Middle Rio Grande Endangered Species Act Collaborative Program

2005 Annual Report

http://mrgesacp.fws.gov

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4.0 Summary

1.0 Introduction

The Middle Rio Grande Endangered Species Act Collaborative Program (Program) is a partnership created to protect and improve the status of listed endangered species, specifically the Rio Grande silvery minnow (silvery minnow) and the southwestern willow flycatcher (flycatcher), in the Middle Rio Grande (MRG) of New Mexico while simultaneously protecting existing and future water uses in the area. The MRG is defined for purposes of the Program as the Rio Grande from the Colorado/New Mexico state line to the northern end of the high water mark at Elephant Butte Reservoir, New Mexico. This report contains the Program's 2005 fiscal and project summaries and highlights its accomplishments in 2005.

During 2005 Congress appropriated $5,374,020 of 'write-in' funding for Program activities, which included addressing many of the U.S. Fish and Wildlife Service's (Service) 2003 Biological Opinion's Reasonable and Prudent Alternative (RPA) activities necessary to avoid jeopardy. Although this funding level was significantly less than the proposed Program's budget, 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. The Program signatories continued their work on authorizing legislation and completing a draft version of a long-range plan.

Above average spring runoff conditions in 2005 provided both opportunities and challenges within the MRG. Sustained spring flows of over 6000 cubic feet per second (cfs) below Cochiti Reservoir created extensive overbanking from the river channel into the surrounding Bosque. This provided an opportunity for the U.S. Army Corps of Engineers (Corps) to complete its Overbank Flooding Study and for researchers to investigate the effects overbank conditions may have on spawning and recruitment of silvery minnow and regeneration of native plant species.

The river overflowed its banks throughout the MRG in 2005 (photos courtesy of Erich Schweller, Tetra Tech.)

1.0 Introduction (continued)

The high spring runoff also caused conditions that seriously threatened the integrity of portions of the levy system and created a six mile-long sand blockage in the river channel above the San Marcial railroad bridge. Federal and state agencies acted quickly to shore up levies and remove the 'Tiffany plug'. As a result, no levies were broken and property damage was minimized.

The above average spring runoff improved conditions for both spawning and recruitment of silvery minnows resulting in significant increases in the number of silvery minnows in the MRG. October catch rates in 2005 increased nearly 50 times over catch rates for 2004 (Dudley *et al.* 2005).

Photograph of silvery minnow (photographer unknown)

Also in 2005, the Service amended the incidental take statement that accompanies the 2003 Biological Opinion (BiOp). Take is now estimated annually using a formula that incorporates population monitoring data, habitat conditions during the spawn (spring runoff) and augmentation. Annual estimation take will now fluctuate as a proportion of population size.

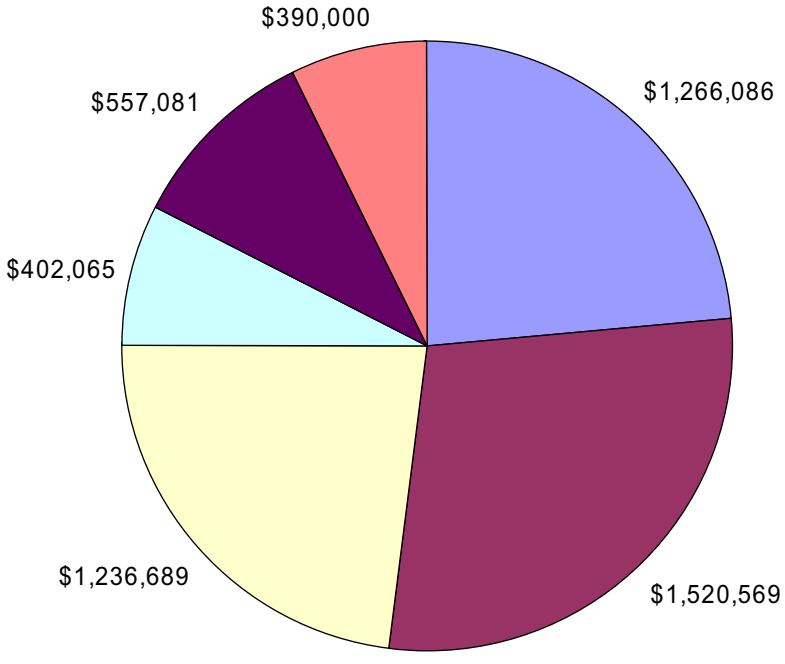
The Service also designated critical habitat for the flycatcher, effective November 18, 2005. This designation replaced the July 1997 critical habitat designation for this species that was set aside pursuant to a court order on May 11, 2001. In total, approximately 120,824 acres fall within the boundaries of critical habitat designation, including Grant, Hidalgo, Mora, Rio Arriba, Socorro, Taos, and Valencia counties in New Mexico.

2.0 2005 Fiscal Year Summary

During fiscal year (FY) 2005, the Program received $5,374,020 from the Federal government to fund activities. The State of New Mexico, through participating agencies and special legislative appropriation (e.g. Water Trust Board capital project funds) provided an additional approximately $1,000,000 for Program activities. Contributions also included in-kind services such as land, access to land, personnel, and equipment used by non-Federal signatory participants.

The Program's long term planning document (currently under revision) provides the basis for prioritizing activities. In addition, within the "write-in" allocation, Congress typically specifies funding amounts for categories of activities. In FY 2005 these categories included water acquisition, water and minnow management improvement, biological opinion monitoring, habitat restoration, science and monitoring, and program management. Figure 1 illustrates how funds allocated by Congress were distributed among the various categories. Table 1 provides a list of projects that received funding in FY 2005. Table 2 provides a list of projects that are generally funded through the Program but were funded through the Bureau of Reclamation (Reclamation) following activities at the end of FY 2004.

Figure 1. Collaborative Program Funding Distribution for FY 2005



2005 Fiscal Year Summary

Table 1. Collaborative Program FY 2005 - Funded Projects

Grant/Contract #	Funded Projects - Funded Entity	Amount Appropriated
03-WC-8860 M-2	**Water Acquisition**	**$1,236,689**
	Habitat Restoration	**$1,266,086**
05-AA-2384	Overbank Flooding - U.S. Army Corps of Engineers	$148,938
05-FG-2436	Perennial Refugia at Drain Outfall - Middle Rio Grande Conservancy District	$86,685
03-NA-2113 M-2	San Juan Pueblo North Chavez Arroyo - San Juan Pueblo (Ohkay Owingeh)	$199,464
03-AA-2074 M-4	Continued Monitoring Activities at the Los Lunas Habitat Restoration Project - U.S. Army Corps of Engineers	$77,565
05-CR-8121	Development & Design of San Acacia Fish Passage - Bureau of Reclamation	$115,000
05-AA-2437 & M-1	Rio Grande Silvery Minnow Fish Passage Feasibility Study at Isleta Diversion Dam - U.S. Army Corps of Engineers	$171,574
04-FG-2253 M-1	Preliminary Evaluation of Island Destablization - New Mexico Interstate Stream Commission	$67,691
05-NA-2443	Santo Domingo Tribe Endangered Species Habitat Improvement Project - Pueblo of Santo Domingo	$399,169
	Biological Opinion Monitoring	**$557,081**
03-CR-8029 M-3&4	Population Monitoring of Rio Grande Silvery Minnow - American Southwest Ichthyological Research Foundation	$252,034
05-CR-8119 & M-1	Population Estimation Study of the Rio Grande Silvery Minnow - American Southwest Ichthyological Research Foundation	$100,040
03-AA-2079 M-2	Southwestern Willow Flycatcher Surveys & Nesting Monitoring - Bureau of Reclamation	$197,360
02-AA-8780 M-4	Experimental Augmentation & Monitoring Plan for Rio Grande Silvery Minnow - U.S. Fish and Wildlife Service	$7,647
	Water & Minnow Management Improvement	**$1,520,569**
04-AA-2246 M-1	Data Collection to Better Define the Interaction of Surface Water & Groundwater in the Middle Rio Grande Valley, NM - U.S. Geological Service	$282,000
03-FG-2092 M-2	Analysis of Conveyance Optimization & On-Farm Efficiencies of Representative Irrigation Sites in the MRGCD - URS Corporation	$138,515
03-FG-2123 M-3&4	O&M Rio Grande Silvery Minnow Rearing & Breeding Facility - City of Albuquerque	$112,450
02-AA-6360 M-8	O&M of Gages (Continuation of contract of 03-CR-408039: Quantification of Flows in the Middle Rio Grande Gages) - New Mexico Interstate Stream Commission/U.S. Geological Survey	$54,600
03-FC-2093 M-2	Evapotranspiration Monitoring & Modeling - University of New Mexico	$115,407
non-Program contract	Minnow Sanctuary - Bureau of Reclamation	$648,700
02-AA-8350	Propagation for 2006 - U.S. Fish and Wildlife Service	$168,897
	Science & Monitoring	**$402,065**
02-FG-8120 M-3	Monitoring Genetic Changes in the Endangered Rio Grande Silvery Minnow & Genetic Analysis of Alternative Captive-breeding Designs - University of New Mexico	$122,569
02-AA-8210 M-2	Habitat Preference of Rio Grande Silvery Minnow in Relation to Fluvial Geomorphology & Flow Regime, Middle Rio Grande Valley, NM - U.S. Fish and Wildlife Service	$63,413
03-CR-8031 M-4	Monitoring the Spatial Reproductive Periodicity of Rio Grande Silvery Minnow - American Southwest Ichthyological Research Foundation	$189,088
06-FG-2450	Rio Grande Silvery Minnow Survival & Recovery Activities - New Mexico State University	$26,995
	Program Management	**$390,000**
03-AA-2083	Bureau of Reclamation Contracting	$250,000
05-PE-43-0151	Collaborative Program Technical Support - Tetra Tech	$140,000
TOTALS (Total appropriated amount was $5,374,020; however, a difference of $1,530 resulted after the distribution of funds)		**$5,372,490**

Table 2. Bureau of Reclamation - Funded Projects

Grant/Contract #	Funded Projects	Amount Appropriated
02-AA-8190 M-3	Rio Grande Silvery Minnow Rescue and Salvage	$292,409
02-AA-8350 M-4	Propagation of Rio Grande Silvery Minnow	$400,000
02-AA-8780 M-3	Experimental Augmentation and Monitoring Plan for Rio Grande Silvery Minnow	$181,780
	TOTALS	**$874,189**

Aerial photo of the Los Lunas Reach (photo courtesy of Mark Horner, Corps)

Rio Grande bosque (photo courtesy of Jordan Vaughn, Tetra Tech Program support)

3.0 Collaborative Program Activities

3.1 Habitat Restoration

Habitat restoration activities include physical manipulations of the Rio Grande channel (riverine) and adjacent bosque (riparian) areas to benefit the listed species. For FY 2005, habitat restoration priorities included: projects that would benefit the silvery minnow located between Cochiti Dam and the southern boundary of Isleta Pueblo; projects that were funded previously for planning, design and environmental compliance activities; projects that would address planning, design, and/or construction for fish passage at Isleta Diversion Dam, Angostura Diversion Dam, and San Acacia Diversion Dam; and projects that protected existing flycatcher territories in the MRG. Table 3.1 summarizes the status of the projects described in this section.

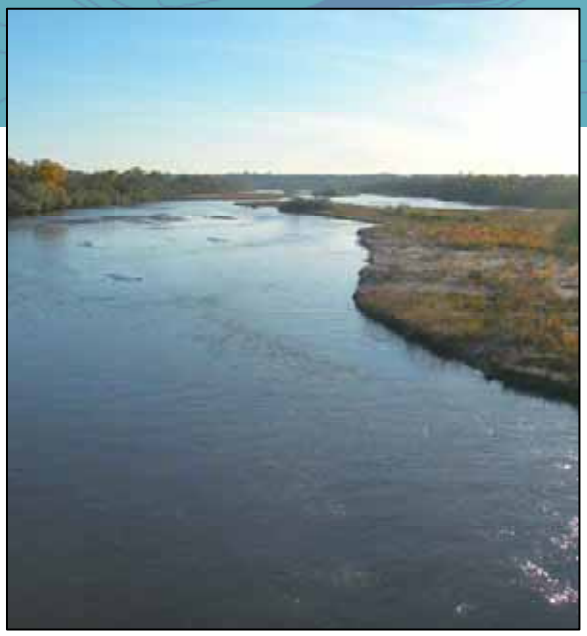
Habitat Restoration Subcommittee members observing bankline modification in the Rio Grande (photo courtesy of Rachelle Schluep, Tetra Tech Program support)

Rio Grande bosque (photo courtesy of Jordan Vaughn, Tetra Tech Program support)

Habitat Restoration

Table 3.1. Habitat Restoration Project Status

Habitat Restoration Projects	Funded Entity	Project Status				Project Notes
		Planning	Permitting	In Progress	Completed	
FY05 Funded Projects						
Overbank Flooding	Army Corps of Engineers				■	Surveyed May 2005; Final Report Submitted July 2005
Perennial Refugia at Drain Outfall	Middle Rio Grande Conservancy District	■				Initial Data Collection Began in November 2005
San Juan Pueblo North Chavez Arroyo	Pueblo of San Juan (Ohkay Owingeh)	■				Planning
Los Lunas Habitat Restoration Project	Bureau of Reclamation				■	2005 Monitoring Complete; Ongoing Monitoring Planned
Development & Design of San Acacia Fish Passage	Bureau of Reclamation				■	Design complete
Rio Grande Silver Minnow Fish Passage Feasibility Study at Isleta Diversion Dam	Army Corps of Engineer			■		Draft report submitted for review
Preliminary Evaluation of Island Destabilization	New Mexico Interstate Stream Commission/Bureau of Reclamation				■	Phase I: Construction completed; ongoing monitoring planned
Santo Domingo Tribe Endangered Species Habitat Improvement Project	Pueblo of Santo Domingo		■			Environmental Compliance Activities in Progress
Ongoing Projects						
Bosque del Apache National Wildlife Refuge: Evapotranspiration Tower Transition Project	U.S. Fish and Wildlife Service			■		Construction in Progress
Rio Grande Nature Center Habitat Restoration	Army Corps of Engineers		■			Environmental Compliance Permitting in Progress
Habitat Restoration Project, Rio Bravo North, and Low Impact, High Yield Habitat, Rio Bravo South	City of Albuquerque		■			Designing and Permitting in Progress
Perennial Pools for Rio Grande Silvery Minnow in the Middle Rio Grand using Cottonwood Snags	Middle Rio Grande Conservancy District				■	Construction completed in August 2005; monitoring will be completed by December 2006



Rio Grande bosque (photo courtesy of Jordan Vaughn, Tetra Tech Program support)

3.1.1 Overbank Flooding

During FY 2005, the Corps led the planning, coordination, and environmental compliance activities required to collect 2005 overbank flooding data. In support of the Corps' efforts, the Service and the Upper Rio Grande Water Operations (URGWOPS) provided aerial photography of the Rio Grande during overbank flooding. In May 2005, during the peak of the high flow releases, an approximately 140 mile long reach of the Rio Grande from Cochiti Dam to the headwaters of Elephant Butte Reservoir was surveyed. Seventy-six complete cross-section surveys were performed and 183 water surface elevations were measured at additional points along the river. A final report was submitted to the Program in July 2005. The data gathered in this effort contributes to planning effective habitat restoration projects and provides monitoring data for previously implemented habitat restoration projects.

3.1.2 Perennial Refugia at Drain Outfall

This project is designed to provide near-term (12 to 24 months from the start of the project) benefits to the silvery minnow by implementing habitat enhancement features at drain outfalls. Preliminary data suggest that drains and their outfalls into the MRG can function as refugia for silvery minnow during drought-induced periods of river channel dewatering and act as important rearing habitat for species conservation. This project will enhance and monitor habitat at three drain outfalls; determine the habitat characteristics in drain outfalls which provide suitable refugia for silvery minnow; and use this knowledge to design and implement habitat enhancement measures at other drain outfalls which lack such suitable habitat. Initial data collection at nine outfalls was performed in November 2005. Analysis of the results of the data collection effort, design of habitat enhancements, and environmental compliance studies are currently underway.

2005 overbank flooding in the MRG (photo courtesy of Erich Schweller, Tetra Tech.)

Two-year-old willow sprouts planted at San Juan Pueblo (Ohkay Owingeh) as part of the flycatcher habitat restoration project (photo courtesy of Dave Morgan)

3.1.3 San Juan Pueblo North Chavez Arroyo

FY 2005 funds are being used to create 10 acres of new flycatcher habitat adjacent to habitat already being created under FY 2003 funds in the Northern Restoration Area, San Juan Pueblo. The new flycatcher habitat will be created by deepening existing old river channels and former backwater ponds in the floodplain and reconnecting them as high-flow channels to the Rio Grande. New water supplies will contribute to passive restoration and revitalization of these potential future nesting sites. Also, Russian olives and other invasive trees will be removed and coyote, Goodding's, and other willow species will be planted to augment the existing stands of coyote willow in the project area.

Before (2003) and after (2005) photos of flycatcher habitat created at San Juan Pueblo (Ohkay Owingeh) [photos courtesy of Dave Morgan].

Rio Grande at Los Lunas Habitat Restoration project area (photo courtesy of Reclamation)

3.1.4 Los Lunas Habitat Restoration Project

The Los Lunas habitat restoration project, which was constructed in 2002, is designed to improve habitat for the silvery minnow and the flycatcher. Improvements to the site and monitoring have been ongoing since construction; however FY 2005 funds were used for re-vegetation, biological monitoring, and cross section surveys. Re-vegetation efforts in 2005 experienced mixed success due to 50-plus days of continuous inundation in May through July. However, monitoring and surveying efforts were successful and nutrient and larval monitoring conducted in 2005 found that areas with near zero velocity provided the most productive spawning and nursery habitat.

Pole plantings at Los Lunas Habitat Restoration project area (photo courtesy of Reclamation)

Floodplain at Los Lunas Habitat Restoration area (photo courtesy of Reclamation)

3.1.5 Development and Design of San Acacia Fish Passage

This FY 2005 study evaluated all potential fish passage alternatives at San Acacia Diversion Dam; recommended three alternatives; and developed conceptual designs and preliminary construction cost estimates for those three alternatives. The draft study report was submitted in May 2006 and the final report was completed in August 2006 with initial input from a study review board consisting of staff from Reclamation, the Service, New Mexico Interstate Stream Commission (NMISC), New Mexico Department of Game and Fish (NMGF), and the Middle Rio Grande Conservancy District (MRGCD).

3.1.6 Rio Grande Silvery Minnow Fish Passage Feasibility Study at Isleta Diversion Dam

This FY 2005 feasibility study is intended to identify and refine fish passage project objectives and constraints; compile and evaluate needed structural, hydraulic, hydrologic, geomorphic, and biological data; and formulate and assess the costs, benefits, and effectiveness of passage alternatives. Phase 1 efforts of this study focus on the vicinity of Isleta Diversion and include the following objectives: 1) reducing the number of egg entrainment into the Belen Highline; 2) maintaining a perennial low-flow channel downstream of the diversion; 3) maintaining sediment continuity and barren sandbar habitat downstream of the structure; and 4) restoring and preserving the cultural needs of the Isleta Pueblo. The Corps is considering operational methods as well as engineering/construction methods. The Corps has met with representatives of the Pueblo of Isleta, the Service, and the MRGCD to gather information. A draft report with various alternatives for meeting project objectives is being prepared.

Rio Grande bosque (photo courtesy of Jordan Vaughn, Tetra Tech Program support)

3.1.7 Preliminary Evaluation of Island Destabilization

The Program funded portion of this project is intended to modify islands to improve adult and juvenile over-wintering habitat and silvery minnow egg retention and rearing habitat within the Albuquerque Reach of the MRG. The NMISC restoration techniques include: three types of vegetated island modification; bar habitat modification; placement of large woody debris; bank scouring; bank lowering; and the establishment of ephemeral channels. Phase I of this project, which included modification of six islands (only 3 of the 6 are shown in map below), was completed in early 2006. Island modification techniques will be evaluated to determine which are the most effective. Design and environmental compliance activities for Phase II of this project are currently underway with construction activities expected to begin in January 2007.

Island modification construction activities (photo courtesy of Page Pegram, NMISC)

Completed island modification (photo courtesy of Page Pegram, NMISC)

Site locations along the South Diversion Channel Reach (part of Albuquerque Reach) of the Rio Grande (map provided by SWCA Environmental)

3.1.8 Santo Domingo Tribe Endangered Species Habitat Improvement Project

In 2005, Santo Domingo Tribe initiated environmental compliance activities for habitat restoration work on two sites along the Rio Grande and one site on the Galisteo Creek. The habitat restoration projects are anticipated to benefit the silvery minnow. Planned restoration activities at the Rio Grande sites include modifying a side channel to connect to the main stem of the river, excavating multiple embayments, and creating a backwater area. At the Galisteo Creek site, 114 acres of scattered salt cedar, Russian olive and Siberian elm will be removed, which will facilitate sediment transport to the Rio Grande. This FY 2005 project is expected to be continued in subsequent years.

3.1.9 Bosque del Apache National Wildlife Refuge: Evapotranspiration Tower Transition Project

Under this FY 2003-funded, multi-year project, the Service will be restoring habitat at the Bosque del Apache National Wildlife Refuge (NWR). Planning and environmental compliance activities have been completed for the project. Following the clearing of 127 acres of monotypic salt cedar, which began in August 2005 and is expected to be completed by Fall 2006, the area will be replanted with native vegetation. Mechanical control of non-native vegetation on 84 acres of river bar is planned and jetty jacks will be removed from the project area. This project will also monitor changes in plant community, wildlife species use, groundwater and surface water dynamics and water use.

Clearing saltcedar at the evapotranspiration tower transition project area. (photo courtesy of Gina Dello Russo, Service, Bosque del Apache NWR)

3.1.10 Rio Grande Nature Center Habitat Restoration

The planning, permitting, and initial construction of this project was originally funded in FY 2004. Using these funds, the Corps designed and initiated environmental compliance for a habitat restoration project at the Rio Grande Nature Center. The project will restore an ephemeral side channel; construct embayments to provide habitat for the silvery minnow; and reconnect the floodplain of the bosque to the river. Non-native vegetation will be removed from the channel and its banks; and native trees, shrubs and grasses will be planted along the side slopes of the channel. This project comprises approximately 15 acres and will primarily benefit the silvery minnow, while providing secondary benefits to the flycatcher. Construction using additional FY 2006 funds is planned for Winter 2006/2007.

3.1.11 Habitat Restoration Project, Rio Bravo North, and Low Impact, High Yield Habitat, Rio Bravo South

Designs and environmental compliance documents are being finalized for this FY 2004-funded project. The Rio Bravo north site is a habitat restoration project encompassing 66 acres of the bosque, and the Rio Bravo south site is a low-impact, high-yield habitat project which includes a 20-acre point bar and six-acre island. This combined project includes: 1) the clearing of non-native vegetation; 2) planting of native vegetation; 3) excavation of ephemeral side channels and embayments; 4) removal of a jetty jack; and 5) development of a moist soil area in the Angostura Reach of the Rio Grande. This project will provide refuge for aquatic organisms, including silvery minnow, and restoration of native riparian vegetation.

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

Using FY 2003 and 2004 funding, three cottonwood snag structures designed to enhance silvery minnow habitat were installed in June 2004 in the Middle Rio Grande below Albuquerque's Bridge Boulevard. Physical and biological monitoring of the cottonwood snags began in 2004 and will be completed by December 2006. Monitoring indicated that all logs and root wads maintained their structural integrity and that bank anchoring systems performed well during the sustained high flows experienced in Spring 2005. Fish sampling was conducted in January and August of 2005. A total of 225 fish representing 14 species were collected on the two sampling occasions. Native fishes represented 55% of all fish collected and the 32 silvery minnow that were collected comprised 14% of all fish examined.

Cottonwood snags installed to enhance silvery minnow habitat (photo courtesy of Tom Wesche, Habitech)

Installation of cottonwood snags in the Rio Grande (photo courtesy of Tom Wesche, Habitech)

3.2 Biological Opinion Monitoring

Monitoring activities allow the Program to measure its effectiveness and ensure that activities associated with Program elements can be evaluated and modified as necessary. Monitoring required by the Biological Opinion includes: 1) monitoring river flows to ensure flow requirements to benefit the silvery minnow are met; 2) surveying for breeding flycatcher in areas where the river was or is expected to become intermittent; 3) monitoring effectiveness of habitat restoration projects; and 4) monitoring reintroduced populations of silvery minnow. Table 3.2 summarizes the status of the projects described below.

Table 3.2. Biological Opinion Monitoring Project Status

Biological Opinion Monitoring Projects	Funded Entity	Project Status			Project Notes
		Planning	In Progress	Completed	
Population Monitoring of Rio Grande Silvery Minnow	American Southwest Ichthyological Research Foundation				2005 Monitoring Complete; Ongoing Monitoring Planned
Population Estimation Study of the Rio Grande Silvery Minnow	American Southwest Ichthyological Research Foundation				In Progress
Southwest Willow Flycatcher Surveys & Nesting Monitoring	Bureau of Reclamation				2005 Monitoring Complete; Ongoing Monitoring Planned
Experimental Augmentation & Monitoring Plan for Rio Grande Silvery Minnow	U.S. Fish and Wildlife Service				2005 Activities Complete; Continuing Augmentation & Monitoring Planned
Rio Grande Silvery Minnow Rescue and Salvage	U.S. Fish and Wildlife Service				2005 Activities Complete

3.2.1 Population Monitoring of Rio Grande Silvery Minnow

Population monitoring of silvery minnow and the associated MRG (Algodones, NM to Elephant Butte Reservoir) fish community has been systematically conducted at multiple sites since 1993 and has been continuously funded by the Program from 2002 to present. The consistent monitoring protocol implemented for this project has yielded a seamless decade-long ecological data set. The information generated during this monitoring effort has provided the foundation necessary to assess changes in the MRG ichthyofaunal community over long-term periods. Specifically, these data have been used to document temporal and spatial trends in native and nonnative fish populations and to assess the influence of environmental variability (i.e., timing, magnitude, and duration of discharge) on species abundance and community structure. Continued monitoring of spatial and temporal changes in the relative abundance of silvery minnow and the associated ichthyofaunal community is essential for gauging the success of long-term recovery efforts and for facilitating informed management decisions. For more information go to http://msb-fish.unm.edu/reports.

Rio Grande bosque (photo courtesy of Jordan Vaughn, Tetra Tech Program support)

3.2.2 Population Estimation Study of the Rio Grande Silvery Minnow

Delayed FY 2005 funding precluded undertaking this project until 2006. Estimating the population size of silvery minnow on an annual basis may provide a useful gauge by which to assess the total increase or decrease in abundance of this federally endangered species. A series of sites, generated at random, will be sampled to develop population estimates based on densities of silvery minnow in different mesohabitats. The relative proportional availability of mesohabitat types combined with actual density estimates in mesohabitats will be used to generate the population estimate at each site. Site density estimates will be extrapolated to provide an estimate for each reach and for the entire Rio Grande study area.

The estimate of population size will complement data collected during the long-term (1993-2006) population monitoring program for the MRG (Angostura, NM to Elephant Butte Reservoir) ichthyofaunal community and will provide a seamless research data set for faunal assessment and management decisions.

Photograph of flycatcher nest (photo courtesy of Darrel Ahlers and Dave Moore)

3.2.3 Southwestern Willow Flycatcher Surveys & Nesting Monitoring

From FY 2001 through FY 2005, the Reclamation Denver Technical Service Center has conducted flycatcher surveys and nest monitoring within the active floodplain of the Rio Grande from the south boundary of the Pueblo of Isleta downstream to Elephant Butte Reservoir. Surveys and nest monitoring not directly related to Reclamation project activities have been funded through the Program.

During 2005 monitoring 17 territories were found in the Sevilleta NWR/La Joya State Wildlife Area; four territories were found in the Belen Reach, which extends from the south boundary of the Pueblo of Isleta to the confluence of Rio Grande and Rio Puerco; and three territories were found within the Tiffany Reach, a subset of the San Marcial Reach south of the Bosque del Apache NWR downstream to Elephant Butte Project Lands.

Annual surveys within this extensive reach of the MRG have provided critical information regarding the limited dispersal of an increasing core population within the Elephant Butte Reservoir conservation pool.

Five-day-old Brown-headed Cowbird chick and one-day-old flycatcher chick (photo courtesy of Darrel Ahlers and Dave Moore, Reclamation Technical Service Center)

Nine-day-old flycatcher (photo courtesy of Darrel Ahlers and Dave Moore, Reclamation Technical Service Center)

VIE-marked Rio Grande silvery minnow (photo courtesy of Jason Remshardt, Service)

3.2.4 Experimental Augmentation and Monitoring Plan for Rio Grande Silvery Minnow

Since June 2002, when the augmentation and monitoring plan began, 562,885 silvery minnow have been marked and released in the Rio Grande between Albuquerque and Socorro as part of the augmentation and monitoring plan funded through the Program. In 2005, an additional 222,648 silvery minnow were marked and released into the Rio Grande. All released fish have been marked with a Visible Implant Elastomer (VIE) tag to allow field identification of released individuals when compared to wild individuals. During monthly monitoring in 2005, 188 silvery minnow that were previously tagged and released were recovered.

In association with augmentation, the Service conducted an in-stream cage study to determine short-term survival of released fish. Over a 4-week study period in November 2005, there was an overall survival rate of 72.2%, which is an exceptional survival rate for stocked, small-bodied fishes. Tag retention of these individuals was also excellent, at 99.3%. This information will be used in determining long-term survival rates and continues to aid in refining techniques for future releases. In 2006, the Program plans to continue its release strategy in all currently occupied reaches, with an estimated 240,000 individuals to be released in 2006 in the Angostura, Isleta, and San Acacia reaches combined. In addition, the Program is preparing an augmentation protocol that will aid in future augmentation activities.

Photographs of silvery minnow augmentation stocking trucks (photo courtesy of Jason Remshardt, Service)

Rio Grande bosque (photo courtesy of Jordan Vaughn, Tetra Tech Program support)

3.2.5 Silvery Minnow Rescue and Salvage

Exceptionally high spring runoff in 2005 caused the MRG to overflow its banks and led to a record spawn year. Overbank areas are excellent nursery sites for minnow eggs to develop into fish. During 2005, as the river receded during the summer, the Service, in collaboration with volunteers, salvaged over 626,000 mostly young-of-year silvery minnows. An estimated 96.3% of these fish were transported alive to perennial flowing sections of the MRG, in both the Albuquerque and Isleta reaches, where they were released. For comparison, 12,864 minnows were rescued in the previous year.

Volunteers sein for stranded silvery minnow in an isolated pool of the Rio Grande bosque (photo courtesy of Brett Thompson, Corps)

Close-up of rescued silvery minnow (photo courtesy of Brett Thompson, Corps)

Silvery minnow being released into the river environment (photo courtesy of Brett Thompson, Corps)

3.3 Water & Minnow Management Improvement

Improved water management allows the needs of the endangered species to be met while continuing existing and planned water uses. Rearing and breeding facilities for silvery minnow increase captive populations and facilitate augmentation efforts in the MRG. Table 3.3 summarizes the status of the projects described below.

Table 3.3 Water & Minnow Management Improvement Project Status

Water & Minnow Management Improvement Projects	Funded Entity	Project Status			Project Notes
		Planning	In Progress	Completed	
FY05 Funded Projects					
Data Collection to Better Define the Interaction of Surface Water & Groundwater in the Middle Rio Grande Valley	U.S. Geological Survey		■		In Progress -- Multi-Year Project
Analysis of Conveyance Optimization & On-Farm Efficiencies of Representative Irrigation Sites in the Middle Rio Grande Conservancy District	URS Corporation		■		In Progress
Operations & Maintenance of Rio Grande Silvery Minnow Rearing & Breeding Facility	City of Albuquerque		■		Ongoing
Operations & Maintenance of Gages (Continuation of contract of 03-CR-408039: Quantification of Flows in the Middle Rio Grande Gages)	New Mexico Interstate Stream Commission/U.S. Geological Survey		■		Gages Installed in 2005; Measurements are Ongoing
Evapotranspiration Monitoring & Modeling	University of New Mexico		■		In Progress
Minnow Sanctuary	Bureau of Reclamation	■			Planning
Propagation for 2006	U.S. Fish and Wildlife Service			■	2005 Maintenance & Spawning of Captive Refugia/Broodstock Successful
Ongoing Projects					
Operational Improvements & Water Management Decision Support System for Irrigation in the Middle Rio Grande Conservancy District	New Mexico Interstate Stream Commission			■	Completed in 2005; Final report complete

3.3.1 Data Collection to Better Define the Interaction of Surface Water and Groundwater in the Middle Rio Grande Valley

Beginning in 2004 and continuing with the aid of FY 2005 funds, the Program has conducted a multi-year project studying surface-groundwater interaction within the MRGCD. Surface-groundwater interaction will be studied via existing transects and new piezometers installed at irrigation sites within the MRGCD. Preliminary field surveys have been conducted to identify surface-groundwater interaction transects and individual well point locations. Permission has been obtained from landowners to install peizometers to augment existing transects and at new locations. Installation of new piezometers and associated monitoring are planned for 2006. The surface-groundwater interaction study is designed to provide quantitative data on the fate of water lost to seepage from surface features (i.e., canals, drains, acequias, etc.), which will add to the overall understanding of the consequences associated with seepage and/or seepage mitigations within these facilities.

3.3.2 Analysis of Conveyance Optimization and On-Farm Efficiencies of Representative Irrigation District Sites in the Middle Rio Grande Conservancy District

Beginning with FY 2003 funds and continuing with FY 2004 and 2005 funds, the Program conducted an evaluation of conveyance canal seepage and irrigation efficiency. Analysis of conveyance seepage was conducted during the winter of 2004/2005 along a designated reach of the Belen Highline Canal. As part of the analysis, geographical, soils, and land use data was compiled; a geomorphic evaluation was conducted; shallow groundwater monitoring wells were installed in transect between the Belen Highline Canal and the river; and surface-groundwater interactions were monitored in the wells. On-farm irrigation efficiency was studied over the 2003 and 2004 irrigation seasons and analyzed in 2005. Interviews regarding the extend and effectiveness of water conservation measures currently employed in the MRGCD were conducted with Natural Resources Conservation Service agents, MRGCD staff, and farmers; data regarding on-farm efficiency and trends in agriculture in Bernalillo, Valencia, and Socorro Counties released in the U.S. Department of Agriculture (USDA) 2002 Census of Agriculture was compiled; current literature regarding on-farm efficiency in the Rio Grande Basin and the regional area was compiled; and efficiency studies were conducted at farms in the MRGCD. Draft reports presenting results of the conveyance seepage and on-farm efficiency analyses were prepared in June 2005. Final reports are expected for 2006.

In 2005, the Program began an additional multi-year project expanding the off-farm conveyance seepage analysis to additional canals within the MRGCD. Seepage analysis was initiated on the Albuquerque Main Canal and will be preformed on at least one additional canal. In addition to determining actual seepage rates, this analysis will help determine relationships between physical characteristics (i.e. surface soil types, canal geometry, depth to groundwater, and proximate vegetation) and seepage potential. These reports are currently in review by the Water Acquisitions and Management (WAM) subcommittee of the Program.

3.3.3 Operations & Maintenance (O&M) of Rio Grande Silvery Minnow Rearing & Breeding Facility

Funding for the operations of the silvery minnow Rearing and Breeding Facility (RABF) located at the Albuquerque Aquarium and Botanic Garden began in 2003 and continued in 2004 and 2005. The RABF 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 2005, the RABF met its goals for: releasing fish; conducting research; working with other facilities and researchers; improving the facility; and engaging in outreach activities within the community. This year the facility tagged and released 90,000 fish to the river and over-wintered another 80,000. These fish were produced from paired and group matings of adults at the RABF and by rearing larvae supplied by the Dexter fish hatchery and technology center. Of the 90,000 fish released, 22,000 were raised in the Naturalized Refugium, while the remainder were raised in the outdoor culture systems. Data was collected on growth, survival, and habitat use of silvery minnow in the refugium. This information will help biologists to better understand what features are useful when constructing silvery minnow habitats. RABF staff monitored silvery minnow spawning activity in the Rio Grande and collected 5000 juvenile silvery minnow from the Rio Grande. These minnows were quarantined and are now held as broodstock at the RABF. The facility worked with several other agencies in 2005. Facility staff conducted a project funded by Reclamation to determine the spawning cues used by the silvery minnow. The preliminary results of this study demonstrate that minnows will spawn in response to an increase in flow or turbidity. The study helped refine the method of spawning silvery minnow using manipulations in environmental cues. The facility spawned fish and collected data for ongoing genetic studies at the University of New Mexico (UNM) and larval and juvenile fish were provided by the RABF to U.S. Geological Survey (USGS) biologists conducting laboratory work on contaminant sensitivity and to U.S. Forest Service biologists conducting laboratory work on feeding habits. The facility also provided multiple tours to school groups and other interested parties and gave presentations to various professional organizations.

3.3.4 O&M of Gages (Continuation of Contract of 03-CR-40-8039: Quantification of Flows in the Middle Rio Grande Gages)

This FY 2003 and 2004 project allowed for the installation of four additional stream gaging stations on the Rio Grande between Isleta and San Marcial. Three new stations were installed in 2005 at: 1) the bridge near Escondida; 2) above US Hwy 380 near San Antonio; and 3) at St Hwy 346 at Bosque. A final gage located near Bosque Farms was installed in 2006.

During 2005, the USGS has been performing standard operations and maintenance for the stations as well as collecting manual streamflow measurements. The manual measurements are necessary to allow office calculations to generate a ratings curve for each station to translate gage height into stream discharge. Upon generation of a ratings curve the USGS will make the station flow data available on their stream gaging webpage (http://waterdata.usgs.gov/nm/nwis/current/?type=flow&group_key=basin_cd). These gages provide valuable flow data for use in management of releases of supplemental water to meet BiOp flow targets.

Evapotranspiration monitoring site at Bosque del Apache National Wildlife Refuge (photo courtesy of John Stormont and Julie Coonrod, UNM)

3.3.5 Evapotranspiration Monitoring and Modeling

This project, which was originally funded in 2003 and has continued with funding in 2004-2005, involves monitoring soil water evaporation as a function of different conditions, such as depth to the water table, soil type, climatic conditions, river staging, shading, and surface mulch. Prior to and during 2005, field data used to interpret soil water evaporation was collected. Collected information includes soil water content, soil water potential, and temperature from five different locations in the MRG bosque. The sites have variable soil types, distances to the ground water table, and surface conditions (shade vs. sun and/or mulch vs. bare). Data from the locations has been used to interpret evaporative fluxes. Additionally, complete energy balance measurements were made at one site for use in a surface temperature-based method for estimating evaporation rate. All data and associated interpretations are being compiled in a database.

In 2005, the evapotranspiration monitoring database was used to develop an empirical predictive model for soil water evaporation as a function of climate, depth to water table, soil type and layering, and surface conditions. Numerical simulations are being used to extend the predictive model to conditions beyond those encountered at the field monitoring locations. The predictive model is also being integrated into a GIS-based model that will account for spatial and temporal variability of climate, river staging, and soil types and will be used to derive a map of estimated soil water evaporation along the MRG.

3.3.6 Minnow Sanctuary

Reclamation, the Service, the MRGCD, and the City of Albuquerque are cooperating in the development of an off-channel sanctuary for the silvery minnow at a site one mile south of Bridge Street in Albuquerque. To create the sanctuary, water will be pumped from the Albuquerque Riverside Drain through a system of constructed channels, pools, and overbank areas in the bosque. After passing through the sanctuary, the water will be returned either to the drain or the river. The sanctuary is designed to serve as one of the additional refugia required by the BiOp.

3.3.7 Propagation for 2005

Propagation activities managed from the Dexter National Fish Hatchery and Technology Center (Dexter NFH&TC) in central New Mexico have been continuously funded since 2001. The center is devoted to the propagation, culture and research of threatened and endangered aquatic species.

In 2005, the Dexter NFH&TC maintained a captive refugia/broodstock of 16,000 adult fish caught in 2002, 2003, and 2005. A total of 222 pairs of 2002 broodstock were spawned, resulting in 200,000 larvae, which were used in restock ponds. An additional 86 pairs of fish were spawned, resulting in 135,000 larvae, which were used at the Albuquerque Biological Park (BioPark) and the Dexter NFH&TC. A total of 160,584 silvery minnow harvested from the Dexter NFH&TC facility and 475 harvested from the associated A-Mountain facility were released into the Rio Grande.

The Dexter NFH&TC also participated in numerous research projects. Projects initiated or continued in 2005 included: a series of feed investigations testing various production diets for the silvery minnow, which were performed in collaboration with the Service; swimming stamina tests; an evaluation of stress associated with salvage and rescue operations of the silvery minnow from the Rio Grande, which is being studied in cooperation with New Mexico State University; VIE marking studies; and genetic analysis of tissue samples collected from silvery minnow reared at Dexter NFH&TC, which was performed with the assistance of the UNM. Additionally, a final draft report on the effects of diet on growth, survival and performance of silvery minnow was released in 2005.

Minnow release from propagation facilities.

3.3.8 Operational Improvements and Water Management Decision Support System for Irrigation in the Middle Rio Grande Conservancy District

This FY 2003 and 2004 project allowed for the development of datasets and computer models used to improve irrigation system operations and facilitate the maintenance of river flows in environmentally sensitive reaches. Information obtained through the datasets and computer models and backed by field testing helped develop a scheduled, rotational water delivery system for the Belen and Socorro Divisions of the MRGCD. Under this program, training workshops and public outreach meetings were also held to familiarize staff and irrigation use with fundamentals of rotational water delivery. This project provided a key tool for the MRGCD to manage its water supply according to crop demand and develop schedule rotation water deliveries. The project was completed in 2005 and a final report is expected in 2006.

3.4 Water Acquisition

In 2005, funding made possible releases of supplemental water to meet the flow requirements of the BiOp and benefit the listed species. Funding was also used to support the Emergency Drought Water Agreement between the State of New Mexico and the United States which provided for releases of water into the Rio Grande to benefit listed species. Funding was used to secure leases of San Juan-Chama Project water from willing leasors to provide supplemental water to the Rio Grande. Funding was also be used for Low Flow Conveyance Channel (LFCC) pumping in which water was pumped from the LFCC into the Rio Grande to enhance river flows to benefit listed species.

3.4.1 Evaluating Water Acquisition Actions

The intent of this FY 2004 funded study was to make a more complete assessment of the utility and feasibility of using water rights acquisitions to supplement flows in the Rio Grande floodway. This work addressed two principal areas: 1) how much consumptive use would result from a flow supplementation program of the magnitude estimated by the Water Acquisition and Management Subcommittee (WAMS) of the Program and 2) how might water rights acquisitions be used to get "wet water" in the Rio Grande floodway to meet the flow targets of the 2003 BiOp.

The Rio Grande basin is already over-appropriated; therefore, any new consumptive uses of water in the basin must be offset by a reduction in existing uses. A water rights acquisition program, acquiring water rights from willing sellers, is one way to offset new consumptive uses. This study estimated that the consumptive use arising from the water operations contemplated by the WAMS average about 7,000 acre-feet per year. Based on a consumptive irrigation requirement of 2.1 feet per acre, this would require the acquisition of approximately 3,300 acres of irrigated lands and their appurtenant water rights within the MRG valley.

This study also determined that, under current water management conditions, water rights acquisition would not be effective in delivering "wet water" to the Rio Grande floodway without either strict priority administration of water rights in the MRG (and good measurement and reporting of diversions) or a cooperative agreement with the MRGCD. Acquisition of water rights will not lead to reduction in diversion from the river or increased storage in upstream reservoirs.

Middle Rio Grande (photo courtesy of Reclamation)

3.5 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 2005 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 3.5 summarizes the status of the projects described below.

Table 3.5. Science and Monitoring Project Status

Science and Monitoring Projects	Funded Entity	Project Status			Project Notes
		Planning	In Progress	Completed	
FY05 Funded Projects					
Monitoring Genetic Changes in the Endangered Rio Grande Silvery Minnow & Genetic Analysis of Alternative Captive-breeding Designs	University of New Mexico				2005 Monitoring Complete; Monitoring is Ongoing
Habitat Preference of Rio Grande Silvery Minnow in Relation to Fluvial Geomorphology & Flow Regime, Middle Rio Grande Valley	U.S. Fish and Wildlife Service				In Progress
Monitoring the Spatial Reproductive Periodicity of Rio Grande Silvery Minnow	American Southwest Ichthyological Research Foundation				2005 Monitoring Complete; Additional Monitoring is Planned
Rio Grande Silvery Minnow Survival & Recovery Activities	New Mexico State University				Preliminary Results
Ongoing Projects					
A Study of Transient Groundwater Riparian Conditions & Sensitivity	New Mexico Interstate Stream Commission				Study Completed in 2005; Final Report Completed
Risks of Adverse Water Quality Impacts to Rio Grande Silvery Minnow	New Mexico Interstate Stream Commission				Study Completed in 2005; Final Report Completed
Evaluation of Bar Morphology, Distribution, & Dynamics	New Mexico Interstate Stream Commission				Study Completed in 2005; Final Report Completed
Pueblo of Sandia Bosque Restoration and Water Quality Monitoring	Pueblo of Sandia				2005 Monitoring Complete; Final Report in Progress

Field work at the Rio Grande as part of UNM's genetic monitoring and analysis project (photo courtesy of UNM)

3.5.1 Monitoring Genetic Changes in the Endangered Rio Grande Silvery Minnow and Genetic Analysis of Alternative Captive-Breeding Designs

Researchers at UNM continue genetic monitoring of the wild silvery minnow population. Monitoring began in 1999 and 2005 marked the seventh silvery minnow generation to be sampled and characterized genetically. Genetic monitoring also continues for all captive stocks produced at the Albuquerque BioPark and Dexter NFH&TC. Genetic monitoring research has addressed important genetic issues associated with captive rearing and augmentation. These analyses have resulted in recommendations for ensuring that captive stocks are genetically representative and diverse, and these recommendations have been adopted widely by hatchery facilities breeding silvery minnow. Major findings of this study include: 1) captive rearing and augmentation have maintained genetic diversity in the silvery minnow population; 2) the spatial distribution of genetic diversity in the wild population has changed over time with augmentation presumed to be partly responsible for injecting diversity into the northern reaches of the MRG; and 3) breeding strategies that seek to maximize genetic diversity (i.e. the use of paired matings) have resulted in higher levels of diversity in captive stocks. Ensuring a genetically diverse wild population is a crucial step toward recovery of the species.

3.5.2 Habitat Preference of Rio Grande Silvery Minnow in Relation to Fluvial Geomorphology & Flow Regime, Middle Rio Grande Valley

The purpose of this study, which was initiated with FY 2002 funds and continued with 2003 and 2005 funds, is to describe silvery minnow habitat selection and investigate potential variation related to varying fluvial geomorphology and flow regime within the Rio Grande between Cochiti Dam and the headwaters of Elephant Butte Reservoir. Silvery minnow is the species of primary interest, but data has been collected for all fishes encountered. Riverine habitats have been monitored at meso (water column size habitat features) and macro (river channel width size habitat features) spatial scales. This study: 1) documents mesohabitat association of silvery minnow; 2) documents mesohabitat availability to compare with silvery minnow mesohabitat association; and 3) evaluates trends between macro and mesohabitat type, silvery minnow associated mesohabitat availability, and silvery minnow abundance. Initial observations suggest that: 1) the Albuquerque Valley Reach contains poor habitat available for the silvery minnow at all flow ranges; 2) the Isleta Reach has contained better quality habitat for the silvery minnow for the period prior to 2005; and 3) the Socorro Valley Reach contains the most consistently better quality habitat for the silvery minnow. Since 2005, the Isleta Reach has been changing from a multi-tread system with connected floodplain surfaces towards a single threaded system with disconnected floodplain surfaces. This trend equates to a potential loss of quality habitat in this reach and should be closely watched by the Program. During the past year, efforts related to this study have collected much needed silvery minnow habitat use data. The data will be analyzed following the completion of field work in the Fall of 2006 and presented in the final report.

3.5.3 Monitoring the Spatial Reproductive Periodicity of Rio Grande Silvery Minnow

Extensive systematic monitoring of the reproductive output of silvery minnow was first conducted in the MRG in 1999, and has been performed annually from 2001 through 2004, thereby providing information on the relative timing, magnitude, and duration of silvery minnow spawning. The focused continuation of this effort is an essential element necessary to gauge silver minnow recovery efforts. The results of the 2005 studies closely mirror those of the 2001-2004 silvery minnow population monitoring program (Section 3.2.1) and documented the continued decline in the reproductive output and overall abundance of this species. The decrease in abundance of silvery minnow reported in the 2003 Population Monitoring study was manifested in the lowest catch rates (daily and cumulative) recorded to date in 2004. Long-term monitoring of the reproductive effort of silvery minnow remains necessary for recovery efforts and to facilitate effective management decisions. Delayed FY 2005 funding precluded undertaking this project until spring 2006. This 2006 effort is designed to provide valuable insight to success of recent stocking efforts and increased population level of silvery minnow. Sampling stations are to be established near the lower ends of the Angostura (one site) and Isleta (one site) and San Acacia (one site) reaches.

The objectives of this study are to: 1) determine daily and monthly catch-rate of silvery minnow eggs in each of the three reaches (Angostura, Isleta, and San Acacia) of the MRG; 2) assess spatial variation in silvery minnow catch rates (between reaches); 3) assess temporal variation in silvery minnow catch rates within reaches; and 4) correlate egg catch rates with reach specific silvery minnow relative abundances.

3.5.4 Rio Grande Silvery Minnow Survival & Recovery Activities

Preliminary work on silvery minnow survival and recovery activities began in the Fall of 2005 with the collection and analysis of silvery minnow from isolated pools within the Peralta reach of the MRG. Work was conducted with Service personnel from the Ecological Services Field Office and the New Mexico Fishery Resources Office. Preliminary results indicate that the cumulative effects of stress from isolation in pools and subsequent transport and release to perennial water (above Albuquerque) may reduce the chances of survival. The project is continuing in 2006.

3.5.5 A Study of Transient Groundwater Riparian Conditions and Sensitivity

Under this FY 2003 and 2004 project, a series of shallow, riparian-zone groundwater models associated with the MRG were designed. The models were developed to represent physical processes relevant to assessing shallow groundwater conditions and exchanges between surface water and shallow groundwater within the floodplain of the Rio Grande from Angostura to San Antonio. Results from the models indicate that replacing non-native vegetation with native vegetation would have minimal impact on groundwater levels or surface water-groundwater interaction. However, the models indicate that regional groundwater conditions do exert strong influence on riparian groundwater elevations and on the magnitude of river seepage. The project was completed in 2005; a final report is expected in 2006.

3.5.6 Risks of Adverse Water Quality Impacts to Rio Grande Silvery Minnow

This study compared existing water chemistry data from the MRG between 1992 and 2005 to accepted toxicity threshold criteria to better understand the possible risks that water quality may pose to the silvery minnow population and the Rio Grande fish community. Results from over 200,000 individual water quality analyses were screened using standard risk assessment methods established by the U.S. Environmental Protection Agency (EPA). While screening indicated that discrete intervals and locations existed where elevated concentrations of one or more contaminants might have affected aquatic life and silvery minnow, no one contaminant could be singled out as producing significant historical impacts or impairing silvery minnow recovery along the MRG. The study concludes that water quality is unlikely to be the primary cause of the silvery minnow population declines observed in the MRG or a major impairment to recovery. The report identified 72 water quality constituents deserving additional study to better assess present-day potentials for water quality effects in the MRG. The findings from this study are currently in review by the Program.

3.5.7 Evaluation of Bar Morphology, Distribution, and Dynamics

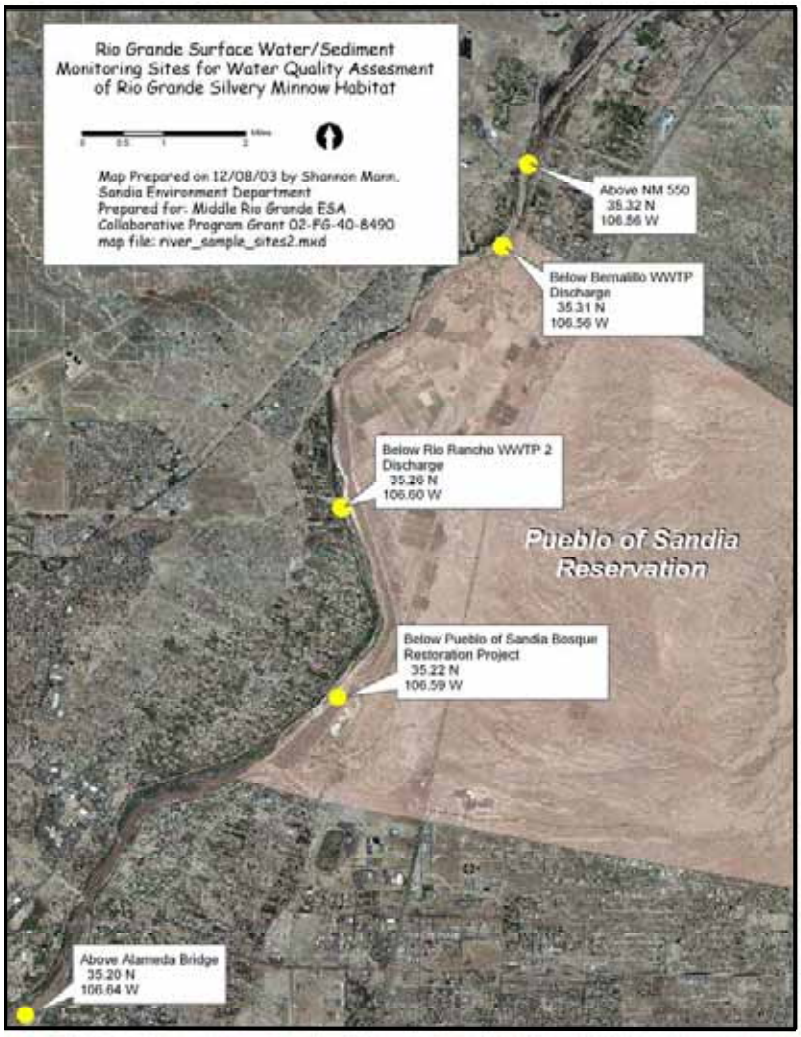
Under this FY 2003 and 2004 study, field observations and measurements were used to classify in-channel and channel-margin bars in the MRG. In the absence of site-specific hydraulic surveys or modeling along specific reaches of the Rio Grande, the bar classification provides a first-cut determination of the magnitude and frequency of flows that will inundate the various bar types. This information is used to identify the level of physical modifications required to meet inundation frequency and duration restoration targets and will be used in future physical habitat restoration projects in the MRG. Field investigations and analysis for this project were conducted in 2003 and 2004 and were completed in 2005. A final report is expected in 2006.

Rio Grande bosque (photo courtesy of Jordan Vaughn, Tetra Tech Program support)

Rio Grande bosque near Montano bridge (photo courtesy of Jordan Vaughn, Tetra Tech Program support)

3.5.8 Pueblo of Sandia Bosque Restoration and Water Quality Monitoring

This FY 2002 project was initiated in December, 2003 and involves water quality and sediment sampling of five sites located in the MRG from NM 550 Bridge south to Alameda Blvd. Bridge. This stretch of the MRG borders the Pueblo of Sandia. A map of the sampling sites is attached. The sites were sampled bimonthly for a year to assess water quality within the Pueblo of Sandia stretch of the MRG. All analyses were conducted to the lowest detectable limit using approved EPA methodology by Severn Trent Laboratories in conjunction with the Service's *Water-Quality Assessment in Relation to Rio Grande Silvery Minnow Habitats within the Middle Rio Grande* study. Parameters sampled included pesticides, herbicides, metals, nutrients, general water chemistry and bacteriologicals. The water quality data analysis and the updating of the Pueblo of Sandia's water quality database were completed in 2005.



Map of Pueblo of Sandia Water Quality sites (map provided by Pueblo of Sandia)

4.0 Summary

In 2005, Program signatories and participants partnered to support habitat restoration, water management, species salvage and research, and other Program activities. Through the Program a variety of research, survey, and construction activities were initiated and continued. The continuation of these activities will assist in improving the status of endangered species in the MRG while protecting existing and future water uses.