

RECLAMATION

Managing Water in the West

ANNUAL REPORT 2007



Gravid Rio Grande silvery minnows at the Calabacillas Arroyo study site, May 2007.

RIO GRANDE FISH COMMUNITY SURVEYS



U.S. Department of the Interior
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**U.S. BUREAU OF RECLAMATION
ALBUQUERQUE AREA OFFICE
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I. 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 supplements surveys conducted by the U.S. Fish and Wildlife Service, New Mexico Department of Game and Fish, and the American Southwest Ichthyological Research. Reclamation conducts electrofishing and seining surveys for monitoring the effects of river maintenance projects. The nursery habitat study is conducted to better define habitat needs of the Rio Grande silvery minnow (silvery minnow) for habitat restoration and population management to avoid jeopardy and support recovery of the species. The information gathered by the nursery habitat study can be used by the Middle Rio Grande Endangered Species Act Collaborative Program (Collaborative Program) participants for habitat restoration projects. Monitoring of silvery minnow egg entrainment is conducted by a contractor for meeting requirements under the 2003 Programmatic Biological Opinion (Service 2003).

II. Methods

Data Collection and Analysis

Fish surveys conducted by Reclamation (Permit #TE813088-0) use standard electrofishing gear (boat and backpack), and seining in the Middle Rio Grande in New Mexico. 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 HandDBase (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 tabulated 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 at Middle Rio Grande Project irrigation canals (Figures 1 and 2, Table 1) to meet requirements under the 2003 Programmatic Biological Opinion (Service 2003). Moore egg collectors (Altenbach et al. 2000) were used for collecting eggs in the canals. Egg data was collected by the Service's Fishery Resources Office under contract to Reclamation.

Electrofishing surveys

Surveys were conducted by Reclamation biologists along several reaches of the Middle Rio Grande (Figures 1, 2 and 3) as part of monitoring project requirements (Table 1). Within each reach, electrofishing was conducted at sites selected from previous studies. Surveys sampled a range of habitat types, including natural (defined as unaltered), backwater, riprap and jetty areas. Data were recorded by sample reach. GPS coordinates were recorded when silvery minnows were collected in dipnets to identify preferred habitat.

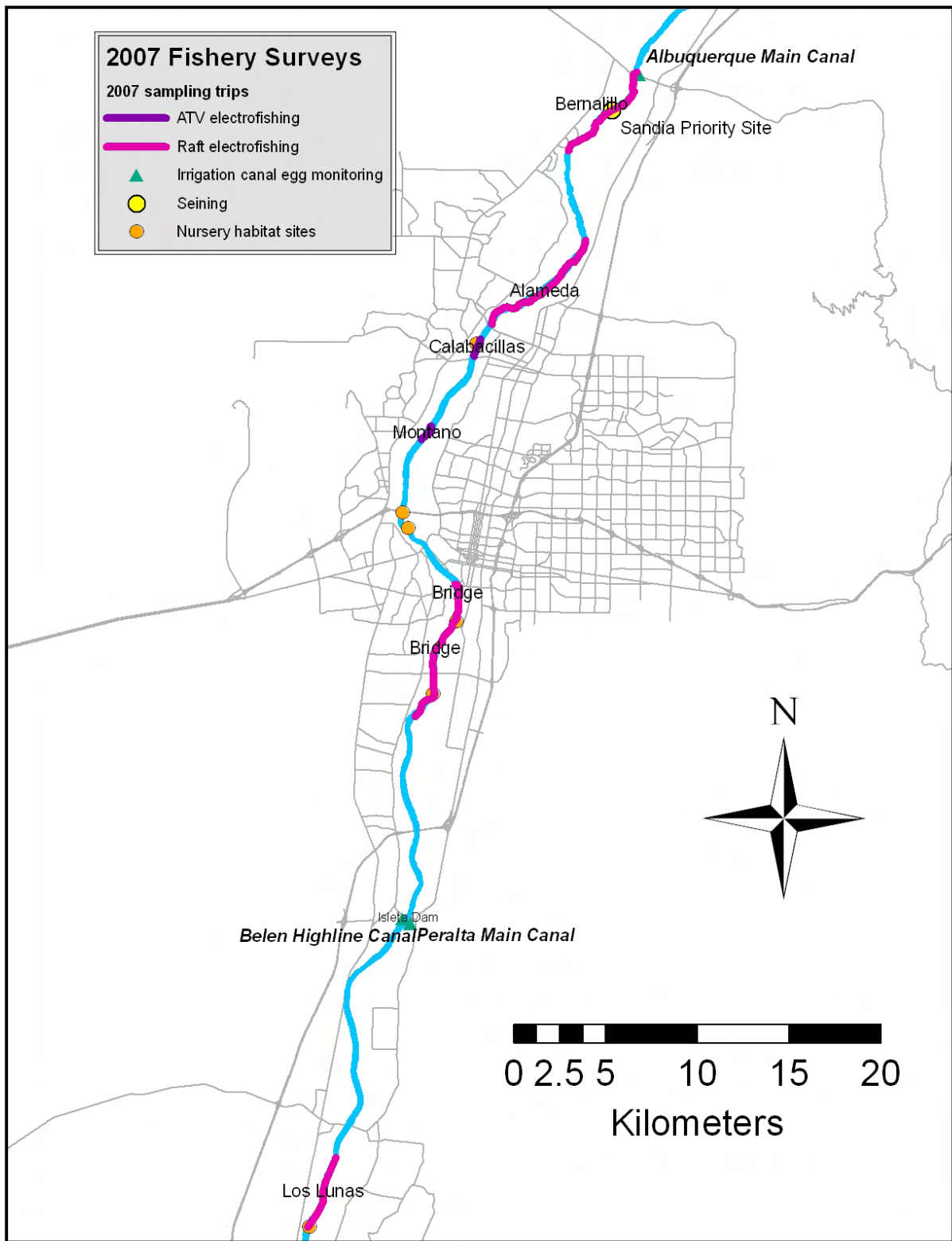


Figure 1. Sites for irrigation diversion monitoring, fish sampling, and electrofishing trips for the Albuquerque and Los Lunas area.

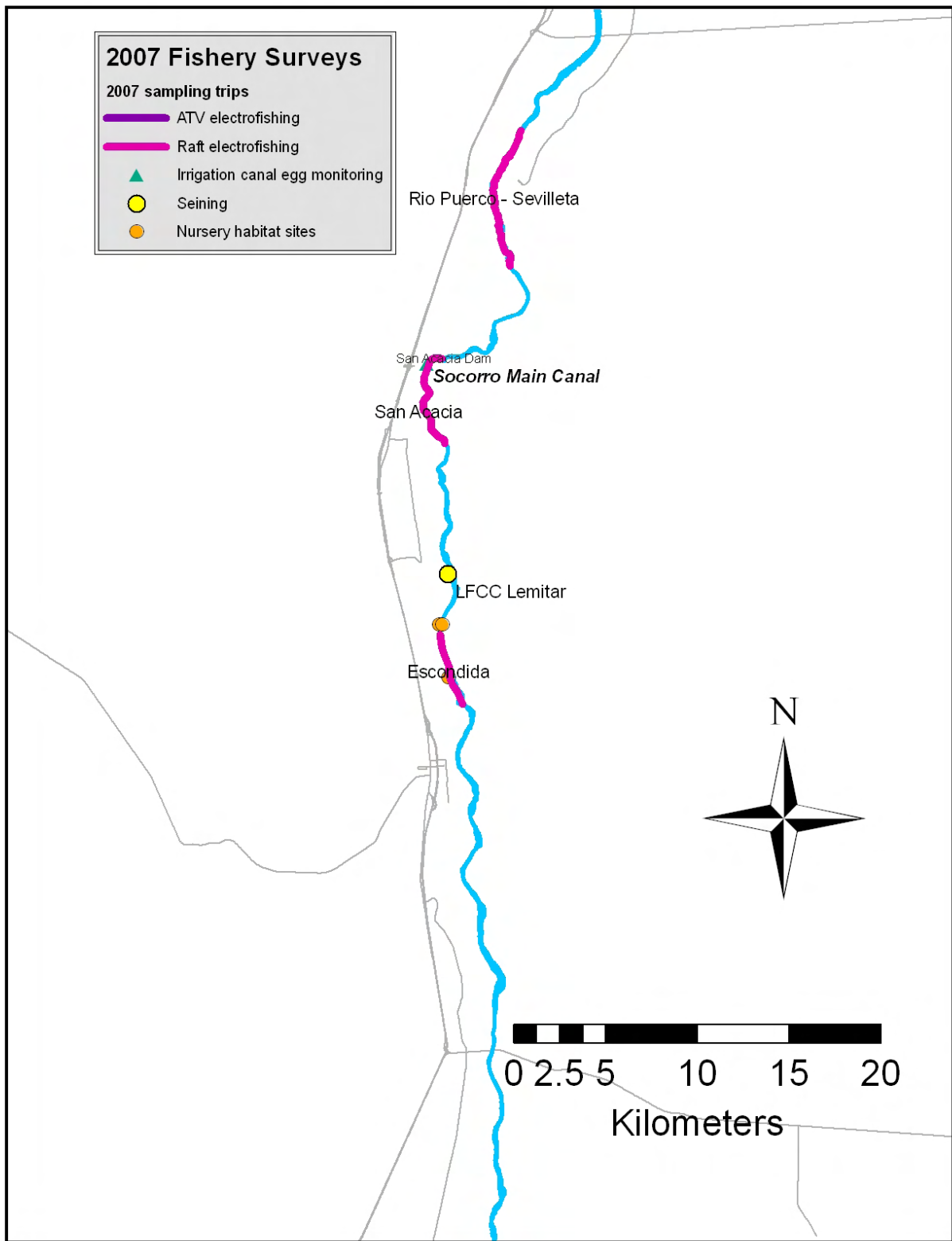


Figure 2. Sites for irrigation diversion monitoring, fish sampling, and electrofishing trips in the vicinity of San Acacia.

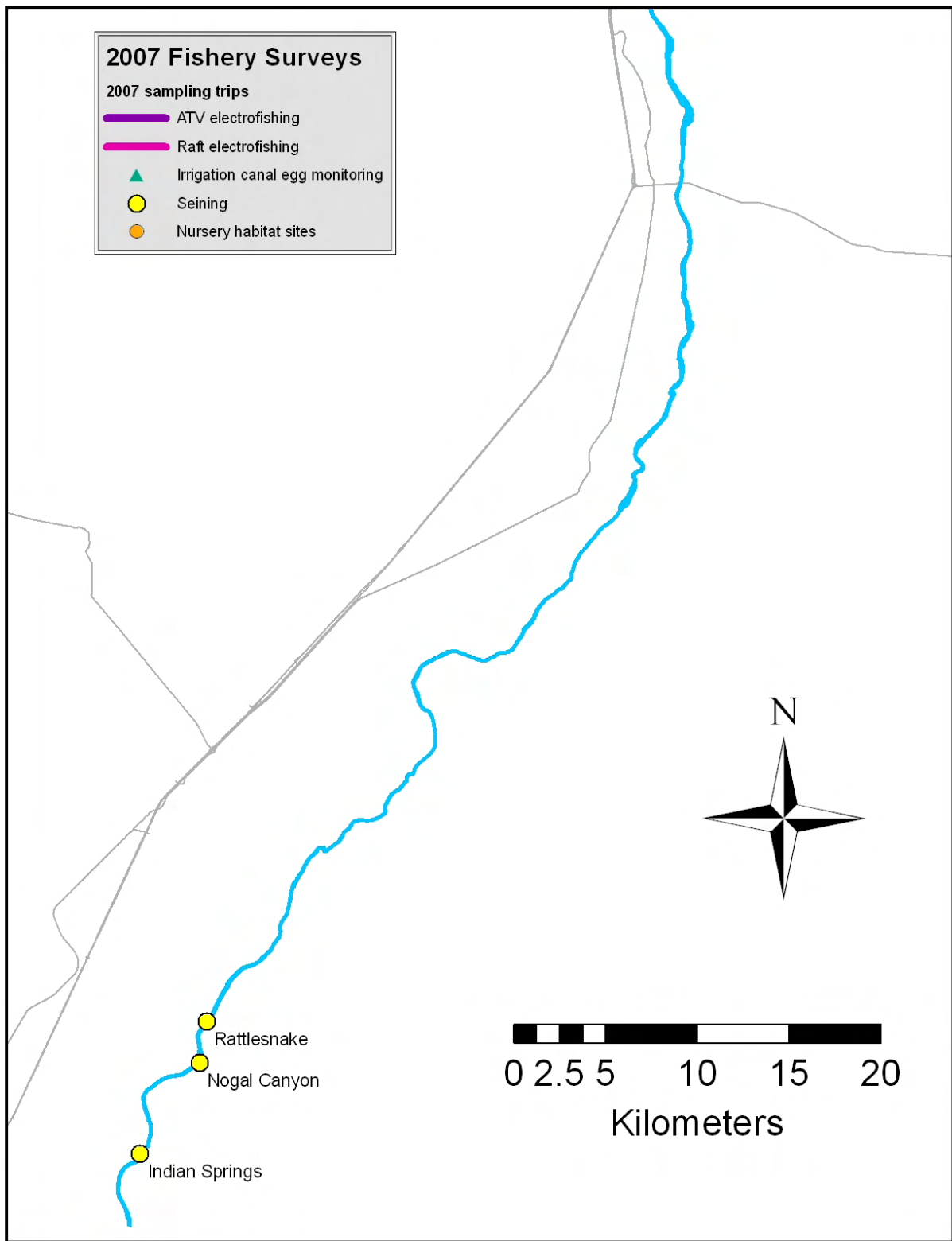


Figure 3. Sites for fish sampling in the Temporary Channel within the Elephant Butte reservoir pool.

A Smith-Root 1.5 kV pulsed-DC electrofisher system was used to sample designated segments along the study reaches. In February 2007, 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 (seconds) electrofished. Water quality measures were usually recorded upon arrival at the raft launch site. Data for water temperature, conductivity, dissolved oxygen and pH were recorded using a Eureka probe and handheld computer. In August 2007, the electrofisher unit was mounted on an amphibious ATV with handheld wands replacing the spherical anodes. The crew walked along the ATV for sampling.

Seining Surveys

Sampling used either a 1/8" or 1/4" inch mesh, 3 m wide seine. Two fish monitoring (seining) surveys (Figures 2 & 3) were conducted in 2007. The first survey examined the fish community in the Low Flow Conveyance Channel (LFCC) downstream of the Lemitar Diversion Structure for the upcoming LFCC realignment at River Mile (RM) 111. The second survey was conducted at three sites (Rattlesnake, Nogal, and Indian Springs) for the Temporary Channel River Maintenance Project.

Nursery Habitat Study

Field data collection at nursery habitat sites (May 3 – June 7, 2007) focused on sampling using kicknets and seines (SWCA Environmental Consultants 2007, Permit #TE045236-3). Kicknets were used by sweeping 0.5 m paths to collect fish larvae and silvery minnow eggs. Larvae and eggs were enumerated using a Trimble GeoXT handheld GPS unit (UTM NAD 83 datum) and released. Fish collected by seining were identified to species when possible, position recorded using the GeoXT, and released. Depth, water velocity, and water quality data were collected by a separate team and recorded to GPS coordinates using the GeoXT. Two samples of fish larvae were preserved for identification for the I-40 and Los Lunas Restoration Sites. Spatial analysis of the egg, larvae and fish data will be presented in a subsequent nursery habitat report.

III. Results and Discussion

Silvery Minnow Eggs

Monitoring for silvery minnow eggs at the irrigation diversion structures (Table 2) collected a total of 94 silvery minnow eggs. All eggs were returned to the river following enumeration. Management of the diversion dams by the Middle Rio Grande Conservancy District (MRGCD) continues to keep the rate of egg entrainment below the initial value of 1,583 in 2002.

MRGCD has reduced diversions in recent years in a move toward greater efficiency with the diverted water (Gensler, pers. comm.). Beginning in 2002, MRGCD shifted activities to use Unit 7 as much as possible, reducing diversions at San Acacia Dam into Socorro Main during the spawning period. In the 1990's Isleta Diversion Dam would typically divert 800 cfs during late May. MRGCD now diverts less than 500 cfs at Isleta in late May, reducing the proportion of the total flow used for irrigation. In 2003 and 2004 MRGCD reduced diversions during the peak of egg production. During the high flow in 2005, the diversions at Isleta represented less than 15 percent of the total flow. No special actions were taken in 2006 and 2007 to reduce diversions at Isleta. Another factor is the change in water velocities around the diversion structures. With lower velocity water entering the canal intakes (due to reduced volume), and an increased water

volume (with higher velocities) moving downstream through the structure, more eggs probably pass through the diversion dam rather than being entrained in the canals.

Electrofishing surveys

The raft and ATV electrofishing results are presented in Table 3. Sampling with the raft usually encompassed between 3-5 miles of river per reach. Lower winter flows in 2007 precluded using the electrofishing raft on the Los Lunas Restoration Site. Seven subreaches were sampled producing 279 silvery minnows. Summer flow in August was suitable for using the amphibious ATV as in previous years with a total of 1,226 silvery minnows being collected in three subreaches.

Nursery Habitat Study

The flow in 2007 provided good opportunities for studying Rio Grande silvery minnow nursery habitat utilization. Of 2,546 kicknet and 784 seine samples (total 3,330), 209 samples had 2,836 silvery minnow eggs. There were 720 kicknet samples with a total of 9,455 fish larvae enumerated but not preserved for identification. A total of 5,865 fish were captured and released during the nursery habitat survey including 324 silvery minnows (Table 4). The two preserved larval fish samples were mostly composed of fathead minnows (Table 5). The number of fish and their eggs found in the study areas demonstrates that silvery minnows will spawn on inundated pointbars and in backwaters when available. While the number of fish larvae found in the study areas confirms the importance of pointbars and backwaters as fish habitat, the lack of silvery minnow larvae in the preserved samples indicates our ignorance of their behavior and habitat preference. The timing and nursery habitat components (depth, vegetation, other variables) used by silvery minnow larvae requires more quantification by focused studies. Data from the nursery habitat study will be evaluated in more detail in a separate report.

Seining Surveys

Table 6 shows the results of the fish seining surveys associated with project monitoring. The survey samples in the LFCC downstream of the Lemitar Diversion Structure were composed of red shiners and mosquitofish. This survey verified that no silvery minnows occur in the LFCC near the proposed realignment project at River Mile 111. The survey conducted on the Temporary Channel collected 133 silvery minnows from the three sites. Pointbars resulting from channel maintenance activities appear to provide habitat for silvery minnows.

IV. CONCLUSIONS

The number of silvery minnow eggs entrained at MRGCD diversion dams continues to be fewer than sampled in 2002. Managed spring flow in 2007 resulted in good recruitment from inundation of nursery areas for sufficient duration to support recruitment. The area and availability of floodplain nursery habitat is an important limiting factor on silvery minnow populations. Surveys have documented the exclusion of silvery minnows from the LFCC since experimental operations were concluded. Silvery minnows continue to utilize the Temporary Channel, likely the result of pointbar formation in the area.

V. ACKNOWLEDGMENTS

Product names in this report are provided to illustrate examples of techniques, and do not imply endorsement of commercial equipment or software used during these studies. Funding for these surveys was provided by Reclamation's Albuquerque Area Office. 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. Steve Hiebert and Juddson Sechrist from the Denver Technical Center operated the raft. SWCA environmental consultants provided valuable expertise and personnel for the nursery habitat study and other sampling. SWCA and New Mexico Fishery Resources Office provided silvery minnow egg entrainment data under contract to Reclamation. The Pueblo of Cochiti and the Corps of Engineers are commended for their combined efforts to provide sufficient flow volume and duration to support recruitment by the silvery minnow during the May spawning period.

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Table 1. Sampling sites and reaches

Study Area	Objectives	Sampling Approach
Albuquerque Main Canal	Silvery minnow egg entrainment	Egg collector
Bernalillo Reach	Priority Sites construction	Electrofishing
Alameda Reach	Habitat and Population Status	Electrofishing
Calabacillas Site	Habitat and Population Status	Kicknet, seine
Montano Reach	Habitat and Population Status	Electrofishing
I-40 Site	Habitat Characterization and Restoration	Kicknet, seine
Central Wasteway Site	Habitat Characterization and Restoration	Kicknet, seine
Bridge Blvd Reach	Habitat and Population Status	Electrofishing
RGSM sanctuary Site	Habitat Characterization	Kicknet, seine
Peralta Main Canal	Silvery minnow egg entrainment	Egg collector
Belen Highline Canal	Silvery minnow egg entrainment	Egg collector
Los Lunas Reach and Site	Habitat Characterization and Restoration	Electrofishing, kicknet, seine
Rio Puerco Reach	Fish Passage	Electrofishing
Socorro Main Canal	Silvery minnow egg entrainment	Egg collector
San Acacia Reach	Priority Sites and Baseline	Electrofishing
LFCC Site	Priority Site construction	Seine
LFCC Outfall Site	Habitat Characterization	Kicknet, seine
Arroyo de La Parida Site	Habitat Characterization	Kicknet, seine
Escondida Reach	Priority Site construction and Baseline	Electrofishing
Socorro North Diversion Channel Site	Habitat Characterization	Kicknet, seine
Temp channel Sites	Channel Maintenance	Seine

Table 2. Results of monitoring for silvery minnow eggs at irrigation diversion structures.

Date	Albuquerque Main	Peralta Main	Belen Highline	Socorro Main	
Time (hours)	31:00	31:00	31:00	31:00	
5/1/07	0	3	2	1	
5/2/07	0	1	8	0	
5/3/07	0	11	12	0	
5/4/07	0	4	16	0	
5/5/07	0	7	3	1	
5/6/07	0	0	0	0	
5/7/07	0	0	1	0	
5/8/07	0	1	0	0	
5/9/07	0	0	0	0	
5/10/07	0	2	1	0	
5/11/07	0	7	0	0	
5/12/07	0	2	0	0	
5/13/07	0	1	0	0	
5/14/07	0	0	0	0	
5/15/07	0	1	0	0	
5/16/07	0	0	0	0	
5/17/07	0	1	0	0	
5/18/07	0	0	0	0	
5/19/07	0	0	0	0	
5/20/07	0	0	0	0	
5/21/07	0	0	0	0	
5/22/07	0	0	0	0	
5/23/07	0	0	0	0	
5/24/07	0	0	0	0	
5/25/07	0	0	0	0	
5/26/07	0	0	0	0	
5/27/07	0	0	0	0	
5/28/07	0	0	0	0	
5/29/07	0	0	0	0	
5/30/07	0	4	0	0	
5/31/07	0	4	0	0	
					Totals
2007 ¹	0	49	43	2	94
2006 ^{1,2}	0	17	8	8	33
2005 ^{1,2}	1	1	3	-	4
2004 ^{1,2}	0	3	3	-	6
2003 ^{1,2}	3	26	48	-	77
2002 ²	0	729	826	28	1,583

1. Diversions managed to minimize entrainment of silvery minnow eggs.

2. Bureau of Reclamation 2002, 2003, 2004, 2005, 2006.

Table 3. Results from 2007 electrofishing surveys.

Species	Total	Bernalillo	Alameda	Bridge Blvd	Los Lunas Raft	Rio Puerco	San Acacia	Escondida	Calabacillas	Montano Argo ATV	Bridge Blvd
		2/22/2007	2/23/2007	2/19/2007	2/16/2007	2/21/2007	2/20/2007	2/15/2007	8/21/2007	8/22/2007	8/23/2007
Ameiurus melas	2	0	0	0	0	0	0	0	0	1	1
Ameiurus natalis	2	0	0	0	1	0	1	0	0	0	0
Carpoides carpio	302	8	17	84	4	7	26	1	3	63	89
Catostomus commersoni	109	0	9	10	0	0	0	0	11	56	23
Cyprinella lutrensis	95	0	0	1	5	52	0	0	29	5	3
Cyprinus carpio	253	44	48	72	17	5	25	24	2	13	3
Gambusia affinis	4	0	0	0	0	0	0	0	3	1	0
Hybognathus amarus	1,505	4	8	60	74	31	81	21	255	631	340
Ictalurus punctatus	246	25	16	41	8	39	12	16	9	49	31
Ictiobus bubalus	2	1	0	0	0	0	1	0	0	0	0
Micropterus salmoides	2	1	0	0	0	0	1	0	0	0	0
Morone chrysops	9	0	4	2	0	1	1	0	1	0	0
Oncorhynchus mykiss	2	0	0	2	0	0	0	0	0	0	0
Pimephales promelas	17	0	0	0	6	0	0	0	5	6	0
Platygobio gracilis	75	0	11	1	3	13	33	14	0	0	0
Rhinichthys cataractae	4	1	2	1	0	0	0	0	0	0	0
Sander vitreus	3	0	0	0	1	2	0	0	0	0	0
Total Fish	2,791	84	115	274	119	150	181	76	318	825	490
Shannon Weiner	1.57	1.23	1.72	1.58	1.33	1.60	1.52	1.42	0.82	0.90	0.96

Table 4. Results from 2007 nursery habitat monitoring study (seine sampling).

Species	Total	Calabacillas	I-40	Central Wasteway	RGSM sanctuary	Los Lunas	LFCC outfall	Arroyo de La Parida	Socorro
Carpoides carpio	74	14	0	0	0	44	1	1	14
Catostomus commersoni	984	0	2	0	0	10	0	0	972
Cyprinella lutrensis	3,344	184	1,055	0	115	1,050	220	142	578
Cyprinus carpio	727	1	399	0	0	237	1	0	89
Dorosoma cepedianum	36	0	0	0	0	6	7	7	16
Gambusia affinis	14	0	2	0	0	6	0	0	6
Hybognathus amarus	324	132	26	0	5	38	12	7	104
Ictalurus punctatus	12	2	3	0	0	4	1	1	1
Lepomis cyanellus	1	0	0	0	0	1	0	0	0
Micropterus salmoides	1	0	0	0	0	0	1	0	0
Pimephales promelas	73	28	10	0	8	11	1	0	15
Platygobio gracilis	262	101	89	0	0	5	21	5	41
Rhinichthys cataractae	13	12	1	0	0	0	0	0	0
Sander vitreus	1	0	0	0	0	0	1	0	0
Total Fish	5,865	474	1,587	0	128	1,412	266	163	1,836
Shannon Weiner	1.36	1.45	0.91	NA	0.40	0.89	0.72	0.56	1.24

Table 5. Larval fish samples identified to species.

Species	Total	Los Lunas 5/17/2007	I-40 6/7/2007
Carpoides carpio	3	0	3
Cyprinus carpio	1	0	1
Pimephales promelas	85	50	35
Total Fish	89	50	39
Shannon Weiner	0.21	0.00	0.39

Table 6. Results from 2007 fish monitoring surveys.

Species	Total	LFCC	Temp channel
		11/7/2007	11/8/2007
Carpoides carpio	4	0	4
Cyprinella lutrensis	573	21	552
Gambusia affinis	113	25	88
Hybognathus amarus	133	0	133
Ictalurus punctatus	31	0	31
Lepomis macrochirus	1	1	0
Pimephales promelas	9	0	9
Platygobio gracilis	3	0	3
Total Fish	867	47	820
Shannon Weiner		0.78	1.02

Table 7. 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 vitreus	Walleye