RIO GRANDE SILVERY MINNOW AUGMENTATION IN THE MIDDLE RIO GRANDE, NEW MEXICO
Annual Report 2014

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Middle Rio Grande Endangered Species Act Collaborative Program

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Cover Photo: NMFWCO staff seining for Rio Grande Silvery Minnow

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EXECUTIVE SUMMARY

- This report covers hatchery fish released in autumn 2013, subsequent fish community monitoring and recaptures throughout 2014, and the calculations and releases of hatchery fish in autumn 2014.

- In 2014, Rio Grande Silvery Minnow (RGSM) failed to recover from very low 2012 levels and continued to show very low abundance, while the proportion of hatchery fish in the river continued to increase. Rank abundance of RGSM increased slightly compared to 2013.

- From December 2013 to November 2014, 1,722 hatchery released RGSM were documented from several combined research projects. This is due in part to continued large numbers of released fish in 2013. The majority of these recaptures were a result of the RGSM salvage program.

- Based on September 2014 population monitoring catch rates, 18 of 20 population monitoring sites had <1.0 RGSM/100m^2 , triggering the requirement for stocking. Compared to previous years, 20 sites were stocked in 2013, 15 in 2012, 10 in 2011, eight in 2010, one in 2009 and no stocking in 2008. Approximately 268,000 RGSM were stocked in the Middle Rio Grande, New Mexico, in 2014.

- In 2014, monitoring for RGSM and the fish community monitoring on tribal lands in Angostura and Isleta reaches (to supplement data collection from other researchers) resulted in collection of 99 RGSM, of which, only 36 were wild RGSM.

- In 2013, the revised augmentation plan for RGSM was implemented. This revised augmentation plan provides a detailed stocking strategy for the Middle Rio Grande, New Mexico between 2013 and 2017.

INTRODUCTION

In 2001, the RGSM Augmentation Plan was created to help increase the number of RGSM in the river. Since that time, >2,000,000 hatchery-raised RGSM were released into the Middle Rio Grande, New Mexico (MRG). Initially, the goal was to produce 500,000 annually for release based primarily on the expected capacities of propagation facilities, along with current population status and suggestions from geneticists. Stocking and monitoring efforts were focused in the Angostura Reach (Albuquerque Reach) where catch rates of wild Rio Grande Silvery Minnow were extremely low and the expected benefit of augmentation could be maximized (Remshardt and Davenport 2003). However, actual production has been limited to 400,000 or less per year.

Widely varying numbers of RGSM have been released in the MRG each year from 0 to 293,000. Between 2002 and 2004, 100,000 to 200,000 RGSM were released annually in the Angostura Reach based on calculations to reach target densities of 1 fish/100m^2. Starting in 2005, augmentation expanded to include the Isleta and San Acacia Reaches. In addition to augmentation and other conservation measures such as habitat improvement, improved spring runoff and habitat conditions for juvenile survival in 2005 created an opportunity for RGSM to increase in abundance. Between 2005 and 2007, 100,000 to 400,000 RGSM were released annually throughout all reaches (Remshardt 2008). In 2008, we began implementing a revised 5-year RGSM Augmentation Plan (Appendix D in Remshardt 2008), which purposely did not stock the Angostura Reach in order to evaluate the effect of hatchery augmentation. Favorable conditions and recruitment beginning in 2008 meant that no augmentation was needed that year; however, the number of RGSM stocked has increased each year since 2009. In 2013, we implemented another revised 5-year RGSM Augmentation Plan, guiding augmentation efforts through 2017 (U.S. Fish and Wildlife Service 2013), which included the resumption of stocking in the Angostura Reach.

This annual report summarizes findings between December 2013 and November 2014. This effort reflects management needs identified in the Middle Rio Grande Endangered Species Collaborative Program (MRGESCP), Item A.2.2 for Rio Grande Silvery Minnow as well as the Rio Grande Silvery Minnow Recovery Plan, 1st Revision, (RGSMRP; U.S. Fish and Wildlife Service 2010). 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 MRGESCP and RGSMRP, respectively.

The ultimate goal of augmentation is to re-establish a self-sustaining population of RGSM in the MRG. Long-term benefits of this study are to: 1) augment populations within the MRG; and 2) evaluate stocking efforts and methods.

Specific objectives of augmentation and monitoring activities in 2014 were to:

1) Implement the revised 5-year augmentation and stocking protocol; calculate number of RGSM necessary to meet target densities of 1 fish/100m^2.

2) Continue to monitor RGSM in the Angostura reach to determine the effect of not augmenting the population from 2008-2012 in that reach.

3) Provide guidance for augmentation activities to maximize survival of RGSM.

METHODS

Study Area

This investigation concentrated on areas within the Angostura, Isleta, and San Acacia reaches (Figure 1). Specific descriptions of fish community sampling locations are given in 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, and 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.

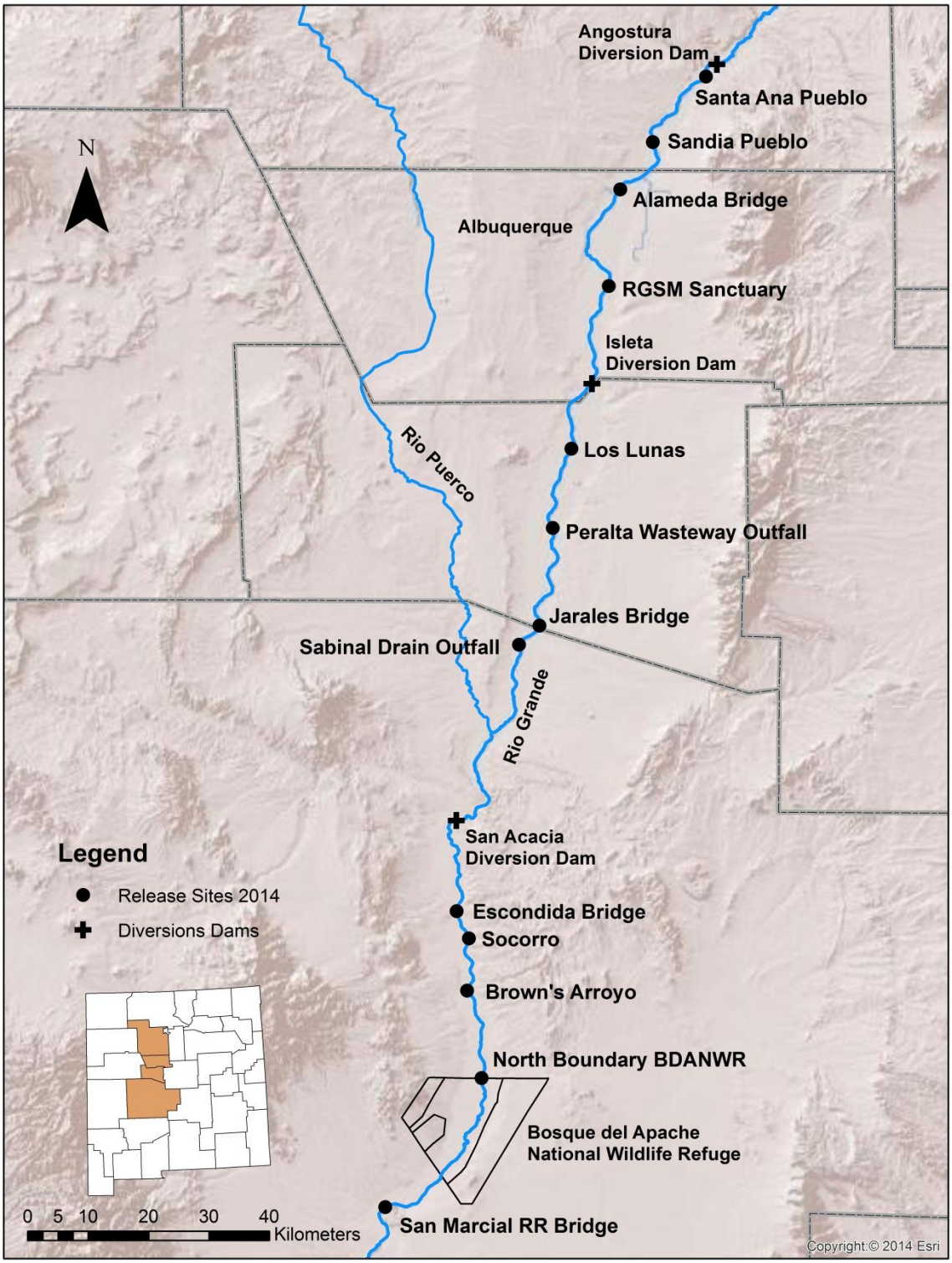

Figure 1-Map of the Middle Rio Grande, New Mexico. Release locations indicate where Rio Grande Silvery Minnow augmentation occurred in autumn 2014.

Fall Augmentation Needs

As detailed in the revised RGSM augmentation plan 2013-2017 (U.S. Fish and Wildlife Service 2013), augmentation efforts were focused on the entire MRG in 2014. Hatchery fish are marked with visible implant elastomer tags (VIE). The number of fish to augment for each site (S_i) is determined using the following formula:

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

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.

Post-Augmentation Monitoring

New Mexico Fish and Wildlife Conservation Office (NMFWCO) monitors stocked fish during surveys at approximately 1-month intervals (weather permitting) to determine survival, growth and movement of hatchery-reared RGSM. Monitoring sites are currently maintained within Sandia Pueblo and Isleta Pueblo boundaries to collect additional recapture data not available from standard population monitoring. These efforts also collected secondary information on fish community structure. Fish were collected by rapidly drawing a 3 m x 1.8 m, 3 mm mesh seine through the water. Each seine haul was limited to a discrete mesohabitat. Length of individual seine hauls were measured to the nearest 0.1 meter to record sampling effort, which was calculated by multiplying the distance of each seine haul by the effective width of the seine (usually 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, total dissolved solids, and salinity) at each monitoring site. Standard length was measured from all RGSM captured, and age class (age 0 and age 1+), including marked and unmarked individuals was recorded. All other fish captured were identified and counted for each individual seine haul in the field and subsequently released.

Table 1-Rio Grande Silvery Minnow monitoring locations and descriptions visited by New Mexico Fish and Wildlife Conservation Office staff in 2014, in the Middle Rio Grande, New Mexico.

Site	Reach	Description
Lomitas Negras	Angostura	New Mexico, Sandoval County, Rio Grande, Pueblo of Sandia, at confluence of Arroyo de las Lomitas Negras and Rio Grande. RM 197.4
Dixon Road	Angostura	New Mexico, Sandoval County, Rio Grande, Pueblo of Sandia, east of Dixon Road, Bernalillo, NM. RM 195.1
North AMAFCA	Angostura	New Mexico, Bernalillo County, Rio Grande, Pueblo of Sandia, at confluence of AMAFCA North Diversion Channel and Rio Grande. RM 193.5
Atrisco Outfall	Angostura	New Mexico, Bernalillo County, Rio Grande, Pueblo of Isleta, 1.9 miles upstream of Isleta Diversion Dam, RM 171.2.
Isleta Diversion Dam	Isleta	New Mexico, Bernalillo County, Rio Grande, Pueblo of Isleta, 0.1 miles downstream of Isleta Diversion Dam, RM 169.3
Alejandro Gate	Isleta	New Mexico, Valencia County, Rio Grande, Pueblo of Isleta, 2.7 miles downstream of Isleta Diversion Dam, RM 166.6

Length-Frequency

Standard lengths of captured RGSM 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 RGSM was assigned to each individual. The regression coefficient *ß* (slope of the regression line) 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.

Fish Community

A summary table of fish collections for the current study period (December 2013 to November 2014) 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).

Recapture Data From Other Research

Recapture data collected from other researchers continues to provide valuable data on movement and retention of VIE marked fish. Included in this year's summary are collections from standard population monitoring and population estimate work for RGSM conducted by ASIR (American Southwest Ichthyological Researchers, LLC); data from NMFWCO RGSM salvage projects, from University of New Mexico (UNM) genetic monitoring, from the U.S. Bureau of Reclamation (USBR), from New Mexico Interstate Stream Commission (NMISC), and the U.S. Army Corps of Engineers (USACE). These researchers were asked to volunteer recapture information on VIE-marked RGSM. These projects have varying objectives and methods, but a summary of recaptures can provide an overall view of RGSM movement and retention in release areas. In 2013, fish releases were timed to occur after population monitoring and estimation events in November 2013 to reduce the effects of stocked fish on their analyses, therefore recapture data from December 2013 through November 2014 is summarized in this report.

RESULTS

Fall Augmentation Needs

Based on the September 2014 catch rates from the standard RGSM population monitoring conducted by ASIR (Dudley et al. 2014b), NMFWCO requested 271,000 RGSM for release in the Middle Rio Grande. Catch rates from the September 2014 monitoring were compared with the target catch rate of 1 RGSM / 100 m^2 for each site (see Table 2). The 20 sites had catch rates from 0 to 2.04 RGSM / 100 m^2. Thirteen of these sites recorded no RGSM. Therefore, 18 sites required augmentation with hatchery RGSM during 2014, however the site at San Acacia Diversion Dam (Table 2) required less than 250 fish and was not stocked.

Table 2- Standardized population monitoring sites for Rio Grande Silvery Minnow in the Middle Rio Grande, New Mexico, river mile (RM), observed minnow density in September 2014, and the number of Rio Grande Silvery Minnow needed to raise densities to 1.0 for that site.

Reach	Site	Observed Density	Release Number
Angostura	Angostura DD	0	17,000
Angostura	Bernalillo	2.04	0
Angostura	RRWWTP	0.21	43,000
Angostura	Central	0	11,000
Angostura	Rio Bravo	0.19	43,000
Isleta	Los Lunas	0.20	23,000
Isleta	Belen	0	12,000
Isleta	Jarales	0	24,000
Isleta	Bernardo	0.2	4,000
Isleta	La Joya	0	15,000
Isleta	Above SADD	0	2,000
San Acacia	SADD	0.85	250
San Acacia	Below SADD	0	22,000
San Acacia	Socorro	0	17,000
San Acacia	Neil Cupp	1.19	0
San Acacia	San Antonio	0	10,000
San Acacia	Bosque NWR	0	11,000
San Acacia	San Marcial	0	7,000
San Acacia	8 Mile d/s SM	0	2,000
San Acacia	10 Mile d/s SM	0	8,000

Table 3- Sites in the Middle Rio Grande, New Mexico, where Rio Grande Silvery Minnow were released October and November 2014, the color of the hatchery mark (GLD = green left dorsal, YLDD = yellow left dorsal, WLD = white left dorsal), the source of the fish (SNARRC = Southwestern Native Aquatic Resources and Recovery Center, LLSMR = Los Lunas Silvery Minnow Refugium, ABQ = Albuquerque BioPark), date released, and the number released.

Reach	Site	Source	Mark	Date	Release Number
Angostura	Santa Ana Pueblo	SNARRC	YLD	9-Oct-2014	40,325
Angostura	Sandia Pueblo	SNARRC	YLD	9-Oct-2014	40,325
Angostura	Alameda Bridge	LLSMR	GLD	9-Oct-2014	4,305
Angostura	Alameda Bridge	ABQ	WLD	9-Oct-2014	1,222
Angostura	RGSM Sanctuary	SNARRC	YLD	24-Nov-2014	27,230
Isleta	Los Lunas	LLSMR	GLD	10-Nov-2014	5,513
Isleta	Peralta Wasteway Outfall	SNARRC	YLD	10-Nov-2014	21,356
Isleta	Jarales	ABQ	WLD	10-Nov-2014	24,245
Isleta	Sabinal Drain Outfall	SNARRC	YLD	10-Nov-2014	22,000
Isleta	Sabinal Drain Outfall	SNARRC	YLD	24-Nov 2014	5,000
San Acacia	Escondida	SNARRC	YLD	10-Nov-2014	15,000
San Acacia	Socorro	SNARRC	YLD	10-Nov-2014	15,000
San Acacia	Brown's Arroyo	SNARRC	YLD	10-Nov-2014	15,000
San Acacia	North Boundary BDANWR	SNARRC	YLD	10-Nov-2014	16,797
San Acacia	San Marcial	SNARRC	YLD	10-Nov-2014	15,000

Because of number of locations that RGSM needed to be released, NMFWCO released hatchery RGSM over an extended period and at a reduced number of sites (Table 3). We avoided stocking at standardized monitoring sites when possible, but preference was given to sites with easy access for hatchery trucks.

Post-Augmentation Monitoring

Augmentation monitoring within the Sandia and Isleta Pueblos continued in 2014, when not conflicting with other projects (e.g. RGSM salvage) and weather permitting. From December 2013 to November 2014 we collected 62 samples. Not all six sites were sampled each month, but all months had at least 3 samples collected from December 2013 to November 2014. Ninety-seven total RGSM were collected (Table 4), and 63 of those were marked as hatchery-reared fish, 14 were YOY, and 19 were wild Age1 or older. Rio Grande Silvery Minnow comprised 1.1% of the total catch, and were present in 5% of all seine hauls (n = 1,280).

Length-Frequency

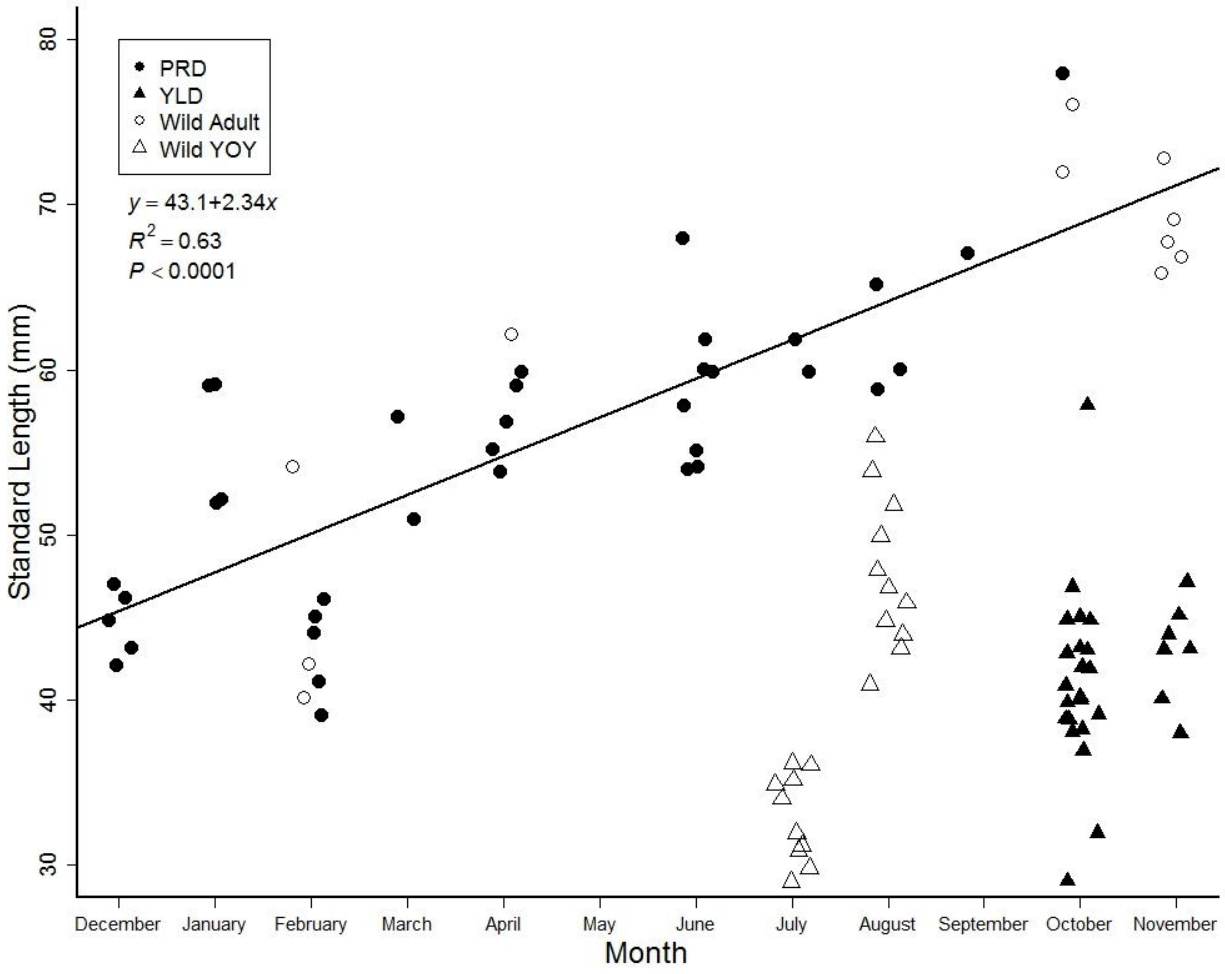

Figure 2-Rio Grande Silvery Minnow standard length by month, December 2013 to November 2014. Regression line relates month to standard length for hatchery released fish. PRD = pink right dorsal hatchery fish, YLD = yellow left dorsal hatchery marked fish, YOY = young of year.

Hatchery fish grew throughout the 2014 monitoring efforts, though most growth occurred before August (Figure 2). Too few wild fish were captured to make a growth estimate, but wild fish were generally larger than hatchery fish of the same age, although because so few wild fish were collected, distinguishing between age 1 and age 0 is difficult. We assumed that the large increase in CPUE of wild RGSM was due to age 0 fish recruiting to gear. We assumed all wild fish in the August sample were age 0, but it is possible some were older fish. Wild age 0 fish were not collected until July sampling.

Fish Community

Table 4-Status, numbers, percent of total, and percent occurrence for all species collected during NMFWCO augmentation monitoring at all sites combined in 2014. For status, N=native and I=introduced. Subspecific names include citations below. Percent occurrence is the percent of hauls that species occurred in for the year, 1,280 total seine hauls.

Species	**Status**	**n**	**Relative Abundance (%)**	**Percent Occurrence (%)**
Gizzard Shad *Dorosoma cepedianum*	N	1	<0.1	<1
Red Shiner *Cyprinella lutrensis*	N	5,055	55.8	31
Common Carp *Cyprinus carpio*	I	14	0.2	1
Rio Grande Chub *Gila pandora*	N	1	<0.1	<1
Rio Grande Silvery Minnow *Hybognathus amarus*	N	97	1.1	5
Fathead Minnow *Pimephales promelas*	N	561	6.2	8
Flathead Chub *Platygobio gracilis gulonella*[a]	N	935	10.3	19
Longnose Dace *Rhinichthys cataractae cataractae*[b]	N	549	6.0	6
River Carpsucker *Carpiodes carpio elongatus*[c]	N	151	1.7	3
White Sucker *Catostomus commersoni*	I	59	0.7	2
Black Bullhead *Ameiurus melas*	I	1	<0.1	<1
Yellow Bullhead *Ameiurus natalis*	I	3	<0.1	<1
Channel Catfish *Ictalurus punctatus*	I	689	7.6	14
Western Mosquitofish *Gambusia affinis*	I	922	10.1	6
White Bass *Morone chrysops*	N	1	<0.1	<1
White Crappie *Pomoxis annularis*	I	11	0.1	<1
TOTAL		9,051		

[a] Olund and Cross (1961) [b] Jenkins and Burkhead (1993)

[c] Trautman (1981)

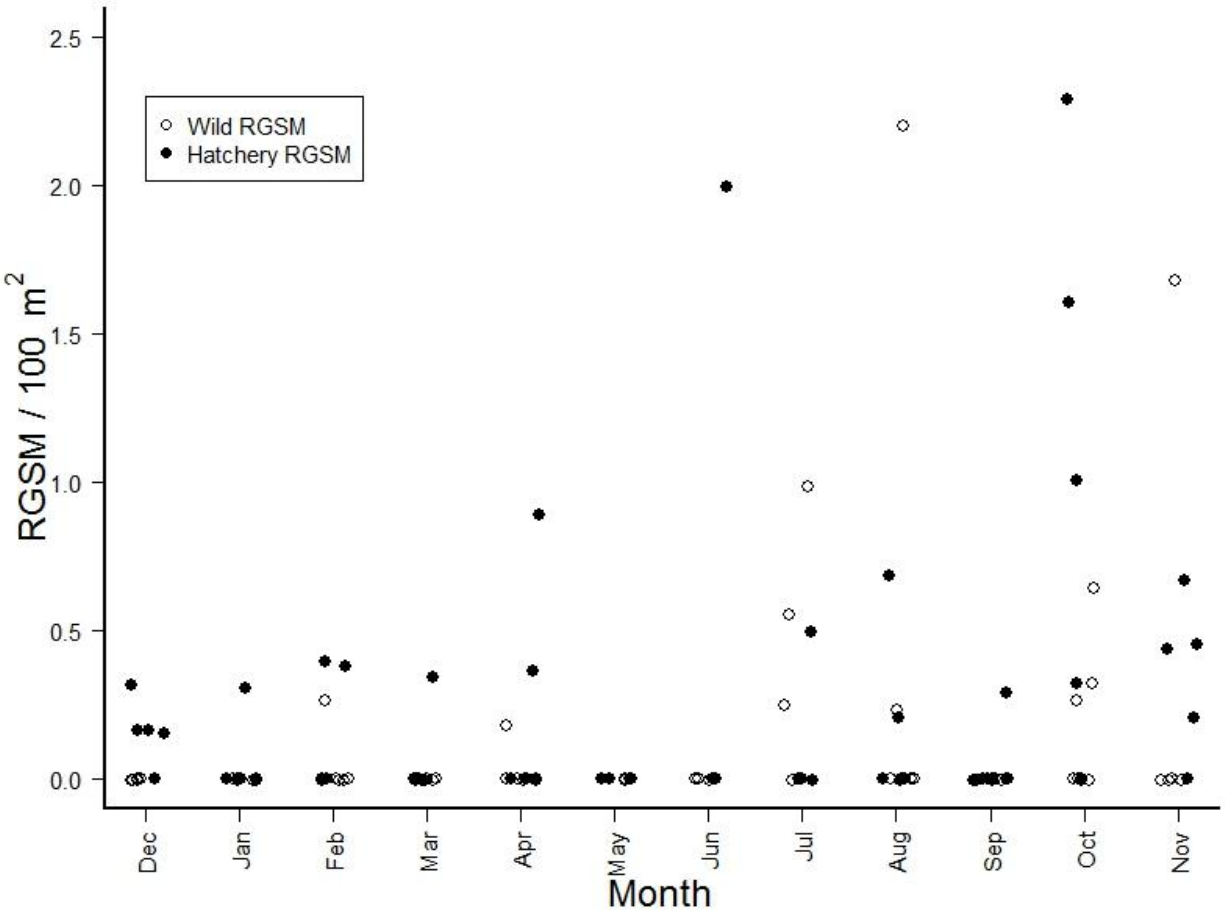

Figure 3-Catch per unit effort (Fish per 100 m^2) of Rio Grande Silvery Minnow (RGSM) , December 2013 to November 2014, during U.S. Fish and Wildlife Service monitoring at 3 to 6 sites per month.

During 2014 monitoring, 9,131 individuals of 16 species were captured (Table 4). Rio Grande Silvery Minnow comprised 1.1% of all fish captured in 2014 monitoring, and occurred in 5% of all seine hauls. Sixty-three of the 99 total RGSM captured were hatchery marked fish. Red Shiner *Cyprinella lutrensis* was the most common fish captured, followed by Flathead Chub *Platygobio gracilis* and Western Mosquitofish *Gambusia affinis*. A single specimen to of Rio Grande Chub *Gila pandora* was collected in 2014.

Recapture Data From Other Research

During monitoring and research in 2014 conducted by ASIR, UNM, USACE, USBR, as well as the NMFWCO, 1,722 total hatchery-marked RGSM were recaptured. The majority of these fish were collected by NMFWCO staff during salvage operations (Archdeacon et al. 2015). Because there were so many release locations and the majority of fish were marked the same color, very little movement can be inferred from the recaptures.

DISCUSSION

The relation between the spring hydrograph and the density of RGSM found the following October is well established (Dudley et al. 2014b). Although the exact mechanism is not known, failing to provide spawning and recruitment flows during the spring and early summer will result in little to no recruitment of young-of-year to spawning adults. For a species of which the vast majority die before 24 months (Horowitz et al. 2011), failure to produce recruits in consecutive years is detrimental to the population. This is directly observable in the RGSM salvage data, as the number of fish per mile has plummeted since 2008 (Archdeacon et al. 2015). Additionally, in 2014 the RGSM population improved slightly but failed to recover from low 2012 levels. In spite of 2.3 million hatchery fish being released since 2002, with nearly 836,000 released since 2012, the RGSM population continues to be at or near record lows. Wild RGSM were among the rarest fishes collected in 2014.

Rio Grande Silvery Minnow have been in decline since 2010, and monitoring on Pueblo lands corroborated other monitoring and research in 2014 (Dudley et al. 2014b; Archdeacon et al. 2015) that there was little increase in the numbers of RGSM present in the Middle Rio Grande. Since 2008, RGSM numbers have declined in every data set available. In 2014, there was some evidence of recruitment as many more age 0 were collected compared to 2013 (14 compared to 1 assumed age 0), but no improvement in overall status in the October standard survey (Dudley et al. 2014b). Rio Grande Silvery Minnow was the most commonly collected fish in 2008 (Remshardt 2009). Rank abundance of RGSM has dropped every year since 2008, when it ranked first. In 2009, RGSM fell to rank two, then rank four in 2010, rank five in 2011, rank six in 2012, and rank 10 in 2013 (Remshardt 2010, 2011, 2012a, 2012b; Archdeacon and Remshardt 2013; Archdeacon 2014). In 2014, RGSM improved to rank seven of 16 species; however RGSM comprised only 1.1% (including hatchery fish) of the total fish captured during monitoring. About 63% of the RGSM captured during NMFWCO monitoring were hatchery marked fish. Catch-per-unit-effort of wild RGSM was low throughout the year, increasing in August with recruitment of age 0 to seines, and then dropping off again.

The number of RGSM released has increased from 2009 to 2013. In 2014, approximately 25,000 fewer RGSM were released, reflecting the slight increase in RGSM density in the September standard monitoring. Thirteen sites, four in the Albuquerque Reach, four in the Isleta Reach, and five in the San Acacia Reach received hatchery fish in 2014. Although RGSM were released at fewer sites compared to 2013, the spread of the sites encompassed all accessible areas of the Rio Grande between Angostura Diversion Dam and Elephant Butte Reservoir.

Poor recruitment of RGSM over the past four years has created the need for increased stocking efforts. Although various conservation efforts have been undertaken in the past in the Middle Rio Grande, the threat of extinction of the RGSM remains high because of continued drought,

the fragmented and isolated nature of currently occupied habitat, and the absence of RGSM in other parts of the historic range. Required augmentation at these levels indicates a system that, under current conditions, is not capable of sustaining wild RGSM.

ACKNOWLEDGEMENTS

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APPENDIX A: Fish Collection Data

ATRISCO OUTFALL

1/29/2014	TPA14-001	30 seine hauls	Effort: 649.3 m^2

Thomas P. Archdeacon, Andy T. Dean, Dustin J. Myers, D. Weston Furr

Species	N
Cyprinella lutrensis	2
VIE Tagged *Hybognathus amarus*	2
Platygobio gracilis	4

ALEJANDRO GATE

1/29/2014	TPA14-002	30 seine hauls	Effort: 716.8 m^2

Thomas P. Archdeacon, Andy T. Dean, Dustin J. Myers, D. Weston Furr

Species	N
Cyprinella lutrensis	69
Platygobio gracilis	1
Ictalurus punctatus	1
Pomoxis annularis	1

DIXON ROAD

1/31/2014	TPA14-003	35 seine hauls	Effort: 842 m^2

Thomas P. Archdeacon, Tristan J. Austring, Stephen R. Davenport, Andy T. Dean, Tim Smith

Species	N
Platygobio gracilis	9
Gambusia affinis	7

NORTH AMAFCA

1/31/2014	TPA14-004	34 seine hauls	Effort: 650.3

Thomas P. Archdeacon, Tristan J. Austring, Stephen R. Davenport, Andy T. Dean, Tim Smith

Species	N
Cyprinella lutrensis	2
Platygobio gracilis	5

LOMITAS NEGRAS

1/31/2014	TPA14-005	30 seine hauls	Effort: 846.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Stephen R. Davenport, Andy T. Dean, Tim Smith

Species	N
Cyprinella lutrensis	1
Platygobio gracilis	6

ALEJANDRO GATE

2/24/2014	TPA14-006	30 seine hauls	Effort: 753.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Angela P. James, Andy T. Dean, Stacey E. Stanford

Species	N
Cyprinella lutrensis	191

Cyprinus carpio	1
Hybognathus amarus	2
VIE Tagged *Hybognathus amarus*	3
Pimephales promelas	8
Platygobio gracilis	1
Ictalurus punctatus	7
Gambusia affinis	1
Pomoxis annularis	1

ATRISCO OUTFALL

2/24/2014 TPA14-007 30 seine hauls Effort: 789.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Angela P. James, Andy T. Dean, Stacey E. Stanford

Species	N
Cyprinella lutrensis	10
VIE Tagged *Hybognathus amarus*	3
Platygobio gracilis	3
Ictalurus punctatus	2

NORTH AMAFCA

2/26/2014 TPA14-008 20 seine hauls Effort: 361.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Tim Smith

Species	N
Cyprinella lutrensis	7
Platygobio gracilis	2
Rhinichthys cataractae	1

DIXON ROAD

2/26/2014 TPA14-009 20 seine hauls Effort: 428.3 m^2

Thomas P. Archdeacon, Tristan J. Austring, Tim Smith

Species	N
Cyprinella lutrensis	1
Cyprinus carpio	1
Platygobio gracilis	3

LOMITAS NEGRAS

2/26/2014 TPA14-010 20 seine hauls Effort: 492 m^2

Thomas P. Archdeacon, Tristan J. Austring, Tim Smith

Species	N
Cyprinella lutrensis	4
Pimephales promelas	2
Platygobio gracilis	4

ATRISCO OUTFALL

3/26/2014 TPA14-011 30 seine hauls Effort: 821.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Andy T. Dean

Species	N
Cyprinella lutrensis	17
Gila pandora	1
Platygobio gracilis	1
Ictalurus punctatus	1

ALEJANDRO GATE

3/26/2014 TPA14-012 25 seine hauls Effort: 583.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Andy T. Dean

Species	N
Cyprinella lutrensis	444
VIE Tagged *Hybognathus amarus*	2
Pimephales promelas	2
Platygobio gracilis	1
Gambusia affinis	2
Pomoxis annularis	1

DIXON ROAD

3/28/2014 TPA14-013 43 seine hauls Effort: 907.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Tim Smith

Species	N
Cyprinella lutrensis	110
Cyprinus carpio	2
Platygobio gracilis	3
Catostomus commersoni	3
Ictalurus punctatus	2
Gambusia affinis	2

NORTH AMAFCA

3/28/2014 TPA14-014 23 seine hauls Effort: 445.8

Thomas P. Archdeacon, Tristan J. Austring, Tim Smith

Species	N
Cyprinella lutrensis	6
Platygobio gracilis	1

LOMITAS NEGRAS

3/28/2014 TPA14-015 23 seine hauls Effort: 584.8

Thomas P. Archdeacon, Tristan J. Austring, Tim Smith

Species	N
Cyprinella lutrensis	1
Platygobio gracilis	10

DIXON ROAD

4/21/2014 TPA14-016 20 seine hauls Effort: 386.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Tim Smith

Species	N
Cyprinella lutrensis	4
Platygobio gracilis	12
Rhinichthys cataractae	3
Ictalurus punctatus	1

NORTH AMAFCA

4/21/2014 TPA14-017 20 seine hauls Effort: 410.3 m^2

Thomas P. Archdeacon, Tristan J. Austring, Tim Smith

Species	N
Cyprinella lutrensis	6
Platygobio gracilis	17
Catostomus commersoni	2
Ictalurus punctatus	1

LOMITAS NEGRAS

4/21/2014 TPA14-018 20 seine hauls Effort: 371.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Tim Smith

Species	N
Cyprinella lutrensis	1
Platygobio gracilis	8
Rhinichthys cataractae	13

VALLE DE ORO

4/28/2014 TPA14-019 20 seine hauls Effort: 517.3 m^2

Thomas P. Archdeacon, Tristan J. Austring, Stephen R. Davenport, Evan Carson, Jennifer O. White, Teresa M. Skiba, Cheyenne G. Davis, Marisa R. McGill

Species	N
Cyprinella lutrensis	19
Pimephales promelas	1
Platygobio gracilis	5
Carpiodes carpio	2
Ameiurus natalis	1
Ictalurus punctatus	3
Gambusia affinis	1
Pomoxis annularis	1

IDD

4/28/2014 TPA14-020 20 seine hauls Effort: 335.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Stephen R. Davenport, Marisa R. McGill

Species	N
Cyprinella lutrensis	371
VIE Tagged *Hybognathus amarus*	3
Pimephales promelas	71
Carpiodes carpio	5
Catostomus commersoni	10

ALEJANDRO GATE

4/28/2014 TPA14-021 21 seine hauls Effort: 551.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Stephen R. Davenport, Evan Carson

Species	N
Cyprinella lutrensis	246
Hybognathus amarus	1
VIE Tagged *Hybognathus amarus*	2
Pimephales promelas	7
Platygobio gracilis	2
Ictalurus punctatus	1
Gambusia affinis	1

ATRISCO OUTFALL

4/28/2014 TPA14-022 20 seine hauls Effort: 525.3 m^2

Thomas P. Archdeacon, Tristan J. Austring, Stephen R. Davenport, Evan Carson

Species	N
Cyprinella lutrensis	4
Catostomus commersoni	2
Ictalurus punctatus	1

DIXON ROAD

5/27/2014 TJA14-002 20 seine hauls Effort: 528.5

Thomas P. Archdeacon, Tristan J. Austring, Tim Smith, Janelle R. Hunt, Peter Ferrari

Species	N
Cyprinella lutrensis	57
Pimephales promelas	1
Platygobio gracilis	18
Catostomus commersoni	10
Ictalurus punctatus	1

NORTH AMAFCA

5/27/2014 TJA14-003 20 seine hauls Effort: 423.3 m^2

Thomas P. Archdeacon, Tristan J. Austring, Tim Smith, Janelle R. Hunt, Peter Ferrari

Species	N
Cyprinella lutrensis	30

Pimephales promelas	1
Platygobio gracilis	3
Catostomus commersoni	3
Gambusia affinis	1

LOMITAS NEGRAS

5/27/2014	TJA14-004	20 seine hauls	Effort: 439.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Tim Smith, Janelle R. Hunt, Peter Ferrari

Species	N
Cyprinella lutrensis	6
Platygobio gracilis	24
Rhinichthys cataractae	24

VALLE DE ORO

5/28/2014	TJA14-005	4 seine hauls	Effort: 113.3 m^2

Thomas P. Archdeacon, Tristan J. Austring, Andy T. Dean, Evan Carson

Species	N

ATRISCO OUTFALL

6/2/2014	TJA14-007	20 seine hauls	Effort: 429 m^2

Thomas P. Archdeacon, Tristan J. Austring, Andy T. Dean, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	14

ALEJANDRO GATE

6/2/2014	TJA14-008	20 seine hauls	Effort: 478.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Andy T. Dean, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	132
Cyprinus carpio	1
Pimephales promelas	15
Platygobio gracilis	1

IDD

6/2/2014	TJA14-009	20 seine hauls	Effort: 401 m^2

Thomas P. Archdeacon, Tristan J. Austring, Andy T. Dean, Kjetil R. Henderson

Species	N
Dorosoma cepedianum	1
Cyprinella lutrensis	486
VIE Tagged *Hybognathus amarus*	8
Pimephales promelas	60
Platygobio gracilis	8
Carpiodes carpio	5

Catostomus commersoni	3
Ictalurus punctatus	1
Pomoxis annularis	2

ATRISCO OUTFALL

7/11/2014	TJA14-028	20 seine hauls	Effort: 444 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	10
Pimephales promelas	1
Carpiodes carpio	1
Ictalurus punctatus	92
Gambusia affinis	1

ALEJANDRO GATE

7/11/2014	TJA14-029	20 seine hauls	Effort: 361.8 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	50
Cyprinus carpio	2
Hybognathus amarus	2
Pimephales promelas	12
Platygobio gracilis	10
Carpiodes carpio	42
Catostomus commersoni	1
Ictalurus punctatus	11
Gambusia affinis	2

IDD

7/11/2014	TJA14-030	20 seine hauls	Effort: 337.5 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	144
Cyprinus carpio	2
Hybognathus amarus	1
VIE Tagged *Hybognathus amarus*	2
Pimephales promelas	80
Platygobio gracilis	5
Carpiodes carpio	50
Ameiurus melas	1
Ictalurus punctatus	54
Gambusia affinis	6
Morone chrysops	1

Pomoxis annularis			2

IDD

7/17/2014	TJA14-035	5 seine hauls	Effort: 64.5 m^2
Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook			

Species	N
Cyprinella lutrensis	16
Hybognathus amarus	3
Platygobio gracilis	1
Carpiodes carpio	8
Ictalurus punctatus	6
Gambusia affinis	1

LOMITAS NEGRAS

7/29/2014	TJA14-039	31 seine hauls	Effort: 709 m^2
Tristan J. Austring, D. Chris Kitcheyan, Tim Smith, Rebecca Cook			

Species	N
Cyprinella lutrensis	12
Hybognathus amarus	7
Pimephales promelas	5
Platygobio gracilis	97
Rhinichthys cataractae	117
Catostomus commersoni	4
Ameiurus natalis	2
Ictalurus punctatus	52
Gambusia affinis	1

NORTH AMAFCA

8/19/2014	RLC14-001	20 seine hauls	Effort: 432.5 m^2
Kjetil R. Henderson, Rebecca Cook, Janelle R. Hunt, Tim Smith, Peter Ferrari			

Species	N
Cyprinella lutrensis	61
YOY *Hybognathus amarus*	1
Pimephales promelas	8
Platygobio gracilis	23
Rhinichthys cataractae	16
Catostomus commersoni	4
Ictalurus punctatus	54
Gambusia affinis	2

DIXON ROAD

8/19/2014	RLC14-002	20 seine hauls	Effort: 430.2 m^2
Kjetil R. Henderson, Rebecca Cook, Janelle R. Hunt, Tim Smith, Peter Ferrari			

Species	N
Cyprinella lutrensis	41
Pimephales promelas	9
Platygobio gracilis	22
Rhinichthys cataractae	3
Catostomus commersoni	4
Ictalurus punctatus	11
Gambusia affinis	1

LOMITAS NEGRAS

8/19/2014 RLC14-003 20 seine hauls Effort: 414.8 m^2

Kjetil R. Henderson, Rebecca Cook, Janelle R. Hunt, Tim Smith, Peter Ferrari

Species	N
Cyprinella lutrensis	24
Pimephales promelas	1
Platygobio gracilis	43
Rhinichthys cataractae	180
Catostomus commersoni	6
Ictalurus punctatus	59
Gambusia affinis	5

ALEJANDRO GATE

8/25/2014 RLC14-004 20 seine hauls Effort: 455 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	179
YOY *Hybognathus amarus*	2
Hybognathus amarus	8
Pimephales promelas	11
Platygobio gracilis	6
Carpiodes carpio	2
Ictalurus punctatus	38
Gambusia affinis	1

ATRISCO OUTFALL

8/25/2014 RLC14-005 20 seine hauls Effort: 478.5 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	27
VIE Tagged *Hybognathus amarus*	1
Pimephales promelas	1
Carpiodes carpio	4
Ictalurus punctatus	47

Gambusia affinis	1

IDD

8/25/2014	RLC14-006	20 seine hauls	Effort: 291.3 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	198
VIE Tagged *Hybognathus amarus*	2
Pimephales promelas	31
Platygobio gracilis	48
Carpiodes carpio	11
Ictalurus punctatus	66
Gambusia affinis	21
Pomoxis annularis	1

ALEJANDRO GATE

9/17/2014	TJA14-041	20 seine hauls	Effort: 441.5 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	176
Cyprinus carpio	3
Pimephales promelas	9
Platygobio gracilis	4
Carpiodes carpio	6
Ictalurus punctatus	5
Gambusia affinis	61

ATRISCO OUTFALL

9/17/2014	TJA14-042	20 seine hauls	Effort: 450 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	3
Cyprinus carpio	1
Pimephales promelas	3
Platygobio gracilis	2
Ictalurus punctatus	8

IDD

9/17/2014	TJA14-043	20 seine hauls	Effort: 340.5 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	338
VIE Tagged *Hybognathus amarus*	1

Pimephales promelas	77
Platygobio gracilis	10
Carpiodes carpio	13
Ictalurus punctatus	47
Gambusia affinis	281
Pomoxis annularis	1

DIXON ROAD

9/30/2014 TPA14-053 20 seine hauls Effort: 493.3 m^2

Thomas P. Archdeacon, Tim Smith, Peter Ferrari, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	11
Pimephales promelas	1
Platygobio gracilis	7
Rhinichthys cataractae	5
Catostomus commersoni	1
Gambusia affinis	13

NORTH AMAFCA

9/30/2014 TPA14-054 20 seine hauls Effort: 383.8 m^2

Thomas P. Archdeacon, Tim Smith, Peter Ferrari, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	58
Pimephales promelas	3
Platygobio gracilis	13
Rhinichthys cataractae	2
Ictalurus punctatus	3
Gambusia affinis	6

LOMITAS NEGRAS

9/30/2014 TPA14-055 20 seine hauls Effort: 489 m^2

Thomas P. Archdeacon, Tim Smith, Peter Ferrari, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	87
Pimephales promelas	5
Platygobio gracilis	59
Rhinichthys cataractae	70
Catostomus commersoni	1
Ictalurus punctatus	20
Gambusia affinis	88

NORTH AMAFCA

10/21/2014 TPA14-066 20 seine hauls Effort: 398 m^2

Thomas P. Archdeacon, Rebecca Cook, Dustin Myers

Species	N
Cyprinella lutrensis	101
VIE Tagged *Hybognathus amarus*	4
Pimephales promelas	3
Platygobio gracilis	24
Catostomus commersoni	1
Ameiurus natalis	1
Ictalurus punctatus	18
Gambusia affinis	4

DIXON ROAD

10/21/2014 TPA14-067 20 seine hauls Effort: 374 m^2

Thomas P. Archdeacon, Rebecca Cook, Dustin Myers

Species	N
Cyprinella lutrensis	58
YOY *Hybognathus amarus*	1
VIE Tagged *Hybognathus amarus*	6
Pimephales promelas	27
Platygobio gracilis	89
Rhinichthys cataractae	8
Ictalurus punctatus	4
Gambusia affinis	1

LOMITAS NEGRAS

10/21/2014 TPA14-068 21 seine hauls Effort: 480.5 m^2

Thomas P. Archdeacon, Rebecca Cook, Dustin Myers

Species	N
Cyprinella lutrensis	46
VIE Tagged *Hybognathus amarus*	11
Pimephales promelas	6
Platygobio gracilis	222
Rhinichthys cataractae	103
Catostomus commersoni	2
Ictalurus punctatus	9
Gambusia affinis	9

ATRISCO OUTFALL

10/22/2014 TPA14-071 20 seine hauls Effort: 409 m^2

Thomas P. Archdeacon, Tristan J. Austring, Rebecca Cook

Species	N
Cyprinella lutrensis	1
Pimephales promelas	1

Carpiodes carpio	1
Ictalurus punctatus	8

IDD

10/22/2014	TPA14-070	20 seine hauls	Effort: 309.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Rebecca Cook

Species	N
Cyprinella lutrensis	399
YOY *Hybognathus amarus*	1
VIE Tagged *Hybognathus amarus*	1
Pimephales promelas	53
Carpiodes carpio	1
Ictalurus punctatus	15
Gambusia affinis	375
Pomoxis annularis	1

ALEJANDRO GATE

10/22/2014	TPA14-069	20 seine hauls	Effort: 310 m^2

Thomas P. Archdeacon, Tristan J. Austring, Rebecca Cook

Species	N
Cyprinella lutrensis	519
Hybognathus amarus	2
Pimephales promelas	11
Platygobio gracilis	5
Carpiodes carpio	2
Ictalurus punctatus	4
Gambusia affinis	11

ATRISCO OUTFALL

11/17/2014	TJA14-047	20 seine hauls	Effort: 453.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Rebecca Cook

Species	N
Cyprinella lutrensis	1
VIE Tagged *Hybognathus amarus*	2
Pimephales promelas	1
Platygobio gracilis	1
Ictalurus punctatus	5
Gambusia affinis	1

IDD

11/17/2014	TJA14-048	18 seine hauls	Effort: 297.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Rebecca Cook

Species	N

Cyprinella lutrensis	232
Hybognathus amarus	5
VIE Tagged *Hybognathus amarus*	2
Pimephales promelas	34
Platygobio gracilis	2
Ictalurus punctatus	32
Gambusia affinis	9
Pomoxis annularis	1

NORTH AMAFCA

11/25/2014 TPA14-073 21 seine hauls Effort: 464.3 m^2

Thomas P. Archdeacon, Kjetil R. Henderson, Rebecca Cook, Tim Smith, Clint Garcia

Species	N
Cyprinella lutrensis	8
Cyprinus carpio	1
Pimephales promelas	1
Platygobio gracilis	5
Catostomus commersoni	2

DIXON ROAD

11/25/2014 TPA14-074 20 seine hauls Effort: 438.3 m^2

Thomas P. Archdeacon, Kjetil R. Henderson, Rebecca Cook, Tim Smith, Clint Garcia

Species	N
Cyprinella lutrensis	2
VIE Tagged *Hybognathus amarus*	2
Platygobio gracilis	8
Catostomus commersoni	1
Gambusia affinis	3

LOMITAS NEGRAS

11/25/2014 TPA14-075 20 seine hauls Effort: 486.3 m^2

Thomas P. Archdeacon, Kjetil R. Henderson, Rebecca Cook, Tim Smith, Clint Garcia

Species	N
Cyprinella lutrensis	2
VIE Tagged *Hybognathus amarus*	1
Platygobio gracilis	34
Rhinichthys cataractae	3
Gambusia affinis	1

APPENDIX B: Fish Collection Data At Random Locations In The Rio Grande, New Mexico

RM 64.5

6/18/2014 TJA14-013 20 seine hauls Effort: 435.75 m^2

Kjetil R. Henderson, Thomas P. Archdeacon, Tristan J. Austring

Species	N
Cyprinella lutrensis	108
Cyprinus carpio	2
Ictalurus punctatus	2
Gambusia affinis	2

RM 66.9

6/18/2014 TJA14-014 20 seine hauls Effort: 564.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	195
Cyprinus carpio	10
VIE Tagged *Hybognathus amarus*	1
Carpiodes carpio	8
Ictalurus furcatus	1
Ictalurus punctatus	1
Gambusia affinis	5

RM 77.3

6/18/2014 TJA14-015 20 seine hauls Effort: 476.3 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	107
Cyprinus carpio	3
VIE Tagged *Hybognathus amarus*	1
Pimephales promelas	1
Platygobio gracilis	4
Carpiodes carpio	1
Ictalurus punctatus	1
Gambusia affinis	1

RM 76.9

6/18/2014 TJA14-016 20 seine hauls Effort: 523.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	206
Ictalurus furcatus	1
Ictalurus punctatus	4

RM 87.6

6/19/2014 TPA14-024 20 seine hauls Effort: 535.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	34
Cyprinus carpio	17
Pimephales promelas	3
Platygobio gracilis	1
Carpiodes carpio	18
Catostomus commersoni	2
Gambusia affinis	18
Pomoxis annularis	1

RM 81.5

6/19/2014 TPA14-025 20 seine hauls Effort: 486.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	151
Cyprinus carpio	3
VIE Tagged *Hybognathus amarus*	3
Pimephales promelas	2
Platygobio gracilis	3
Carpiodes carpio	4
Catostomus commersoni	1
Ictalurus furcatus	2
Gambusia affinis	1

RM 92.7

6/19/2014 TPA14-026 20 seine hauls Effort: 557.3 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	23
Cyprinus carpio	3
Pimephales promelas	6
Platygobio gracilis	3
Carpiodes carpio	30
Catostomus commersoni	1
Ictalurus punctatus	1
Gambusia affinis	2
Pomoxis annularis	1

RM 99.5

6/19/2014 TPA14-027 20 seine hauls Effort: 444.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	21
Cyprinus carpio	7
VIE Tagged *Hybognathus amarus*	2
Pimephales promelas	11
Platygobio gracilis	4
Carpiodes carpio	6
Catostomus commersoni	7
Ictalurus furcatus	1
Gambusia affinis	34

RM 106.9

6/24/2014 TPA14-032 20 seine hauls Effort: 445 m^2

Thomas P. Archdeacon, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	47
Cyprinus carpio	2
Pimephales promelas	3
Platygobio gracilis	9
Carpiodes carpio	60
Catostomus commersoni	3
Ictalurus punctatus	2
Gambusia affinis	33

RM 153.0

6/30/2014 TJA14-020 20 seine hauls Effort: 432.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Rebecca Cook

Species	N
Cyprinella lutrensis	138
Cyprinus carpio	15
VIE Tagged *Hybognathus amarus*	1
Pimephales promelas	7
Carpiodes carpio	7
Gambusia affinis	7

RM 161.6

7/2/2014 TPA14-038 20 seine hauls Effort: 374 m^2

Thomas P. Archdeacon, Stephen R. Davenport

Species	N
Cyprinella lutrensis	70
Hybognathus amarus	6
VIE Tagged *Hybognathus amarus*	1
Pimephales promelas	1

Platygobio gracilis	1
Carpiodes carpio	30
Catostomus commersoni	4
Gambusia affinis	3

RM 124.2

7/7/2014 TJA14-021 20 seine hauls Effort: 491.5 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	124
Cyprinus carpio	28
Hybognathus amarus	1
Pimephales promelas	7
Platygobio gracilis	2
Carpiodes carpio	53
Catostomus commersoni	13
Ameiurus natalis	8
Ictalurus punctatus	376
Gambusia affinis	89

RM 116.8

7/7/2014 TJA14-022 20 seine hauls Effort: 366.3 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	271
Cyprinus carpio	71
Pimephales promelas	8
Platygobio gracilis	29
Carpiodes carpio	46
Catostomus commersoni	9
Ameiurus melas	1
Ictalurus punctatus	762
Gambusia affinis	55
Pomoxis annularis	3

RM 130.9

7/7/2014 TJA14-023 20 seine hauls Effort: 362.3 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	304
Cyprinus carpio	24
Pimephales promelas	32
Platygobio gracilis	10

Carpiodes carpio	63
Ictalurus punctatus	120
Gambusia affinis	299

RM 135.0

7/8/2014 TJA14-024 20 seine hauls Effort: 331.8 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	146
Cyprinus carpio	1
Hybognathus amarus	2
Pimephales promelas	2
Platygobio gracilis	1
Carpiodes carpio	52
Ameiurus natalis	1
Ictalurus punctatus	79
Gambusia affinis	198

RM 140.3

7/8/2014 TJA14-025 20 seine hauls Effort: 308.3 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	162
Cyprinus carpio	7
Hybognathus amarus	6
Pimephales promelas	33
Carpiodes carpio	42
Ictalurus punctatus	49
Gambusia affinis	474

RM 177.3

7/9/2014 TJA14-026 20 seine hauls Effort: 368.3 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Platygobio gracilis	3
Ameiurus natalis	1
Ictalurus punctatus	22

RM 180.0

7/9/2014 TJA14-027 20 seine hauls Effort: 352.9 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	11

Cyprinus carpio	3
Platygobio gracilis	8
Carpiodes carpio	15
Catostomus commersoni	1
Ictalurus punctatus	73
Gambusia affinis	2
Sander vitreus	1

RM 183.3

7/16/2014 TJA14-031 20 seine hauls Effort: 297.8 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Dorosoma cepedianum	1
Cyprinella lutrensis	12
Cyprinus carpio	2
Pimephales promelas	15
Platygobio gracilis	5
Rhinichthys cataractae	1
Carpiodes carpio	2
Catostomus commersoni	7
Ictalurus punctatus	90
Gambusia affinis	3

RM 188.9

7/16/2014 TJA14-032 20 seine hauls Effort: 337.6 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	24
Pimephales promelas	10
Platygobio gracilis	43
Carpiodes carpio	26
Catostomus commersoni	1
Ictalurus punctatus	81
Gambusia affinis	7

RM 135.0

9/29/2014 TPA14-052 20 seine hauls Effort: 513.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	300
Cyprinus carpio	3
Pimephales promelas	7
Carpiodes carpio	9

Ameiurus natalis	1
Ictalurus punctatus	80
Gambusia affinis	97

RM 188.9

9/29/2014 TPA14-046 20 seine hauls Effort: 474.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	31
Hybognathus amarus	2
Pimephales promelas	9
Platygobio gracilis	27
Carpiodes carpio	1
Ictalurus punctatus	7
Gambusia affinis	5

RM 183.3

9/29/2014 TPA14-047b 20 seine hauls Effort: 381.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	6
Pimephales promelas	2
Platygobio gracilis	2
Rhinichthys cataractae	2
Ictalurus punctatus	24
Gambusia affinis	8

RM 180.0

9/29/2014 TPA14-048 20 seine hauls Effort: 479.3 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	6
Hybognathus amarus	1
Platygobio gracilis	9
Carpiodes carpio	6
Ictalurus punctatus	11
Gambusia affinis	7

RM 177.3

9/29/2014 TPA14-049 20 seine hauls Effort: 510.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	6

Platygobio gracilis	2
Ictalurus punctatus	9
Gambusia affinis	16

RM 161.6

9/29/2014 TPA14-050 20 seine hauls Effort: 411.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	166
Pimephales promelas	5
Platygobio gracilis	1
Carpiodes carpio	5
Ictalurus punctatus	21
Gambusia affinis	95

RM 130.9

9/29/2014 TPA14-051 20 seine hauls Effort: 486 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	462
Cyprinus carpio	1
Hybognathus amarus	1
Pimephales promelas	1
Carpiodes carpio	9
Ameiurus natalis	1
Ictalurus punctatus	34
Gambusia affinis	29
Pomoxis annularis	1

RM 99.5

10/1/2014 TPA14-061 20 seine hauls Effort: 406.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	318
Platygobio gracilis	4
Ictalurus punctatus	1

RM 77.3

10/1/2014 TPA14-056 20 seine hauls Effort: 519.8 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	135
Gambusia affinis	10

RM 81.5

10/1/2014 TPA14-057 20 seine hauls Effort: 478 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	6

RM 76.9

10/1/2014 TPA14-058 20 seine hauls Effort: 456.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	37
Ictalurus punctatus	1
Gambusia affinis	1

RM 87.6

10/1/2014 TPA14-059 20 seine hauls Effort: 516.3 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	34
Carpiodes carpio	1
Gambusia affinis	8

RM 92.7

10/1/2014 TPA14-060 20 seine hauls Effort: 426.5 m^2

Thomas P. Archdeacon, Tristan J. Austring, Kjetil R. Henderson

Species	N
Cyprinella lutrensis	50
Ictalurus punctatus	1

RM 153.0

10/14/2014 TPA14-062 20 seine hauls Effort: 355 m^2

Thomas P. Archdeacon, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	39
Pimephales promelas	9
Ictalurus punctatus	3
Gambusia affinis	28

RM 140.3

10/14/2014 TPA14-063 20 seine hauls Effort: 399.3 m^2

Thomas P. Archdeacon, Kjetil R. Henderson, Rebecca Cook

Species	N

Cyprinella lutrensis	500
Pimephales promelas	7
Ictalurus punctatus	4
Gambusia affinis	419

RM 124.2

10/14/2014 TPA14-064 20 seine hauls Effort: 359.5 m^2

Thomas P. Archdeacon, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	130
Cyprinus carpio	7
Hybognathus amarus	1
Pimephales promelas	3
Platygobio gracilis	9
Carpiodes carpio	2
Ictalurus punctatus	70
Gambusia affinis	12

RM 116.8

10/14/2014 TPA14-065 20 seine hauls Effort: 388.8 m^2

Thomas P. Archdeacon, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	4
Platygobio gracilis	19

RM 64.5

10/15/2014 TJA14-044 20 seine hauls Effort: 329.5 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	116
Ictalurus punctatus	1

RM 66.9

10/15/2014 TJA14-045 20 seine hauls Effort: 427.8 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N
Cyprinella lutrensis	26
Ictalurus punctatus	1

RM 106.9

10/15/2014 TJA14-046 20 seine hauls Effort: 409.5 m^2

Tristan J. Austring, Kjetil R. Henderson, Rebecca Cook

Species	N

Cyprinella lutrensis	95
Hybognathus amarus	1
VIE Tagged *Hybognathus amarus*	1
Platygobio gracilis	4
Ictalurus punctatus	2

Appendix C: Rio Grande Silvery Minnow Master Release List

Color	Location	Side	Number	Release	Date
yellow	left	predorsal	4,600	San Marcial	1-Jan-02
green	left	predorsal	7,300	Socorro	2-Jan-02
orange	right	predorsal	2,082	Alameda	2-Jun-02
orange	left	predorsal	41,500	Corrales	9-Dec-02
green	left	predorsal	61,118	Bernalillo	2-Jan-03
red	left	predorsal	22,266	Sandia	3-Apr-03
yellow	right	predorsal	48,513	Sandia	3-Jan-04
red	right	predorsal	46,545	Sandia-float	4-Apr-04
red	right	predorsal	10,099	Sandia-float	4-Apr-04
green	right	predorsal	8,500	Sandia-float	4-Apr-04
orange	right	predorsal	1,500	Bernalillo	15-Apr-04
yellow	right	anal	9,622	Bernalillo-day	3-Nov-04
red	right	anal	8,639	Sandia-float-day	3-Nov-04
orange	right	anal	7,845	Bernalillo-night	5-Nov-04
green	right	anal	6,956	Sandia-float-night	5-Nov-04
yellow	left	anal	3,021	Bernalillo-day	3-Nov-04
yellow	left	anal	2,791	Bernalillo-day	3-Nov-04
yellow	left	anal	433	Bernalillo-day	3-Nov-04
red	left	anal	2,638	Sandia-float-day	3-Nov-04
red	left	anal	715	Sandia-float-day	3-Nov-04
red	left	anal	357	Sandia-float-day	3-Nov-04
red	left	anal	2,792	Sandia-float-day	3-Nov-04
orange	left	anal	3,245	Bernalillo-night	5-Nov-04
orange	left	anal	834	Bernalillo-night	5-Nov-04
orange	left	anal	1,986	Bernalillo-night	5-Nov-04
green	left	anal	4,777	Sandia-float-night	5-Nov-04
green	left	anal	773	Sandia-float-night	5-Nov-04
green	left	anal	297	Sandia-float-night	5-Nov-04
green	left	anal	1,032	Sandia-float-night	5-Nov-04
yellow	left	predorsal	570	Central bridge	20-Oct-04
yellow	left	predorsal	1,318	Central bridge	9-Nov-04
yellow	left	predorsal	4,349	Central bridge	9-Nov-04
yellow	left	predorsal	475	Rio Bravo	5-Jan-05
orange	right	predorsal	1,540	Rio Bravo	5-Jan-05
white	right	anal	802	Sandia-float-day	12-Apr-05
white	right	anal	3,858	Sandia-float-day	12-Apr-05
white	right	anal	143	Sandia-float-day	12-Apr-05
white	right	anal	197	Sandia-float-day	12-Apr-05
purple	right	anal	4,258	Bernalillo-day	12-Apr-05
purple	right	anal	742	Bernalillo-day	12-Apr-05
pink	right	anal	500	Sandia-truck-night	13-Apr-05
pink	right	anal	1,940	Sandia-truck-night	13-Apr-05

pink	right	anal	1,088	Sandia-truck-night	13-Apr-05
pink	right	anal	672	Sandia-truck-night	13-Apr-05
pink	right	anal	1,454	Sandia-truck-night	13-Apr-05
blue	right	anal	4,549	Bernalillo-night	13-Apr-05
blue	right	anal	462	Bernalillo-night	13-Apr-05
white	left	anal	11,080	Sandia-float-day	12-Apr-05
purple	left	anal	8,800	Bernalillo-day	12-Apr-05
pink	left	anal	10,026	Sandia-truck-night	13-Apr-05
blue	left	anal	10,242	Bernalillo-night	13-Apr-05
green	left	dorsal	6,638	Rio Bravo	26-May-05
green	left	dorsal	3,719	Rio Bravo	26-May-05
orange	right	predorsal	227	Bridge street	5-Jul-05
orange	left	predorsal	21	Bridge street	5-Jul-05
orange	right	predorsal	20,000	Bernalillo	12-Sep-05
white	right	predorsal	5,812	Bernalillo-Montano	8-Nov-05
white	right	predorsal	6,968	Bernalillo-Montano	8-Nov-05
white	right	predorsal	2,073	Bernalillo-Montano	8-Nov-05
purple	right	predorsal	7,693	Bridge street	8-Nov-05
purple	right	predorsal	6,228	Bridge street	8-Nov-05
pink	right	predorsal	3,765	Bernalillo	8-Nov-05
pink	right	predorsal	5,677	Bernalillo	8-Nov-05
pink	right	predorsal	5,733	Bernalillo	8-Nov-05
blue	right	predorsal	8,741	Bridge - Los Padillas	8-Nov-05
blue	right	predorsal	1,037	Bridge - Los Padillas	8-Nov-05
blue	right	predorsal	2,739	Bridge - Los Padillas	8-Nov-05
blue	right	predorsal	1,568	Bridge - Los Padillas	8-Nov-05
blue	right	predorsal	2,197	Bridge - Los Padillas	8-Nov-05
white	left	predorsal	21,000	Lemitar-Socorro	7-Nov-05
purple	left	predorsal	28,986	Bernardo	7-Nov-05
pink	left	predorsal	25,642	Socorro	7-Nov-05
blue	left	predorsal	25,436	Bernardo - Rio Puerco	7-Nov-05
red	right	predorsal	10,209	Bridge street	18-Apr-06
red	right	predorsal	9,534	Bridge street	18-Apr-06
red	right	predorsal	4,662	Bridge street	18-Apr-06
green	right	predorsal	14,143	Bernalillo	18-Apr-06
green	right	predorsal	4,520	Bernalillo	18-Apr-06
green	right	predorsal	4,242	Bernalillo	18-Apr-06
orange	right	predorsal	30,117	Sadd	18-Apr-06
yellow	right	predorsal	30,893	Rio Puerco	18-Apr-06
red	left	predorsal	25,367	Bridge street	21-Sep-06
red	left	predorsal	18,474	Bridge street	21-Sep-06
green	left	predorsal	28,227	Bernalillo	21-Sep-06
green	left	predorsal	8,246	Bernalillo	21-Sep-06

green	left	predorsal	7,693	Bernalillo	21-Sep-06
green	left	predorsal	162	Bernalillo	21-Sep-06
green	left	predorsal	60	Bernalillo	21-Sep-06
orange	left	predorsal	30,349	SADD	16-Oct-06
yellow	left	predorsal	30,385	Rio Puerco	16-Oct-06
	none		51,158	San Marcial	13-Oct-06
	none		2,500	San Marcial	3-Nov-06
	none		107,910	San Marcial	21-Nov-06
pink	right	predorsal	370	Bridge street	29-May-07
pink	right	predorsal	10,148	Bridge street	29-May-07
pink	right	predorsal	5,938	Bridge street	29-May-07
pink	right	predorsal	4,732	Bridge street	29-May-07
	none		17,000	Bridge street	31-May-07
pink	left	predorsal	44,328	Bernardo-Brown's arroyo	9-Oct-07
pink	left	predorsal	16,031	1.5 mi below San Acacia	25-Oct-07
pink	left	predorsal	4,607	1.5 mi below San Acacia	25-Oct-07
pink	left	predorsal	30,000	1.5 mi below San Acacia	3-Dec-07
yellow	left	predorsal	21,218	Mid-BDANWR	12-Nov-09
orange	right	predorsal	12,437	Jarales Bridge	4-Nov-10
orange	right	predorsal	5,146	La Joya	4-Nov-10
orange	right	predorsal	5,715	La Joya	4-Nov-10
orange	right	predorsal	1,761	Jarales Bridge	4-Nov-10
orange	right	predorsal	728	La Joya	4-Nov-10
orange	right	predorsal	5,802	Jarales Bridge	4-Nov-10
orange	right	predorsal	2,401	La Joya	4-Nov-10
orange	right	predorsal	30,000	Mid-BDANWR	16-Nov-10
orange	right	predorsal	20,000	San Marcial	16-Nov-10
orange	right	predorsal	10,000	8 mi below San Marcial	16-Nov-10
orange	right	predorsal	10,000	Bernardo	15-Nov-10
orange	right	predorsal	10,000	Above SADD	15-Nov-10
orange	right	predorsal	22,000	1.5 mi below SADD	15-Nov-10
green	right	predorsal	3,756	1.5 mi below SADD	11-Mar-11
red	right	predorsal	3,000	Neil Cupp	14-Nov-11
red	right	predorsal	9,000	Neil Cupp	14-Nov-11
red	right	predorsal	43,000	1.5 mi below SADD	14-Nov-11
red	right	predorsal	20,919	San Antonio	16-Nov-11
red	right	predorsal	10,000	SADD	16-Nov-11
red	right	predorsal	15,047	Socorro	16-Nov-11
red	right	predorsal	23,213	Mid-BDANWR	16-Nov-11
red	right	predorsal	19,341	10 miles below SMRRXG	16-Nov-11
yellow	right	predorsal	10,000	Bernardo	16-Nov-11
yellow	right	predorsal	26,000	La Joya	16-Nov-11
yellow	right	predorsal	11,318	Above SADD	16-Nov-11

pink	left	predorsal	27,241	La Joya	7-Nov-12
pink	left	predorsal	1,046	Los Lunas	5-Nov-12
pink	left	predorsal	21,000	Belen	6-Nov-12
pink	left	predorsal	30,270	Los Lunas	3-Nov-12
pink	left	predorsal	31,000	Jarales Bridge	3-Nov-12
yellow	left	predorsal	14,000	San Marcial	7-Nov-12
yellow	left	predorsal	8,000	8 mi below San Marcial	7-Nov-12
yellow	left	predorsal	12,000	10 miles below SMRRXG	7-Nov-12
pink	left	predorsal	10,000	Bernardo	6-Nov-12
pink	left	predorsal	10,000	Above SADD	6-Nov-12
yellow	left	predorsal	8,000	SADD	3-Nov-12
yellow	left	predorsal	34,000	1.5 mi below SADD	3-Nov-12
yellow	left	predorsal	17,000	Socorro	16-Nov-12
yellow	left	predorsal	23,000	Mid-BDANWR	16-Nov-12
yellow	left	predorsal	18,000	North Boundary BDANWR	7-Nov-12
yellow	left	predorsal	10,000	Neil Cupp	7-Nov-12
green/red	right	predorsal	142	North Boundary BDANWR	27-Mar-13
pink	right	predorsal	30,000	Santa Ana Pueblo	13-Nov-13
pink	right	predorsal	12,500	Sandia Pueblo	1-Nov-13
pink	right	predorsal	40,000	Alameda Bridge	11-Oct-13
pink	right	predorsal	41,350	Bridge Street	11-Oct-13
pink	right	predorsal	20,000	Los Lunas	13-Nov-13
green	right	predorsal	77	Los Lunas	13-Nov-13
pink	right	predorsal	20,000	Peralta Wasteway Outfall	13-Nov-13
pink	right	predorsal	15,000	Jarales Bridge	20-Nov-13
pink	right	predorsal	20,000	Sabinal Drain Outfall	13-Nov-13
pink	right	predorsal	5,000	Bernardo	13-Nov-13
pink	right	predorsal	9,000	Rio Puerco Confluence	13-Nov-13
pink	right	predorsal	15,000	SADD	20-Nov-13
pink	right	predorsal	15,000	Socorro	20-Nov-13
pink	right	predorsal	12,500	Brown's Arroyo	25-Nov-13
pink	right	predorsal	12,500	North Boundary BDANWR	25-Nov-13
pink	right	predorsal	12,500	Mid-BDANWR	25-Nov-13
pink	right	predorsal	12,500	San Marcial	25-Nov-13
yellow	left	predorsal	40,325	Santa Ana Pueblo	9-Oct-14
yellow	left	predorsal	40,325	Sandia Pueblo	9-Oct-14
green	left	predorsal	4,305	Alameda Bridge	9-Oct-14
white	left	predorsal	1,222	Alameda Bridge	9-Oct-14
green	left	predorsal	5,513	Los Lunas	10-Nov-14
white	left	predorsal	24,245	Jarales Bridge	10-Nov-14
yellow	left	predorsal	22,000	Sabinal Drain Outfall	10-Nov-14
yellow	left	predorsal	21,356	Peralta Wasteway Outfall	10-Nov-14
yellow	left	predorsal	15,000	Escondida	10-Nov-14

yellow	left	predorsal	15,000	Socorro	10-Nov-14
yellow	left	predorsal	15,000	Brown's Arroyo	10-Nov-14
yellow	left	predorsal	16,797	North Boundary BDANWR	10-Nov-14
yellow	left	predorsal	15,000	San Marcial	10-Nov-14
yellow	left	predorsal	5,000	Sabinal Drain Outfall	24-Nov-14
yellow	left	predorsal	27,230	RGSM Sanctuary	24-Nov-14

Appendix D: Rio Grande Silvery Minnow 2014 Recapture List

Field #	N	Recapture Date	Release Date	Number of Days Post-Release	RM released	RM recaptured	Distance Traveled (RM)*
Pink Left Dorsal, 5 November 2012, 130,557 released							
RKD13-247	1	12/4/2013	11/3/2012	396	161.5 - 117.8	99.5	-18.3
RKD14-069	1	6/4/2014	11/3/2012	578	161.5 - 117.8	116.2	-1.6
TJA14-018	1	6/27/2014	11/3/2012	601	161.5 - 117.8	90.45	0
Pink Right Dorsal, 11 October 2013, 292,850 released							
RKD13-241	54	12/4/2013	10/11/2013	54	207.3 - 67.5	58.8	-8.7
RKD13-242	19	12/4/2013	10/11/2013	54	207.3 - 67.5	60.5	-7
RKD13-243	4	12/4/2013	10/11/2013	54	207.3 - 67.5	68.6	0
RKD13-244	2	12/4/2013	10/11/2013	54	207.3 - 67.5	79.1	0
RKD13-245	5	12/4/2013	10/11/2013	54	207.3 - 67.5	87.1	0
RKD13-246	7	12/4/2013	10/11/2013	54	207.3 - 67.5	91.7	0
RKD13-247	40	12/4/2013	10/11/2013	54	207.3 - 67.5	99.5	0
RKD13-248	51	12/4/2013	10/11/2013	54	207.3 - 67.5	114.6	0
RKD13-251	9	12/5/2013	10/11/2013	55	207.3 - 67.5	127	0
RKD13-254	3	12/5/2013	10/11/2013	55	207.3 - 67.5	151.5	0
RKD13-255	11	12/5/2013	10/11/2013	55	207.3 - 67.5	161.4	0
RKD13-256	5	12/5/2013	10/11/2013	55	207.3 - 67.5	178.3	0
RKD13-257	2	12/5/2013	10/11/2013	55	207.3 - 67.5	183.4	0
RKD13-259	42	12/5/2013	10/11/2013	55	207.3 - 67.5	203.8	0
RKD13-260	17	12/5/2013	10/11/2013	55	207.3 - 67.5	200	0
TJA13-050	1	12/16/2013	10/11/2013	66	207.3 - 67.5	195.2	0
TJA13-051	1	12/16/2013	10/11/2013	66	207.3 - 67.5	193.5	0
TJA13-052	2	12/16/2013	10/11/2013	66	207.3 - 67.5	197.8	0
TJA13-054	1	12/17/2013	10/11/2013	67	207.3 - 67.5	171.2	0
TPA14-001	2	1/29/2014	10/11/2013	110	207.3 - 67.5	171.2	0
RKD14-001	8	2/3/2014	10/11/2013	115	207.3 - 67.5	58.8	-8.7
RKD14-002	14	2/3/2014	10/11/2013	115	207.3 - 67.5	60.5	-7
RKD14-003	1	2/3/2014	10/11/2013	115	207.3 - 67.5	68.6	0
RKD14-005	8	2/3/2014	10/11/2013	115	207.3 - 67.5	87.1	0
RKD14-006	8	2/3/2014	10/11/2013	115	207.3 - 67.5	91.7	0
RKD14-007	26	2/3/2014	10/11/2013	115	207.3 - 67.5	99.5	0
RKD14-008	28	2/3/2014	10/11/2013	115	207.3 - 67.5	114.6	0
RKD14-009	8	2/3/2014	10/11/2013	115	207.3 - 67.5	116.2	0
RKD14-010	2	2/3/2014	10/11/2013	115	207.3 - 67.5	116.8	0
RKD14-011	2	2/4/2014	10/11/2013	116	207.3 - 67.5	127	0
RKD14-012	10	2/4/2014	10/11/2013	116	207.3 - 67.5	130.6	0
RKD14-013	1	2/4/2014	10/11/2013	116	207.3 - 67.5	143.2	0
RKD14-014	9	2/4/2014	10/11/2013	116	207.3 - 67.5	151.5	0
RKD14-015	2	2/4/2014	10/11/2013	116	207.3 - 67.5	161.4	0

Field #	N	Recapture Date	Release Date	Number of Days Post-Release	RM released	RM recaptured	Distance Traveled (RM)*
Pink Right Dorsal, 11 October 2013, 292,850 released							
RKD14-016	3	2/4/2014	10/11/2013	116	207.3 - 67.5	178.3	0
RKD14-017	1	2/4/2014	10/11/2013	116	207.3 - 67.5	183.4	0
F14-JS-SA	16	2/18/2014	10/11/2013	130	207.3 - 67.5	114.4	0
F14-JS-DC	6	2/20/1014	10/11/2013	132	207.3 - 67.5	48.8	-18.7
F14-JS-BDA	13	2/21/1014	10/11/2013	133	207.3 - 67.5	83.4	0
F14-JS-MO	6	2/24/2014	10/11/2013	136	207.3 - 67.5	185.3	0
TPA14-006	3	2/24/2014	10/11/2013	136	207.3 - 67.5	166.6	0
TPA14-007	3	2/24/2014	10/11/2013	136	207.3 - 67.5	171.2	0
F14-JS-LL	8	2/26/2014	10/11/2013	138	207.3 - 67.5	153.5	0
EC1404	2	3/3/2014	10/11/2013	143	207.3 - 67.5	114.6	0
EC1403	1	3/3/2014	10/11/2013	143	207.3 - 67.5	87.1	0
EC1402	2	3/3/2014	10/11/2013	143	207.3 - 67.5	68.6	0
EC1405	2	3/4/2014	10/11/2013	144	207.3 - 67.5	191.9	0
EC1406	12	3/4/2014	10/11/2013	144	207.3 - 67.5	183.4	0
EC1408	3	3/10/2014	10/11/2013	150	207.3 - 67.5	151.5	0
EC1409	49	3/10/2014	10/11/2013	150	207.3 - 67.5	130.6	0
EC1407	1	3/10/2014	10/11/2013	150	207.3 - 67.5	127	0
TPA14-012	2	3/26/2014	10/11/2013	166	207.3 - 67.5	166.6	0
RKD14-029	21	4/2/2014	10/11/2013	173	207.3 - 67.5	116.2	0
RKD14-028	2	4/2/2014	10/11/2013	173	207.3 - 67.5	114.6	0
RKD14-032	2	4/3/2014	10/11/2013	174	207.3 - 67.5	130.6	0
EC1410	16	4/15/2014	10/11/2013	186	207.3 - 67.5	116.2	0
EC1412	1	4/22/2014	10/11/2013	193	207.3 - 67.5	183.4	0
EC1411	5	4/22/2014	10/11/2013	193	207.3 - 67.5	181.6	0
TPA14-020	3	4/28/2014	10/11/2013	199	207.3 - 67.5	169.3	0
TPA14-021	2	4/28/2014	10/11/2013	199	207.3 - 67.5	166.6	0
TPA1420	10	4/28/2014	10/11/2013	199	207.3 - 67.5	169.3	0
TPA1421	2	4/28/2014	10/11/2013	199	207.3 - 67.5	166.6	0
RKD14-048	1	5/5/2014	10/11/2013	206	207.3 - 67.5	114.6	0
RKD14-049	2	5/5/2014	10/11/2013	206	207.3 - 67.5	116.2	0
RKD14-055	2	5/6/2014	10/11/2013	207	207.3 - 67.5	161.4	0
EC1413	50	5/15/2014	10/11/2013	216	207.3 - 67.5	186.6	0
Willow Creek North A	12	5/22/2014	10/11/2013	224	207.3 - 67.5	201.8	0
Atrisco	50	5/24/2014	10/11/2013	226	207.3 - 67.5	183.4	0
Willow Creek South	8	5/25/2014	10/11/2013	226	207.3 - 67.5	200.9	0
TJA14-012	5	5/30/2014	10/11/2013	231	207.3 - 67.5	157	0
TJA14-009	8	6/2/2014	10/11/2013	234	207.3 - 67.5	169.3	0
RKD14-064	2	6/4/2014	10/11/2013	236	207.3 - 67.5	79.1	0

Field #	N	Recapture Date	Release Date	Number of Days Post-Release	RM released	RM recaptured	Distance Traveled (RM)*
Pink Right Dorsal, 11 October 2013, 292,850 released							
RKD14-069	2	6/4/2014	10/11/2013	236	207.3 - 67.5	116.2	0
RKD14-073	1	6/5/2014	10/11/2013	237	207.3 - 67.5	143.2	0
TJA14-014	1	6/18/2014	10/11/2013	250	207.3 - 67.5	66.9	-0.6
TJA14-015	1	6/18/2014	10/11/2013	250	207.3 - 67.5	77.3	0
TPA14-025	3	6/19/2014	10/11/2013	251	207.3 - 67.5	81.5	0
TPA14-027	2	6/19/2014	10/11/2013	251	207.3 - 67.5	99.5	0
TPA14-028	12	6/20/2014	10/11/2013	252	207.3 - 67.5	75.5	0
TPA14-029	126	6/21/2014	10/11/2013	253	207.3 - 67.5	79.65	0
3A	2	6/23/2014	10/11/2013	255	207.3 - 67.5	186.5	0
TPA14-030	74	6/23/2014	10/11/2013	255	207.3 - 67.5	83.9	0
TPA14-031	13	6/24/2014	10/11/2013	256	207.3 - 67.5	85.75	0
TPA14-033	86	6/25/2014	10/11/2013	257	207.3 - 67.5	87.5	0
TJA14-017	17	6/26/2014	10/11/2013	258	207.3 - 67.5	89.35	0
TJA14-018	30	6/27/2014	10/11/2013	259	207.3 - 67.5	90.45	0
TJA14-019	45	6/28/2014	10/11/2013	260	207.3 - 67.5	91.55	0
TPA14-034	10	6/29/2014	10/11/2013	261	207.3 - 67.5	92.4	0
TJA14-020	1	6/30/2014	10/11/2013	262	207.3 - 67.5	153	0
TPA14-035	15	6/30/2014	10/11/2013	262	207.3 - 67.5	93	0
TPA14-036	5	7/1/2014	10/11/2013	263	207.3 - 67.5	93.9	0
TPA14-038	1	7/2/2014	10/11/2013	264	207.3 - 67.5	161.6	0
TPA14-037	29	7/2/2014	10/11/2013	264	207.3 - 67.5	94.8	0
TPA14-039	26	7/3/2014	10/11/2013	265	207.3 - 67.5	95.7	0
TPA14-040	7	7/4/2014	10/11/2013	266	207.3 - 67.5	96.25	0
TPA14-041	32	7/5/2014	10/11/2013	267	207.3 - 67.5	96.75	0
RKD14-083	1	7/8/2014	10/11/2013	270	207.3 - 67.5	68.6	0
RKD14-088	2	7/8/2014	10/11/2013	270	207.3 - 67.5	114.6	0
RKD14-089	3	7/8/2014	10/11/2013	270	207.3 - 67.5	116.2	0
RKD14-097	2	7/9/2014	10/11/2013	271	207.3 - 67.5	183.4	0
TJA14-030	2	7/11/2014	10/11/2013	273	207.3 - 67.5	169.3	0
TJA14-037	4	7/28/2014	10/11/2013	290	207.3 - 67.5	80.4	0
TJA14-038	7	7/28/2014	10/11/2013	290	207.3 - 67.5	88.65	0
ALEJANDRO GATE	4	7/29/2014	10/11/2013	291	207.3 - 67.5	166.6	0
TJA14-040	7	7/30/2014	10/11/2013	292	207.3 - 67.5	85.45	0
RKD14-107	1	8/6/2014	10/11/2013	299	207.3 - 67.5	99.5	0
5B	1	8/7/2014	10/11/2013	300	207.3 - 67.5	176.4	0
5D-E	1	8/7/2014	10/11/2013	300	207.3 - 67.5	172.8	0
RLC14-005	1	8/25/2014	10/11/2013	318	207.3 - 67.5	171.2	0
RLC14-006	2	8/25/2014	10/11/2013	318	207.3 - 67.5	169.3	0

Field #	N	Recapture Date	Release Date	Number of Days Post-Release	RM released	RM recaptured	Distance Traveled (RM)*
Pink Right Dorsal, 11 October 2013, 292,850 released							
TPA14-042	5	9/8/2014	10/11/2013	332	207.3 - 67.5	81.2	0
RKD14-126	1	9/9/2014	10/11/2013	333	207.3 - 67.5	91.7	0
TPA14-043	10	9/10/2014	10/11/2013	334	207.3 - 67.5	153.7	0
RKD14-137	1	9/10/2014	10/11/2013	334	207.3 - 67.5	183.4	0
RKD14-139	2	9/10/2014	10/11/2013	334	207.3 - 67.5	203.8	0
TJA14-043	1	9/17/2014	10/11/2013	341	207.3 - 67.5	169.3	0
TPA14-046	3	9/26/2014	10/11/2013	350	207.3 - 67.5	154.7	0
TPA14-047	3	9/27/2014	10/11/2013	351	207.3 - 67.5	152.7	0
TJA14-046	1	10/15/2014	10/11/2013	369	207.3 - 67.5	106.9	0
TPA14-070	1	10/22/2014	10/11/2013	376	207.3 - 67.5	169.3	0
RKD14-167	1	11/3/2014	10/11/2013	388	207.3 - 67.5	99.5	0
Yellow Left Dorsal, 8 November 2012, 144,000 released							
RKD14-009	6	2/3/2014	11/3/2012	457	115.6 - 56.3	56.3	0
TJA14-018	1	6/27/2014	11/3/2012	601	115.6 - 56.3	56.3	0
Yellow Left Dorsal, 9 October 2014, 233,033 released							
TPA14-066	4	10/21/2014	10/9/2014	12	207.3 - 67.5	67.5	0
TPA14-067	6	10/21/2014	10/9/2014	12	207.3 - 67.5	67.5	0
TPA14-068	11	10/21/2014	10/9/2014	12	207.3 - 67.5	67.5	0
RKD14-209	27	11/10/2014	10/9/2014	32	207.3 - 67.5	67.5	0
RKD14-210	4	11/10/2014	10/9/2014	32	207.3 - 67.5	67.5	0
RKD14-214	4	11/11/2014	10/9/2014	33	207.3 - 67.5	67.5	0
RKD14-215	24	11/11/2014	10/9/2014	33	207.3 - 67.5	67.5	0
RKD14-217	3	11/11/2014	10/9/2014	33	207.3 - 67.5	67.5	0
RKD14-219	6	11/11/2014	10/9/2014	33	207.3 - 67.5	67.5	0
RKD14-220	3	11/11/2014	10/9/2014	33	207.3 - 67.5	67.5	0
RKD14-222	2	11/12/2014	10/9/2014	34	207.3 - 67.5	67.5	0
RKD14-224	1	11/12/2014	10/9/2014	34	207.3 - 67.5	67.5	0
RKD14-225	15	11/12/2014	10/9/2014	34	207.3 - 67.5	67.5	0
RKD14-229	6	11/12/2014	10/9/2014	34	207.3 - 67.5	67.5	0
RKD14-230	9	11/12/2014	10/9/2014	34	207.3 - 67.5	67.5	0
RKD14-232	2	11/13/2014	10/9/2014	35	207.3 - 67.5	67.5	0
RKD14-234	8	11/13/2014	10/9/2014	35	207.3 - 67.5	67.5	0
RKD14-235	25	11/13/2014	10/9/2014	35	207.3 - 67.5	67.5	0
RKD14-239	22	11/13/2014	10/9/2014	35	207.3 - 67.5	67.5	0
RKD14-240	6	11/13/2014	10/9/2014	35	207.3 - 67.5	67.5	0
TJA14-047	2	11/17/2014	10/9/2014	39	207.3 - 67.5	67.5	0
TJA14-048	2	11/17/2014	10/9/2014	39	207.3 - 67.5	67.5	0
TPA14-074	2	11/25/2014	10/9/2014	47	207.3 - 67.5	67.5	0
TPA14-075	1	11/25/2014	10/9/2014	47	207.3 - 67.5	67.5	0

UNM Monitoring
BOR Monitoring
ASIR Population Monitoring/Population Estimate
NMISC Monitoring
USACE Monitoring
NMFWCO Augmentation/Salvage Monitoring

*****Distance traveled is the minimum distance a fish might have traveled from the release location, and can only be calculated for fish recaptured outside the released range.

Appendix E: Memo On Hatchery Survival Cage Study

United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE

New Mexico Fish and Wildlife Conservation Office

3800 Commons Avenue NE

To: Manuel Ulibarri, Project Leader Southwest Native Aquatic Resources and Recovery Center

From: Thomas P. Archdeacon, Fish Biologist

Subject: Overnight survival of hatchery RGSM in cages

Date: 17 October 2014

Staff from the New Mexico Fish and Wildlife Conservation Office (NMFWCO), with assistance from Southwest Native Aquatic Resources and Recovery Center (SNARRC), the City of Albuquerque BioPark (BioPark) and Los Lunas Silvery Minnow Refugium (LLSMR) conducted a 24-h cage survival study on hatchery-reared Rio Grande Silvery Minnow (RGSM).

Rio Grande Silvery Minnow were transported from SNARRC by SNARRC staff; fish from the BioPark and LLSMR were transported by NMFWCO staff. All RGSM were marked with visible implant elastomer (VIE), LLSMR were marked green, BioPark marked white, and SNARRC marked yellow. Fish were acclimated to river conditions by slowing exchanging tank water with river water at the Albuquerque-Bernalillo County Water User Authority drinking water facility located downstream of the Alameda bridge in Albuquerque, NM. Five cages measuring approximately 0.5 m x 0.5 m x 0.5 m were anchored in the river at this location.

After acclimating fish to river conditions, we collected a net of fish and placed them in a 5-gal bucket to transport from the truck to the cages ensuringall fish had the same handling post-transport to the release site. We then counted out 20 RGSM from each hatchery for each cage.

Thus, we used 300 total RGSM, 20 fish x 3 hatcheries x 5 cages. Fish were placed in cages at 0811 h on 9 October 2014 and released at 0933 h on 10 October 2014. We preserved dead fish in 70% ethanol for examination. No SNARRC RGSM died, five BioPark fish died, and four LLSMR fish died (Table 1). Several fish escaped from cage 5 prior to release (Table 1).

Mortality overall was 3.1% (95% confidence interval 1.6–5.8%), and for SNARRC was 0% (95% confidence interval 0–3.7%), for the BioPark 5.3% (95% confidence interval 2.3–11.8%), and LLSMR 4.2% (95% confidence interval 1.6–10.0%). These differences are not statistically significant (Friedman's Test, $P = 0.23$).

Table 1-Number of dead Rio Grande Silvery Minnow found in cages placed in the Rio Grande after 24-h.

Cage	1	2	3	4	5	**Total**
BioPark	2/20	0/20	1/20	0/20	2/14	5/94
LLSMR	3/20	1/20	0/20	0/20	0/15	4/95
SNARRC	0/20	0/20	0/20	0/20	0/20	0/100
Total	5/60	1/60	1/60	0/60	2/49	9/289

Thanks to BioPark, SNARRC, and LLSMR staff for assistance with providing fish. Any questions should be directed to thomas_archdeacon@fws.gov.