RIO GRANDE SILVERY MINNOW AUGMENTATION IN THE MIDDLE RIO GRANDE, NEW MEXICO

Annual Report 2007

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Middle Rio Grande Endangered Species Act Collaborative Program

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Cover Photo: U.S. Senator Pete Domenici, U.S. Representatives Tom Udall and Heather Wilson releasing the 1,000,000th Rio Grande silvery minnow from the Augmentation Program to the Rio Grande near the Hispanic Cultural Center, Albuquerque, New Mexico. May 29, 2007.

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EXECUTIVE SUMMARY

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

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

- Results indicate that hatchery raised individuals can be released back to the wild with adequate retention in or near original release sites, can experience survival of at least 2 years after release, and ultimately can contribute to future spawning efforts.

- In addition to reporting for 2007, an updated Rio Grande silvery minnow Augmentation Plan was prepared and can be found in Appendix D.

- Future efforts in 2008 will include continuing augmentation efforts in the Middle Rio Grande and potentially reintroductions in the Big Bend region of Texas.

INTRODUCTION

Emergency relocation efforts in 1996, 1998, and 1999 moved an estimated 11,000 adult and juvenile Rio Grande silvery minnow (*Hybognathus amarus*) from isolated pools downstream of San Acacia Dam to upstream locations in Isleta and Angostura reaches. From May to June 2000, an estimated 204,000 larval and 414 adult Rio Grande silvery minnow were stocked by personnel from the Museum of Southwestern Biology near New Mexico Highway 6 Bridge in Los Lunas and U.S. Highway 550 Bridge in Bernalillo. Larval fish were the result of some of the first captive spawning attempts of wild adults. Benefits of these stocking attempts were unknown and evaluations of translocations and other stocking attempts were needed to provide guidance for future management.

Beginning in June 2002, the New Mexico Fish and Wildlife Conservation Office (NMFWCO) began experimental augmentation and monitoring of Visible Implant Elastomer (VIE) tagged juvenile and adult Rio Grande silvery minnow in the Middle Rio Grande, New Mexico (MRGNM) (Remshardt and Davenport 2003). Monitoring efforts focused on evaluation of experimental stocking success of Rio Grande silvery minnow reared in captive propagation facilities and released throughout the current range (Remshardt 2008).

This annual report summarizes findings between January and December 2007. This effort reflects management needs identified in the Middle Rio Grande Endangered Species Program (Program), Item A.2.2 for Rio Grande silvery minnow as well as the Rio Grande Silvery Minnow Recovery Plan (RGSMRP; U.S. Fish and Wildlife Service 1999). These include development and refinement of augmentation protocols for use in the middle Rio Grande (Task 8b) and annual monitoring of augmented populations as identified as a needed task (Task 8d) by the Program and RGSMRP, respectively.

The ultimate goal of augmentation is to re-establish self-sustaining populations of Rio Grande silvery minnow in the MRGNM and throughout its former range. Long-term benefits of this study are to: 1) augment populations within the MRGNM; and 2) evaluate stocking efforts and methods.

Specific objectives of augmentation and monitoring activities in 2007 were to:

1) Determine temporal and spatial upstream and downstream movement of stocked Rio Grande silvery minnow within and among reaches.

2) Identify and characterize river reaches where retention and survival of stocked Rio Grande silvery minnow are maximized.

3) Provide guidance for augmentation activities to maximize survival of Rio Grande silvery minnow.

METHODS

Study Area

This investigation concentrates on areas relative to the known current range within Angostura, Isleta, and San Acacia reaches (Figure 1, Table 1). Angostura Reach (61 km) extends from Angostura Diversion Dam (River Mile (RM) 209.7) to Isleta Diversion Dam (RM 169.3) and includes the cities of Bernalillo, Corrales, and Albuquerque. Isleta Reach (90 km) extends from Isleta Diversion Dam to San Acacia Diversion Dam. This reach includes the southern portion of Isleta Pueblo, cities of Bosque Farms, Valencia, Los Lunas, Belen, and smaller villages such as La Joya, and Bernardo, along with Sevilleta National Wildlife Refuge, all within Bernalillo, Valencia, and Socorro counties. The San Acacia Reach (roughly 76 km) extends from San Acacia Diversion Dam to the headwaters of Elephant Butte Reservoir (the exact location of the lower boundary varies depending upon reservoir water-surface elevation). This reach is relatively remote, including only the city of Socorro and villages of San Acacia, Lemitar, Escondida, and San Antonio along with Bosque del Apache National Wildlife Refuge, within Socorro and Sierra counties.

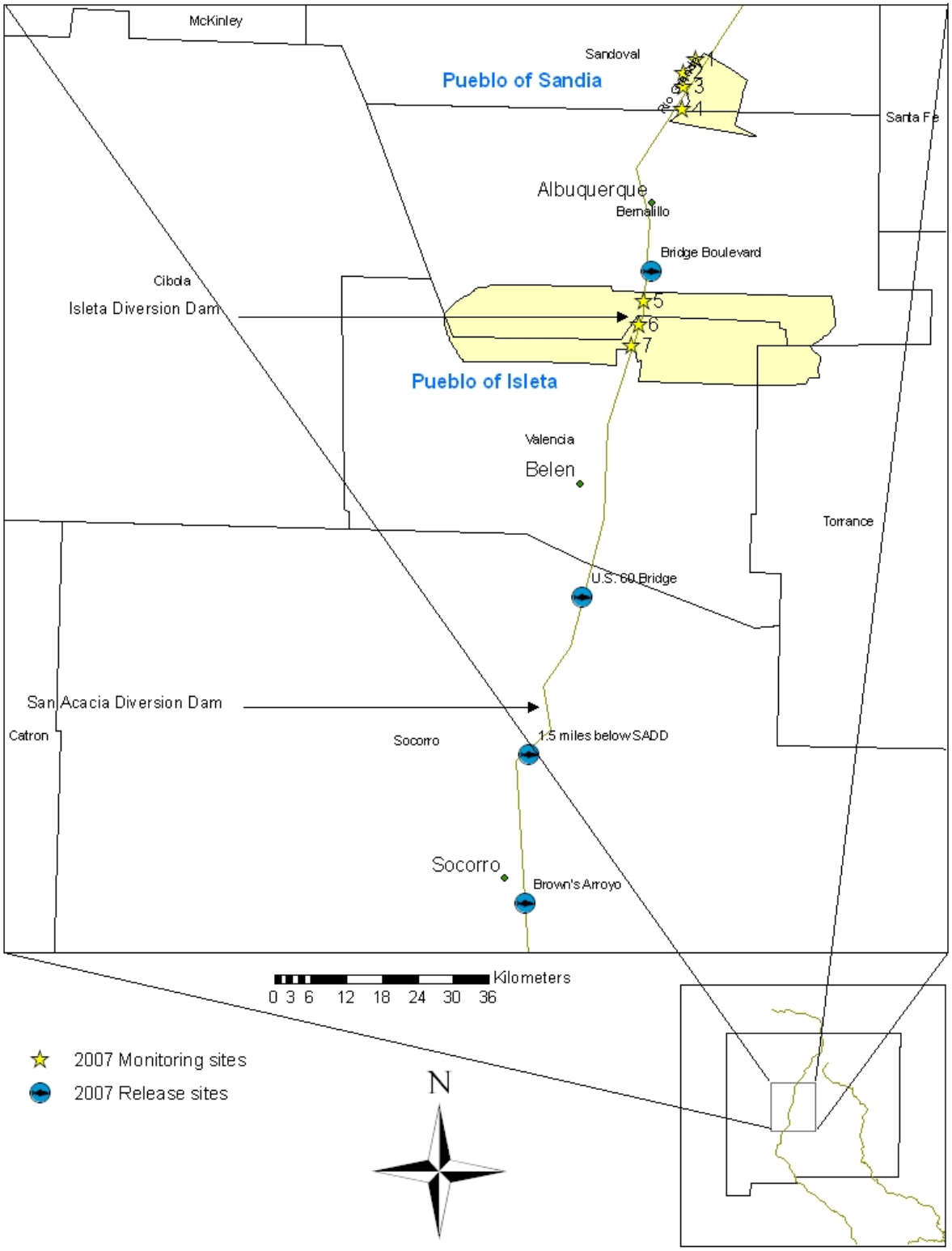

Figure 1. Map of study area for Rio Grande silvery minnow augmentation and monitoring.

Augmentation

In 2007, all released fish were propagated and/or reared at Dexter National Fish Hatchery and Technology Center (Dexter) or the City of Albuquerque's Rio Grande silvery minnow Rearing and Breeding Facility (Biopark). Released fish originated from two sources: 1) wild-captured eggs reared in hatchery; or 2) spawning of captive broodstock. Released fish were marked using a Visible Implant Elastomer (VIE) tag.

Several release sites were chosen within each reach based on access, habitat quality, and relative position to diversion structures. Sites in 2007 included those within the Angostura (Bridge Street), Isleta (Rio Puerco confluence) and San Acacia reaches (1.5 miles below San Acacia diversion dam and Brown's Arroyo) (Table 2).

All released fish were placed in one of several livecars for up to 6 hours. This "soft-release" technique allowed fish to recover from the stresses of handling and hauling and decrease dispersal and immediate mortality associated with these stresses. Each livecar was constructed of small mesh (3 mm) to facilitate water flow but prevent escape of fish. Livecars were constructed with a 3mm mesh cover with to prevent predation by birds and provide cover. Each livecar was also constructed with an opening on one side that was initially closed. Livecars were placed 20 m apart along the shoreline in 0.5-1.0 m deep, low-velocity (< 0.5m/sec) habitat, with tumbleweeds placed inside to provide additional cover. Livecars were placed at the site several days prior to study to establish algal growth. After 4-6 hours, livecars were opened to allow passive escape. The following day, the livecars were removed and fish that remained in the livecars were released.

Post-Augmentation Monitoring

Monitoring of stocked fish involved specific post-stocking surveys at 1-month intervals to determine survival, growth and movement. Monitoring sites were selected to document upstream and downstream movement from release site. These efforts were also used to collect secondary information on fish community structure. Fish were collected with a 3 m x 1.8 m, 3 mm mesh seine. Length of individual seine hauls were measured to the nearest 0.1 meter to estimate sampling effort, which was calculated by multiplying the distance of each seine haul by the effective width of the seine (2.5 m). Catch rates for all fish were calculated as number of fish per 100 m^2 sampled. All mesohabitat types were sampled within each site with a minimum of 30 seine hauls at each sampling location, except at high flows when safe wading was difficult or during intermittent conditions when seinable habitat was limited. Water quality parameters were measured (pH, conductivity, water temperature, air temperature, total dissolved solids, and salinity) at each monitoring site. Standard and total lengths were measured from a minimum of 10 Rio Grande silvery minnow per site, including marked and unmarked individuals. All other fish captured were identified and enumerated for each individual seine haul in the field and subsequently released. Scientific and common names are arranged in phylogenetic order and follow Nelson et al. (2004), except where subspecies are noted. The use of subspecific epithets reflects the importance of geographical subdivisions in evolution.

Table 1. Rio Grande silvery minnow augmentation monitoring site descriptions, 2007.

Site #	Site Name	Description
Angostura Reach		
1	Sandia Bosque Line 14	New Mexico, Sandoval County, Rio Grande, Pueblo of Sandia, 1.5 miles downstream of U.S. 550 Bridge crossing, RM 202.0.
2	Sandia PNM Gasline	New Mexico, Sandoval County, Rio Grande, Pueblo of Sandia, 3.6 miles downstream of U.S. 550 Bridge crossing, RM 199.9.
3	Lomitas Negras	New Mexico, Sandoval County, Rio Grande, below Rio Ranch #3 Wastewater Treatment Plant Outfall, RM 198.3
4	Dixon Road	New Mexico, Sandoval County, Rio Grande, at Sandia Wasteway Outfall, RM 196.0
5	Atrisco Outfall	New Mexico, Bernalillo County, Rio Grande, Pueblo of Isleta, 1.9 miles upstream of Isleta Diversion Dam, RM 171.2.
Isleta Reach		
6	Below Isleta Dam	New Mexico, Bernalillo County, Rio Grande, Pueblo of Isleta, 0.1 miles downstream of Isleta Diversion Dam, RM 169.3
7	Alejandro Gate	New Mexico, Valencia County, Rio Grande, Pueblo of Isleta, 2.7 miles downstream of Isleta Diversion Dam, RM 166.6.

Table 2. Rio Grande silvery minnow augmentation release site descriptions, 2007.

Site Name	Description
Angostura Reach	
Bridge Street	New Mexico, Bernalillo County, Rio Grande, RM 181.6
Isleta Reach	
U.S. 60 Bridge	New Mexico, Socorro County, Rio Grande, RM 130.6
San Acacia Reach	
1.5 m below SADD	New Mexico, Socorro County, Rio Grande, RM 114.6
Brown's Arroyo	New Mexico, Socorro County, Rio Grande, RM 94.0

Length-Frequency

Standard lengths of captured Rio Grande silvery minnow were compared by sampling trip to evaluate potential differences in growth rates. The Petersen method of length-frequency analysis was used to estimate age groups (Isaac 1990, Devries and Frie 1996). In this method, the frequency of individuals was plotted as a function of 2 mm standard length increments for each monthly monitoring sample. Age was then assigned to each individually measured fish. Similarly, the known age of recaptured marked and measured Rio Grande silvery minnow was assigned to each individual. Linear regression was used to compare the potential differences between and among marked and unmarked fish by plotting standard length against estimated (or known) ages. The regression coefficient *ß*, or slope was also used as an estimate of instantaneous growth, or in this case monthly growth rate since each sample was spaced approximately one month apart. Student's *t* was used to test the hypothesis about equality of two population regression coefficients, or in this case, the equality of growth rates between and among marked and unmarked Rio Grande silvery minnow ($\alpha = 0.05$).

Movement

Recapture data were used to conduct an examination of the overall distance traveled. Expected and observed recaptures were summarized. Various other projects and researchers conducted monitoring activities throughout the Middle Rio Grande in 2007. All researchers are asked to volunteer recapture information on VIE-marked Rio Grande silvery minnow. These projects have varying objectives and methods, but a summary of recaptures can provide an overall view of movement. Details on these recaptures along with this study are provided in Appendix A.

Recapture data for 2007 was summarized from projects including monitoring activities from Rio Grande silvery minnow salvage (NMFWCO), Rio Grande silvery minnow population monitoring (American Southwest Ichthyological Research Foundation), and Rio Grande silvery minnow fish health collections (NM Ecological Services and Dexter Fish Health Center). These surveys represented collections throughout the calendar year and current range downstream of Angostura Diversion Dam (RM 209.7) to the upstream portion of Elephant Butte Lake State Park (RM 57.7).

Fish Community

A summary table of fish collections for the current study period (January 2007 to December 2007) was constructed with observations made for each species including status of the species (native or introduced), total number of individuals, relative percentage of each species, percent occurrence in individual seine hauls, and density (fish / 100 m^2). Observations were also made on total number of species, total effort, and uncommon species. Most fish names in this report are those in the American Fisheries Society's "A List of Common and Scientific Names of Fishes from the United States and Canada" (Nelson et al. 2004). Updates and use of subspecific names include additional citations.

RESULTS

Augmentation

In 2007, a total of 133,154 Rio Grande silvery minnow were released into the MRGNM (Table 5). The 2007 releases consisted of a spring release near Albuquerque and fall releases in the Isleta and San Acacia reaches. The May 2007 release in Albuquerque signified a milestone in the Rio Grande silvery minnow augmentation program of 1,000,000 fish released.

In 2007, released fish originated from both wild-egg collection and captive spawning. Wild-captured eggs are the priority source for augmentation and represented 21% of fish released. The remainder of released fish were made up of ages 0, 1, and 2 captive-spawned individuals. In 2006, egg capture from the wild did not satisfy future production goals and captive spawning at both facilities was initiated to meet 2007 release targets.

Table 3. Rio Grande silvery minnow releases in 2007 administered by NMFWCO.

VIE color	Body Location	Number Released	Release Site (RM)	Release Date
pink	right, predorsal	10,518	Bridge Street (181.6)	29 May 2007
pink	right, predorsal	10,670	Bridge Street (181.6)	29 May 2007
n/a	n/a	17,000	Bridge Street (181.6)	31 May 2007
pink	left, predorsal	22,164	Bernardo (130.6)	9 October 2007
pink	left, predorsal	22,164	Brown's Arroyo (94.0)	9 October 2007
pink	left, predorsal	20,638	1.5 miles below SADD (114.6)	25 October 2007
pink	left, predorsal	30,000	1.5 miles below SADD (114.6)	3 December 2007
TOTAL		**133,154**		

Post-Augmentation Monitoring

There were a total of 10,172 Rio Grande silvery minnow collected between January and December 2007 (Table 6), including 53 positively identified as previously released individuals (Table 7). Rio Grande silvery minnow represented 25.2% of all fish captured, were collected in 23.0% of all seine hauls with an overall catch rate of 16.89 individuals/100 m^2 (Table 6). Of 53 marked individuals recaptured, the majority (n=42) were recaptures from the fall 2006 release near Bernalillo. This is expected as our monitoring sites are focused within the pueblos of Sandia and Isleta where sampling is limited by other researchers. Over the sampling period, catch rates varied for Rio Grande silvery minnow, with the largest collection of 1,484 juvenile individuals occurring in July 2007 below Isleta Diversion Dam. The majority (94%) of recaptures occurred between January and April 2007. Catch rates varied between sites, with the highest number of marked Rio Grande silvery minnow recaptures (N = 31) occurring at the Lomitas Negras site (Sandia Pueblo).

Table 4. Status, numbers, percent of total, percent occurrence, and density for all species collected at all sites combined in 2007 in Rio Grande, New Mexico. For status, N=native and I=introduced. Subspecific names include citations below.

Species	Status	N	% of Total	Percent Occurrence	Density (fish/100m^2)
rainbow trout *Oncorhynchus mykiss*	I	1	0.0	<0.1	<0.01
red shiner *Cyprinella lutrensis*	N	7,963	19.7	27.1	13.23
common carp *Cyprinus carpio*	I	4,551	11.3	3.5	7.56
Rio Grande silvery minnow *Hybognathus amarus*	N	10,172	25.2	23.0	16.89
fathead minnow *Pimephales promelas*	N	442	1.1	6.5	0.73
flathead chub *Platygobio gracilis gulonella*[a]	N	575	1.4	12.5	0.95
longnose dace *Rhinichthys cataractae cataractae*[b]	N	197	0.5	4.6	0.33
river carpsucker *Carpiodes carpio elongatus*[c]	N	389	1.0	4.8	0.65
white sucker *Catostomus commersoni*	I	12,743	31.6	9.6	21.16
black buffalo *Ictiobus bubalus*	N	1	0.0	<0.1	<0.01
yellow bullhead *Ameiurus natalis*	I	5	0.0	0.2	0.01
channel catfish *Ictalurus punctatus*	I	280	0.7	5.8	0.47
western mosquitofish *Gambusia affinis*	I	2,957	7.3	6.6	4.91
green sunfish *Lepomis cyanellus*	I	5	0.0	0.2	0.01
bluegill *Lepomis macrochirus speciosus*[d]	N	11	0.0	0.3	0.02
largemouth bass *Micropterus salmoides*	I	61	0.2	1.0	0.10
white crappie *Pomoxis annularis*	I	15	0.0	0.5	0.02
yellow perch *Perca flavescens*	I	1	0.0	<0.1	<0.01
walleye *Sander vitreus*	I	12	0.0	0.1	0.02
TOTAL		40,381	100	54.9	67.07

[a] Olund and Cross (1961)
[b] Jenkins and Burkhead (1993)
[c] Trautman (1981)
[d] Hubbs and Lagler (1958), Avise and Smith (1974)

Table 5. Number of marked Rio Grande silvery minnow recaptured by site in 2007.

Site	River Mile	RGSM recaptures 2007
Sandia Line 14	202.0	3
Sandia PNM Gasline	199.9	1
Lomitas Negras	198.3	31
Dixon Road	195.5	6
Atrisco Outfall	171.2	4
Below IDD	169.3	5
Alejandro Gate	166.6	3
TOTAL	-	53

Length-Frequency

There were 508 unmarked and 50 marked Rio Grande silvery minnow in the length-frequency dataset captured in 2007. Monthly growth rate for unmarked Rio Grande silvery minnow was estimated at 1.892 mm/month. Monthly growth rate for marked Rio Grande silvery minnow was estimated at 2.458 mm/month but was not significantly different ($P > 0.05$) from unmarked fish ($F_{2,555}$=615.6) (Figure 3).

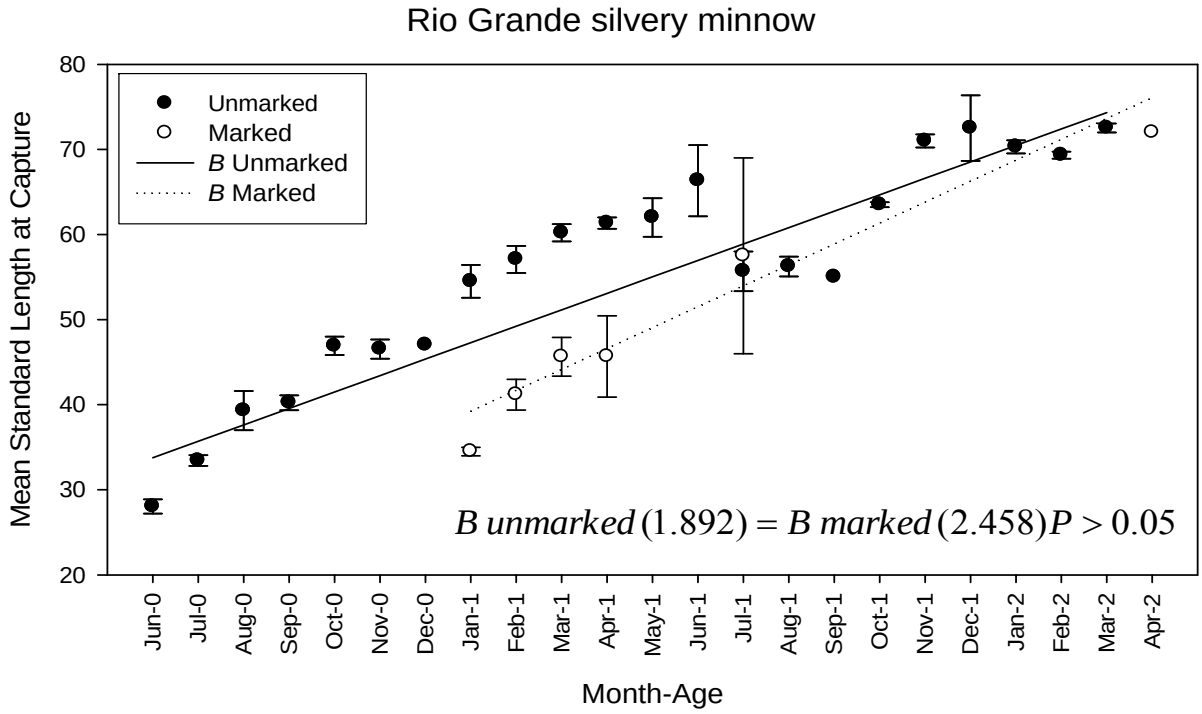

Figure 2. Comparison of marked Rio Grande silvery minnow standard lengths at recapture between unmarked (wild) and marked.

Upon examination of length-frequency data by month, there appeared to be a minimum of two age classes of Rio Grande silvery minnow at any one time, generally represented by ages 1 and 2+ individuals between January and June and ages 0 and 1+ between July and December (Figures 4-5). The strong 2005 (and to a lesser extent 2006) year-classes were fairly well represented early in 2007 but generally disappeared from the samples by May 2007. By July 2007, low-level recruitment to juvenile life stage (1-2 months old) was documented at all sites with highest age-0 catch rates at the Isleta Pueblo sites (Isleta Reach). The largest RGSM observed in 2007 (82 mm SL) was likely an Age-2 fish from the 2005 year class and was collected below Isleta Diversion Dam in April prior to the spawning season.

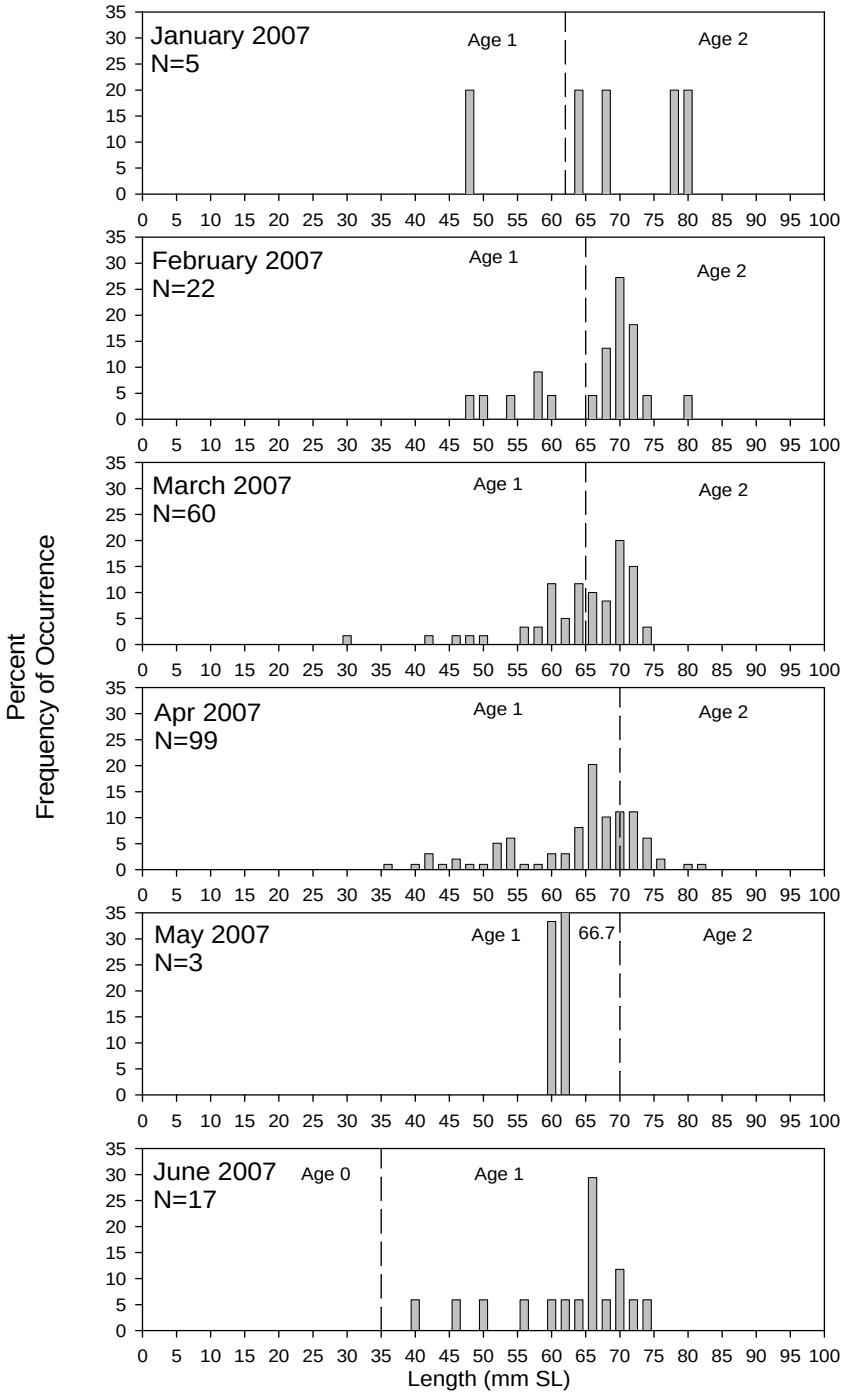

Figure 3. Length-frequency histograms of unmarked Rio Grande silvery minnow captured between January and June 2007. Dashed lines represent estimated breaks between year classes.

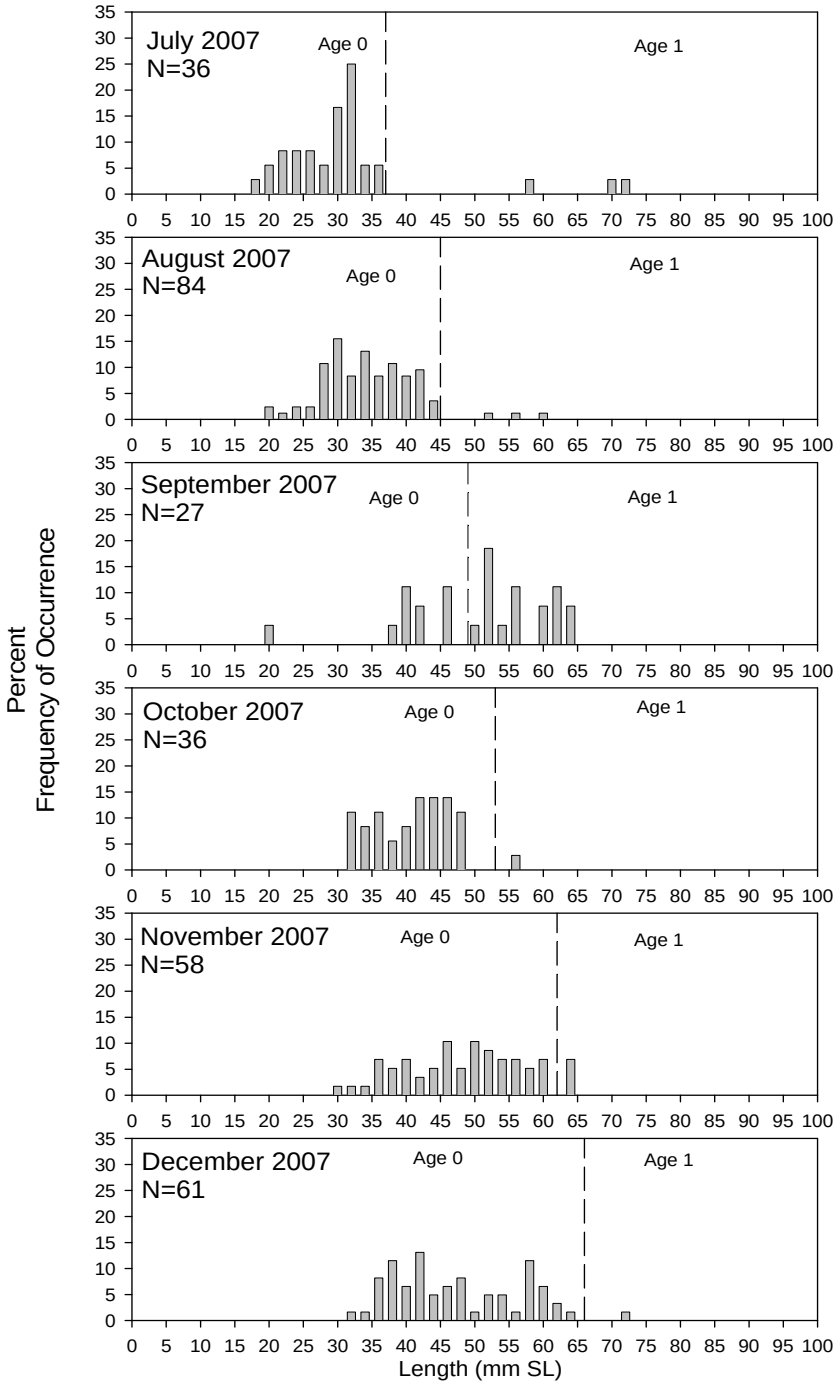

Figure 4. Length-frequency histograms of unmarked Rio Grande silvery minnow captured between July and December 2007. Dashed lines represent estimated breaks between year classes.

Movement

When combining all researchers, a total of 332 Rio Grande silvery minnow were recaptured in 2007. Examination of all recapture data in 2007 indicated that fish movement continued to be generally downstream following release, with 95% of all recaptures at or downstream of the release site. Over 94% of recaptures were within 15 miles of the release site (Figure 5). Fifty percent of recaptures occurred within 64 days and 90% were within 201 days of release. Maximum distance traveled from release to recapture was 88.9 miles downstream 257 days after release (Appendix A, RKD07-071). One recapture occurred during salvage operations 30.2 miles upstream of the release site 304 days after release (Appendix A, WJR07-681). One individual (72 mm SL) was recaptured 575 days after release 1.5 miles downstream of the release point near Bernalillo (Appendix A, WJR07-566). Based on stocking information, this fish was released as part of a group of 18 month-old individuals and was approximately three years old.

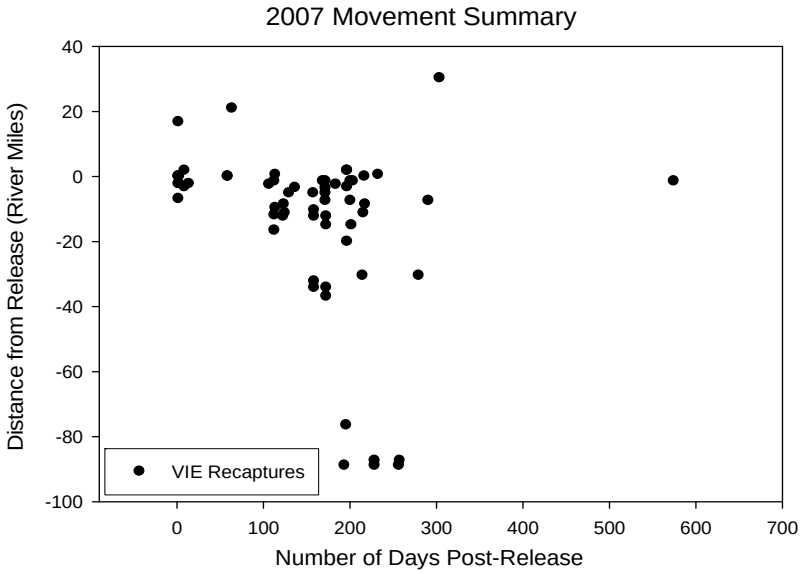

Figure 5. Movement summary for recaptured Rio Grande silvery minnow in 2007.

Fish Community

From January to December 2007, 3,888 seine hauls totaling 60,218.6 m^2 were conducted. In these samples, 40,381 individuals representing 19 species were collected (Table 6). Native cyprinids such as red shiner (*Cyprinella lutrensis*), Rio Grande silvery minnow, fathead minnow (*Pimephales promelas*), flathead chub (*Platygobio gracilis gulonella*), and longnose dace (*Rhinichthys cataractae cataractae*) represented 48% of all individuals collected. White sucker (*Catostomus commersoni*) was the numerically most dominant species of the fish community and accounted for 32% of all fish collected.

DISCUSSION

Augmentation efforts in 2007 are now in the sixth year in the Middle Rio Grande, New Mexico. Since 2002, 1,114,890 Rio Grande silvery minnow have been released. The total number of released Rio Grande silvery minnow was lower (N=133,154) compared to the high release numbers in 2006 (N=418,851) and recaptures reflected that decrease (2006, N=510 and 2007 N=332). Implementation of more conservative protocols for handling, hauling, tempering and shifting the release period primarily to fall could have resulted in a higher percentage of released individuals being recaptured in 2007 compared to years past. Additionally, the October catch rates observed during population monitoring were one order of magnitude higher in 2007 than in 2006, indicating that conditions were favorable for all Rio Grande silvery minnow (Dudley and Platania 2008).

We began releasing Rio Grande silvery minnow in lower reaches (Isleta and San Acacia) in fall of 2005. After two years of recapture data through 2007, recapture probabilities in these lower reaches is similar compared to Angostura Reach, with varying degrees of sampling frequency. Releases from the Angostura Reach near Bernalillo continue to produce the most recaptures indicating release habitats near this site are highly favorable for survival. Long-term persistence of Rio Grande silvery minnow in the Middle Rio Grande, New Mexico will likely depend, in part, on continued augmentation.

Augmentation efforts in the Middle Rio Grande, New Mexico will continue in 2008, but will be shadowed by reintroduction efforts in Big Bend, Texas. This project will take advantage of lessons learned from augmentation strategies employed since 2002.

ACKNOWLEDGEMENTS

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Appendix A.
Recapture information of Rio Grande silvery minnow in 2007 from augmentation monitoring and other researchers.

Field #	N	Recapture Date	Release Date	Number of Days Post-Release	rm release	rm recapture	Distance Traveled (RM)*
Orange Right Dorsal, 12 September 2005 @ 550 Bridge							
WJR07-566	1	4/10/2007	9/12/2005	575	203.5	202.0	-1.5
Green Right Dorsal, 18 April 2006 @ 550 Bridge							
WJR07-541	1	1/23/2007	4/18/2006	280	203.5	173.0	-30.5
Red Left Dorsal, 21 September 2006 @ Bridge Street							
WJR07-540	1	1/22/2007	9/21/2006	123	181.6	169.3	-12.3
WJR07-541	19	1/23/2007	9/21/2006	124	181.6	173.0	-8.6
WJR07-555	3	2/27/2007	9/21/2006	159	181.6	171.2	-10.4
WJR07-556	1	2/27/2007	9/21/2006	159	181.6	169.3	-12.3
WJR07-563	1	3/13/2007	9/21/2006	173	181.6	169.3	-12.3
WJR07-564	1	3/13/2007	9/21/2006	173	181.6	166.6	-15
RKD07-041	1	4/6/2007	9/21/2006	197	181.6	178.3	-3.3
RKD07-042	3	4/6/2007	9/21/2006	197	181.6	183.4	1.8
WJR07-571	1	4/11/2007	9/21/2006	202	181.6	166.6	-15
WJR07-575	19	4/27/2007	9/21/2006	218	181.6	173.0	-8.6
Green Left Dorsal, 21 September 2006 @ 550 Bridge							
WJR07-542	16	1/24/2007	9/21/2006	125	203.5	192.2	-11.3
WJR07-547	2	1/29/2007	9/21/2006	130	203.5	198.3	-5.2
RKD07-021	1	2/5/2007	9/21/2006	137	203.5	200.0	-3.5
WJR07-552	17	2/26/2007	9/21/2006	158	203.5	198.3	-5.2
WJR07-555	1	2/27/2007	9/21/2006	159	203.5	171.2	-32.3
WJR07-556	1	2/27/2007	9/21/2006	159	203.5	169.3	-34.2
WJR07-558	1	3/12/2007	9/21/2006	172	203.5	196.0	-7.5
WJR07-559	10	3/12/2007	9/21/2006	172	203.5	198.3	-5.2
WJR07-560	1	3/12/2007	9/21/2006	172	203.5	202.0	-1.5
WJR07-561	1	3/12/2007	9/21/2006	172	203.5	199.9	-3.6
WJR07-563	1	3/13/2007	9/21/2006	173	203.5	169.3	-34.2
WJR07-564	1	3/13/2007	9/21/2006	173	203.5	166.6	-36.9
RKD07-029	2	4/3/2007	9/21/2006	194	203.5	114.6	-88.9
RKD07-036	10	4/5/2007	9/21/2006	196	203.5	127.0	-76.5
RKD07-042	2	4/6/2007	9/21/2006	197	203.5	183.4	-20.1
WJR07-566	1	4/10/2007	9/21/2006	201	203.5	202.0	-1.5
WJR07-568	4	4/10/2007	9/21/2006	201	203.5	196.0	-7.5
WJR07-575	6	4/24/2007	9/21/2006	215	203.5	173.0	-30.5
WJR07-576	17	4/25/2007	9/21/2006	216	203.5	192.2	-11.3
WJR07-577	2	4/26/2007	9/21/2006	217	203.5	203.5	0
RKD07-050	2	5/8/2007	9/21/2006	229	203.5	114.6	-88.9
RKD07-051	1	5/8/2007	9/21/2006	229	203.5	116.1	-87.4
RKD07-071	3	6/5/2007	9/21/2006	257	203.5	114.6	-88.9
RKD07-072	1	6/6/2007	9/21/2006	258	203.5	116.1	-87.4
LTT07-007	1	7/9/2007	9/21/2006	291	203.5	196.0	-7.5

Orange Left Dorsal, 16 October 2006 @ below San Acacia Diversion Dam

RKD07-007	2	2/6/2007	10/16/2006	113	116.1	99.5	-16.6
RKD07-008	2	2/6/2007	10/16/2006	113	116.1	114.6	-1.5
RKD07-029	8	4/3/2007	10/16/2006	169	116.1	114.6	-1.5
RKD07-050	6	5/8/2007	10/16/2006	204	116.1	114.6	-1.5

Yellow Left Dorsal, 16 October 2006 @ Rio Puerco confluence

WJR07-549	17	1/31/2007	10/16/2006	107	126.5	124.0	-2.5
RKD07-008	2	2/6/2007	10/16/2006	113	126.5	114.6	-11.9
RKD07-010	19	2/7/2007	10/16/2006	114	126.5	116.8	-9.7
RKD07-011	1	2/7/2007	10/16/2006	114	126.5	127.0	0.5
WJR07-573	19	4/18/2007	10/16/2006	184	126.5	124.0	-2.5
RKD07-074	1	6/6/2007	10/16/2006	233	126.5	127.0	0.5
WJR07-681	1	8/16/2007	10/16/2006	304	126.5	156.7	30.2

Pink Right Dorsal, 29 May 2007 @ Bridge Street

RKD07-079	6	6/7/2007	5/29/2007	9	181.6	178.3	-3.3
RKD07-080	2	6/7/2007	5/29/2007	9	181.6	183.4	1.8
SRD07-046	2	7/10/2007	5/29/2007	2	181.6	198.3	16.7
RKD07-292	1	12/12/2007	5/29/2007	197	181.6	183.4	1.8

Pink Left Dorsal, 9 October, 25 October, and 3 December 2007 @ U.S. 60 Bridge and Brown's Arroyo

RKD07-158	1	10/11/2007	10/9/2007	2	130.6/94.0	87.1	-6.9
RKD07-160	12	10/12/2007	10/9/2007	3	130.6/94.0	130.6	0
RKD07-164	9	10/12/2007	10/9/2007	3	130.6/94.0	91.7	-2.3
SRD07-087	2	10/23/2007	10/9/2007	14	130.6/94.0	91.7	-2.3
RKD07-281	2	12/5/2007	12/3/2007	2	130.6/94.0	91.7	-2.3
RKD07-282	2	12/5/2007	12/3/2007	2	130.6/94.0	99.5	0
RKD07-283	55	12/5/2007	12/3/2007	2	130.6/94.0	114.6	0
RKD07-286	1	12/7/2007	10/9/2007	59	130.6/94.0	127.0	0
RKD07-287	1	12/7/2007	10/9/2007	59	130.6/94.0	130.6	0
RKD07-289	1	12/12/2007	10/9/2007	64	130.6/94.0	151.5	20.9

ES Fish Health
RGSM Salvage
ASIRF Pop Monitoring

* calculated as the minimum unidirectional distance between release and recapture points within the river channel

Appendix B.
Ichthyofaunal composition of 2007 Rio Grande silvery minnow augmentation monitoring surveys

Atrisco Outfall

22 January 2007 WJR07-538 30 seine hauls Effort: 861.0 m^2

Personnel: W. Jason Remshardt, James Sandoval, Leeanna Torres

Family	Species	N
Cyprinidae	*Pimephales promelas*	1
Poeciliidae	*Gambusia affinis*	2

Alejandro Gate

22 January 2007 WJR07-539 30 seine hauls Effort: 905.1 m^2

Personnel: W. Jason Remshardt, James Sandoval, Leeanna Torres

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	22
Cyprinidae	*Hybognathus amarus*	1
Cyprinidae	*Platygobio gracilis*	2
Poeciliidae	*Gambusia affinis*	1

Below Isleta Diversion Dam

22 January 2007 WJR07-540 30 seine hauls Effort: 866.0 m^2

Personnel: W. Jason Remshardt, James Sandoval, Leeanna Torres

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	11
Cyprinidae	*Hybognathus amarus*	3
Cyprinidae	*Pimephales promelas*	1
Cyprinidae	*Platygobio gracilis*	2
Catostomidae	*Ictiobus bubalus*	1
Ictaluridae	*Ictalurus punctatus*	1

Dixon Road

29 January 2007 WJR07-544 30 seine hauls Effort: 849.0 m^2

Personnel: James Sandoval, Leeanna Torres, Scott Bulgrin, M. Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	1
Cyprinidae	*Pimephales promelas*	1
Cyprinidae	*Platygobio gracilis*	1
Catostomidae	*Catostomus commersoni*	1

Sandia PNM Gasline

29 January 2007 WJR07-545 30 seine hauls Effort: 936.0 m^2

Personnel: James Sandoval, Leeanna Torres, Scott Bulgrin, M. Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	2
Cyprinidae	*Cyprinus carpio*	1
Catostomidae	*Catostomus commersoni*	1

Sandia Line 14

29 January 2007 WJR07-546 30 seine hauls Effort: 964.0 m^2

Personnel: James Sandoval, Leeanna Torres, Scott Bulgrin, M. Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	2
Cyprinidae	*Platygobio gracilis*	4
Catostomidae	*Carpiodes carpio*	2
Poeciliidae	*Gambusia affinis*	5
Centrarchidae	*Micropterus salmoides*	1

Sandia Line 14

29 January 2007 WJR07-547 30 seine hauls Effort: 657.5 m^2

Personnel: James Sandoval, Leeanna Torres, S. Bulgrin, M. Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	2
Cyprinidae	*Hybognathus amarus*	5
Cyprinidae	*Pimephales promelas*	2
Cyprinidae	*Platygobio gracilis*	34
Catostomidae	*Catostomus commersoni*	3
Poeciliidae	*Gambusia affinis*	22
Centrarchidae	*Lepomis macrochirus*	1
Centrarchidae	*Micropterus salmoides*	1

Sandia PNM Gasline

26 February 2007 WJR07-551 30 seine hauls Effort: 774.5 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, S. Bulgrin, M. Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	1
Cyprinidae	*Hybognathus amarus*	1
Cyprinidae	*Platygobio gracilis*	5

Lomitas Negras

26 February 2007 WJR07-552 30 seine hauls Effort: 749.8 m^2

Personnel: : W. Jason Remshardt, Leeanna Torres, S. Bulgrin, M. Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	20
Cyprinidae	*Cyprinus carpio*	1
Cyprinidae	*Hybognathus amarus*	19
Cyprinidae	*Platygobio gracilis*	24
Cyprinidae	*Rhinichthys cataractae*	2
Catostomidae	*Catostomus commersoni*	2
Poeciliidae	*Gambusia affinis*	30
Centrarchidae	*Micropterus salmoides*	2

Sandia Line 14

26 February 2007 WJR07-553 30 seine hauls Effort: 935.8 m^2

Personnel: : W. Jason Remshardt, Leeanna Torres, S. Bulgrin, M. Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	2

Sandia PNM Gasline

26 February 2007 WJR07-554 30 seine hauls Effort: 892.0 m^2

Personnel: : W. Jason Remshardt, Leeanna Torres, S. Bulgrin, M. Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	8
Cyprinidae	*Hybognathus amarus*	1
Cyprinidae	*Pimephales promelas*	2
Cyprinidae	*Platygobio gracilis*	14

Atrisco Outfall

27 February 2007 WJR07-555 30 seine hauls Effort: 998.5 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, James Sandoval

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	19
Cyprinidae	*Hybognathus amarus*	6
Cyprinidae	*Pimephales promelas*	1
Cyprinidae	*Platygobio gracilis*	7
Ictaluridae	*Ictalurus punctatus*	8
Poeciliidae	*Gambusia affinis*	1

Below Isleta Diversion Dam

26 February 2007 WJR07-556 30 seine hauls Effort: 723.0 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, James Sandoval

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	151
Cyprinidae	*Hybognathus amarus*	18
Cyprinidae	*Pimephales promelas*	17
Cyprinidae	*Platygobio gracilis*	1
Poeciliidae	*Gambusia affinis*	3
Centrarchidae	*Lepomis cyanellus*	1
Centrarchidae	*Pomoxis annularis*	1

Alejandro Gate

26 February 2007 WJR07-557 30 seine hauls Effort: 992.8 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, James Sandoval

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	33
Cyprinidae	*Platygobio gracilis*	2
Catostomidae	*Carpiodes carpio*	1

Dixon Road

12 March 2007 WJR07-558 30 seine hauls Effort: 712.8 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, S. Bulgrin, M. Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	19
Cyprinidae	*Hybognathus amarus*	8
Cyprinidae	*Platygobio gracilis*	4
Cyprinidae	*Rhinichthys cataractae*	1

Lomitas Negras

12 March 2007 WJR07-559 30 seine hauls Effort: 785.0 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, S. Bulgrin, M. Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	41
Cyprinidae	*Hybognathus amarus*	24
Cyprinidae	*Pimephales promelas*	10
Cyprinidae	*Platygobio gracilis*	12
Cyprinidae	*Rhinichthys cataractae*	2
Catostomidae	*Catostomus commersoni*	11
Ictaluridae	*Ameiurus natalis*	1
Poeciliidae	*Gambusia affinis*	6
Centrarchidae	*Micropterus salmoides*	2

Sandia Line 14

12 March 2007 WJR07-560 30 seine hauls Effort: 784.3 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, S. Bulgrin, M. Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	25
Cyprinidae	*Hybognathus amarus*	9
Cyprinidae	*Platygobio gracilis*	4
Cyprinidae	*Rhinichthys cataractae*	1
Ictaluridae	*Ictalurus punctatus*	1

Sandia PNM Gasline

12 March 2007 WJR07-561 30 seine hauls Effort: 806.5 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, S. Bulgrin, M. Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	2
Cyprinidae	*Hybognathus amarus*	9
Cyprinidae	*Pimephales promelas*	3
Cyprinidae	*Platygobio gracilis*	6
Cyprinidae	*Rhinichthys cataractae*	1

Atrisco Outfall

13 March 2007 WJR07-562 30 seine hauls Effort: 1012.1 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, James Sandoval

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	9
Cyprinidae	*Pimephales promelas*	1
Cyprinidae	*Platygobio gracilis*	10
Ictaluridae	*Ictalurus punctatus*	1
Poeciliidae	*Gambusia affinis*	7

Below Isleta Diversion Dam

13 March 2007 WJR07-563 30 seine hauls Effort: 945.3 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, James Sandoval

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	93
Cyprinidae	*Hybognathus amarus*	36
Cyprinidae	*Pimephales promelas*	30
Cyprinidae	*Platygobio gracilis*	3
Catostomidae	*Catostomus commersoni*	1
Poeciliidae	*Gambusia affinis*	3

Alejandro Gate

13 March 2007 WJR07-564 30 seine hauls Effort: 887.8 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, James Sandoval

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	169
Cyprinidae	*Hybognathus amarus*	4
Cyprinidae	*Pimephales promelas*	30
Cyprinidae	*Platygobio gracilis*	3
Ictaluridae	*Ictalurus punctatus*	1
Poeciliidae	*Gambusia affinis*	3
Centrarchidae	*Pomoxis annularis*	1

Lomitas Negras

10 April 2007 WJR07-565 30 seine hauls Effort: 821.9 m^2

Personnel: W. Jason Remshardt, Pauletta Dodge, S. Bulgrin, M. Morales, David Forbess

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	8
Cyprinidae	*Cyprinus carpio*	1
Cyprinidae	*Hybognathus amarus*	1
Cyprinidae	*Platygobio gracilis*	47
Cyprinidae	*Rhinichthys cataractae*	14
Catostomidae	*Carpiodes carpio*	1
Ictaluridae	*Ictalurus punctatus*	3
Poeciliidae	*Gambusia affinis*	9

Sandia Line 14

10 April 2007 WJR07-566 30 seine hauls Effort: 709.8 m^2

Personnel: W. Jason Remshardt, Pauletta Dodge, S. Bulgrin, M. Morales, David Forbess

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	11
Cyprinidae	*Hybognathus amarus*	37
Cyprinidae	*Pimephales promelas*	3
Cyprinidae	*Platygobio gracilis*	5
Cyprinidae	*Rhinichthys cataractae*	4
Catostomidae	*Carpiodes carpio*	1
Catostomidae	*Catostomus commersoni*	1
Ictaluridae	*Ictalurus punctatus*	1

Sandia PNM Gasline

10 April 2007 WJR07-567 30 seine hauls Effort: 812.0 m^2

Personnel: W. Jason Remshardt, Pauletta Dodge, S. Bulgrin, M. Morales, David Forbess

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	2
Cyprinidae	*Platygobio gracilis*	14
Cyprinidae	*Rhinichthys cataractae*	9
Catostomidae	*Catostomus commersoni*	1
Ictaluridae	*Ictalurus punctatus*	4

Dixon Road

10 April 2007 WJR07-568 30 seine hauls Effort: 776.8 m^2

Personnel: W. Jason Remshardt, Pauletta Dodge, S. Bulgrin, M. Morales, David Forbess

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	11
Cyprinidae	*Hybognathus amarus*	15
Cyprinidae	*Pimephales promelas*	4
Cyprinidae	*Platygobio gracilis*	21
Cyprinidae	*Rhinichthys cataractae*	3
Catostomidae	*Catostomus commersoni*	6

Atrisco Outfall

11 April 2007 WJR07-569 30 seine hauls Effort: 1099.0 m^2

Personnel: W. Jason Remshardt, James Sandoval, Pauletta Dodge

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	4
Cyprinidae	*Cyprinus carpio*	1
Cyprinidae	*Platygobio gracilis*	7
Cyprinidae	*Rhinichthys cataractae*	3
Catostomidae	*Carpiodes carpio*	1
Ictaluridae	*Ictalurus punctatus*	7
Poeciliidae	*Gambusia affinis*	2

Below Isleta Diversion Dam

11 April 2007 WJR07-570 30 seine hauls Effort: 1009.0 m^2

Personnel: W. Jason Remshardt, James Sandoval, Pauletta Dodge

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	78
Cyprinidae	*Hybognathus amarus*	70
Cyprinidae	*Pimephales promelas*	3
Cyprinidae	*Platygobio gracilis*	1
Catostomidae	*Carpiodes carpio*	1
Centrarchidae	*Pomoxis annularis*	2

Alejandro Gate

11 April 2007 WJR07-571 30 seine hauls Effort: 918.5 m^2

Personnel: W. Jason Remshardt, James Sandoval, Pauletta Dodge

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	344
Cyprinidae	*Hybognathus amarus*	15
Cyprinidae	*Pimephales promelas*	24
Cyprinidae	*Platygobio gracilis*	8
Cyprinidae	*Rhinichthys cataractae*	1
Ictaluridae	*Ictalurus punctatus*	7
Poeciliidae	*Gambusia affinis*	1

Dixon Road

21 May 2007 WJR07-656 30 seine hauls Effort: 854.5 m^2

Personnel: W. Jason Remshardt, SJB, Casey Smith, Bethany Gray

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	8
Cyprinidae	*Platygobio gracilis*	9
Cyprinidae	*Rhinichthys cataractae*	1
Catostomidae	*Catostomus commersoni*	1
Ictaluridae	*Ictalurus punctatus*	1
Centrarchidae	*Lepomis macrochirus*	4

Lomitas Negras

21 May 2007 WJR07-657 30 seine hauls Effort: 731.8 m^2

Personnel: W. Jason Remshardt, SJB, Casey Smith, Bethany Gray

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	10
Cyprinidae	*Cyprinus carpio*	1
Cyprinidae	*Pimephales promelas*	1
Cyprinidae	*Platygobio gracilis*	1
Cyprinidae	*Rhinichthys cataractae*	3
Catostomidae	*Carpiodes carpio*	4
Ictaluridae	*Ictalurus punctatus*	2

Sandia Line 14

21 May 2007 WJR07-658 30 seine hauls Effort: 687.3 m^2

Personnel: W. Jason Remshardt, SJB, Casey Smith, Bethany Gray

Family	Species	N
Cyprinidae	*Cyprinus carpio*	1
Cyprinidae	*Hybognathus amarus*	1
Cyprinidae	*Platygobio gracilis*	6
Cyprinidae	*Rhinichthys cataractae*	2
Catostomidae	*Catostomus commersoni*	1

Sandia PNM Gasline

21 May 2007 WJR07-659 30 seine hauls Effort: 437.5 m^2

Personnel: W. Jason Remshardt, SJB, Casey Smith, Bethany Gray

Family	Species	N
Cyprinidae	*Platygobio gracilis*	6
Cyprinidae	*Rhinichthys cataractae*	1

Below Isleta Diversion Dam

22 May 2007 LTT07-005 30 seine hauls Effort: 1767.8 m^2

Personnel: Leeanna Torres, Evan Anderson, Jeanette Grode, Andrew Farwick, Kevin Lente

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	58
Cyprinidae	*Hybognathus amarus*	458
Cyprinidae	*Pimephales promelas*	4
Cyprinidae	*Platygobio gracilis*	5
Catostomidae	*Carpiodes carpio*	1
Ictaluridae	*Ictalurus punctatus*	1

Alejandro Gate

22 May 2007 LTT07-007 30 seine hauls Effort: 724.0 m^2

Personnel: Leeanna Torres, Evan Anderson, Jeanette Grode, Andrew Farwick, Kevin Lente

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	1
Cyprinidae	*Hybognathus amarus*	649
Centrarchidae	*Lepomis cyanellus*	1

Dixon Road

18 June 2007 WJR07-660 30 seine hauls Effort: 650.1 m^2

Personnel: W. Jason Remshardt, Scott Bulgrin, Tammy Knecht, Evan Anderson, Casey Smith

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	34
Cyprinidae	*Cyprinus carpio*	554
Cyprinidae	*Hybognathus amarus*	108
Cyprinidae	*Pimephales promelas*	1
Cyprinidae	*Platygobio gracilis*	10
Cyprinidae	*Rhinichthys cataractae*	3
Catostomidae	*Carpiodes carpio*	6
Catostomidae	*Catostomus commersoni*	1346
Poeciliidae	*Gambusia affinis*	2

Lomitas Negras

18 June 2007 WJR07-661 30 seine hauls Effort: 584.7 m^2

Personnel: W. Jason Remshardt, Scott Bulgrin, Tammy Knecht, Evan Anderson, Casey Smith

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	54
Cyprinidae	*Cyprinus carpio*	3451
Cyprinidae	*Hybognathus amarus*	558
Cyprinidae	*Pimephales promelas*	12
Catostomidae	*Catostomus commersoni*	8278
Poeciliidae	*Gambusia affinis*	731
Centrarchidae	*Micropterus salmoides*	22

Sandia Line 14

19 June 2007 WJR07-662 30 seine hauls Effort: m^2

Personnel: Scott Bulgrin, Casey Smith, Tammy Knecht, William Remshardt

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	56
Cyprinidae	*Cyprinus carpio*	272
Cyprinidae	*Hybognathus amarus*	282
Cyprinidae	*Pimephales promelas*	2
Cyprinidae	*Platygobio gracilis*	9
Cyprinidae	*Rhinichthys cataractae*	20
Catostomidae	*Catostomus commersoni*	813
Ictaluridae	*Ictalurus punctatus*	1
Poeciliidae	*Gambusia affinis*	7
Percidae	*Sander vitreus*	11

Sandia PNM Gasline

19 June 2007 WJR07-663 30 seine hauls Effort: m^2

Personnel: Scott Bulgrin, Casey Smith, Tammy Knecht, William Remshardt

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	3
Cyprinidae	*Hybognathus amarus*	147
Cyprinidae	*Platygobio gracilis*	14
Cyprinidae	*Rhinichthys cataractae*	4
Catostomidae	*Catostomus commersoni*	119

Atrisco Outfall

19 June 2007 WJR07-664 30 seine hauls Effort: m^2

Personnel: Scott Bulgrin, Casey Smith, Tammy Knecht, William Remshardt

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	1
Cyprinidae	*Hybognathus amarus*	74
Cyprinidae	*Pimephales promelas*	1
Cyprinidae	*Platygobio gracilis*	1
Cyprinidae	*Rhinichthys cataractae*	1
Catostomidae	*Catostomus commersoni*	281
Ictaluridae	*Ictalurus punctatus*	1
Poeciliidae	*Gambusia affinis*	16
Centrarchidae	*Lepomis cyanellus*	1

Below Isleta Diversion Dam

19 June 2007 WJR07-665 30 seine hauls Effort: m^2

Personnel: Scott Bulgrin, Casey Smith, Tammy Knecht, William Remshardt

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	323
Cyprinidae	*Cyprinus carpio*	37
Cyprinidae	*Hybognathus amarus*	96
Catostomidae	*Catostomus commersoni*	41
Ictaluridae	*Ictalurus punctatus*	3

Alejandro Outfall

19 June 2007 WJR07-666 30 seine hauls Effort: m^2

Personnel: Scott Bulgrin, Casey Smith, Tammy Knecht, William Remshardt

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	220
Cyprinidae	*Cyprinus carpio*	37
Cyprinidae	*Hybognathus amarus*	184
Cyprinidae	*Platygobio gracilis*	2
Catostomidae	*Catostomus commersoni*	41
Ictaluridae	*Ictalurus punctatus*	3
Poeciliidae	*Gambusia affinis*	36
Centrarchidae	*Lepomis cyanellus*	1
Centrarchidae	*Micropterus salmoides*	1
Percidae	*Sander vitreus*	12

Sandia Line 14

09 July 2007 LTT07-005 30 seine hauls Effort: 842.3 m^2

Personnel: Leeanna Torres, Tammy Knecht, Casey Smith, T. Austring

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	20
Cyprinidae	*Cyprinus carpio*	4
Cyprinidae	*Platygobio gracilis*	7
Cyprinidae	*Rhinichthys cataractae*	34
Catostomidae	*Catostomus commersoni*	26

Sandia PNM Gasline

09 July 2007 LTT07-006 30 seine hauls Effort: 571.8

Personnel: Leeanna Torres, Tammy Knecht, Casey Smith, T. Austring

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	3
Cyprinidae	*Cyprinus carpio*	15
Cyprinidae	*Hybognathus amarus*	594
Cyprinidae	*Pimephales promelas*	13
Cyprinidae	*Platygobio gracilis*	13
Cyprinidae	*Rhinichthys cataractae*	9
Catostomidae	*Carpiodes carpio*	1
Catostomidae	*Catostomus commersoni*	213
Ictaluridae	*Ictalurus punctatus*	3
Poeciliidae	*Gambusia affinis*	35

Dixon Road

09 July 2007 LTT07-007 30 seine hauls Effort: 649.5 m^2

Personnel: Leeanna Torres, Tammy Knecht, Casey Smith, T. Austring

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	4
Cyprinidae	*Cyprinus carpio*	1
Cyprinidae	*Platygobio gracilis*	2
Cyprinidae	*Rhinichthys cataractae*	16
Catostomidae	*Catostomus commersoni*	137
Ictaluridae	*Ictalurus punctatus*	1
Poeciliidae	*Gambusia affinis*	5

Lomitas Negras

10 July 2007 SRD07-046 30 seine hauls Effort: 738.0 m^2

Personnel: Stephen Davenport, Casey Smith, Tammy Knecht

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	11
Cyprinidae	*Cyprinus carpio*	139
Cyprinidae	*Hybognathus amarus*	121
Cyprinidae	*Pimephales promelas*	25
Cyprinidae	*Platygobio gracilis*	14
Cyprinidae	*Rhinichthys cataractae*	10
Catostomidae	*Carpiodes carpio*	1
Catostomidae	*Catostomus commersoni*	660
Ictaluridae	*Ictalurus punctatus*	1
Poeciliidae	*Gambusia affinis*	35
Centrarchidae	*Micropterus salmoides*	1
Centrarchidae	*Pomoxis annularis*	1

Alejandro Gate

10 July 2007 TPA07-002 30 seine hauls Effort: 693.5 m^2

Personnel: Thomas Archdeacon, W. Jason Remshardt

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	91
Cyprinidae	*Cyprinus carpio*	139
Cyprinidae	*Hybognathus amarus*	457
Cyprinidae	*Pimephales promelas*	10
Cyprinidae	*Platygobio gracilis*	3
Catostomidae	*Carpiodes carpio*	22
Catostomidae	*Catostomus commersoni*	4
Ictaluridae	*Ictalurus punctatus*	10
Poeciliidae	*Gambusia affinis*	88
Centrarchidae	*Pomoxis annularis*	2

Atrisco Outfall

10 July 2007 WJR07-673 30 seine hauls Effort: 996.0 m^2

Personnel: Thomas Archdeacon, W. Jason Remshardt

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	10
Cyprinidae	*Cyprinus carpio*	6
Cyprinidae	*Hybognathus amarus*	30
Cyprinidae	*Pimephales promelas*	22
Cyprinidae	*Platygobio gracilis*	7
Cyprinidae	*Rhinichthys cataractae*	3
Catostomidae	*Carpiodes carpio*	45
Catostomidae	*Catostomus commersoni*	171
Ictaluridae	*Ictalurus punctatus*	39
Poeciliidae	*Gambusia affinis*	9
Centrarchidae	*Micropterus salmoides*	7
Centrarchidae	*Pomoxis annularis*	2

Below Isleta Diversion Dam

10 July 2007 WJR07-674 30 seine hauls Effort: 854.3 m^2

Personnel: Thomas Archdeacon, W. Jason Remshardt

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	132
Cyprinidae	*Cyprinus carpio*	7
Cyprinidae	*Hybognathus amarus*	1484
Cyprinidae	*Pimephales promelas*	3
Cyprinidae	*Platygobio gracilis*	2
Catostomidae	*Carpiodes carpio*	8
Catostomidae	*Catostomus commersoni*	6
Ictaluridae	*Ictalurus punctatus*	19

Below Isleta Diversion Dam

13 August 2007 LTT13AUG07-01 30 seine hauls Effort: 677.0m^2

Personnel: Leeanna Torres, Evan B. Anderson, Casey Smith, Kevin Lente

Family	Species	N
Cyprinidae	*Cyprinus lutrensis*	307
Cyprinidae	*Cyprinus carpio*	1
Cyprinidae	*Hybognathus amarus*	221
Cyprinidae	*Pimephales promelas*	3
Cyprinidae	*Platygobio gracilis*	5
Catostomidae	*Carpiodes carpio*	3
Ictaluridae	*Ictalurus punctatus*	8
Poeciliidae	*Gambusia affinis*	32

Atrisco Outfall

13 August 2007 LTT13AUG07-02 30 seine hauls Effort: 1047.8 m^2

Personnel: Leeanna Torres, Evan B. Anderson, Casey Smith, Kevin Lente

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	37
Cyprinidae	*Cyprinus carpio*	1
Cyprinidae	*Hybognathus amarus*	1
Cyprinidae	*Pimephales promelas*	37
Cyprinidae	*Platygobio gracilis*	6
Catostomidae	*Carpiodes carpio*	65
Catostomidae	*Catostomus commersoni*	5
Ictaluridae	*Ictalurus punctatus*	6
Poeciliidae	*Gambusia affinis*	91
Centrarchidae	*Micropterus salmoides*	1

Alejandro Gate

13 August 2007 LTT13AUG07-03 30 seine hauls Effort: 735.5 m^2

Personnel: Leeanna Torres, Evan B. Anderson, Casey Smith, Kevin Lente

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	577
Cyprinidae	*Cyprinus carpio*	16
Cyprinidae	*Hybognathus amarus*	412
Cyprinidae	*Pimephales promelas*	6
Cyprinidae	*Platygobio gracilis*	2
Catostomidae	*Carpiodes carpio*	58
Catostomidae	*Catostomus commersoni*	1
Ictaluridae	*Ictalurus punctatus*	11
Poeciliidae	*Gambusia affinis*	114

Dixon Road

14 August 2007 LTT14AUG07-01 30 seine hauls Effort: 740.5 m^2

Personnel: Leeanna Torres, Scott Bulgrin, Bethany Gray

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	15
Cyprinidae	*Cyprinus carpio*	2
Cyprinidae	*Hybognathus amarus*	37
Cyprinidae	*Pimephales promelas*	1
Cyprinidae	*Platygobio gracilis*	42
Cyprinidae	*Rhinichthys cataractae*	22
Catostomidae	*Carpiodes carpio*	5
Catostomidae	*Catostomus commersoni*	11
Ictaluridae	*Ictalurus punctatus*	16
Poeciliidae	*Gambusia affinis*	4
Centrarchidae	*Micropterus salmoides*	1
Centrarchidae	*Pomoxis annularis*	2
Percidae	*Perca flavescens*	1

Lomitas Negras

14 August 2007 LTT14AUG07-02 30 seine hauls Effort: 842.5 m^2

Personnel: Leeanna Torres, Scott Bulgrin, Bethany Gray

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	14
Cyprinidae	*Cyprinus carpio*	8
Cyprinidae	*Hybognathus amarus*	145
Cyprinidae	*Pimephales promelas*	61
Cyprinidae	*Platygobio gracilis*	20
Cyprinidae	*Rhinichthys cataractae*	5
Catostomidae	*Carpiodes carpio*	2
Catostomidae	*Catostomus commersoni*	30
Ictaluridae	*Ameiurus natalis*	1
Ictaluridae	*Ictalurus punctatus*	16
Poeciliidae	*Gambusia affinis*	547
Centrarchidae	*Lepomis macrochirus*	4
Centrarchidae	*Micropterus salmoides*	1

Sandia Line 14

14 August 2007 LTT14AUG07-03 30 seine hauls Effort: 762.3 m^2

Personnel: Leeanna Torres, Scott Bulgrin, Bethany Gray

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	9
Cyprinidae	*Hybognathus amarus*	53
Cyprinidae	*Platygobio gracilis*	31
Cyprinidae	*Rhinichthys cataractae*	1
Catostomidae	*Catostomus commersoni*	10
Ictaluridae	*Ameiurus natalis*	2
Poeciliidae	*Gambusia affinis*	16

Sandia PNM Gasline

14 August 2007 LTT14AUG07-04 30 seine hauls Effort: 765.3 m^2

Personnel: Leeanna Torres, Scott Bulgrin, Bethany Gray

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	15
Cyprinidae	*Cyprinus carpio*	4
Cyprinidae	*Hybognathus amarus*	70
Cyprinidae	*Pimephales promelas*	4
Cyprinidae	*Platygobio gracilis*	13
Cyprinidae	*Rhinichthys cataractae*	3
Catostomidae	*Carpiodes carpio*	34
Catostomidae	*Catostomus commersoni*	12
Ictaluridae	*Ictalurus punctatus*	7
Poeciliidae	*Gambusia affinis*	264

Atrisco Outfall

16 October 2007 WJR07-683 30 seine hauls Effort: 652.5 m^2

Personnel: W. Jason Remshardt, Tammy Knecht, James Sandoval, David Kitcheyan

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	186
Cyprinidae	*Hybognathus amarus*	6
Cyprinidae	*Pimephales promelas*	5
Cyprinidae	*Platygobio gracilis*	3
Cyprinidae	*Rhinichthys cataractae*	4
Catostomidae	*Carpiodes carpio*	17
Catostomidae	*Catostomus commersoni*	1
Ictaluridae	*Ictalurus punctatus*	15
Poeciliidae	*Gambusia affinis*	45

Below Isleta Diversion Dam

16 October 2007 WJR07-684 30 seine hauls Effort: 608.0 m^2

Personnel: W. Jason Remshardt, Tammy Knecht, James Sandoval, David Kitcheyan

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	1014
Cyprinidae	*Hybognathus amarus*	136
Cyprinidae	*Pimephales promelas*	4
Cyprinidae	*Platygobio gracilis*	1
Catostomidae	*Carpiodes carpio*	21
Ictaluridae	*Ictalurus punctatus*	17
Poeciliidae	*Gambusia affinis*	4

Alejandro Gate

16 October 2007 WJR07-685 30 seine hauls Effort: 660.0 m^2

Personnel: W. Jason Remshardt, Tammy Knecht, James Sandoval, David Kitcheyan

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	1722
Cyprinidae	*Cyprinus carpio*	4
Cyprinidae	*Hybognathus amarus*	273
Cyprinidae	*Pimephales promelas*	2
Catostomidae	*Carpiodes carpio*	7
Ictaluridae	*Ictalurus punctatus*	31
Poeciliidae	*Gambusia affinis*	157

Dixon Road

30 October 2007 WJR07-686 30 seine hauls Effort: 933.0 m^2

Personnel: W. Jason Remshardt, Tammy Knecht, Tim Smith, Brian Duran

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	225
Cyprinidae	*Hybognathus amarus*	604
Cyprinidae	*Platygobio gracilis*	26
Catostomidae	*Catostomus commersoni*	5
Ictaluridae	*Ameiurus natalis*	1
Ictaluridae	*Ictalurus punctatus*	5
Poeciliidae	*Gambusia affinis*	157

Sandia PNM Gasline

30 October 2007 WJR07-687 30 seine hauls Effort: 1064.5 m^2

Personnel: W. Jason Remshardt, Tammy Knecht, Tim Smith, Brian Duran

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	28
Cyprinidae	*Hybognathus amarus*	11
Cyprinidae	*Pimephales promelas*	2
Cyprinidae	*Platygobio gracilis*	11
Cyprinidae	*Rhinichthys cataractae*	2
Catostomidae	*Catostomus commersoni*	5
Ictaluridae	*Ictalurus punctatus*	5

Sandia Line 14

30 October 2007 WJR07-688 30 seine hauls Effort: 1000.3 m^2

Personnel: W. Jason Remshardt, Tammy Knecht, Tim Smith, Brian Duran

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	131
Cyprinidae	*Hybognathus amarus*	276
Cyprinidae	*Pimephales promelas*	3
Cyprinidae	*Platygobio gracilis*	12
Cyprinidae	*Rhinichthys cataractae*	4
Ictaluridae	*Ictalurus punctatus*	1
Poeciliidae	*Gambusia affinis*	231

Atrisco Outfall

26 November 2007 WJR07-689 30 seine hauls Effort: 973.8 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, Evan B. Anderson

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	80
Cyprinidae	*Hybognathus amarus*	3
Cyprinidae	*Pimephales promelas*	5
Catostomidae	*Carpiodes carpio*	34
Ictaluridae	*Ictalurus punctatus*	4
Poeciliidae	*Gambusia affinis*	46
Centrarchidae	*Pomoxis annularis*	1

Below Isleta Diversion Dam

26 November 2007 WJR07-690 30 seine hauls Effort: 742.3 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, Evan B. Anderson

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	534
Cyprinidae	*Hybognathus amarus*	239
Cyprinidae	*Pimephales promelas*	1
Cyprinidae	*Platygobio gracilis*	1
Catostomidae	*Carpiodes carpio*	9
Ictaluridae	*Ictalurus punctatus*	13
Poeciliidae	*Gambusia affinis*	2

Alejandro Gate

26 November 2007 WJR07-691 30 seine hauls Effort: 853.0 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, Evan B. Anderson

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	223
Cyprinidae	*Cyprinus carpio*	15
Cyprinidae	*Hybognathus amarus*	1058
Cyprinidae	*Platygobio gracilis*	3
Catostomidae	*Carpiodes carpio*	4
Ictaluridae	*Ictalurus punctatus*	1
Poeciliidae	*Gambusia affinis*	2

Dixon Road

27 November 2007 WJR07-692 30 seine hauls Effort: 757.0 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, Tammy Knecht, Tim Smith, Mark Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	50
Cyprinidae	*Hybognathus amarus*	10
Cyprinidae	*Platygobio gracilis*	3
Cyprinidae	*Rhinichthys cataractae*	2
Poeciliidae	*Gambusia affinis*	2

Lomitas Negras

27 November 2007 WJR07-693 30 seine hauls Effort: 631.8 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, Tammy Knecht, Tim Smith, Mark Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	33
Cyprinidae	*Hybognathus amarus*	178
Cyprinidae	*Pimephales promelas*	2
Cyprinidae	*Platygobio gracilis*	3
Catostomidae	*Carpiodes carpio*	1
Catostomidae	*Catostomus commersoni*	1
Ictaluridae	*Ictalurus punctatus*	1
Poeciliidae	*Gambusia affinis*	103
Centrarchidae	*Lepomis macrochirus*	1
Centrarchidae	*Micropterus salmoides*	1

Sandia Line 14

27 November 2007 WJR07-694 30 seine hauls Effort: 790.8 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, Tammy Knecht, Tim Smith, Mark Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	45
Cyprinidae	*Hybognathus amarus*	365
Cyprinidae	*Pimephales promelas*	8
Cyprinidae	*Platygobio gracilis*	14
Cyprinidae	*Rhinichthys cataractae*	1
Ictaluridae	*Ictalurus punctatus*	2
Poeciliidae	*Gambusia affinis*	9

Sandia PNM Gasline

27 November 2007 WJR07-695 30 seine hauls Effort: 848.8 m^2

Personnel: W. Jason Remshardt, Leeanna Torres, Tammy Knecht, Tim Smith, Mark Morales

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	5
Cyprinidae	*Hybognathus amarus*	4
Cyprinidae	*Pimephales promelas*	1
Cyprinidae	*Platygobio gracilis*	5
Poeciliidae	*Gambusia affinis*	1

Atrisco Outfall

17 December 2007 WJR07-696 12 seine hauls Effort: 939.0 m^2

Personnel: W. Jason Remshardt, Tammy Knecht, Evan B. Anderson, Tracy A. Diver

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	39
Cyprinidae	*Hybognathus amarus*	8
Cyprinidae	*Pimephales promelas*	7
Cyprinidae	*Platygobio gracilis*	1
Catostomidae	*Carpiodes carpio*	14
Poeciliidae	*Gambusia affinis*	10

Below Isleta Diversion Dam

17 December 2007 WJR07-697 30 seine hauls Effort: 684.8 m^2

Personnel: W. Jason Remshardt, Tammy Knecht, Evan B. Anderson, Tracy A. Diver

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	79
Cyprinidae	*Hybognathus amarus*	31
Cyprinidae	*Pimephales promelas*	8
Catostomidae	*Carpiodes carpio*	20
Catostomidae	*Catostomus commersoni*	1
Ictaluridae	*Ictalurus punctatus*	16
Poeciliidae	*Gambusia affinis*	9
Centrarchidae	*Micropterus salmoides*	1

Alejandro Gate

17 December 2007 WJR07-698 30 seine hauls Effort: 633.8 m^2

Personnel: Tammy Knecht, Evan B. Anderson, Tracy A. Diver

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	161
Cyprinidae	*Hybognathus amarus*	79
Ictaluridae	*Ictalurus punctatus*	1

Dixon Road

18 December 2007 WJR07-699 30 seine hauls Effort: 998.5 m^2

Personnel: W. Jason Remshardt, Tammy Knecht, Evan B. Anderson, Tracy A. Diver

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	182
Cyprinidae	*Hybognathus amarus*	4
Cyprinidae	*Platygobio gracilis*	2
Poeciliidae	*Gambusia affinis*	2

Lomitas Negras

18 December 2007 WJR07-700 30 seine hauls Effort: 817.0 m^2

Personnel: W. Jason Remshardt, Tammy Knecht, Evan B. Anderson, Tracy A. Diver

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	71
Cyprinidae	*Cyprinus carpio*	13
Cyprinidae	*Hybognathus amarus*	364
Cyprinidae	*Pimephales promelas*	76
Catostomidae	*Carpiodes carpio*	1
Catostomidae	*Catostomus commersoni*	1
Poeciliidae	*Gambusia affinis*	207
Centrarchidae	*Lepomis macrochirus*	2
Percidae	*Micropterus salmoides*	17
Centrarchidae	*Pomoxis annularis*	3

Sandia Line 14

18 December 2007 WJR07-701 30 seine hauls Effort: 718.5 m^2

Personnel: W. Jason Remshardt, Tammy Knecht, Evan B. Anderson, Tracy A. Diver

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	5
Cyprinidae	*Hybognathus amarus*	13

Sandia PNM Gasline

18 December 2007 WJR07-702 30 seine hauls Effort: 803.8 m^2

Personnel: W. Jason Remshardt, Tammy Knecht, Evan B. Anderson, Tracy A. Diver

Family	Species	N
Cyprinidae	*Cyprinella lutrensis*	46
Cyprinidae	*Hybognathus amarus*	46
Cyprinidae	*Rhinichthys cataractae*	39
Poeciliidae	*Gambusia affinis*	4

Appendix C.
Water quality measurements by collection number. For detailed site information, cross-reference with Appendix B.

Collno = collection number; Temp = water temperature (C); DO = dissolved oxygen (mg/l); SpC = specific conductance (ms/cm); TDS = total dissolved solids (mg/l); Sal = salinity (ppt).

Collno	Temp	DO	SpC	Tds	Sal	pH
LTT07-005	16.96	7.18	338	0.220	0.16	8.95
LTT07-006	17.59	7.44	320	0.207	0.15	9.03
LTT07-007	17.67	7.03	298	0.225	0.17	9.25
LTT07JUL-005	21.87	9.51	348	0.223	0.17	7.31
LTT07JUL-006	.	.	.	.	.	.
LTT13AUG07-01	25.03	7.85	457	0.247	0.20	7.17
LTT13AUG07-02	25.02	7.97	420	0.273	0.20	7.10
LTT13AUG07-03	32.34	6.17	543	0.310	0.23	7.40
LTT14AUG07-01	23.47	7.80	341	0.229	0.17	7.96
LTT14AUG07-02	25.71	7.50	407	0.261	0.19	7.92
LTT14AUG07-03	25.98	8.59	370	0.236	0.17	7.24
LTT14AUG07-04	27.39	7.76	376	0.238	0.17	7.45
SRD07-046	22.90	6.83	.	.	0.20	.
TPA07-002	31.19	9.26	414	0.267	0.21	7.94
WJR07-538	3.14	13.44	425	0.276	0.20	6.76
WJR07-539	4.78	12.75	437	0.284	0.21	8.08
WJR07-540	6.76	11.46	430	0.279	0.21	8.09
WJR07-544	9.16	9.17	487	0.316	0.24	7.26
WJR07-545	3.35	12.70	350	0.228	0.17	7.79
WJR07-546	3.80	12.63	349	0.227	0.17	7.88
WJR07-547	5.61	12.40	390	0.253	0.19	8.13
WJR07-551	5.26	9.75	323	0.210	0.16	8.37
WJR07-552	6.80	9.19	354	0.230	0.17	8.52
WJR07-553	6.79	9.84	317	0.206	0.15	8.42
WJR07-554	7.63	9.14	314	0.205	0.15	8.30
WJR07-555	6.95	8.60	382	0.248	0.19	7.61
WJR07-556	8.07	8.18	412	0.268	0.20	8.18
WJR07-557	9.30	8.46	405	0.263	0.20	8.22
WJR07-558	7.89	9.00	324	0.211	0.16	7.78
WJR07-559	9.69	9.26	358	0.233	0.17	8.37
WJR07-560	8.66	10.02	322	0.210	0.15	8.27
WJR07-561	9.41	9.76	322	0.209	0.15	8.38
WJR07-562	9.81	8.80	367	0.239	0.18	7.77
WJR07-563	10.62	9.02	401	0.261	0.19	8.00
WJR07-564	12.45	9.16	393	0.256	0.19	8.18
WJR07-565	10.01	11.11	265	0.172	0.13	6.15
WJR07-566	10.43	11.65	249	0.162	0.12	8.26
WJR07-567	11.41	11.30	248	0.161	0.12	8.27
WJR07-568	13.57	10.69	247	0.186	0.14	8.17
WJR07-569	10.13	11.31	268	0.174	0.13	7.62

Collno	Temp	DO	SpC	Tds	Sal	pH
WJR07-570	11.77	10.74	291	0.189	0.14	8.01
WJR07-571	13.41	9.57	363	0.237	0.18	7.89
WJR07-656	14.96	8.22	377	0.245	0.18	9.10
WJR07-657	16.34	8.26	330	0.214	0.16	9.19
WJR07-658	17.97	8.35	316	0.206	0.15	9.26
WJR07-659	18.55	8.08	315	0.205	0.15	9.23
WJR07-660	19.10	7.24	358	0.234	0.17	7.71
WJR07-661	19.93	7.95	386	0.251	0.19	8.13
WJR07-662	20.99	7.42	355	0.231	0.17	8.29
WJR07-663	21.37	10.40	321	0.205	0.16	6.96
WJR07-664	21.98	6.70	363	0.250	0.19	7.83
WJR07-665	22.70	7.97	413	0.268	0.20	8.45
WJR07-666	26.31	6.12	402	0.261	0.19	8.21
WJR07-673	23.41	9.32	396	0.253	0.20	7.61
WJR07-674	24.00	9.09	411	0.262	0.21	7.84
WJR07-683	12.88	9.66	421	0.278	0.21	8.11
WJR07-684	13.54	10.34	433	0.301	0.23	8.13
WJR07-685	17.43	9.93	468	0.304	0.23	8.21
WJR07-686	11.38	.	.	.	.	.
WJR07-687	11.70	10.43	.	.	.	.
WJR07-688	13.35	11.54	.	.	.	.
WJR07-689	5.22	13.39	303	0.245	0.18	8.01
WJR07-690	7.92	11.70	431	0.280	0.21	8.20
WJR07-691	8.26	12.07	407	0.265	0.20	8.32
WJR07-692	7.68	11.30	435	0.272	0.21	8.46
WJR07-693	6.91	12.66	492	0.255	0.19	8.57
WJR07-694	6.73	13.09	324	0.211	0.16	8.47
WJR07-695	6.88	12.82	322	0.209	0.15	8.69
WJR07-696	2.50	15.26	337	0.230	0.17	8.11
WJR07-697	5.09	14.07	384	0.250	0.19	8.05
WJR07-698	5.80	13.83	364	0.237	0.18	8.13
WJR07-699	10.20	8.80	491	0.319	0.24	8.20
WJR07-700	6.04	11.18	476	0.266	0.20	8.48
WJR07-701	5.07	11.39	333	0.217	0.16	8.47
WJR07-702	5.55	10.39	331	0.216	0.16	8.27

Appendix D.
5-year augmentation plan for Rio Grande silvery minnow (Revised 2008)
Middle Rio Grande, New Mexico 2008-2012

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EXECUTIVE SUMMARY

In 2001, the "Rio Grande silvery minnow augmentation plan" was created. Since that time, over 1,000,000 hatchery-raised Rio Grande silvery minnow have been released into the Middle Rio Grande, New Mexico. Initially the goal was to produce 500,000 annually for release based primarily on the expected capacities of propagation facilities. Our stocking and monitoring efforts were initially focused in the Angostura Reach (Albuquerque), where catch rates were extremely low and the expected benefit of augmentation could be maximized. Between 2002 and 2004, 100,000 to 200,000 Rio Grande silvery minnow were released annually in the Angostura Reach.

Starting in 2005, augmentation was expanded to include the Isleta and San Acacia Reaches. Between 2005 and 2007, 100,000 to 400,000 Rio Grande silvery minnow were released annually throughout all reaches. In addition to augmentation and other conservation measures such as habitat improvement, improved water conditions in 2005 created an opportunity for Rio Grande silvery minnow to increase in abundance.

While hatchery released individuals cannot count directly towards recovery goals, their presence and success reproduction will ultimately result in increased numbers that can contribute to recovery. This revised augmentation plan will provide a detailed stocking strategy only for the Middle Rio Grande, New Mexico between 2008 and 2012. It is understood that other Rio Grande silvery minnow stocking projects (including Big Bend reintroduction) may factor into availability of fish for release, and coordination of all projects will be necessary. The core population within the Middle Rio Grande, New Mexico will remain the priority for all conservation activities including augmentation, but when conditions warrant, other stocking projects should benefit.

INTRODUCTION

The Rio Grande silvery minnow (*Hybognathus amarus*) was historically found in the mainstem Rio Grande and its larger tributaries (Chama River and Jemez River) from near Española to the Gulf of Mexico, and in the Pecos River from Santa Rosa downstream to its confluence with the Rio Grande (Bestgen and Platania 1991). Currently, Rio Grande silvery minnow has been found in the middle Rio Grande, New Mexico, between Cochiti Dam and Elephant Butte Reservoir, representing 283 km (176 mi) or 5-7% of the historical range. The species has declined and it is estimated that more than 70% of the known population of Rio Grande silvery minnow inhabits the reach from the San Acacia diversion dam downstream to Elephant Butte Reservoir (U.S. Fish and Wildlife Service 2007).

Throughout much of its historic and current range, the decline of Rio Grande silvery minnow may be attributed in part to modification of stream discharge patterns and sediment loads, channel desiccation, obstructions to upstream movement (e.g., impoundments and diversion dams), channelization, competition and predation by introduced nonnative species, and water quality degradation. One factor of considerable importance is the loss of nursery habitat. During spawning, fertilized eggs could passively drift up to 390 km downstream before being able to move out of the drift (Platania 2000). If spawning were to occur at the uppermost location (Cochiti Dam), many larvae could be transferred past Angostura and Isleta diversion dams before being able to actively seek out low-flow nursery areas given current uniform channel conditions. In a more natural channel with adequate low-velocity nursery habitat, eggs may only drift as much as 100 m downstream in a day (W. L. Minckley pers. comm.). It is likely that some or all of the factors may have contributed to the decline of Rio Grande silvery minnow which ultimately resulted in the listing of this endemic cyprinid as a federal endangered species (U.S. Fish and Wildlife Service 2007).

The Middle Rio Grande, New Mexico, is separated into four reaches, each designated by its upstream structure: Cochiti, Angostura, Isleta, and San Acacia. Cochiti Reach has been monitored infrequently since 1994, when Rio Grande silvery minnow was present on Santo Domingo and San Felipe Pueblos Rio Grande silvery minnow was last collected on Cochiti Pueblo in 1988 downstream of Cochiti Dam (Platania 1993) and may still be present in Cochiti Reach although reduced in abundance compared with historic collections (Platania 1995). Recent limited surveys in this reach near Peña Blanca did not result in any Rio Grande silvery minnow collection (Torres et al. 2008).

Relationship to recovery plan

In accordance with the Draft Revised Rio Grande silvery minnow Recovery Plan (Recovery Plan) (U.S. Fish and Wildlife Service 2007), to stabilize and enhance populations within its historic range, information is needed to determine the biological responses of Rio Grande silvery minnow to altered habitat and define augmentation requirements. To ensure survival of Rio Grande silvery minnow and maximize the probability of its successful recovery, it is necessary to maintain viable populations upstream in all reaches of the Middle Rio Grande.

The New Mexico Fish and Wildlife Conservation Office oversees management activities associated with propagation and augmentation, including development of propagation and augmentation plans, monitoring activities, collection of broodstock for propagation activities, and transfer between propagation facilities.

The priority for Rio Grande silvery minnow recovery related to augmentation is to maintain and enhance populations in the Middle Rio Grande, New Mexico as identified in the Recovery Actions and Narrative under section 3.2 (inset below) in the Recovery Plan (U.S. Fish and Wildlife Service 2007).

3.2 Continue Rio Grande silvery minnow augmentation activities.

Augmentation of the existing population of the Rio Grande silvery minnow has already taken place. The captive breeding program must be continued in order to provide fish for future augmentation, as necessary.

3.2.1 Develop, follow, and annually update a master plan for Rio Grande silvery minnow augmentation.

The need for augmentation of populations and sub-populations will spatially and temporally vary. A plan that identifies augmentation and repatriation locations and identifies population number goals is needed to achieve goals in a timely manner. The plan should be refined, as new information becomes available and the species moves toward recovery. Such a plan would necessarily require consultation with tribes and pueblos and respect the individual desire of each to participate or not.

3.2.2 Coordinate augmentation needs with propagation activities.

Based upon annual population estimates, determine the number of Rio Grande silvery minnow needed to augment each population (or subpopulation) to enable timely achievement of long-term population goals. Based upon estimates of populations and sub-populations, augmentation plans will be developed for each reach. Annual population estimates should be used to refine each augmentation plan.

Objectives

Clearly, augmentation activities for Rio Grande silvery minnow should be considered one part of the solution to prevent extinction of the species. Propagation and augmentation activities cannot reduce the need for restoration of long-term habitat conditions in the middle Rio Grande, New Mexico. The ultimate goal of this augmentation plan is to maintain populations of Rio Grande silvery minnow in the Middle Rio Grande, New Mexico, and to preserve the balance of the native fish community. The objective of this augmentation plan is to determine stocking rates and sites for release of hatchery raised Rio Grande silvery minnow (wild-caught, captive hatching of wild-caught eggs, captive propagation of wild-caught individuals, and propagation of captively bred individuals).

AUGMENTATION

This plan outlines augmentation activities for Rio Grande silvery minnow to be overseen by New Mexico Fish and Wildlife Conservation Office between 2008 and 2012. All formal augmentation will be as near to November 15th as possible. Initial augmentation targets will be prepared by January 15th and presented to propagation facilities at the semi-annual Rio Grande silvery minnow genetics and propagation workgroup meeting. Final augmentation numbers and sites will be determined on or before November 1st using Rio Grande silvery minnow population monitoring data from September. In addition, augmentation will focus on Isleta and San Acacia reaches only. Since 2001, Angostura Reach has been the focus of augmentation. To accurately determine the success of these efforts and the continued effects of these releases, a period of time without intensive stocking needs to be evaluated.

January 15th Initial Augmentation Target

The initial target for augmentation will be based on the previous fall's releases in addition to the spring runoff forecast. These initial targets will be formulated as follows:

Total Release = Previous year's release * Spring runoff factor.

Where Spring runoff is defined as follows:

Spring runoff = 1.5 in Dry years
Spring runoff = 1 in Average years
Spring runoff = 0.5 in Wet years

For the purposed of this calculation, dry, average, and wet years are defined as follows based on the Natural Resources Conservation Service's (NRCS) January 1 "Most Probable" Streamflow Forecast (generally available by January 7) available at http://www.wcc.nrcs.usda.gov/cgibin/bor.pl. For each scenario, the definitions are as follows:

Dry year: NRCS January 1 Streamflow Forecast at Otowi Gage is less than 80 percent of average*,
Average year: NRCS January 1 Streamflow Forecast at Otowi Gage is 80 to 120 percent of average*,
Wet year: NRCS January 1 Streamflow Forecast at Otowi Gage is 120 percent or higher of average*,

*Average is defined by NRCS as being the average streamflow at the point of reference (Otowi Gage for the 30-year period from 1971 through 2000.

These initial targets are for general planning purposes only and will likely change at the final determination on November 1st. Understanding that the streamflow predictions may change significantly between January 1 and April 1 (typically used for accurate predictions), this early prediction is necessary to prepare propagation facilities in time for production season which can begin as early as March 1. Also, it will take into account the variability that may be attributed to spawning success and effects of intermittency due to streamflow predictions.

November 1st Final Augmentation Targets

Between January 15th and November 1st, additional modifications to the augmentation targets will be made and discussed with propagation facilities for planning purposes. On November 1st, the final augmentation targets and stocking locations will be made available to each of the propagation facilities. The November 1st augmentation targets will be calculated based on the September catch rates reported from the Rio Grande silvery minnow population monitoring data. Typically, October catch rates are the standard for determining status of fish populations, but the time and preparation needed to determine specific stocking rates makes using the October numbers problematic (October monitoring data may not be available until mid-November). Therefore, the September catch rates will be used as a surrogate. Based on the Recovery Plan, Recovery Goal 1: (Prevent Extinction) details criteria 1.A.1 as:

> "….these may also be defined as sub-populations in which the lower boundary of a 95 percent confidence interval of October catch per unit effort (CPUE) data from all sites (20) within each reach is > 1 fish/100 m^2. "

Understanding that hatchery-released individuals would not contribute to recovery goals, we are assuming that hatchery-released individuals will survive similarly to the wild individuals to the following spring and contribute to the subsequent season's population through reproduction.

A review of augmentation activities since 2002 suggests that while all augmentation is beneficial, there are higher benefits observed when stocking at relatively low base population numbers. For example during the initial augmentation activity in the fall/winter of 2002/2003, standing catch rates of wild Rio Grande silvery minnow in the Angostura Reach was between 0.04 and 0.60 fish/100 m^2. Over 120,000 were stocked that winter in this reach (~1/100 m^2) and these additional fish resulted in increased catch rates of 0.08 to 0.23/100 m^2 and typically represented over 50% of the collections that winter (Dudley and Platania 2004). Based on calculated densities from average river area (Table 1.), overwinter catch rates were 61.0% of expected. This expected value take into consideration calculated monthly survival rates (0.64) from previous augmentation studies (Remshardt 2007).

As augmentation efforts expanded between 2003 and 2005, population numbers increased accordingly. In the winter of 2005/2006, catch rates of unmarked Rio Grande silvery minnow were between 5 and 40/100 m^2 (Dudley and Platania 2007). Over 325,000 fish were released that winter river-wide (0.77/100 m^2) and resulted in increased catch rates of 0.02 to 0.05/100 m^2 and typically represented less than 1% of the collections than winter (Dudley and Platania 2007). Based on calculated densities from average river area (Table 1.), overwinter catch rates were 27.0% of expected, or 44% of that observed at lower base catch rates reported above.

Table 1. Estimated Metrics of Reaches in the Middle Rio Grande, New Mexico.

Reach	Length (m)	Average Width (m)	Total area (m^2)
Angostura	65,000	182	11,830,000
Isleta	85,500	161	13,765,500
San Acacia	92,000	182	16,744,000

A combination of the immediate recovery goal for preventing extinction (all sites with greater than 1 fish/100 m^2) and the increased efficiency of augmentation at lower base densities (less than 1 fish/100 m^2) provide a framework for calculating augmentation needs on a site-by-site basis annually using a target of 1 fish/100 m^2. This is only meant to be an initial target for the initial 5 years (2008-2012) and may be adjusted upward as status of Rio Grande silvery minnow improves.

Release Locations

Release sites will be selected based on the September catch rates at the 15 standard population monitoring sites in the Isleta and San Acacia reaches. The average distance between these monitoring sites (12 km) approximately represents the range of downstream dispersal observed for Rio Grande silvery minnow (10 km) (Remshardt 2008). Therefore, each monitoring site will represent a potential stocking site. Additional stocking locations can be added as needed to improve retention and survival or within Pueblo boundaries as allowed.

Release Calculations

The release number (A) for each site (S_i) is calculated using the following formula:

$$AS_i = (C_t - C_o) \times (\text{total estimated area } m^2 \text{ between } S_i \text{ and } S_{i+1})$$

where; C_t = Target catch rate at each site, or 1 fish / 100 m^2,
C_o = Observed catch rate at each site in September
S_i = Site of release
S_{i+1} = Next downstream site.

Similarly, the total number of fish needed each year is the sum of each individual site release number. A minimum of 10,000 will be released at any one site if required and calculated number to be released will be rounded to the nearest 1,000. A cursory examination of the potential maximum number of fish requested annually could be near 310,000 fish for the Isleta and San Acacia reaches if catch rates at all 15 sites was 0 fish / 100 m^2.

Source of Fish

All transplanted fish will originate from Dexter National Fish Hatchery and Technology Center and the Albuquerque Biological Park. Released fish can originate from several sources from this priority list: 1) wild captured eggs reared in hatchery; 2) captive-spawned eggs of wild stock F0; and 3) captive-spawned eggs of domestic stock F1. Maintaining stocks at several facilities

prevents the species from extinction due to stochastic events and serves to minimize the impact of any one facility on the genome of the Rio Grande silvery minnow. No specific percentage is expected to come from one facility or another and relative contributions from each facility can vary from year to year. But it is anticipated that a minimum of 25% will originate from each facility.

Marking Techniques

All released fish will be externally batch-marked with Visible Implant Elastomer (VIE) tags for future identification. This method provides the level of detail needed for this study and overall effectiveness (low mortality < 5% and high tag retention > 95%) necessitate its use. Each year's release will be given a different mark (color and/or location).

Release

Fish raised by captive propagation will be stocked out each fall (age-0 or 1) at a minimum of 40 mm SL. In order for these stocked fish to effectively contribute to the various populations, they must survive to reproduce in the following years. The added cost and space constraints associated with keeping large numbers of captively-spawned Rio Grande silvery minnow overwinter necessitates their stocking as soon as habitat conditions allow.

All fish will be stocked after water diversions for irrigation has stopped. The fall stocking period has proven to provide the highest recapture rates. Stocking in the fall will allow captive-reared individuals to reach maximum size while avoiding predation, competition, and habitat degradation (intermittency) during summer low-flow periods when age-0 fish are most susceptible. Also, fall release allows the stocked fish several months to acclimate to the river before higher flows (and spawning) occur the following spring.

Soft Release

At each release site, a soft release technique will be used. Past habitat results have verified the importance of low-velocity habitat of sufficient depth (> 0.5 m) for release; these habitats provide areas for cover and acclimation to riverine conditions after release. Transplanted fish will be "tempered" in the Rio Grande prior to their release. Holding pens (4` x 4` x 4`) will be installed at release sites to hold Rio Grande silvery minnow for up to 18 hours prior to final release to allow an opportunity to acclimate to riverine conditions, which may reduce predation and downstream dispersal specifically related to the added stress of handling. Depending on where the fish are being distributed from (Dexter or Albuquerque), travel time to stocking locations may take between 4 and 6 hours. Each facility will be advised to try and reach the stocking destination between 10:00 and 12:00 hours. As many as 10,000 fish will be placed in each holding pen immediately after the hatchery truck has tempered the hauling water to the river. This typically can take anywhere between 0.5 and 1 hour. That evening, after 4-6 hours in the pen, a release door attached to each pen will be opened to allow the fish to passively escape overnight. The following morning, the pens will be removed and any remaining fish will be released. Release procedures and conditions will be carefully documented an analyzed to allow for adaptive management.

Monitoring

Monitoring of stocked fish will include a combination of surveys conducted by NMFWCO within tribal boundaries as allowed and data provided by other researchers working in the Rio Grande. These additional data sources could include Rio Grande silvery minnow population monitoring, fish health studies, salvage and rescue, habitat surveys, and other sources as appropriate.

RISK

Releasing captive-reared fish into the wild is not without risks. Genetic and ecological risks must be evaluated against the possible benefits of the augmentation efforts. These risks are described in detail in the Rio Grande silvery minnow genetics management and propagation plan (USFWS et al. 2007).

Ecological concerns associated with stocking captive-reared Rio Grande silvery minnow in the wild include passive downstream movement, pathogen and parasite transmission, intra- and interspecific competition, and predation. By allowing fish to reach optimum size (40 mm SL) before stocking, VIE tagging is more efficient and over-winter survival is expected to be higher. Samples from all sources of stocked fish will be analyzed for presence and extent of pathogens and parasites before transfer or stocking into the Rio Grande.

ADAPTIVE MANAGEMENT

When and if the immediate recovery goal of preventing extinction is reached (5 consecutive years of catch rates > 1 fish/100 m^2 at the 15 monitoring sites), the augmentation needs could be re-calculated to assess the potential benefits at higher base densities. But it should be expected that the benefits of augmentation will be lessened at these higher base densities as described above. Additional increases in catch rates (densities) will likely require other conservation activities such as habitat enhancement, water conservation, and fish passage.

If the overall catch rate for Angostura Reach drops to below 0.1 fish / 100 m^2 during October, then augmentation will be re-initiated for this reach the following year. If the number of available fish for augmentation outnumbers the calculated need as described, then steps can be taken to ensure that these fish be used for other management actions, including reintroduction into Big Bend, Texas. Based on the size of this reintroduction effort, it is not anticipated that we will outsupply the total demand for Big Bend initially, but if similar calculations in this and/or other management areas indicate that propagation fish still remain, then these additional fish can be released into the Middle Rio Grande as determined by the NMFWCO and U.S. Fish and Wildlife Service.

Table 2. Summary of Rio Grande silvery minnow augmentation releases 2002-2007.

color	location	number	release site	river mile	date
orange	right, predorsal	2,082	alameda	192.2	2-Jun-02
orange	left, predorsal	41,500	corrales	200.0	9-Dec-02
green	left, predorsal	61,118	bernalillo	203.5	2-Jan-03
red	left, predorsal	22,266	sandia	199.9	3-Apr-03
yellow	right, predorsal	48,513	sandia	199.9	3-Jan-04
red	right, predorsal	46,545	sandia-float	203.5-192.2	4-Apr-04
red	right, predorsal	10,099	sandia-float	203.5-192.2	4-Apr-04
green	right, predorsal	8,500	sandia-float	203.5-192.2	4-Apr-04
orange	right, predorsal	1,500	bernalillo	203.5	15-Apr-04
yellow	right, anal	9,622	bernalillo-day	203.5	3-Nov-04
red	right, anal	8,639	sandia-float-day	203.5-192.2	3-Nov-04
orange	right, anal	7,845	bernalillo-night	203.5	5-Nov-04
green	right, anal	6,956	sandia-float-night	203.5-192.2	5-Nov-04
yellow	left, anal	6,245	bernalillo-day	203.5	3-Nov-04
red	left, anal	7,006	sandia-float-day	203.5-192.2	3-Nov-04
orange	left, anal	6,065	bernalillo-night	203.5	5-Nov-04
green	left, anal	6,879	sandia-float-night	203.5-192.2	5-Nov-04
yellow	left, predorsal	570	central bridge	183.4	20-Oct-04
yellow	left, predorsal	5,667	central bridge	183.4	9-Nov-04
yellow	left, predorsal	475	Rio Bravo	178.3	5-Jan-05
orange	right, predorsal	1,540	Rio Bravo	178.3	5-Jan-05
white	right, anal	5,000	sandia-float-day	203.5-192.2	12-Apr-05
purple	right, anal	5,000	bernalillo-day	203.5	12-Apr-05
pink	right, anal	5,654	sandia-truck-night	203.5-192.2	13-Apr-05
blue	right, anal	5,011	bernalillo-night	203.5	13-Apr-05
white	left, anal	11,080	sandia-float-day	203.5-192.2	12-Apr-05
purple	left, anal	8,800	bernalillo-day	203.5	12-Apr-05
pink	left, anal	10,026	sandia-truck-night	203.5-192.2	13-Apr-05
blue	left, anal	10,242	bernalillo-night	203.5	13-Apr-05
green	left, dorsal	10,357	Rio Bravo	178.3	26-May-05
orange	right, predorsal	227	bridge street	181.6	5-Jul-05
orange	left, predorsal	21	bridge street	181.6	5-Jul-05
orange	right, predorsal	20,000	bernalillo	203.5	12-Sep-05
white	right, predorsal	14,853	bernalillo-montano	203.5-189.0	8-Nov-05
purple	right, predorsal	13,921	bridge street	181.6	8-Nov-05
pink	right, predorsal	15,715	bernalillo	203.5	8-Nov-05
blue	right, predorsal	16,282	bridge - los padillas	203.5-173.0	8-Nov-05
white	left, predorsal	21,000	lemitar-socorro	108.0-100.4	7-Nov-05
purple	left, predorsal	28,986	bernardo	130.6	7-Nov-05
pink	left, predorsal	25,642	socorro	100.4	7-Nov-05
blue	left, predorsal	25,436	bernardo - rio puerco	130.6-126.5	7-Nov-05
red	right, predorsal	24,405	bridge street	181.6	18-Apr-06
green	right, predorsal	22,905	bernalillo	203.5	18-Apr-06
orange	right, predorsal	30,117	sadd	116.1	18-Apr-06
yellow	right, predorsal	30,893	rio puerco	126.5	18-Apr-06
red	left, predorsal	43,841	bridge street	181.6	21-Sep-06
green	left, predorsal	44,388	bernalillo	203.5	21-Sep-06
orange	left, predorsal	30,349	sadd	116.1	16-Oct-06
yellow	left, predorsal	30,385	rio puerco	126.5	16-Oct-06
	none	51,158	san marcial	68.6	13-Oct-06
	none	2,500	san marcial	68.6	3-Nov-06
	none	107,910	san marcial	68.6	21-Nov-06
pink	right, predorsal	370	bridge street	181.6	29-May-07
pink	right, predorsal	10,148	bridge street	181.6	29-May-07
pink	right, predorsal	5,938	bridge street	181.6	29-May-07
pink	right, predorsal	4,732	bridge street	181.6	29-May-07
	none	17,000	bridge street	181.6	31-May-07
pink	left, predorsal	44,328	bernardo-brown's arroyo	130.6-94.0	9-Oct-07
pink	left, predorsal	16,031	1.5 mi below san acacia	114.5	25-Oct-07
pink	left, predorsal	4,607	1.5 mi below san acacia	114.5	25-Oct-07
pink	left, predorsal	30,000	1.5 mi below san acacia	114.5	3-Dec-07
	Total	**1,114,890**			

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