phase II, Albuquerque Riverine Restoration	New Mexico Interstate Stream Commission	one-year project	yes	Habitat Restoration	06-FG-40-2549	\$2,176,500	FY 2006
Isleta Reach Riverine Restoration & Habitat Improvements	New Mexico Interstate Stream Commission	one-year project	yes	Habitat Restoration	07-FG-40-2708	\$548,550	FY 2007
Rio Grande Nature Center Habitat Restoration Project	U.S. Army Corps of Engineers	multi-year project	yes	Habitat Restoration	04-AA-40-2251	\$99,736	FY 2006
					04-AA-40-2251	\$237,570	FY 2007
Alleviating Rio Grande Silvery Minnow Entrapment	U.S. Army Corps of Engineers	multi-year project		Habitat Restoration	06-AA-40-2553	\$91,018	FY 2006
Construction of Perennial Refugia for Rio Grande Silvery Minnow at Drain Outfalls	Middle Rio Grande Conservancy District and Habitech, Inc.	multi –year project	yes	Habitat Restoration	05-FG-40-2436	\$91,502	FY 2006
					05-FG-40-2436	\$41,622	FY 2007
Evaluation of Perennial Wetted Instream Habitat Use by the RGSM: Monitoring of Fish and Habitat.	Habitech, Inc.	two-year project	no	Science	06-CR-40-8144 & 06-AA-40-2572	\$120,996	FY 2006
Evaluation of Perennial Wetted Instream Habitat Use by the RGSM: Water Quality Monitoring	U.S. Geological Survey			Science			
Evaluation of Perennial Wetted Instream Habitat Use by the RGSM: Water Quality Monitoring Extension	US Geological Survey	contract modification	no	Science	06-AA-40-2572	\$19,594	FY 2007
Cochiti Reach Minnow Habitat Construction, Santo Domingo Pueblo; Phases II and III	Santa Domingo Pueblo	multi-year project	yes	Habitat Restoration	06-NA-40-2552 (Phase 2)	\$358,776	FY 2006
					07-NA-40-2702 (Phase 3)	\$354,148	FY 2007
Succession and Suitability in Willow Flycatcher Habitat at Ohkay Owingeh	Ohkay Owingeh tribe	multi-year project	yes	Habitat Restoration	07-NA-40-2705	\$115,525	FY 2007
Pueblo of Sandia Habitat Restoration Project	Pueblo of Sandia and SWCA, Inc.	multi-year project	yes	Habitat Restoration	06-CR-40-8145 (SWCA)	\$239,152	FY 2006
					07-NA-40-2707 (Pueblo of Sandia)	\$961,481	FY 2007

### **3.6.1 Phase II, Albuquerque Riverine Restoration**

The NMISC seeks to proactively implement habitat improvements that meet the needs of the listed species throughout their life cycles. In the Albuquerque reach, reliable streamflows occur but habitat has been limited due mainly to channelization, channel degradation, flood-control features and operations that decrease peak flows, and an increased presence of vegetation. These changes have disconnected the floodplain from the channel in this reach, causing a loss of habitat primarily for the egg, larval and juvenile life stages of the silvery minnow which depend on seasonal overbank flows. Therefore, the NMISC has worked with the Program to restore natural river dynamics in this reach and to size habitat and river features so that they are consistent with the current hydrologic regime. The goal of the Phase I and Phase II restoration projects has been to redistribute the sediment mass so that the resulting bars and floodplain are inundated with appropriate frequency and duration to provide suitable habitat, including slow-moving water in overbank areas, for spawning and recruitment of silvery minnows at a variety of flows.

The NMISC's FY 2006 and FY 2007 habitat restoration projects are designed to increase habitat diversity and provide better egg retention and larval rearing to promote an increase in the silvery minnow population in the Albuquerque Reach. Habitat restoration techniques that have been employed on Program projects include destabilization of river bars, islands and/or banks, removal of channelization features such as jetty jacks, removal of exotic, woody vegetation from the riparian areas, construction of willow swales and backwater areas, modification of bars and bank-lines, lowering of terraces and banks, construction of ephemeral channels, and methods that promote riverbed scouring. The resulting habitat features allow for overbank flooding, provide water at the time needed to promote the natural establishment of willows for flycatcher habitat and create ephemeral nursery habitat for retention of silvery minnow larvae and eggs.

In the FY 2006 and FY 2007 phases of the NMISC's habitat restoration project, a total of 96.8 acres were modified within 5 subreaches of the Albuquerque reach: the Highway 550 reach in Bernalillo, the North Diversion Channel reach, the Paseo del Norte reach, the I-40 reach and the South Diversion Channel reach. A range of techniques were employed at sites within each of these reaches. Figure 3.2.1.1 shows the construction phase of one of the island modifications in the South Diversion Channel subreach. Figure 3.2.1.2 shows a bankline cut and embayment construction at a site in the I-40 subreach (Ref. 15). Shown in figure 3.2.1.3 is the modification of an island in the Paseo Del Norte subreach (Ref. 17).



Figure 3.6.1.1. Island modification in the South Diversion Channel subreach. (Photo provided by Anders Lundahl, Interstate Stream Commission and shown is Sara Beck, SWCA)



Figure 3.6.1.2. Bankline cut and embayment construction at a site in the I-40 to Central subreach. (Photo provided by Anders Lundahl, Interstate Stream Commission)



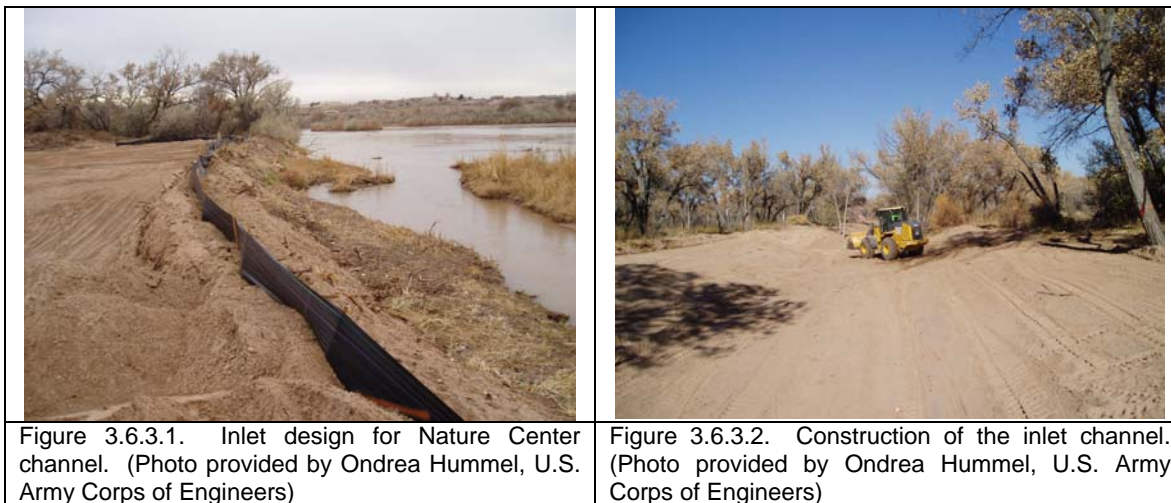
Figure 3.6.1.3. Island modification in the Paseo Del Norte subreach. The features shown are designed to inundate at river flows of 2,500 cfs or greater. The inundated shelf provides habitat to support various life stages of the silvery minnow. A shelf, approximately 8 to 10 wide, was also excavated on the northeastern bank of the island to provide additional habitat for silvery minnows at lower river flows. (Photo provided by Anders Lundahl, Interstate Stream Commission)

### 3.6.2 Isleta Reach Riverine Restoration and Habitat Improvements for the Rio Grande Silver Minnow

Techniques employed in the New Mexico Interstate Stream Commission's Albuquerque Reach habitat restoration projects, such as island lowering and bar and bank modifications, are being evaluated for their applicability in the Isleta reach, for the purpose of increasing spawning, retention and recruitment habitat for the silvery minnow in the Isleta Reach. The introduction of large woody debris to the river channel is also being considered. The NMISC hopes to develop habitat that will increase and protect the silvery minnow population in that reach as specified under the 2003 BiOp. The Environmental Compliance document is under review and construction is expected to begin in February 2009.

### 3.6.3 Rio Grande Nature Center Silvery Minnow Habitat Restoration Project

This project, performed under FY 2006 and FY 2007 Program Funding, has created and restored habitat for the silvery minnow and the flycatcher at the Rio Grande Nature Center in Albuquerque. In this project, an ephemeral side-channel in the floodplain was restored; reconnecting existing channel-like topography in the riparian zone to the river and providing areas where additional native vegetation, such as willow, can regenerate and create potential habitat for the flycatcher. Water, wildlife and habitat monitoring are now being implemented to monitor the effectiveness of this habitat restoration project.



### 3.6.4 Alleviating Rio Grande Silvery Minnow Entrapment

Historical river engineering activities such as straightening and deepening channels, altering river and floodplain elevations, and removing aquatic plants and snags, have reduced the number of clear escape routes for juvenile silvery minnow from shallow areas and pools. This project is intended to physically alter elevations of the Rio Grande floodplain and connect isolated pools to the main river channel using shallow channels. Excavation grades are designed to be shallow to prevent the draining of floodplains and pools so the project can effectively restore ecological function to the floodplain. Using FY 2006 funding, a project was designed in Bosque Farms, downstream of Isleta Pueblo on the east side of the river, to construct a channel through a natural bankline berm which would connect portions of the floodplain to the river at flows above 2,000 cfs. When constructed, the channel should establish an escape route for young-of-year silvery minnow spawned in the floodplain.

### 3.6.5 Construction of Perennial Refugia at Drain Outfalls

Preliminary findings from work conducted in FY 2005 have shown that drains and their outfalls into the Middle Rio Grande can function as refugia for silvery minnow during periods of river channel dewatering and serve as important rearing habitat for species conservation. Previous studies have determined the habitat characteristics in drain outfalls which provide suitable refugia for silvery minnow and have used that knowledge to design and implement habitat enhancement measures at drain outfalls lacking such suitable habitat. In this project, these characteristics have been enhanced at several sites.



Installation of cottonwood snags were completed at three project sites (Refs. 18, 19, and 20). Eight (8) snags were installed at the Peralta Wasteway outfall (gage designation PERWW) and seven (7) snags were installed at the Lower Peralta Drain #1 (gage designation LP1DR) and Los Chavez Wasteway (gage designation LCWW) outfalls. Daily monitoring for silvery minnow presence and threats to the local minnow population was performed.

### **3.6.6 Evaluation of Perennial Wetted Instream Habitat Use by the Silvery Minnow**

The use of woody structures to form pools that can be more permanently wetted through periodic water releases from irrigation drains may contribute to the long-term survival and recovery of the silvery minnow. Previously, woody debris has been used to create deep pools and low-velocity flow areas in the Rio Grande that can serve as over-winter habitat for silvery minnow and as refugia for silvery minnow during periods of river intermittency. The intent of this study was to evaluate the effectiveness of these habitats by monitoring silvery minnow use, health, and survival relative to hydrology and water quality at selected sites where woody structures had been installed at irrigation drain outfalls in the Isleta Reach of the Rio Grande.

The USGS studied water quality and fish health at three sites on the Pueblo of Isleta. A report detailing the results of this monitoring is expected in 2009. The Belen subreach did not dry after the woody debris was emplaced and, therefore, the additional scheduled monitoring has not been performed.

### **3.6.7 Cochiti Reach Silvery Minnow Habitat Construction, Santo Domingo Pueblo Phase II**

The Santa Domingo Pueblo is working to promote overbank flooding and increase sediment flow to create and improve silvery minnow habitat in the Cochiti Reach of the Rio Grande. Specific objectives of Phases II and III of this project, performed with FY 2006 and FY 2007 funding, include enhancing, enlarging, and transitioning a backwater habitat into a low velocity flow-through habitat; enhancing, modifying, and reconnecting a backwater created by the Bureau of Reclamation in the 1990s that is currently isolated from the Rio Grande; conducting a bankline modification project; and utilizing cottonwood root balls to reduce water velocity and enhance sediment deposition. Phase II construction is nearly completed.

The third phase of this habitat restoration project at Santo Domingo Pueblo involves habitat construction and thinning of non-native phreatophytes in the Rio Grande bosque which is anticipated to contribute to the enhancement and recovery of the silvery minnow and the flycatcher in the Cochiti Reach of the Middle Rio Grande. During 2007, planning efforts for this phase were undertaken and environmental compliance documents were prepared. Completion of construction is expected in 2009.

### **3.6.8 Succession and Suitability in Flycatcher Habitat at Ohkay Owingeh**

The purpose of this multiphase project is to study flycatcher habitat preferences at Ohkay Owingeh, and then utilize the results of the study to use in designing habitat improvements. In the study portion of this project which includes the FY 2006 and FY 2007 phases, investigators monitored and compared occupied and abandoned flycatcher habitat to better understand the length of time the habitat remains suitable, as well as the habitat characteristics or changes that make flycatchers abandon a previously occupied territory. This information will be used to

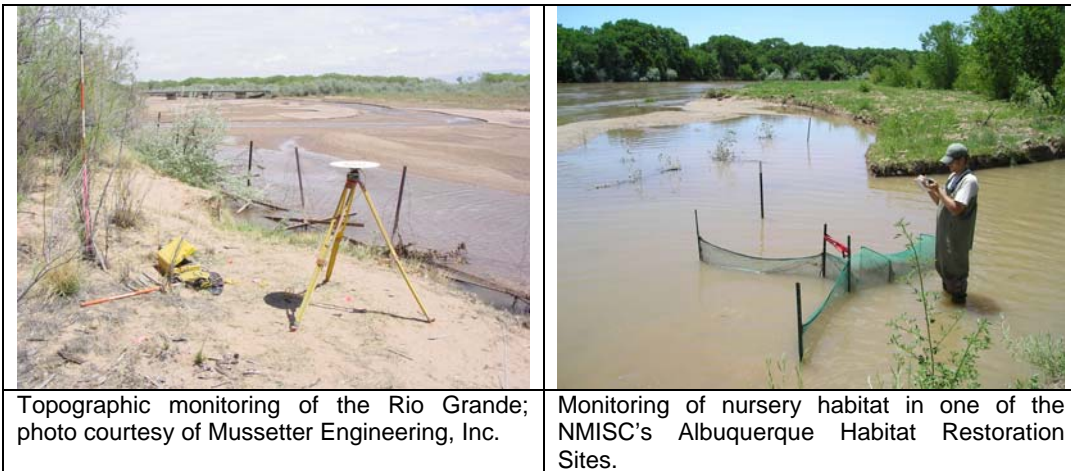
determine whether abandoned habitat can be restored to the status of suitable habitat. In 2007, vegetation and wildlife data was collected and design parameters were formulated for enhancements to abandoned habitat. The Pueblo plans, in the next phase of this project, to apply lessons learned from the study to manage vegetation in four to six abandoned patches of habitat, 15 to 30 acres each, with the hope of enhancing habitat sufficiently to draw the flycatchers back to the territory.

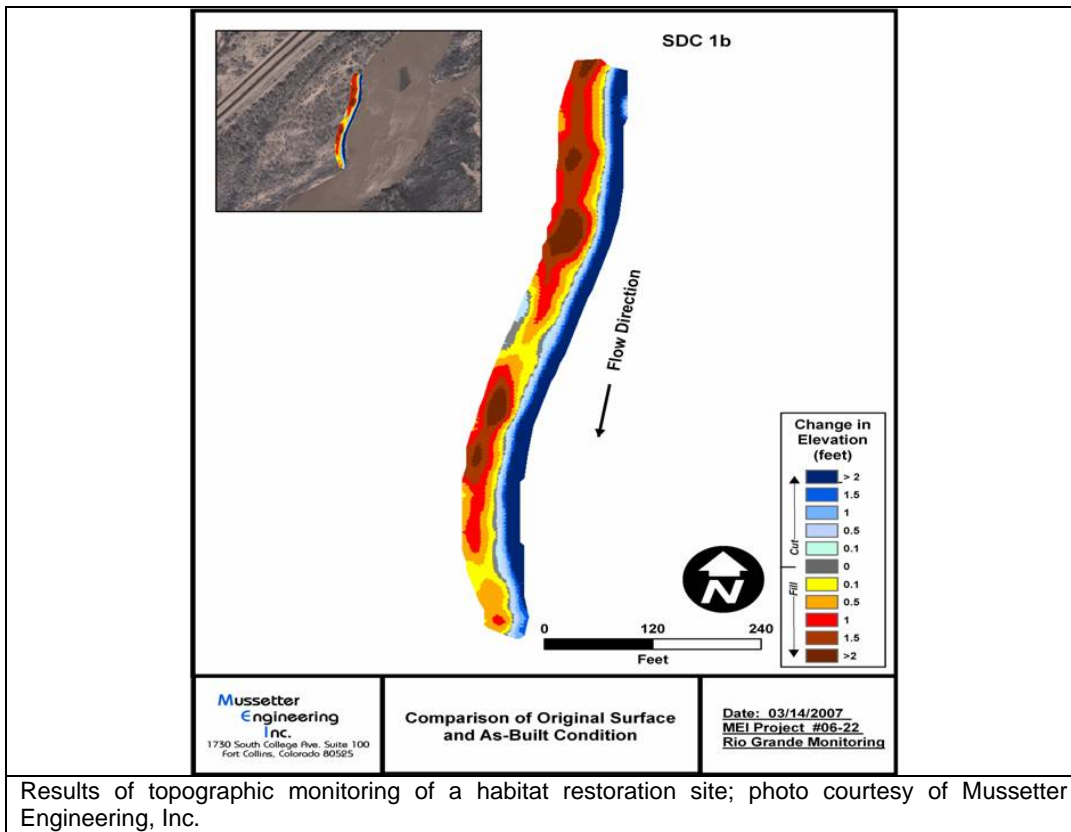
### **3.6.9 Sandia Pueblo Habitat Restoration Project**

Sandia Pueblo is currently preparing designs for a habitat restoration project for the approximately 9-mile sub-reach of the Albuquerque Reach of the Rio Grande that passes through the Pueblo. Year-round silvery minnow augmentation and salvage efforts have placed thousands of silvery minnows in areas directly upstream and within Pueblo of Sandia lands. Therefore, habitat improvements in this reach have the potential to provide significant benefit to the species. This project is intended to increase riverine habitat complexity to support various life stages of the silvery minnow, including enhancement of silvery minnow egg retention, larval development and to create additional open-water habitat. Improvements to surface water hydrology and overbank flooding should have the additional benefit of supporting the generation of suitable flycatcher habitat in the approximately 1,100 acres that lie within the area between a federally constructed levee on the east side of the river and the river itself.

### 3.7 Habitat Restoration Monitoring

The 2003 BiOp requires that “Monitoring will be conducted for each project annually for 10 years in order to assess whether created habitats are self-sustaining, successfully regenerating, and are supporting the flycatcher and silvery minnow.” Because each restoration project is unique, habitat restoration monitoring is designed to evaluate the performance criteria identified by the project sponsor. Depending on the agreed-upon goals of the restoration project, the following types of monitoring may be appropriate: Ichthyofaunal (fish) monitoring, flycatcher monitoring, vegetation monitoring, groundwater monitoring, geomorphologic monitoring, and/or hydrological monitoring. Additional information on recommended monitoring protocols may be found in the Collaborative Program’s Draft Interim Monitoring Plan, dated February 4, 2004. Both *implementation monitoring*, which addresses whether restoration projects were completed as designed, and *effectiveness monitoring*, which assesses whether the restoration project goals are achieved, should be implemented.





**Table 3.7.1 Collaborative Program FY 2006 and FY 2007 Funded Projects:**

**Habitat Restoration Monitoring**

Funded Projects – Funded Entity	Entity Performing Work	Continuing Activity or Distinct Project	BiOp Requirement	Sponsoring Workgroup	Grant/ Contract #	Amount Appropriated	Year of Allocation
<b>Habitat Restoration Monitoring</b>							
Monitoring of Albuquerque Reach Riverine Restoration and Habitat Improvement Sites for the Rio Grande Silvery Minnow	New Mexico Interstate Stream Commission and SWCA, Inc.	one-year	yes	Habitat Restoration	07-FG-40-2704	\$171,288	FY 2007
Los Lunas Habitat Restoration Site Fisheries and Nursery Habitat Monitoring	SWCA, Inc.	ongoing	yes	Habitat Restoration	07-FG-40-2671	\$55,674	FY 2007

### **3.7.1 Monitoring of Albuquerque Reach Riverine Restoration and Habitat Improvements for the Rio Grande Silvery Minnow**

The NMISC Riverine Restoration Phase I 2007 Monitoring Report was completed March 2008. Construction was initiated in January 2006 and monitoring was conducted in the fall of 2006 and fall of 2007. The NMISC Riverine Restoration Phase I and II Monitoring Report is in draft form at this time, but it will be completed by April 2008. Limited fisheries monitoring was conducted during the 2007 spring runoff to examine adult and larval fish use and egg retention at Highway 550 and Interstate 40 (I-40) nursery habitat sites. Water quality data was collected prior to Phase II construction in early 2007 and after construction, in late 2007. The construction of Phase II restoration concluded in spring 2007, ahead of the anticipated spring runoff. Monitoring surveys took place in December 2007 and January 2008. Pre-construction vegetation surveys were accomplished in June 2006 and vegetation monitoring continued in fall and winter of 2007.

### **3.7.2 Los Lunas Habitat Restoration Monitoring**

The Los Lunas Site is being monitored to determine if silvery minnow are utilizing the site as nursery habitat. Monthly ichthyofaunal surveys were initiated in November 2007 and continued through the spring runoff season of 2008. The primary goal of the monitoring study is to monitor the site for the presence of spawning and larval silvery minnow. A secondary objective is to characterize the structure of the adult fish community at the Los Lunas Habitat Restoration Site. In addition, water quality parameters were measured during the initial monitoring event.

The Los Lunas Habitat Restoration project fish community monitoring was performed in November 2007. During this monitoring period, a total of 185 fish were counted occupying the restoration site, of which 159 were silvery minnow. Silvery minnow were reportedly most numerous in moderately deep (0.5 to 0.75 meter deep) runs immediately adjacent to shorelines. Overall, the condition of the collected silvery minnow was found to be good.

## **3.8 Other Science and Monitoring**

The Program pursues scientifically based solutions to address the needs of the listed species and the ecosystems upon which they depend. Monitoring and adaptive management are used to ensure that Program activities achieve the desired objectives. The science and monitoring priorities for Fiscal Years 2006 and 2007 included: 1) assessing key habitat requirements of the silvery minnow and flycatcher essential to alleviate jeopardy and promote recovery; 2) assessing hydrologic and geomorphic impacts on habitat qualities; and 3) monitoring and assessing the population status of the silvery minnow and flycatcher. Table 3.8.1 summarizes the status of the projects described under Other Science and Monitoring.

**Table 3.8.1 Collaborative Program FY 2006 and FY 2007 Funded Projects:**

**Other Science and Monitoring**

Funded Projects – Funded Entity	Entity Performing Work	Continuing Activity or Distinct Project	BiOp Requirement	Sponsoring Workgroup	Grant/ Contract #	Amount Appropriated	Year of Allocation
Annual Water Quality Monitoring Program	New Mexico Environment Department	ongoing	yes	Science	06-FG-40-2548	\$170,951	FY 2006
					06-FG-40-2551	\$213,773	FY 2007
Rio Grande Silvery Minnow Health Assessment	US Fish & Wildlife Service	ongoing (since 2003)	yes	Science	06-AA-40-2548	\$386,255	FY 2006
					06-AA-40-2548	\$339,224	FY 2007
Monitoring of the Reproductive Periodicity of Rio Grande Silvery Minnow	American Southwest Ichthyological Researchers, L.L.C.	multi-year project	yes	Science	03-CR-40-8031	\$149,784	FY 2007
Survival & Recovery Activities	New Mexico State University (Colleen Caldwell)	multi-year project	yes	Science	06-FG-40-2450	\$36,101	FY 2007
Investigating the Longitudinal Movement of Rio Grande Silvery Minnow <i>Hybognathus amarus</i> Using Passive Implantable Transmitter (PIT) Tags.	U. S. Fish & Wildlife Service	multi-year project	no	Science	07-AA-40-2711	\$25,851	FY 2007
Effects of Nutrient Availability on Periphyton Growth and Diversity in the Middle Rio Grande: Top-down and Bottom-up Factors.	University of New Mexico	multi-year project	no	Science	07-CR-40-8204	\$120,168	FY 2007
Rio Grande Silvery Minnow Toxicity Study	U.S. Geological Survey	multi-year project	No	Science	04-AA-40-2247	\$38,410	FY 2006
Middle Rio Grande Operations Biological Assessment and Analysis (including 2007 Bureau of Reclamation Experimental Activities, Population Viability Analysis, and Population and Habitat Viability Analysis)	Bureau of Reclamation and U. S. Fish & Wildlife Service	multi-year project	no	Science	Various	\$331,497	FY 2007

### **3.8.1 Annual Water Quality Monitoring Program**

The Middle Rio Grande Endangered Species Act Collaborative Program (MRGESACP) contracted with the New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) to conduct water-quality monitoring and assessment to allow the MRGESACP to determine potential water-quality relationships that may affect Rio Grande silvery minnow (RGSM) recovery in the MRG. Specifically, NMED conducted quarterly sampling of water and sediment, toxicity tests, and annual fish tissue collection and analysis at ten stations in the MRG as determined by the MRGESACP. The survey extended from Bosque del Apache, downstream of San Antonio, north to the Angostura Diversion Works, upstream of Bernalillo covering approximately 180 miles of river during each sampling event. This report provides details on the survey work completed between October 2006 and September 2007. In addition to the sampling conducted specifically for this grant, NMED solicited and compiled water chemistry data for sites on the MRG within the study area from other sources and an earlier NMED study collected in the years 2000 through 2007. NMED evaluated the data against available New Mexico Water Quality Control Commission (WQCC) approved water quality standards to determine exceedences in water quality criteria. The analysis of water quality data (2000-2007) shows exceedences of water quality criteria for dissolved oxygen in two areas “Rio Grande (non-pueblo Alameda Bridge to Angostura Div)” and “Rio Grande (Isleta Pueblo bnd to Alameda Bridge)” and for bacteria (*E. coli*) in most of the area. Based on a 2005 microbial tracking study, the sources of the bacteria are believed to be primarily from dogs or wildlife.

### **3.8.2 Rio Grande Silvery Minnow Health Assessment**

This study used a suite of standard, well-documented methods for observation of fish health including: necropsy to determine their vital organ condition, number and type of lesions, parasites and pathogens, condition factor, organosomatic indices, to monitor and characterize the health and fitness of the silvery minnow. Additionally, the results were combined with concurrent water quality data to determine the relationships between health and water quality.

The following six (6) study sites were located along the middle Rio Grande: 1) Bernalillo, 2) Alameda, 3) Los Padillas, 4) Los Lunas, 5) La Joya, and 6) San Antonio, NM. The least number of silvery minnow were collected at Los Padillas the most were collected at the MRG Alameda site. The silvery minnow that are collected from seine hauls were examined for the presence of fish pathogens, external parasites and viral and bacterial pathogens. Most, if not all, silvery minnow viral samples were negative for any viral replicating agents.

### **3.8.3 Survival and Recovery Activities**

Rescue and repatriation of silvery minnows from isolated pools during intermittent flow produces stress resulting from seining, handling, low dissolved oxygen, temperature fluctuations and transport to perennial reaches of river. Physical stressors are unavoidable during fish rescue and repatriation. However, development of an understanding of the magnitude and duration of the stress response following rescue could assist in refining handling procedures to improve survival after repatriation. The objective of this research is to characterize time to recovery and survival of silvery minnows subjected to rescue activities. Investigators accompanied Fish & Wildlife Service personnel during daily rescue and salvage operations. Water quality of the isolated pools is being quantified while the fish are processed for transport and repatriation to the enclosures in the perennial reach. A series of enclosures have been established at the study sites to evaluate the stress from handling and transport versus the stress produced by environmental

conditions in isolated pools and subsequent handling. This work contributes to Reasonable and Prudent Measure 3.1 of the 2003 BiOp which requires the Action Agencies and parties to the consultation, in coordination with the Service, to determine both the direct and indirect effects of salvage operations on the silvery minnow.

#### **3.8.4 Investigating the Longitudinal Movement of Rio Grande Silvery Minnow using Passive Implantable Transmitter (PIT) Tags.**

This project represents Phase I of a multi-year study of silvery minnow longitudinal (i.e. upstream or downstream) movement. In order for their movements to be tracked, silvery minnows must be tagged. Phase I of this project was funded in Fiscal Year 2007 and consisted of comparison and selection of fish tagging methods. Mortality associated with two implant methods (surgical and injection) for passive integrated transponder (“PIT”) tags were compared. It was concluded that either surgical implantation or injection of PIT tags is a feasible method to tag Rio Grande silvery minnow if fish are greater than 60 mm standard length and are held in captivity for a minimum of 6 days after tagging. Phase I also included the installation of a Crump weir in the fish passage channel at the Albuquerque-Bernalillo County Water Utility Authority’s diversion for its drinking water project. This Crump weir will be used to assist in counting fish moving upstream and downstream through the fish passage. Phase II of this project will include field-testing of a weir antenna and large-scale tagging and release of up to 10,000 silvery minnow, so their longitudinal movement can be studied.

#### **3.8.5 Nutrient Availability (Nutrient effects on algal biomass and diversity in the Middle Rio Grande)**

In the Middle Rio Grande, invertebrates and fish grazers, such as the silvery minnow, are dependent on algal growth as a food source. Because algal production is often limited by nutrient availability, this study seeks to determine whether nutrient levels in the river are sufficient to support adequate algal food resources for grazers, including the silvery minnow. The study also evaluates other factors that may affect algal growth, including turbidity (which causes light limitation), temperature, seasonal precipitation patterns and fish grazing.

The initial award for this three-year project was made in Fiscal Year 2007. The project is currently in a data-collection phase.

#### **3.8.6 Rio Grande Silvery Minnow Toxicity Study**

The Program has been funding a series of laboratory studies to analyze the toxicity of adverse water quality condition on different life stages of the silvery minnow. The first phase of the project, in 2005, evaluated the toxicity of high temperature and low dissolved oxygen concentrations on larval and juvenile silvery minnow. Results indicated silvery minnow have an extraordinary ability to withstand extreme conditions, with 50% surviving water temperatures between 35 and 37 degrees Celsius and oxygen concentrations as low as 0.6 to 0.8 mg/L. However, the fish were found to be sensitive to short bursts of ammonia. In pulsed ammonia tests, exposures to high ammonia concentrations for only 1.5 hours were nearly as toxic as exposures to the same concentrations for 96 hours. Additional funding was provided to these researchers in Fiscal Years 2006 and 2007 to further clarify these results and to perform them on additional silvery minnow life stages. In FY 2006, acute toxicity tests were performed to determine the lethal tolerance of silvery minnow (in this case, 11-month olds) to high temperature, low dissolved oxygen and chronic exposure to ammonia. In FY 2007, larval fish



were tested for their differences in response to chronic versus pulsed ammonia releases. The results are now being statistically analyzed and the significance of the findings are being evaluated.

### **3.8.7 2007 Bureau of Reclamation Experimental Activities on the Middle Rio Grande**

In 2007, the Program funded a series of experimental activities consistent with the monitoring and adaptive management provisions of the 2003 Biological Opinion (U.S. Fish and Wildlife Service 2003) to learn about the vulnerability of silvery minnow to conditions of drought in the Middle Rio Grande—specifically involving periods at which flow in the river becomes discontinuous and wetted habitat is reduced to ephemeral pools. This study represents an initial effort to quantify environmental variation among these pools and to assess their intrinsic value as prospective refugial habitats in sustaining populations of silvery minnow through brief periods of hydrologic scarcity. Additionally, this study sought to determine whether opportunities exist for enhancing environmental attributes of these prospective refugial habitats, including through the strategic application of supplemental water supplies or return flow from irrigated agriculture. Field surveys were conducted between June 30, 2007 and October 23, 2007 and included:

- In-stream refugia monitoring: Environmental conditions, including physical dimensions of the pool (using GPS) and water quality parameters, including pH, temperature, conductivity, dissolved oxygen and ammonia, were monitored in pools after they became isolated from running water habitats as a consequence of diminished flow in the river.
- Wetted and drying reach monitoring in the Isleta Reach: river conditions were monitored during and following the recession of running water to document trends in the development of pools and perennially wetted reaches below Isleta Diversion Dam. Sources of water supplying wetted reaches and pools were documented.
- Wasteway and outfall monitoring: monthly monitoring of habitat conditions was performed at 14 Middle Rio Grande Conservancy District (MRGCD) irrigation outfalls in the Isleta Reach.

The results of this study, coupled with those reported in the toxicity studies described in Section 3.8.6, suggest that the silvery minnow is physiologically flexible—capable of surviving absolute extremes and large fluctuations in chemical and physical conditions. Short of complete or near desiccation of habitat, the silvery minnow exhibits a capacity to withstand the wide variety of environmental conditions common to the monitored pools over the periods of observation.

### **3.9 Program Management, Public Outreach and Environmental Compliance**

The Program requires management and administrative support to accomplish its goals and objectives. The Program Management Team, responsible for Program management and administration, consists of a Program Manager and representatives of Reclamation, the Service, the Corps, and the NMISC, as well as administrative and clerical staff (federal employees and contractors). The Program Management Team provides management and technical support to the Executive Committee, Coordination Committee and work groups. The Program Manager is responsible for determining the most expeditious and reasonable manner to carry out assignments as directed by the Executive Committee, whether through a work group, assignment to the Program Management Team or outsourcing.

The Program has a responsibility to educate and inform the general public, stakeholders, and State and Federal Legislators about Program activities and accomplishments. Program outreach efforts support: 1) requests for long-term non-federal cost share funding; 2) understanding by the general public regarding the potential role of the Program in Middle Rio Grande (MRG) water management and endangered species recovery issues; 3) increased awareness by the general public and decision-makers regarding the collaborative problem-solving approach and funding requirements of the Program.

There are several Federal laws that require Program activities to obtain environmental compliance before they can be implemented. Under Section 7 of the Endangered Species Act, Federal agencies are directed to ensure their discretionary actions are not likely to jeopardize listed species. Under Section 2 of the Fish and Wildlife Coordination Act, Federal agencies must consult with the Fish and Wildlife Service and with State wildlife agencies on the fish and wildlife impacts of federal or federally licensed or permitted water projects. The National Environmental Protection Act of 1969 (NEPA) requires all Federal agencies to consider environmental impacts as they plan Federal projects and disclose to the public any significant impacts on the quality of the human environment. Section 106 of the National Historic Preservation Act requires Federal agencies to identify any cultural resources within a project area, and if any cultural resources may be affected, to consult with the appropriate State Historic Preservation Office and/or Tribal Historic Preservation Office.

Table 3.9.1 summarizes the Program Management and Administration Activities of the Program in Fiscal Years 2006 and 2007.

**Table 3.9.1 Collaborative Program FY 2006 and FY 2007 Funded Projects:**

**Program Management**

Funded Projects – Funded Entity	Entity Performing Work	Continuing Activity or Distinct Project	BiOp Requirement	Sponsoring Workgroup	Grant/ Contract #	Amount Appropriated	Year of Allocation
<b>Program Management and Environmental Compliance</b>							
Program Management and Support - Bureau of Reclamation	Bureau of Reclamation	ongoing	no	n/a	Various	\$800,000	FY 2006
					Various	\$1,196,868	FY 2007
Program Management and Support - U S Army Corps of Engineers	U. S. Army Corps of Engineers	ongoing	no	n/a		\$200,000	FY 2006
					07-AA-40-2672	\$176,208	FY 2007
Program management and support (incl. 2007 forum) – FWS	US Fish & Wildlife Service	ongoing	no	n/a	02-AA-40-8110	\$60,681	FY 2007
Program Contracted Technical Support – Tetra Tech	TetraTech, Inc.	ongoing	no	n/a	05-PE-43-0151	\$75,000	FY 2006
					05-PE-43-0151	\$285,000	FY 2007
Collaborative Program NEPA-ESA Programmatic Compliance	SWCA, Inc.	multi-year project	no	n/a	03-PE-40-0167	\$176,515	FY 2006
					03-PE-40-0167	\$52,073	FY 2007
Collaborative Program webpage development & maintenance	IceTech, Inc.	ongoing	no	n/a	07-PE-43-0093	\$65,231	FY 2007
Collaborative Program Public outreach	multi-agency	ongoing	no	n/a		\$15,000	FY 2007
GIS Database Development		multi-year project	no	n/a	07-AA-40-2691	\$856,680	FY 2007

**3.9.1 Program Management, Bureau of Reclamation**

Reclamation has provided contracting and financial management support for the Program since 2001, managing more than \$63 million in federal funding. Reclamation also provides representatives to participate in Program committees. In 2006, Reclamation provided an Executive Committee member, Interim Steering Committee member, interim Program Implementation Team member and representatives for all technical subcommittees. In 2007, Reclamation employed a Program Manager and provided management staff responsible for overall Program administration, coordination and dissemination of information about Program activities. In addition, Reclamation provided an Executive Committee member, Program Management Team member, Coordination Committee member, and representatives for the technical workgroups.

Program management and support activities are required to implement all aspects of the 2003 BiOp Reasonable and Prudent Alternative (RPA) and the Reasonable and Prudent Measures (RPMs), with the exception of the San Marcial Railroad Bridge realignment. Reclamation serves (1) as the fiscal agent for the Program, managing the Federal funding allocated by Congress to the Program and (2) as the contracting agency, administering interagency agreements, financial assistance, and contracts for Program projects. Reclamation conducts water operations and management of supplemental water in compliance with federal and state law. Reclamation also provides technical support to assist with the evaluation of proposed projects; review of project deliverables; development of scopes of work; and development of monitoring and program assessment plans.

### **3.9.2 Program Management, U. S. Army Corps of Engineers**

The Corps staffed the interim Program Manager position in 2005 - 2006 and also provided administrative and technical support to accomplish the goals and objectives of the Program. The Program Manager is responsible for overall Program administration, coordination and dissemination of information about Program activities. Administrative support provided included contracting for certain Program activities mutually agreed upon by Reclamation and the Corps. Corps management and technical support includes ensuring coordination of Corps activities (i.e. studies, surveys, assessments, planning, design, NEPA compliance, construction, funding) with Program activities.

In 2007, the Corps provided a representative that served as a member of the Program Management Team. In addition, the Corps provided contracting support for the proposed Program Database and Albuquerque Reach Analysis & Recommendations.

Program management and support is required to implement all aspects of the 2003 BiOp RPA and RPMs. The Corps is either directly or indirectly fulfilling these BiOp requirements through use of Corps employees, contractors, or contracts.

### **3.9.3 Program Management, Fish and Wildlife Service**

In 2007, the Program provided funding for a full time staff biologist from the Service to serve as a member of the Program Management Team. The staff biologist was needed to assist with such Program tasks as coordinating, planning and managing workgroups staffed by Program participants, to fulfill Program bylaws and to accomplish the Long Term Plan of the Program. The Service's biologist also conducted Section 7 consultation for the Collaborative Program, and was the lead organizer of the annual Collaborative Program Symposium. The Service also provided an MRG ESA Coordinator to serve on the Coordination Committee.

Other tasks that were performed exclusively by the Service representative include: serving as Service contact for ESA (and other) compliance necessary for Program activities including a Programmatic Biological Assessment, as needed; serving as liaison between the Program and the recovery teams for the silvery minnow and flycatcher; serving as liaison between Program and other Middle Rio Grande projects providing coordination particularly with regard to ESA compliance (both Section 7 and Section 10).

### **3.9.4 Program Management, New Mexico Interstate Stream Commission**

The NMISC is a committed partner in the management of the Program. Using non-federal cost share funding, it has provided staff to serve as members of the Executive Committee, the Coordination Committee and the Program Management Team. These staff have worked with the Program toward the goals of fulfilling Program bylaws, accomplishing the Long Term Plan of the Program, and complying with 2003 Biological Opinion requirements. These management staff participate in Program planning and management, provide technical support and coordinate the NMISC's participation in the various subcommittees and workgroups that are part of the Program. The NMISC has also provided representatives for all technical work groups, including the Science Work Group, Species Water Management Work Group, Habitat Restoration Work Group, and Ad Hoc work groups. The NMISC provides technical support to assist with the evaluation of proposed projects, development of scopes of work, review of project deliverables, and development of monitoring plans.

### **3.9.5 Program Technical and Administrative Support – contracted**

Staffing is contracted to perform general and administrative tasks and provide organizational support at the direction of the Program Manager. Specific duties include: (1) take notes at most Program meetings, (2) prepare and distribute meeting summaries, (3) update Program website, calendar and database with current documents, activities, photos, and other information, (4) maintain Collaborative Program project tracking database, (5) assist with development of the Program Long Term Plan, (6) assist subcommittee co-chairs to develop meeting agendas, (7) provide technical support for the annual symposium and other workshops, and (8) respond to miscellaneous information and related needs from committee co-chairs, and other committee members.

### **3.9.6 NEPA-ESA Compliance**

Several administrative draft Programmatic Environmental Impact Statements (PEIS) have been prepared and shared with Program signatories and Pueblos for comment. In 2006, a determination was made to formally consult with the U.S. Fish and Wildlife Service (Service) to achieve ESA coverage for the general type of activities performed by the Program, including those activities that incidentally have some adverse effects. The purpose of the PEIS and Biological Assessment/ Biological Opinion process is to provide programmatic NEPA and ESA coverage for the activities described in the Program's Long Term Plan. Additional project-specific compliance is also sought by the Program for individual activities, particularly on-the-ground activities. However, Reclamation has determined that programmatic NEPA is not required for the establishment of the Collaborative Program. Instead, NEPA and ESA Compliance are conducted for individual activities as appropriate.

### **3.9.7 Webpage Development and Maintenance**

A scope of work for the development and maintenance of a Program web site was finalized and a contract to develop the new web site was awarded in September 2007 to IceTech, Inc. Program documents have been transferred to the new web site. Photographs of Program activities and finalized documents may be viewed by members of the public.

### **3.9.8 Public Information and Outreach**

The Program recognizes the importance of public outreach to build public support for Program activities. Therefore, the Program includes a Public Information and Outreach Workgroup. Accomplishments of the Program's public outreach efforts include: (1) preparation of briefing materials for legislators and the media; (2) creating photo displays and posters highlighting Program activities; (3) the 2<sup>nd</sup> Annual collaborative Program Symposium; (4) organization of the Millionth Minnow Event including a news conference, release of silvery minnows into the Rio Grande by dignitaries and Program signatories, contribution of a story on the event to the New Mexico Wildlife Magazine, and work with local media to get the story covered; and (5) designing and ordering banners and exhibits for use at a variety of Collaborative Program events. The Program also began coordination of tours and presentations for state legislators and members of Congress highlighting Collaborative Program accomplishments, and began submitting a monthly legal ad to the Albuquerque Journal announcing upcoming Executive Committee meetings.

### **3.9.9 Annual Symposiums**

The Program sponsored 2-day symposiums in April 2006 and April 2007. The symposia showcased the many activities that the Program has funded and provided participants with an opportunity to hear about the results of the projects. The presentations provided information which increased our understanding of the silvery minnow's life history and highlighted efforts to improve habitat in the Middle Rio Grande for both the Rio Grande silvery minnow and the Southwestern willow flycatcher. Presentations were also given to explain the various water management improvement efforts that are underway and to provide updates on water quality studies. The powerpoint slide shows may be accessed at [www.mrgesa.com](http://www.mrgesa.com) in the Events, Symposium, Collaborative Program Symposium menu option.

### **3.9.10 GIS Database Development**

The Corps awarded an indefinite delivery contract for GIS database development in September 2008. When completed, the database will serve many different Program needs including: integration and spatial correlation of disparate data types generated by the Program's numerous research and monitoring projects, analysis of monitoring data to determine the effectiveness of Program activities in meeting Program goals, access to project information via spatial and non-spatial queries and project tracking. The initial task order will be awarded in the first quarter of FY 2009 and will include an assessment and documentation of the Program's requirements for the database system.

## Abbreviations and Acronyms

AAO	Reclamation Albuquerque Area Office
AF or ac-ft	Acre Feet, 1 af = 325,851 gallons
AGG/DEG	Aggradational and Degradational
Alliance	Alliance for the Rio Grande Heritage
BA	Biological Assessment
BdA	Bosque del Apache National Wildlife Refuge
BEMP	Bosque Ecological Monitoring Program
BIA	Bureau of Indian Affairs
BiOp	Biological Opinion
CEC	Categorical Exclusion Checklist
CFS	Cubic Feet per Second, 1 CFS = 449 gallons per minute
CMP	corrugated metal pipe
COA	City of Albuquerque
COE or Corps	U.S. Army Corps of Engineers
CSU	Colorado State University
CY	Cubic Yard
EB	Elephant Butte
EC	Executive Committee
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ET	Evapo-transpiration
FWS or Service	US Fish and Wildlife Service
FY	Fiscal Year (Oct 1 to Sept 30)
GRF	Gradient Restoration Facility
ISC or NMISC	NM Interstate Stream Commission
HR	Habitat Restoration
InSc	Interim Steering Committee
LFCC	Low Flow Conveyance Channel
LTP	Long Term Plan
LLSMR	Los Lunas Silvery Minnow Refugium
M&I	Municipal and Industrial
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MRG	Middle Rio Grande
MRGCD	Middle Rio Grande Conservancy District
MRGESCP	MRG Endangered Species Collaborative Program
NAD	North American Datum 1927 or 1983
NAVD	North American Vertical Datum 1929 or 1988
NEPA	National Environmental Protection Act
NMDGF	New Mexico Department of Game and Fish
NMISC or ISC	New Mexico Interstate Stream Commission
NMSU	New Mexico State University
O&M	Operations and Maintenance
OSE	NM Office of the State Engineer
PIO	Public Information and Outreach work group
PM	Program Manager

PMP	Program Monitoring Plan
PMT	Program Management Team
Program	MRG Endangered Species Collaborative Program
PHVA	Population Habitat Viability Assessment
PVA	Population Viability Analysis
Reclamation	Bureau of Reclamation
RL	Range Line
RM	River Mile, measured upstream from Caballo Dam
RMRS	UDSA Forest Service, Rocky Mountain Research Station
Service	US Fish and Wildlife Service
SLC	Reclamation's Upper Colorado Regional Office, Salt Lake City, UT
SSWCD	Sierra Soil & Water Conservation District
UNM	University of New Mexico
USDA	US Department of Agriculture