# RECLAMATION

*Managing Water in the West*

## ANNUAL REPORT 2005

# RIO GRANDE FISH COMMUNITY SURVEYS

U.S. Department of the Interior
Bureau of Reclamation

# ANNUAL REPORT-2005

# RIO GRANDE FISH COMMUNITY SURVEYS

## October 2005

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## Introduction

The U.S. Bureau of Reclamation annually conducts fish community surveys on the Rio Grande to document trends in fish community structure, evaluate the effects of river maintenance and water operations, and other project-related commitments. The data collected supplement surveys conducted by the U.S. Fish and Wildlife Service, New Mexico Department of Game and Fish, and the American Southwest Ichthyological Research Foundation.

## Methods

Fish surveys conducted by Reclamation use standard electrofishing gear (boat and backpack), seining, and trapping in four reaches of the Middle Rio Grande in New Mexico. Additional sampling for Rio Grande silvery minnow (*Hybognathus* amarus) eggs was performed using Moore egg collectors (Altenbach et al. 1999) and quadrats.

## Data Collection and Analysis

Captured fish were identified to species, enumerated for all surveys, and released. Fish collected during electrofishing were measured for total length (mm), weighed (g), and released. Data was recorded using HanDBase (DDH software) on Palm or Hewlett Packard handheld computers or printed datasheets. The handheld computers were transported in waterproof OtterBox cases. Data was downloaded onto workstations frequently and exported into Excel for summarization. The total number of species and individuals for each species were calculated by site. The Shannon-Weiner index was calculated for each site as a measure of species diversity.

## Surveys for Silvery Minnow Eggs

Surveys for silvery minnow eggs were conducted (Figure 1) at Middle Rio Grande Conservancy District (MRGCD) irrigation diversions (U.S. Fish and Wildlife Service 2003). Moore egg collectors were used for collecting egg in the canals. Egg data was collected by SWCA Environmental Consultants under contract to the U.S. Bureau of Reclamation. SWCA will be compiling all the available data for silvery minnow egg monitoring.

## Electrofishing surveys

Surveys were conducted by Reclamation biologists along several reaches of the Middle Rio Grande (Figure 2) as part of monitoring project requirements. Within each reach, electrofishing was conducted at sites selected from previous studies and new sites where monitoring is required. Surveys included a range of habitat types, including natural (defined as not altered), backwater, riprap and jetty areas. Data were recorded relative to sample reach and habitat type. Sampling by habitat types allowed for replication and subsequent statistical inference. GPS coordinates were recorded when silvery minnows were identified in a net to identify preferred habitat.

A Smith-Root 1.5 kV pulsed-DC electrofisher system was used to sample designated segments along the study reaches in February 2005. The electrofisher unit was mounted on a raft with two sphere anodes and adjusted to produce 2.0-3.5 amps at 30 pulses per second for sampling in reaches with 400 cfs flows. Water conductance varied from 300 to 600 ms/cm upstream to downstream. Sampling effort was measured by time (sec) electrofished.

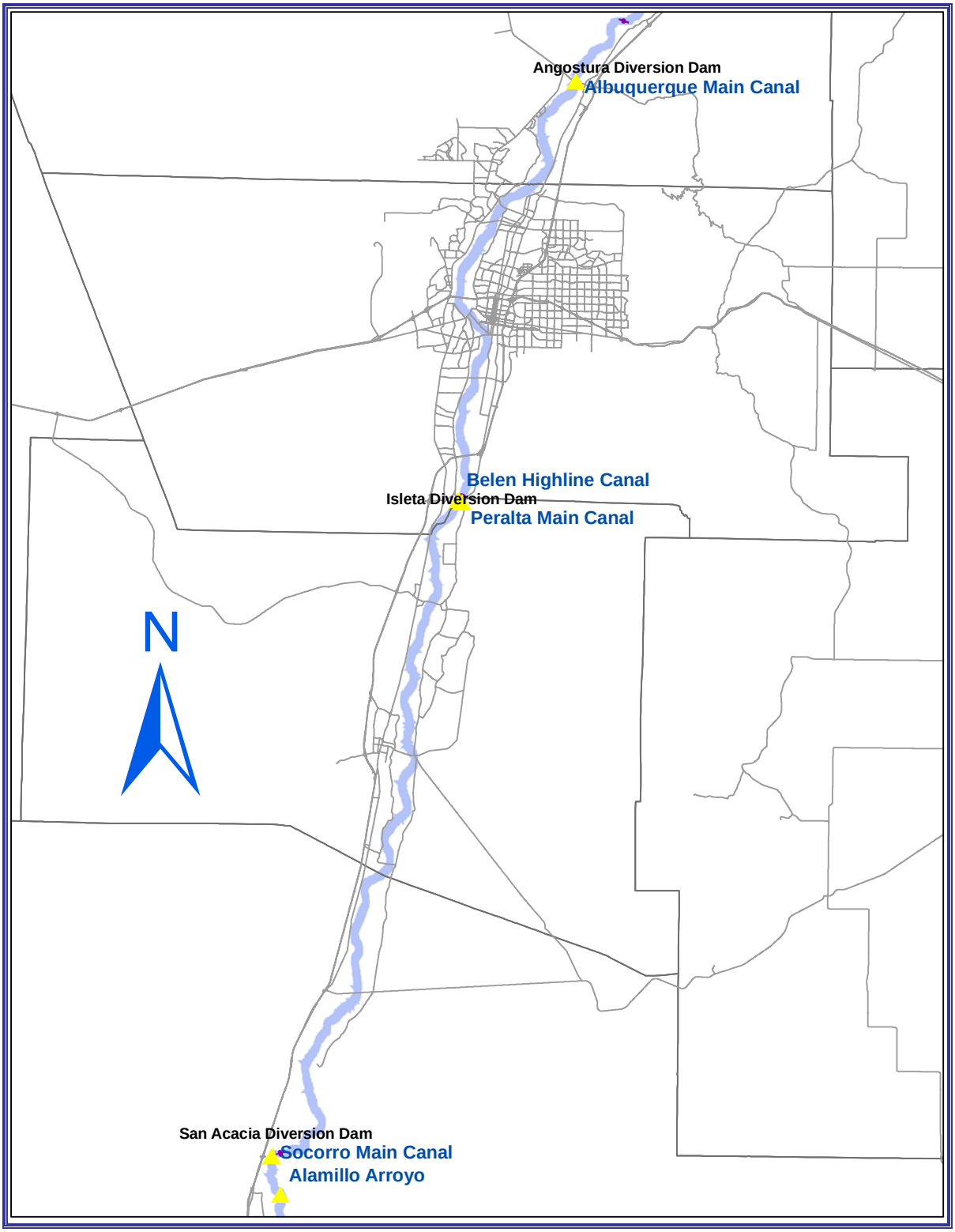


**Figure 1.** Irrigation diversion sampling locations.

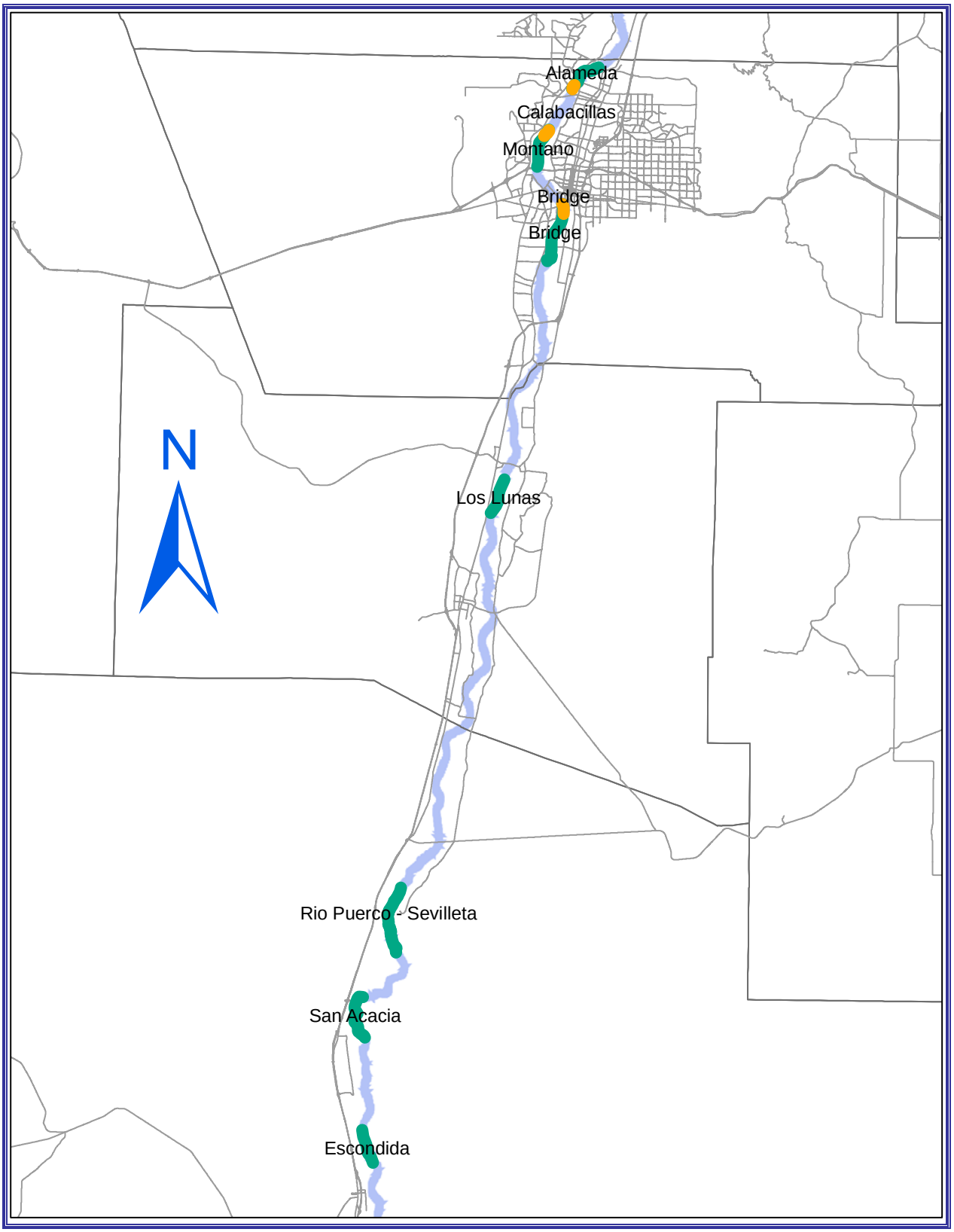


**Figure 2.** Sampling paths for raft (green) and Argo (orange) electrofishing.

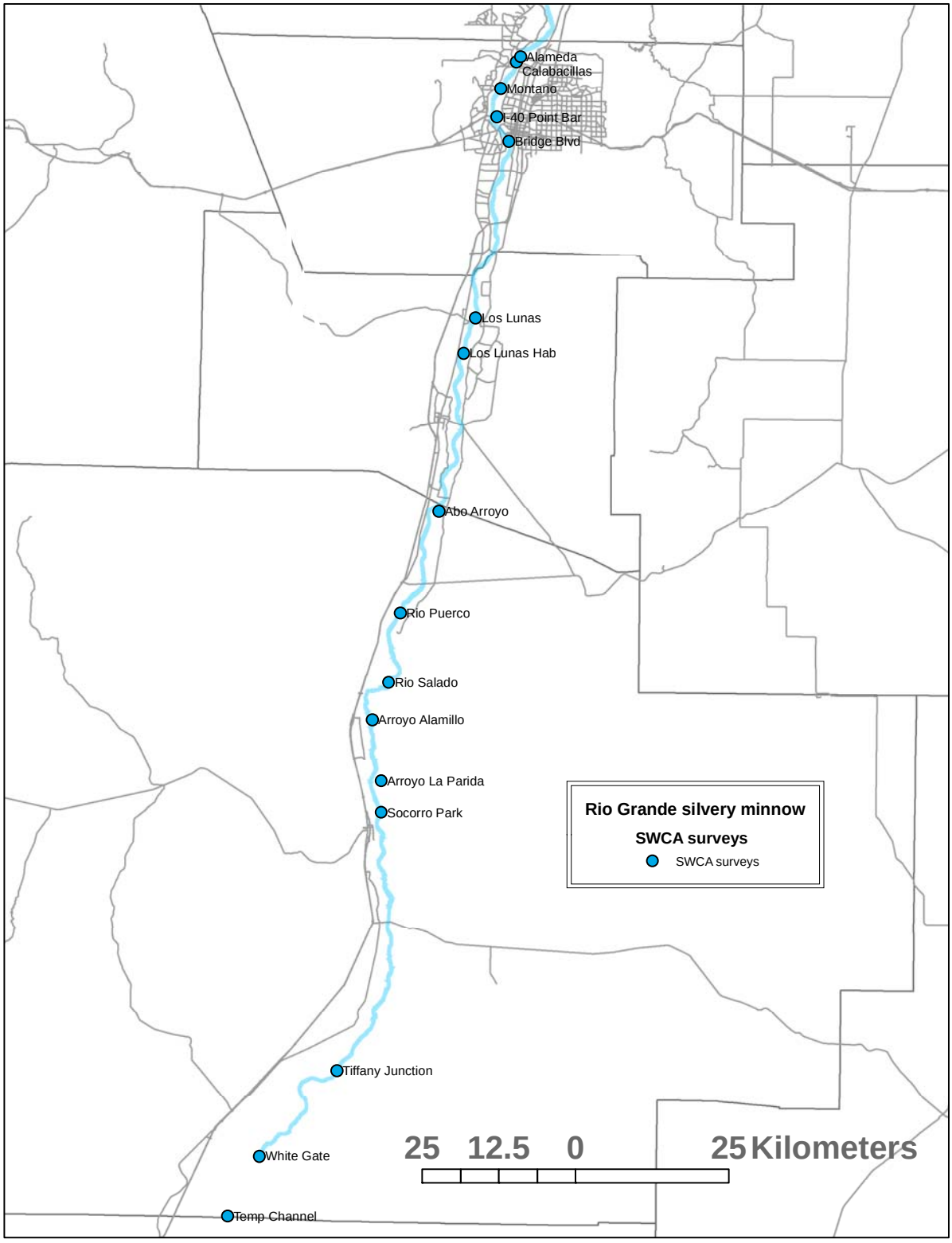


**Figure 3.** July longitudinal sampling locations.

The Smith-Root pulsed-DC electroshocking system was mounted on an Argo all-terrain vehicle (ATV) replacing the spherical anodes with a pair of wands with anode hoops in August 2005. The ATV facilitated sampling in 100-200 cfs flows where the river channel is wider with shallow water (mean depth < 0.5 m). Two technicians walk beside the ATV, sweeping the water area with the wands. Two additional technicians net the electro-anesthetized fish.

**Seining Surveys**

A series of sites were surveyed by SWCA under contract to Reclamation in July 2005 using seines. These longitudinal surveys (Figure 3) were designed to complement fish community monitoring surveys conducted by other entities to fill in details on the recruitment and distribution of various fish species following spring runoff. Fish were identified to species, counted, and released.

**Results and Discussion**

Monitoring for silvery minnow eggs at the irrigation diversion structures (Table 1) collected a total of 5 silvery minnow eggs using Moore egg collectors. Twenty-four silvery minnow eggs were collected at Alamillo Arroyo. All eggs were returned to the river following enumeration.

The combined raft and ATV electrofishing results are presented in Table 2. Sampling with the raft usually encompassed about three miles of river. Using the ATV allowed sampling of about one mile of river with greater intensity and capture rates. The number of species and Shannon-Weiner index were notably lower during the summer surveys as a result of high recruitment by silvery minnows. Silvery minnows composed 84.7% of the fish community in Albuquerque area during August.

Flows of 1000-1400 cfs (Albuquerque Gage) facilitated using the electrofishing raft on the Los Lunas Restoration Site. During the summer of 2004, the site was dry due to river intermittency downstream of Isleta Diversion Dam. Thirty-eight silvery minnows were collected at the site in February (Figure 4), recolonizing the site within four months of re-wetting. Most of the silvery minnows were collected in shallow, slackwater habitat. This is consistent with previous observations (Dudley and Platania 1996) that silvery minnows select low velocity habitat during the winter.

Summer electrofishing surveys in the Albuquerque area found high numbers of young-of-year (YOY) silvery minnows (1614/1905 total fish). The silvery minnows were found predominantly in narrow (<10 m width), shallow (<0.25 m depth) channels with slow water velocities. Fish numbers dropped notably when crossing deeper channels (0.5 m depth) with faster velocities. The presence of high densities of silvery minnows in shallow channels does not appear to attract avian predators, regardless of visibility. No birds were noted adjacent to shallow channels where numerous silvery minnows were present. In July, a shallow channel (<0.15 m) with hundreds of silvery minnows was observed under a bridge (~10 m elevation). No birds were observed despite the visibility of fish from above. These results supplement previous observations (Dudley and Platania 1997) that YOY silvery minnows prefer shallow habitat produced by a complex braided channel.

The longitudinal fish community surveys are shown in Table 3 with a cross-listing of species and common names in Table 4. Silvery minnows were 64.6% of the fish collected. The Shannon-Weiner index generally decreased where silvery minnows were numerous, indicating a

low level of species diversity. The low silvery minnow numbers downstream of Tiffany indicate poor habitat quality. This observation will be discussed in the nursery habitat study report.

Sampling at the Rio Salado confluence observed silvery minnows using habitat features not previously reported. Silvery minnows were collected in all habitats (every seine haul) sampled at this location. Young-of-year silvery minnows were observed in large numbers (100's) over a shallow (<0.15 m) cobble substrate. Some silvery minnows were chased into a stationary seine (kick-set) in slightly deeper water for identification. Kick-set sampling in a riffle at the Rio Salado collected several silvery minnows in association with longnose dace (*Rhinichthys cataractae*). This observation is consistent with previously reported swimming speeds (Bestgen *et al*. 2003) and that silvery minnows are capable of ascending steeper riverine features than previously reported. The high numbers of silvery minnows collected at the Rio Salado confluence are probably the result of quality nursery habitat inundated in the arroyo mouth during the elevated spring runoff.

The significant increase in silvery minnows appears due to increased recruitment resulting from inundation of floodplain habitat. Winter and summer sampling at Bridge Blvd and Montaño showed a considerable increase in the number of silvery minnows. Winter sampling covers about a three mile reach with deeper water while the summer sampling is limited to a one mile reach in shallower water. Despite the differences in sampling protocol, the increased numbers of silvery minnows is a significant indicator of recruitment.

Previous studies by Porter and Massong (2004 a,b,c) have emphasized the role of floodplain habitat for completing the life cycle of the silvery minnow. Channel incision following construction of Cochiti Dam and other dams reduces the availability of floodplain habitat in years with below average runoff. This degradation of habitat quality and availability for producing young of year silvery minnows has probably contributed to their declining populations in recent years.

## CONCLUSIONS

Silvery minnow recruitment was high in 2005 due to increased floodplain inundation. The availability of floodplain nursery habitat is an important limiting factor on silvery minnow populations. Young-of-year silvery minnows use narrow shallow habitat regardless of substrate. Silvery minnows can swim upstream through fairly steep riffles, demonstrating an ability for negotiating swift currents.

## ACKNOWLEDGMENTS

Funding for these surveys was provided by the U.S. Bureau of Reclamation Albuquerque Area Office, the U.S. Bureau of Reclamation Science and Technology Program, and the New Mexico Interstate Stream Commission. We appreciate the cooperation of the Middle Rio Grande Conservancy District, Sandia Pueblo, City of Albuquerque Open Space and Sevilleta National Wildlife Refuge in providing access to study sites. The Socorro Field Division maintained the Argo ATV for the semi-aquatic electrofishing surveys.

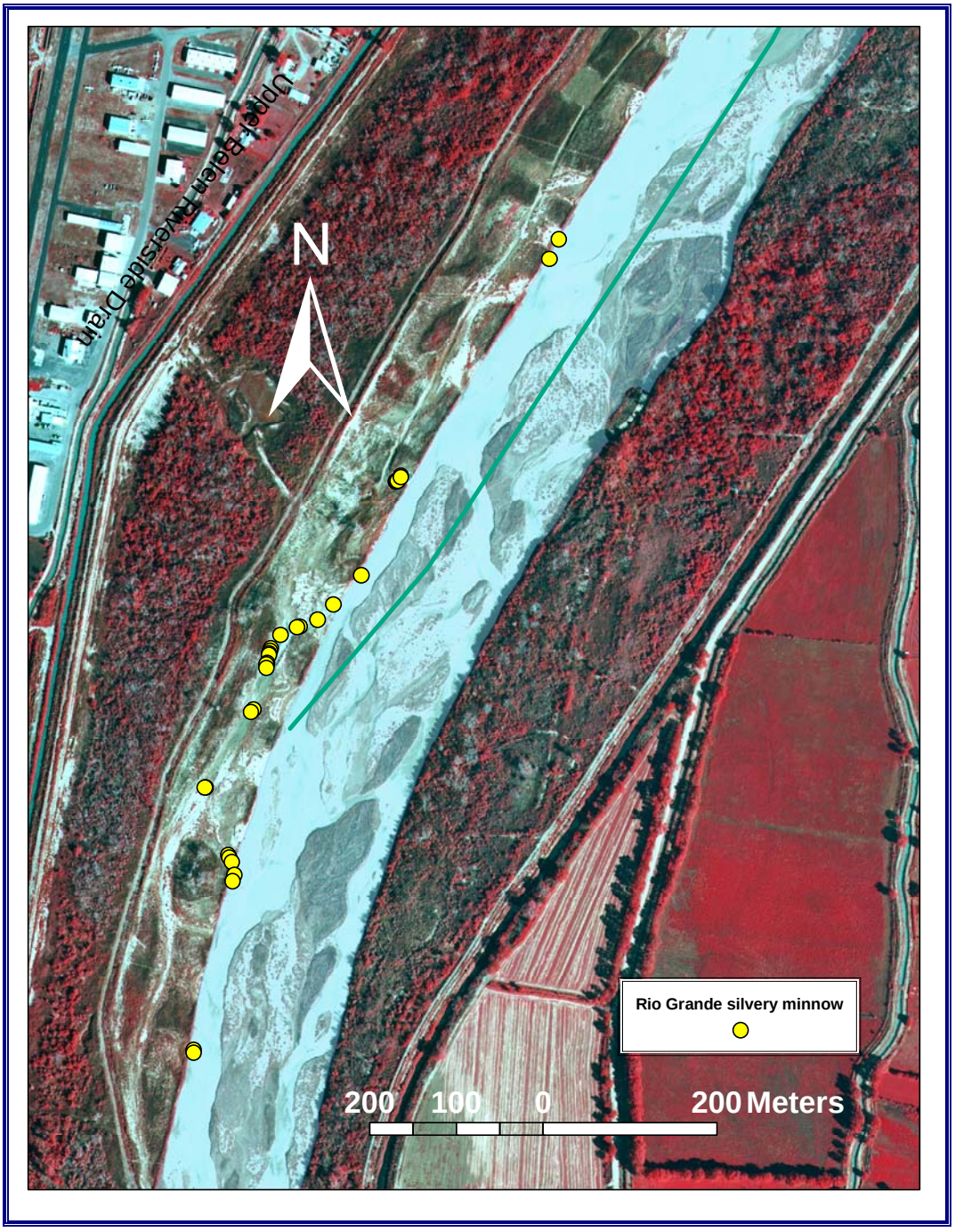


**Figure 4.** Los Lunas Restoration Site Rio Grande silvery minnow locations (February 2005).

**Table 1.** Results of monitoring for silvery minnow eggs at irrigation diversion structures.

| **Date** | Albuquerque Main | Peralta Main | Belen Highline | Alamillo Arroyo |
|---|---|---|---|---|
| Time (hours) | 30:55 | 31:00 | 31:01 | 34:30 |
| 5/1/2005 | 0 | 0 | 0 | 0 |
| 5/2/2005 | 0 | 0 | 0 | 0 |
| 5/3/2005 | 0 | 0 | 0 | 0 |
| 5/4/2005 | 0 | 0 | 0 | 0 |
| 5/5/2005 | 0 | 0 | 0 | 4 |
| 5/6/2005 | 0 | 1 | 0 | 0 |
| 5/7/2005 | 0 | 0 | 0 | 4 |
| 5/8/2005 | 0 | 0 | 0 | 0 |
| 5/9/2005 | 0 | 0 | 1 | 1 |
| 5/10/2005 | 0 | 0 | 0 | 0 |
| 5/11/2005 | 0 | 0 | 0 | 0 |
| 5/12/2005 | 0 | 0 | 1 | 2 |
| 5/13/2005 | 0 | 0 | 0 | 1 |
| 5/14/2005 | 0 | 0 | 0 | 0 |
| 5/15/2005 | 0 | 0 | 0 | 3 |
| 5/16/2005 | 0 | 0 | 0 | 0 |
| 5/17/2005 | 0 | 0 | 0 | 0 |
| 5/18/2005 | 0 | 0 | 0 | 2 |
| 5/19/2005 | 0 | 0 | 0 | 0 |
| 5/20/2005 | 0 | 0 | 0 | 2 |
| 5/21/2005 | 1 | 0 | 0 | 1 |
| 5/22/2005 | 0 | 0 | 0 | 0 |
| 5/23/2005 | 0 | 0 | 0 | 4 |
| 5/24/2005 | 0 | 0 | 0 | 0 |
| 5/25/2005 | 0 | 0 | 0 | 0 |
| 5/26/2005 | 0 | 0 | 0 | 0 |
| 5/27/2005 | 0 | 0 | 0 | 0 |
| 5/28/2005 | 0 | 0 | 1 | 0 |
| 5/29/2005 | 0 | 0 | 0 | 0 |
| 5/30/2005 | 0 | 0 | 0 | 0 |
| 5/31/2005 | 0 | 0 | 0 | 0 |
| **Totals** | | | | |
| 2005[1] | 1 | 1 | 3 | 24 |
| 2004[1,2] | 0 | 3 | 3 | - |
| 2003[1,2] | 3 | 26 | 48 | - |
| 2002[2] | 0 | 729 | 826 | 28[3] |

1. Diversions managed to minimize entrainment of silvery minnow eggs.
2. Bureau of Reclamation 2002, 2003, 2004.
3. Socorro Main Canal

**Table 2.** Rio Grande electrofishing surveys. Raft surveys were conducted in February and the ATV was used for the August surveys.

| Species | Total | Alameda | Montaño | Bridge Blvd | Los Lunas | Rio Puerco | San Acacia | Escondida | Bridge Blvd | Montaño | Calabacillas |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2/15/2005 | 2/16/2005 | 2/18/2005 | 2/24/2005 | 2/23/2005 | 2/22/2005 | 2/17/2005 | 8/16/2005 | 8/17/2005 | 8/16/2005 |
| Ameiurus natalis | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carpoides carpio | 138 | 7 | 16 | 44 | 8 | 1 | 9 | 12 | 34 | 1 | 3 |
| Catostomus commersoni | 177 | 21 | 8 | 4 | 0 | 0 | 0 | 1 | 3 | 21 | 25 |
| Cyprinella lutrensis | 108 | 5 | 1 | 1 | 1 | 15 | 8 | 46 | 10 | 10 | 7 |
| Cyprinus carpio | 157 | 16 | 15 | 26 | 6 | 7 | 19 | 16 | 1 | 7 | 8 |
| Gambusia affinis | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 5 |
| Hybognathus amarus | 1732 | 13 | 7 | 4 | 46 | 0 | 32 | 16 | 415 | 712[1] | 487[2] |
| Ictalurus punctatus | 81 | 17 | 31 | 11 | 0 | 5 | 5 | 3 | 2 | 4 | 0 |
| Ictiobus bubalus | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 |
| Lepomis macrochirus | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Micropterus dolomeiui | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Micropterus salmoides | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 5 |
| Morone chrysops | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 1 | 7 |
| Oncorhynchus mykiss | 9 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Perca flavescens | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Pimephales promelas | 77 | 0 | 0 | 0 | 15 | 3 | 0 | 1 | 6 | 19 | 18 |
| Platygobio gracilis | 126 | 18 | 14 | 5 | 1 | 4 | 3 | 3 | 2 | 27 | 35 |
| Rhinichthys cataractae | 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 12 |
| Salmo trutta | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sander vitreus | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 2005 Total Fish | 2712 | 103 | 94 | 95 | 77 | 35 | 78 | 101 | 485 | 807 | 613 |
| Shannon Weiner | 1.48 | 1.97 | 1.79 | 1.43 | 1.17 | 1.52 | 1.61 | 1.60 | 0.66 | 0.58 | 0.93 |
| | | | | | | | | | | | |
| 2004 Total Fish | | | | | 25 | | 50 | 6 | | | 450 |
| Shannon Weiner | | | | | 1.38 | | 0.68 | 0.64 | | | 1.74 |

1. Six silvery minnows were preserved as incidental take.

2. Three silvery minnows were preserved as incidental take

**Table 3.** Summer longitudinal fish surveys on the Rio Grande (July 25-29, 2005).

| Species | Total | Alameda | Montano | I-40 Point Bar | Bridge Blvd | Los Lunas Hwy 6 | Los Lunas Restoration | Abo Arroyo | Rio Puerco | Rio Salado | Arroyo Alamillo | Arroyo de La Parida | Socorro Park | Tiffany Junction | White Gate | Temporary Channel |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ameiurus natalis | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| Carpoides carpio | 143 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 2 | 3 | 125 | 2 | 6 |
| Cyprinella lutrensis | 775 | 19 | 29 | 2 | 18 | 55 | 35 | 133 | 5 | 50 | 50 | 115 | 113 | 114 | 54 | 14 |
| Cyprinus carpio | 631 | 23 | 4 | 28 | 16 | 12 | 2 | 78 | 66 | 31 | 14 | 110 | 13 | 186 | 6 | 39 |
| Dorosoma cepedianum | 184 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 77 | 29 | 13 | 29 | 34 |
| Gambusia affinis | 1099 | 36 | 25 | 7 | 0 | 26 | 16 | 507 | 94 | 24 | 26 | 119 | 23 | 7 | 1 | 192 |
| Hybognathus amarus | 8094 | 47 | 82 | 75 | 34 | 3882 | 1767 | 329 | 1377 | 267 | 696 | 1049 | 134 | 83 | 3 | 2 |
| Ictalurus punctatus | 173 | 0 | 2 | 1 | 1 | 10 | 8 | 5 | 63 | 4 | 30 | 13 | 16 | 8 | 3 | 17 |
| Morone chrysops | 167 | 20 | 4 | 2 | 3 | 4 | 1 | 24 | 5 | 5 | 0 | 8 | 73 | 9 | 0 | 0 |
| Morone saxatilis | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oncorhynchus mykiss | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Perca flavescens | 13 | 4 | 1 | 1 | 6 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pimephales promelas | 1155 | 14 | 15 | 20 | 0 | 49 | 35 | 93 | 33 | 17 | 29 | 745 | 110 | 27 | 0 | 1 |
| Platygobio gracilis | 74 | 2 | 2 | 0 | 8 | 1 | 0 | 0 | 0 | 4 | 8 | 25 | 14 | 0 | 0 | 0 |
| Pomoxis annularis | 11 | 8 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Fish | 12529 | 174 | 167 | 136 | 86 | 4040 | 1865 | 1173 | 1646 | 402 | 856 | 2263 | 528 | 572 | 98 | 311 |
| Shannon Weiner | 1.32 | 1.95 | 1.54 | 1.28 | 1.58 | 0.23 | 0.28 | 1.47 | 0.69 | 1.18 | 0.81 | 1.40 | 1.90 | 1.71 | 1.20 | 1.30 |

**Table 4.** Rio Grande fish species and common names.

| Species Name | Common Name |
|---|---|
| Ameiurus melas | Black Bullhead |
| Ameiurus natalis | Yellow Bullhead |
| Carpoides carpio | River Carpsucker |
| Catostomus commersoni | White Sucker |
| Cyprinella lutrensis | Red Shiner |
| Cyprinus carpio | Common Carp |
| Dorosoma cepedianum | Gizzard Shad |
| Gambusia affinis | Mosquito Fish |
| Hybognathus amarus | Silvery Minnow |
| Ictalurus furcatus | Blue Catfish |
| Ictalurus punctatus | Channel Catfish |
| Ictiobus bubalus | Small Mouth Buffalo |
| Lepomis cyanellus | Green Sunfish |
| Lepomis macrochirus | Bluegill Sunfish |
| Micropterus dolomeiui | Smallmouth Bass |
| Micropterus salmoides | Largemouth Bass |
| Morone chrysops | White Bass |
| Morone saxatilis | Striped Bass |
| Oncorhynchus mykiss | Rainbow Trout |
| Perca flavescens | Yellow Perch |
| Pimephales promelas | Fathead Minnow |
| Platygobio gracilis | Flathead Chub |
| Pomoxis annularis | White Crappie |
| Pomoxis nigromaculatus | Black Crappie |
| Pylodictis olivaris | Flathead Catfish |
| Rhinichthys cataractae | Longnose Dace |
| Salmo trutta | Brown Trout |
| Sander vitreum | Walleye |

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