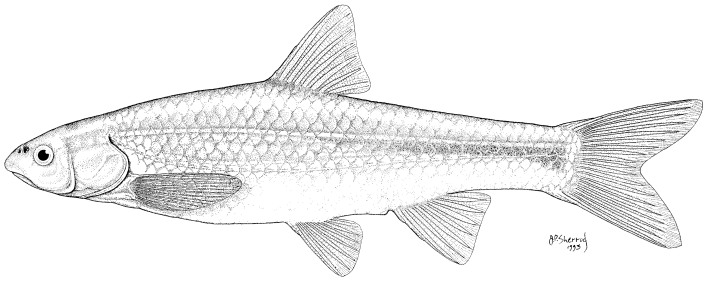
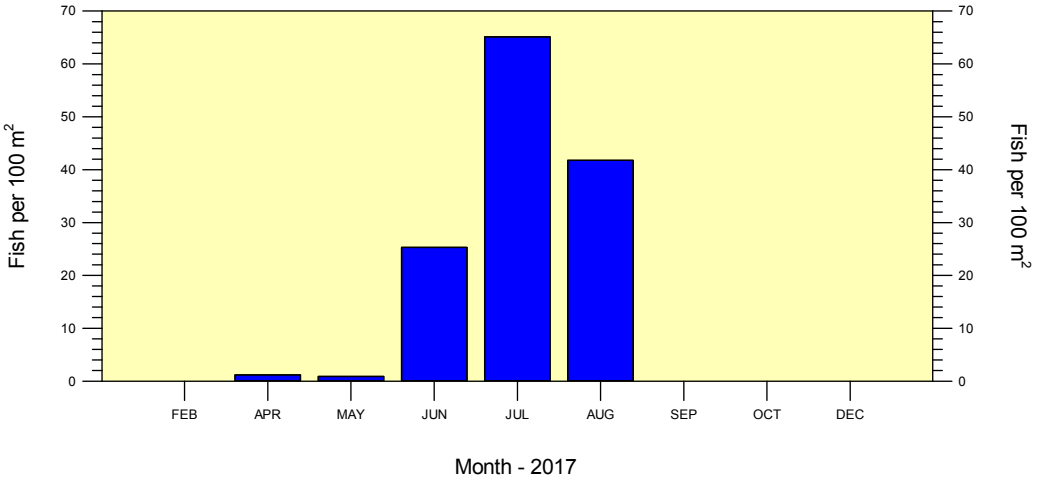
Rio Grande Silvery Minnow Population Monitoring Results from August 2017

A Middle Rio Grande Endangered Species Collaborative Program Funded Research Project





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18 September 2017

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U.S. Bureau of Reclamation
Albuquerque Area Office
555 Broadway NE, Suite 100
Albuquerque, NM 87102-2352

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Albuquerque Area Office
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SUMMARY OF AUGUST 2017 POPULATION MONITORING

The August population monitoring efforts were conducted at 20 sites throughout the Middle Rio Grande. Five sites were located in the Angostura Reach, six sites in the Isleta Reach, and nine sites in the San Acacia Reach. A list of collection localities is appended (Table A). Adult and juvenile fish were obtained by rapidly drawing a 3.1 m x 1.8 m small mesh (3/16th inch) seine through discrete mesohabitats. Larval fish were also collected with a 1.0 m x 1.0 m fine mesh (1/16th inch) seine. All fishes were identified to species and enumerated. We used length-age relationships to assign ages (i.e., age-0, age-1, and age-2+) to all Rio Grande Silvery Minnow collected. Age-0 individuals are, however, only present after annual spring spawning occurs (ca. April–June). Figures illustrating fish densities (i.e., fish per 100 m^2) were prepared for the ten focal species to facilitate comparisons across reaches.

During August, sampling covered 10,381.6 m^2 (surface area) of water and yielded 9,353 fish. There were no dry sampling sites. Cumulative fish density, at all sites combined, was 90.09 individuals/100 m^2 sampled. The three most common species were Rio Grande Silvery Minnow (n = 4,339), Red Shiner (n = 1,651), and Western Mosquitofish (n = 1,298). The 20 sampling sites yielded a total of 18 fish species. Rio Grande Silvery Minnow was present in 192 of the 313 seine hauls that yielded fish. We collected Rio Grande Silvery Minnow at 20 of the 20 sampling sites, and its overall density was 41.79 (n = 4,339) individuals/100 m^2 sampled. Densities of unmarked and marked individuals were 41.79 (n = 4,339) and 0.00 (n = 0) individuals/100 m^2 sampled, respectively. Densities of age-0, age-1, and age-2+ individuals were 41.27 (n = 4,285), 0.50 (n = 52), and 0.02 (n = 2) individuals/100 m^2 sampled, respectively.

AUGUST 2017 POPULATION MONITORING BY RIVER REACH

Angostura Reach

Mean daily discharge in the Angostura Reach (Rio Grande at Albuquerque, NM; USGS Gage 8330000) averaged 488.9 and ranged from 376 to 745 cfs from 16 July to 15 August. Water temperatures ranged from 22.3 to 24.4 ^{o}C during the Angostura Reach sampling efforts (ca. 0830–1530 h). Secchi disk measurements of water clarity ranged from 5 to 22 cm.

Sampling for fishes in the Angostura Reach during August yielded 1,125 individuals with a cumulative fish density of 43.5 individuals/100 m^2 sampled. The overall sampling effort in the Angostura Reach covered 2,585.0 m^2 (surface area) of water. Densities of all fish species combined ranged from 34.2 to 55.5 individuals per 100 m^2 at the five sampling sites. In August, there were 16 fish species collected in the Angostura Reach. Rio Grande Silvery Minnow was the most abundant taxon (n = 352), followed by Red Shiner (n = 208), and Channel Catfish (n = 125). Densities of Rio Grande Silvery Minnow ranged from 7.3 to 26.0 individuals per 100 m^2. Rio Grande Silvery Minnow (n = 352) was present in 48 of the 92 seine hauls that yielded fish during August.

Isleta Reach

In the Isleta Reach, mean daily discharge (Rio Grande at Isleta Lakes near Isleta, NM; USGS Gage 08354900) averaged 445.1 and ranged from 311 to 636 cfs from 16 July to 15 August. Water temperatures ranged from 23.8 to 30.7 ^{o}C throughout the sampling localities during the day (ca. 0930–1600 h). Secchi disk measurements ranged from 0 to 3 cm during sampling.

Isleta Reach population monitoring efforts produced 3,779 individuals in August with a cumulative fish density of 121.8 individuals/100 m^2 sampled. The total sampling effort in the Isleta Reach during August covered 3,102.3 m^2 (surface area) of water. Fish densities (all species combined) at the six sites ranged from 72.8 to 197.4 individuals per 100 m^2 sampled. There were 12 fish species collected in the Isleta Reach during August. Western Mosquitofish was the most abundant taxon (n = 1,066), followed by Red Shiner (n = 1,045), and Rio Grande Silvery Minnow (n = 968). Densities of Rio Grande Silvery Minnow ranged from 2.6 to 67.6 individuals per 100 m^2. Rio Grande Silvery Minnow (n = 968) was present in 62 of the 101 seine hauls that yielded fish during August.

San Acacia Reach

Mean daily discharge at San Acacia (Rio Grande Floodway at San Acacia, NM; USGS Gage 08354900) from 16 July to 15 August was generally higher (average = 180.5; range = 66–362 cfs) to San Marcial (Rio Grande Floodway at San Marcial, NM; USGS Gage 08358400) during the same period (average = 36.3; range = 20–83 cfs). Water temperatures in August for the San Acacia Reach ranged from 23.4 to 27.5 ^{o}C (ca. 0930–1600 h). Water clarity was generally lower in this reach (Secchi disk range = 0–25 cm) compared to the two upstream reaches.

Population monitoring efforts in the San Acacia Reach during August yielded 4,449 individuals with a cumulative fish density of 94.8 individuals per 100 m^2 sampled. Sampling in the San Acacia Reach covered an area of 4,694.4 m^2 of water. Fish densities (all species combined) ranged from 0.7 to 331.5 individuals per 100 m^2 at the nine sites sampled in the San Acacia Reach. In August, there were 15 fish species collected in the San Acacia Reach. Rio Grande Silvery Minnow was the most abundant taxon (n = 3,019), followed by Flathead Chub (n = 486), and Red Shiner (n = 398). Densities of Rio Grande Silvery Minnow ranged from 0.2 to 300.6 individuals per 100 m^2. Rio Grande Silvery Minnow (n = 3,019) was present in 82 of the 120 seine hauls that yielded fish during August.

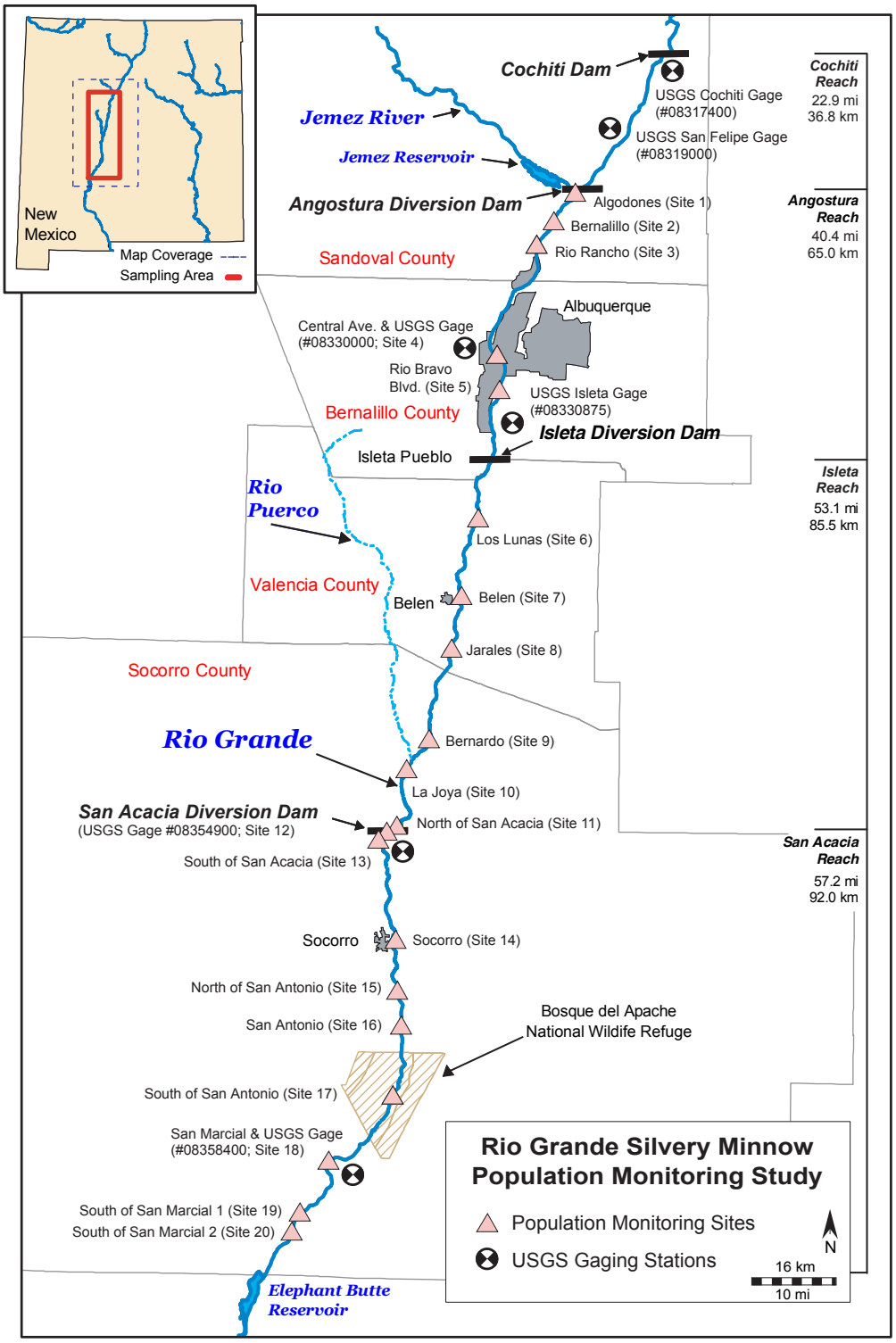

Figure 1. Map of the study area and sampling sites (numbered) for the Rio Grande Silvery Minnow population monitoring study. Sampling site descriptions are located in Appendix A.

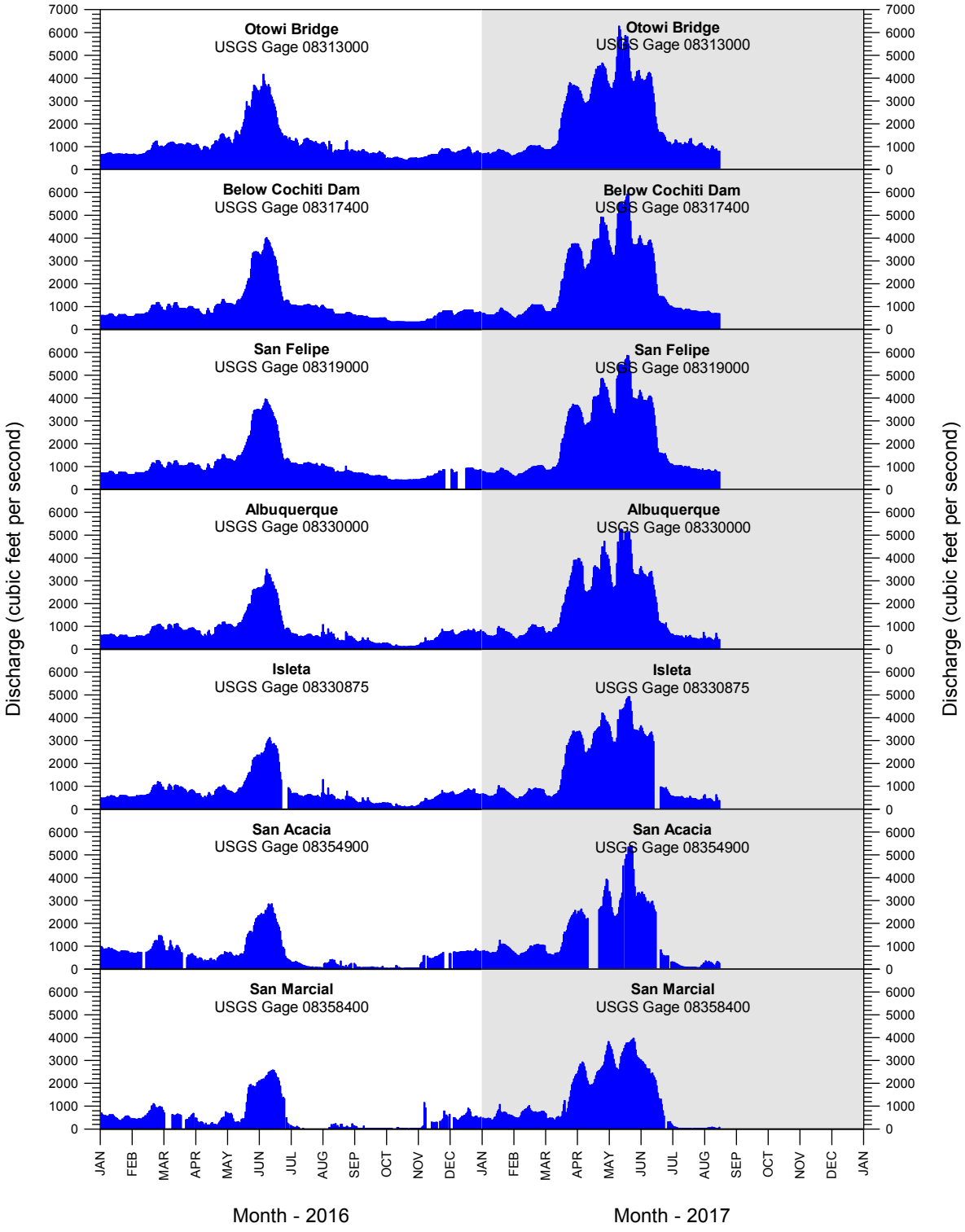

Figure 2. Rio Grande discharge from 1 January 2016 to 15 August 2017 at U.S. Geological Survey (USGS) gaging stations. Discharge data are provisional and subject to change.

Table 1. Scientific names, common names, and species codes of fish collected in the Middle Rio Grande since 1993.

Scientific Name	Common Name	Species Code
Order Clupeiformes		
Family Clupeidae	**herrings**	
Dorosoma cepedianum	Gizzard Shad	(DORCEP)
Dorosoma petenense	Threadfin Shad	(DORPET)
Order Cypriniformes		
Family Cyprinidae	**carps and minnows**	
Campostoma anomalum	Central Stoneroller	(CAMANO)
Carassius auratus	Goldfish	(CARAUR)
Cyprinella lutrensis	Red Shiner[1]	(CYPLUT)
Cyprinus carpio	Common Carp[1]	(CYPCAR)
Gila pandora	Rio Grande Chub	(GILPAN)
Hybognathus amarus	Rio Grande Silvery Minnow[1]	(HYBAMA)
Notemigonus crysoleucas	Golden Shiner	(NOTCRY)
Pimephales promelas	Fathead Minnow[1]	(PIMPRO)
Pimephales vigilax	Bullhead Minnow	(PIMVIG)
Platygobio gracilis	Flathead Chub[1]	(PLAGRA)
Rhinichthys cataractae	Longnose Dace[1]	(RHICAT)
Family Catostomidae	**suckers**	
Carpiodes carpio	River Carpsucker[1]	(CARCAR)
Catostomus commersonii	White Sucker[1]	(CATCOM)
Ictiobus bubalus	Smallmouth Buffalo	(ICTBUB)
Order Siluriformes		
Family Ictaluridae	**North American catfishes**	
Ameiurus melas	Black Bullhead	(AMEMEL)
Ameiurus natalis	Yellow Bullhead	(AMENAT)
Ictalurus furcatus	Blue Catfish	(ICTFUR)
Ictalurus punctatus	Channel Catfish[1]	(ICTPUN)
Pylodictis olivaris	Flathead Catfish	(PYLOLI)
Order Salmoniformes		
Family Salmonidae	**trouts and salmons**	
Oncorhynchus mykiss	Rainbow Trout	(ONCMYK)
Salmo trutta	Brown Trout	(SALTRU)
Order Cyprinodontiformes		
Family Poeciliidae	**livebearers**	
Gambusia affinis	Western Mosquitofish[1]	(GAMAFF)

Table 1. Scientific names, common names, and species codes of fish collected in the Middle Rio Grande since 1993 (continued).

Scientific Name	Common Name	Species Code
Order Perciformes		
Family Moronidae	**temperate basses**	
Morone chrysops	White Bass	(MORCHR)
Morone saxatilis	Striped Bass	(MORSAX)
Family Centrarchidae	**sunfishes**	
Lepomis cyanellus	Green Sunfish	(LEPCYA)
Lepomis macrochirus	Bluegill	(LEPMAC)
Lepomis megalotis	Longear Sunfish	(LEPMEG)
Micropterus dolomieu	Smallmouth Bass	(MICDOL)
Micropterus salmoides	Largemouth Bass	(MICSAL)
Pomoxis annularis	White Crappie	(POMANN)
Pomoxis nigromaculatus	Black Crappie	(POMNIG)
Family Percidae	**perches**	
Perca flavescens	Yellow Perch	(PERFLA)
Percina macrolepida	Bigscale Logperch	(PERMAC)
Sander vitreus	Walleye	(SANVIT)

[1] = Focal taxa were the most abundant species from recent Middle Rio Grande collections.

Table 2. Summary of the August 2017 Rio Grande Silvery Minnow population monitoring results (species list is based on fish collected since 1993).

Family	Common Name	Residence Status[1]	Total Number of Individuals	Percent (%) of Total	Frequency of Occurrence[2]	% Frequency of Occurrence[2]
Clupeidae	Gizzard Shad	N	3	0.03	1	5
Clupeidae	Threadfin Shad	I	-	-	-	-
Cyprinidae	Central Stoneroller	I	-	-	-	-
Cyprinidae	Goldfish	I	-	-	-	-
Cyprinidae	Red Shiner	N	1,651	17.65	20	100
Cyprinidae	Common Carp	I	121	1.29	17	85
Cyprinidae	Rio Grande Chub	N	-	-	-	-
Cyprinidae	Rio Grande Silvery Minnow	N	4,339	46.39	20	100
Cyprinidae	Golden Shiner	I	-	-	-	-
Cyprinidae	Fathead Minnow	N	75	0.80	11	55
Cyprinidae	Bullhead Minnow	I	-	-	-	-
Cyprinidae	Flathead Chub	N	591	6.32	17	85
Cyprinidae	Longnose Dace	N	98	1.05	6	30
Catostomidae	River Carpsucker	N	159	1.70	11	55
Catostomidae	White Sucker	I	66	0.71	6	30
Catostomidae	Smallmouth Buffalo	N	-	-	-	-
Ictaluridae	Black Bullhead	I	3	0.03	2	10
Ictaluridae	Yellow Bullhead	I	26	0.28	9	45
Ictaluridae	Blue Catfish	N	24	0.26	4	20
Ictaluridae	Channel Catfish	I	873	9.33	16	80
Ictaluridae	Flathead Catfish	N	-	-	-	-
Salmonidae	Rainbow Trout	I	1	0.01	1	5
Salmonidae	Brown Trout	I	-	-	-	-
Poeciliidae	Western Mosquitofish	I	1,298	13.88	18	90
Moronidae	White Bass	I	2	0.02	2	10
Moronidae	Striped Bass	I	-	-	-	-
Centrarchidae	Green Sunfish	I	-	-	-	-
Centrarchidae	Bluegill	N	-	-	-	-
Centrarchidae	Longear Sunfish	I	-	-	-	-
Centrarchidae	Smallmouth Bass	I	-	-	-	-
Centrarchidae	Largemouth Bass	I	14	0.15	6	30
Centrarchidae	White Crappie	I	9	0.10	5	25
Centrarchidae	Black Crappie	I	-	-	-	-
Percidae	Yellow Perch	I	-	-	-	-
Percidae	Bigscale Logperch	I	-	-	-	-
Percidae	Walleye	I	-	-	-	-
Monthly Total			**9,353**	**100.00**		

[1] = N (native); I (introduced)
[2] = Frequency and % frequency of occurrence were based on 20 site samples.

Table 3. Summary of the Rio Grande Silvery Minnow population monitoring results by month. Sampling was not conducted in February of 2017.

Family	Common Name	Feb	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec	Total
Clupeidae	Gizzard Shad	-	-	2	2	2	3	-	-	-	9
Clupeidae	Threadfin Shad	-	-	-	4	-	-	-	-	-	4
Cyprinidae	Central Stoneroller	-	-	-	-	-	-	-	-	-	0
Cyprinidae	Goldfish	-	-	-	-	-	-	-	-	-	0
Cyprinidae	Red Shiner	-	159	602	1,264	2,388	1,651	-	-	-	6,064
Cyprinidae	Common Carp	-	12	149	408	188	121	-	-	-	878
Cyprinidae	Rio Grande Chub	-	-	-	-	-	-	-	-	-	0
Cyprinidae	Rio Grande Silvery Minnow	-	111	119	2,327	6,920	4,339	-	-	-	13,816
Cyprinidae	Golden Shiner	-	-	-	-	-	-	-	-	-	0
Cyprinidae	Fathead Minnow	-	4	6	63	18	75	-	-	-	166
Cyprinidae	Bullhead Minnow	-	-	-	-	1	-	-	-	-	1
Cyprinidae	Flathead Chub	-	84	215	426	185	591	-	-	-	1,501
Cyprinidae	Longnose Dace	-	28	41	93	72	98	-	-	-	332
Catostomidae	River Carpsucker	-	2	5	9	111	159	-	-	-	286
Catostomidae	White Sucker	-	9	78	139	108	66	-	-	-	400
Catostomidae	Smallmouth Buffalo	-	-	4	-	20	-	-	-	-	24
Ictaluridae	Black Bullhead	-	-	-	-	9	3	-	-	-	12
Ictaluridae	Yellow Bullhead	-	-	-	1	23	26	-	-	-	50
Ictaluridae	Blue Catfish	-	-	2	25	27	24	-	-	-	78
Ictaluridae	Channel Catfish	-	86	61	38	130	873	-	-	-	1,188
Ictaluridae	Flathead Catfish	-	-	1	-	-	-	-	-	-	1
Salmonidae	Rainbow Trout	-	-	-	-	-	1	-	-	-	1
Salmonidae	Brown Trout	-	-	-	-	-	-	-	-	-	0
Poeciliidae	Western Mosquitofish	-	4	43	123	650	1,298	-	-	-	2,118
Moronidae	White Bass	-	-	1	1	-	2	-	-	-	4
Moronidae	Striped Bass	-	-	-	-	-	-	-	-	-	0
Centrarchidae	Green Sunfish	-	-	1	-	-	-	-	-	-	1
Centrarchidae	Bluegill	-	-	-	-	-	-	-	-	-	0
Centrarchidae	Longear Sunfish	-	-	-	-	-	-	-	-	-	0
Centrarchidae	Smallmouth Bass	-	-	-	-	-	-	-	-	-	0
Centrarchidae	Largemouth Bass	-	1	1	-	16	14	-	-	-	32
Centrarchidae	White Crappie	-	-	-	1	8	9	-	-	-	18
Centrarchidae	Black Crappie	-	-	-	-	-	-	-	-	-	0
Percidae	Yellow Perch	-	-	-	-	-	-	-	-	-	0
Percidae	Bigscale Logperch	-	-	-	-	-	-	-	-	-	0
Percidae	Walleye	-	-	-	-	-	-	-	-	-	0
Monthly Totals		**-**	**500**	**1,331**	**4,924**	**10,876**	**9,353**	**-**	**-**	**-**	**26,984**

Table 4. Summary of the abundance of Rio Grande Silvery Minnow, by reach, site, and month, during 2017. Marked individuals at sites are shown in parentheses. Sampling was not conducted in February of 2017. Sampling at the additional sites (e.g., 21–30) took place in May of 2017.

Reach	Site	Locality	Feb	Apr	May	Jun	Jul	Aug	Sep	Oct	Dec	Total
Angostura	1	Angostura Dam	-	-	-	-	1(0)	33(0)	-	-	-	34
Angostura	2	Bernalillo	-	8(0)	-	9(0)	82(0)	54(0)	-	-	-	153
Angostura	3	Rio Rancho	-	-	1(0)	12(0)	58(0)	144(0)	-	-	-	215
Angostura	21	Site 21	-	-	3(0)	-	-	-	-	-	-	3
Angostura	22	Site 22	-	-	-	-	-	-	-	-	-	0
Angostura	23	Site 23	-	-	1(0)	-	-	-	-	-	-	1
Angostura	24	Site 24	-	-	10(0)	-	-	-	-	-	-	10
Angostura	4	Central Ave.	-	9(0)	28(0)	201(0)	533(0)	54(0)	-	-	-	825
Angostura	5	Rio Bravo Blvd.	-	18(0)	14(0)	17(0)	141(0)	67(0)	-	-	-	257
Angostura	25	Site 25	-	-	11(0)	-	-	-	-	-	-	11
Angostura Totals			*-*	*35*	*68*	*239*	*815*	*352*	*-*	*-*	*-*	*1,509*
Isleta	26	Site 26	-	-	7(0)	-	-	-	-	-	-	7
Isleta	6	Los Lunas	-	-	-	796(0)	76(0)	224(0)	-	-	-	1,096
Isleta	27	Site 27	-	-	2(0)	-	-	-	-	-	-	2
Isleta	7	Belen	-	-	2(0)	555(0)	231(0)	14(0)	-	-	-	802
Isleta	8	Jarales	-	2(0)	2(0)	177(0)	389(0)	35(0)	-	-	-	605
Isleta	28	Site 28	-	-	1(0)	-	-	-	-	-	-	1
Isleta	9	Bernardo	-	-	-	11(0)	326(0)	197(0)	-	-	-	534
Isleta	10	La Joya	-	-	1(0)	15(0)	293(0)	158(0)	-	-	-	467
Isleta	29	Site 29	-	-	1(0)	-	-	-	-	-	-	1
Isleta	11	North of San Acacia	-	-	-	8(0)	784(0)	340(0)	-	-	-	1,132
Isleta Totals			*-*	*2*	*16*	*1,562*	*2,099*	*968*	*-*	*-*	*-*	*4,647*
San Acacia	12	San Acacia Dam	-	15(0)	2(0)	3(0)	1566(0)	165(0)	-	-	-	1,751
San Acacia	13	South of San Acacia	-	37(0)	12(0)	75(0)	899(0)	760(0)	-	-	-	1,783
San Acacia	30	Site 30	-	-	16(0)	-	-	-	-	-	-	16
San Acacia	14	Socorro	-	1(0)	-	16(0)	251(0)	1686(0)	-	-	-	1,954
San Acacia	15	North of San Antonio	-	18(0)	2(0)	7(0)	588(0)	181(0)	-	-	-	796
San Acacia	16	San Antonio	-	-	1(0)	17(0)	562(0)	105(0)	-	-	-	685
San Acacia	17	South of San Antonio	-	-	1(0)	214(0)	84(0)	1(0)	-	-	-	300
San Acacia	18	San Marcial	-	2(0)	-	48(0)	21(0)	90(0)	-	-	-	161
San Acacia	19	South of San Marcial 1	-	1(1)	-	146(0)	8(0)	26(0)	-	-	-	181
San Acacia	20	South of San Marcial 2	-	-	1(1)	-	27(0)	5(0)	-	-	-	33
San Acacia Totals			*-*	*74*	*35*	*526*	*4,006*	*3,019*	*-*	*-*	*-*	*7,660*
Monthly Totals			**-**	**111**	**119**	**2,327**	**6,920**	**4,339**	**-**	**-**	**-**	**13,816**

Table 5. Summary of the abundance of Rio Grande Silvery Minnow, by reach, site and mesohabitat, during August 2017. Blank cells indicate mesohabitats that were unavailable for sampling at certain sites.

Reach	Site	Locality	BW	PO	RU	SHPO	SHRU	Total
Angostura	1	Angostura Dam	21	-	-	10	2	33
Angostura	2	Bernalillo	-	2	-	23	29	54
Angostura	3	Rio Rancho		42	-	24	78	144
Angostura	4	Central Ave.	32	1	-	14	7	54
Angostura	5	Rio Bravo Blvd.		3	5	23	36	67
Angostura Totals			*53*	*48*	*5*	*94*	*152*	*352*
Isleta	6	Los Lunas	-	149	1	-	74	224
Isleta	7	Belen	-		-	5	9	14
Isleta	8	Jarales	8		-	12	15	35
Isleta	9	Bernardo	106	5	11	19	56	197
Isleta	10	La Joya	4	2	-	67	85	158
Isleta	11	North of San Acacia			-	137	203	340
Isleta Totals			*118*	*156*	*12*	*240*	*442*	*968*
San Acacia	12	San Acacia Dam		1	2	89	73	165
San Acacia	13	South of San Acacia		116	1	345	298	760
San Acacia	14	Socorro			12	1,466	208	1,686
San Acacia	15	North of San Antonio	53		1	84	43	181
San Acacia	16	San Antonio		89	-	13	3	105
San Acacia	17	South of San Antonio			-	-	1	1
San Acacia	18	San Marcial	51		-	16	23	90
San Acacia	19	South of San Marcial 1		-	-	19	7	26
San Acacia	20	South of San Marcial 2	-		-	1	4	5
San Acacia Totals			*104*	*206*	*16*	*2,033*	*660*	*3,019*
Monthly Totals			**275**	**410**	**33**	**2,367**	**1,254**	**4,339**

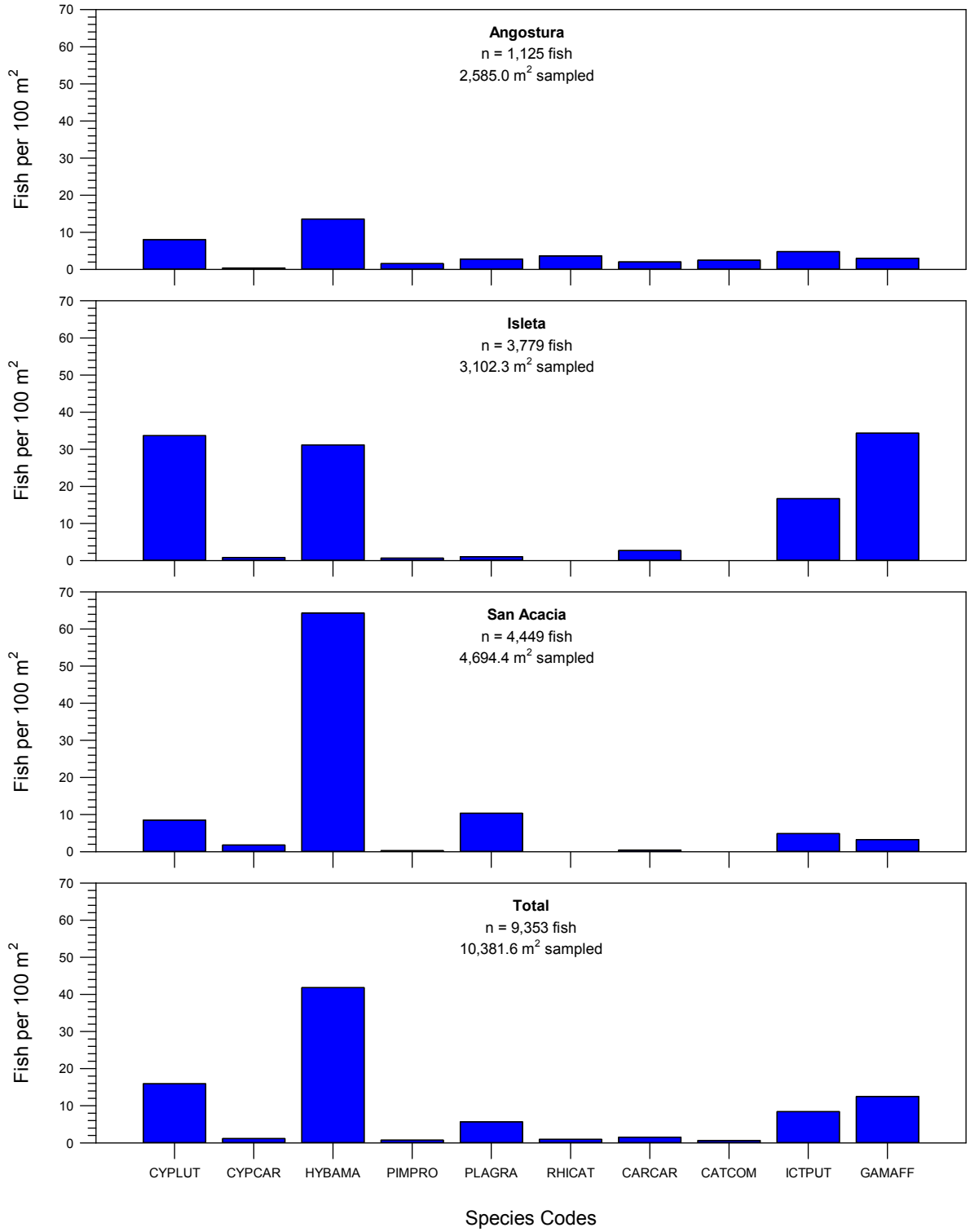

Figure 3. Fish densities during August 2017 for each focal species (see Table 1 for species codes), by sampling reach, in the Middle Rio Grande. Note: all marked and unmarked individuals are included.

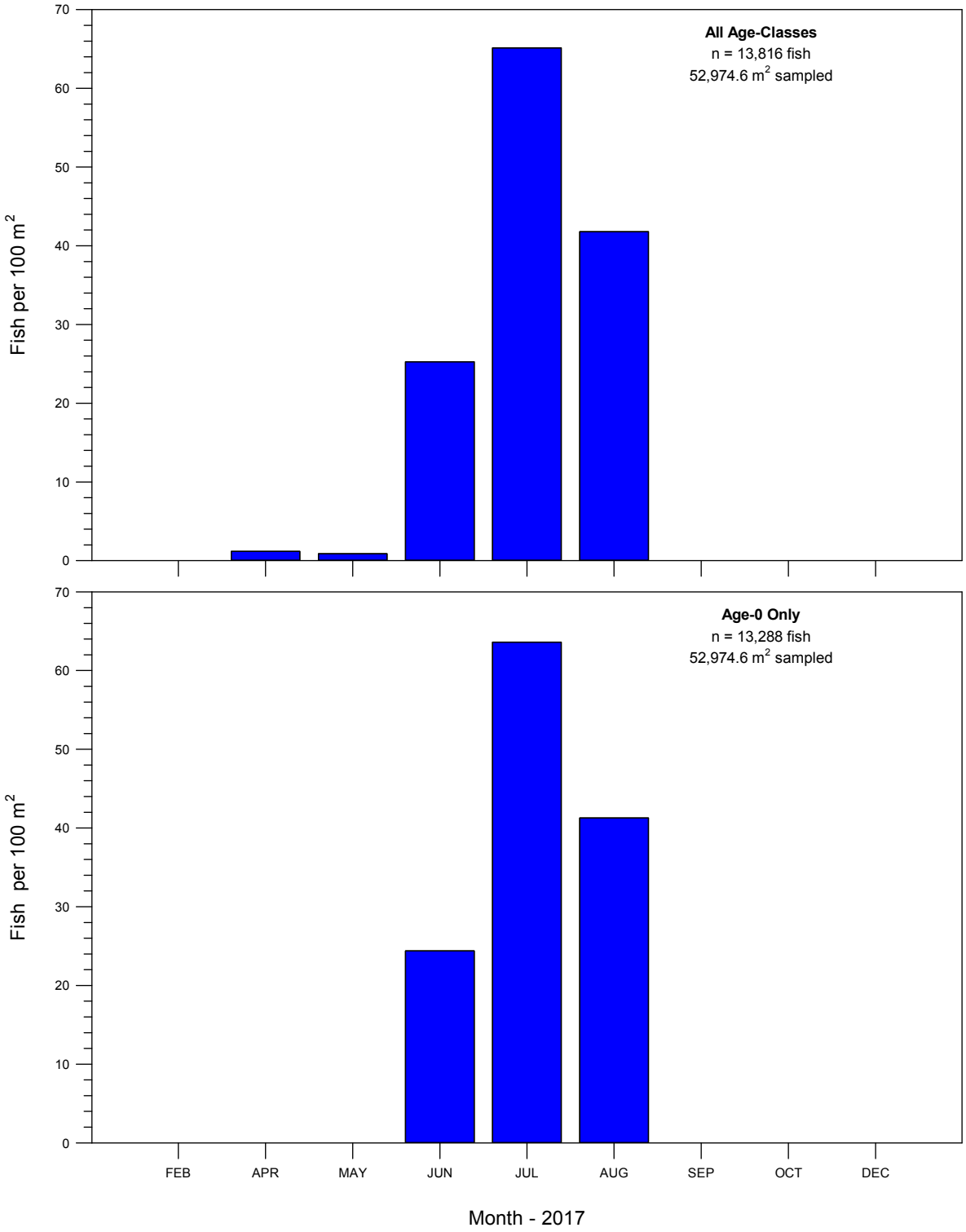

Figure 4. Rio Grande Silvery Minnow densities (all age-classes and age-0 only) during 2017, by sampling month, in the Middle Rio Grande. Note: all marked and unmarked individuals are included. Sampling was not conducted in February of 2017.

APPENDIX A (Sampling Sites)

Middle Rio Grande Fish Sampling Sites

Table A - 1. Sampling reaches and sites for population monitoring of Rio Grande Silvery Minnow in the Middle Rio Grande, NM.

Reach and Site	Locality
Angostura Reach	
1	New Mexico, Sandoval County, Rio Grande, downstream of Angostura Diversion Dam, Algodones. River Mile: 209.7; UTM Easting: 363811; UTM Northing: 3916006; Zone: 13S; Datum: NAD27
2	New Mexico, Sandoval County, Rio Grande, upstream of US Highway 550 bridge crossing, Bernalillo. River Mile: 203.8; UTM Easting: 358543; UTM Northing: 3909722; Zone: 13S; Datum: NAD27
3	New Mexico, Sandoval County, Rio Grande, ca. 4.0 miles downstream of US Highway 550 bridge crossing, at Rio Rancho Wastewater Treatment Plant, Rio Rancho. River Mile: 200.0; UTM Easting: 354772; UTM Northing: 3905355; Zone: 13S; Datum: NAD27
4	New Mexico, Bernalillo County, Rio Grande, upstream of Central Avenue (US Highway 66) bridge crossing, Albuquerque. River Mile: 183.4; UTM Easting: 346840; UTM Northing: 3884094; Zone: 13S; Datum: NAD27
5	New Mexico, Bernalillo County, Rio Grande, upstream of Rio Bravo Boulevard bridge crossing, Albuquerque. River Mile: 178.3; UTM Easting: 347554; UTM Northing: 3877163; Zone: 13S; Datum: NAD27
Isleta Reach	
6	New Mexico, Valencia County, Rio Grande, ca. 0.3 miles upstream of Los Lunas (NM State Highway 49) bridge crossing, Los Lunas. River Mile: 161.4; UTM Easting: 342898; UTM Northing: 3852531; Zone: 13S; Datum: NAD27
7	New Mexico, Valencia County, Rio Grande, ca. 1.0 miles upstream of NM State Highway 309/6 bridge crossing, Belen. River Mile: 151.5; UTM Easting: 339972; UTM Northing: 3837061; Zone: 13S; Datum: NAD27
8	New Mexico, Valencia County, Rio Grande, ca. 2.2 miles upstream of NM State Highway 346 bridge crossing, Jarales. River Mile: 143.2; UTM Easting: 338136; UTM Northing: 3827329; Zone: 13S; Datum: NAD27
9	New Mexico, Socorro County, Rio Grande, upstream of US Highway 60 bridge crossing, Bernardo. River Mile: 130.6; UTM Easting: 334604; UTM Northing: 3809726; Zone: 13S; Datum: NAD27
10	New Mexico, Socorro County, Rio Grande, ca. 3.5 miles downstream of US Highway 60 bridge crossing, La Joya. River Mile: 127.0; UTM Easting: 331094; UTM Northing: 3805229; Zone: 13S; Datum: NAD27
11	New Mexico, Socorro County, Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia. River Mile: 116.8; UTM Easting: 327902; UTM Northing: 3792603; Zone: 13S; Datum: NAD27

Table A - 1. Sampling reaches and sites for population monitoring of Rio Grande Silvery Minnow in the Middle Rio Grande, NM (continued).

Reach and Site	Locality
San Acacia Reach	
12	New Mexico, Socorro County, Rio Grande, downstream of San Acacia Diversion Dam, San Acacia. River Mile: 116.2; UTM Easting: 326162; UTM Northing: 3791977; Zone: 13S; Datum: NAD27
13	New Mexico, Socorro County, Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia. River Mile: 114.6; UTM Easting: 325263; UTM Northing: 3790442; Zone: 13S; Datum: NAD27
14	New Mexico, Socorro County, Rio Grande, ca. 0.5 miles upstream of the Low Flow Conveyance Channel bridge, east and upstream of Socorro Wastewater Treatment Plant, Socorro. River Mile: 99.5; UTM Easting: 327097; UTM Northing: 3771043; Zone: 13S; Datum: NAD27
15	New Mexico, Socorro County, Rio Grande, ca. 4.0 miles upstream of US Highway 380 bridge crossing, San Antonio. River Mile: 91.7; UTM Easting: 328140; UTM Northing: 3761283; Zone: 13S; Datum: NAD27
16	New Mexico, Socorro County, Rio Grande, upstream of US Highway 380 bridge crossing, San Antonio. River Mile: 87.1; UTM Easting: 328914; UTM Northing: 3754471; Zone: 13S; Datum: NAD27
17	New Mexico, Socorro County, Rio Grande, directly east of Bosque del Apache National Wildlife Refuge headquarters, San Antonio. River Mile: 79.1; UTM Easting: 327055; UTM Northing: 3740839; Zone: 13S; Datum: NAD27
18	New Mexico, Socorro County, Rio Grande, downstream of the San Marcial railroad crossing, San Marcial. River Mile: 68.6; UTM Easting: 315284; UTM Northing: 3728347; Zone: 13S; Datum: NAD27
19	New Mexico, Socorro County, Rio Grande, at its former confluence with the Low Flow Conveyance Channel and 16 miles downstream of the southern end of the Bosque del Apache National Wildlife Refuge, San Marcial. River Mile: 60.5; UTM Easting: 309487; UTM Northing: 3718178; Zone: 13S; Datum: NAD27
20	New Mexico, Socorro County, Rio Grande, ca. 10.0 miles downstream of the San Marcial Railroad Bridge crossing, San Marcial. River Mile: 58.8; UTM Easting: 307846; UTM Northing: 3716150; Zone: 13S; Datum: NAD27

APPENDIX B (Site-Specific Ichthyofaunal Composition)

Site-specific ichthyofaunal composition during the August 2017
Rio Grande Silvery Minnow population monitoring study

Monthly and annual reports, along with raw data, are available at:
http://mrgescp.dbstephens.com

** Data are provisional and should be verified by direct inspection of field data **

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage **RKD17-128**
Rio Grande, directly below Angostura Diversion Dam, Algodones.

Site Number: 1 River Mile: 209.7 04 August 2017
UTM Easting: 363811 UTM Northing: 3916006 Zone: 13 Quad: San Felipe Pueblo
M.A. Farrington, A.L. Barkalow, M.J. Chavez, A.C. Wedemeyer Effort: 455.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	59
76	*Hybognathus amarus**	33
76	*Platygobio gracilis*	11
76	*Rhinichthys cataractae*	42
81	*Catostomus commersonii*	9
93	*Ameiurus melas*	1
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	2
294	*Micropterus salmoides*	5
294	*Pomoxis annularis*	1

***Hybognathus amarus* (age-classes):**

age-0	17
age-1	16
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage **RKD17-129**
Rio Grande, at US HWY 550 (formerly NM State HWY 44) bridge crossing, Bernalillo.

Site Number: 2 River Mile: 203.8 04 August 2017
UTM Easting: 358543 UTM Northing: 3909722 Zone: 13 Quad: Bernalillo
M.A. Farrington, A.L. Barkalow, M.J. Chavez, A.C. Wedemeyer Effort: 549.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	38
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	54
76	*Platygobio gracilis*	22
76	*Rhinichthys cataractae*	32
81	*Carpiodes carpio*	9
81	*Catostomus commersonii*	14
93	*Ameiurus natalis*	2
93	*Ictalurus punctatus*	10
212	*Gambusia affinis*	5
294	*Pomoxis annularis*	1

***Hybognathus amarus* (age-classes):**

age-0	48
age-1	6
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage **RKD17-130**
Rio Grande, ca. 4.0 miles downstream of US HWY 550 (formerly NM State HWY 44) bridge crossing, at Rio Rancho Wastewater Treatment Plant, Rio Rancho.

Site Number: 3 River Mile: 200.0 04 August 2017
UTM Easting: 354772 UTM Northing: 3905355 Zone: 13 Quad: Bernalillo
M.A. Farrington, A.L. Barkalow, M.J. Chavez, A.C. Wedemeyer Effort: 553.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	49
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	144
76	*Pimephales promelas*	9
76	*Platygobio gracilis*	22
76	*Rhinichthys cataractae*	11
81	*Catostomus commersonii*	30
93	*Ameiurus natalis*	6
93	*Ictalurus punctatus*	13
143	*Oncorhynchus mykiss*	1
212	*Gambusia affinis*	19
283	*Morone chrysops*	1
294	*Micropterus salmoides*	1

***Hybognathus amarus* (age-classes):**

age-0	135
age-1	9
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage **RKD17-127**
Rio Grande, at Central Avenue bridge crossing (US HWY 66), Albuquerque.

Site Number: 4 River Mile: 183.4 04 August 2017
UTM Easting: 346840 UTM Northing: 3884094 Zone: 13 Quad: Albuquerque West
M.A. Farrington, A.L. Barkalow, M.J. Chavez, A.C. Wedemeyer Effort: 517.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	48
76	*Cyprinus carpio*	5
76	*Hybognathus amarus**	54
76	*Pimephales promelas*	13
76	*Platygobio gracilis*	4
81	*Carpiodes carpio*	11
81	*Catostomus commersonii*	6
93	*Ictalurus punctatus*	65
212	*Gambusia affinis*	37
294	*Micropterus salmoides*	4

***Hybognathus amarus* (age-classes):**

age-0	53
age-1	
age-2+	1

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage **RKD17-126**
Rio Grande, at Rio Bravo Blvd. Bridge crossing (NM State HWY 500) crossing, Albuquerque.

Site Number: 5 River Mile: 178.3 04 August 2017
UTM Easting: 347554 UTM Northing: 3877163 Zone: 13 Quad: Albuquerque West
M.A. Farrington, A.L. Barkalow, M.J. Chavez, A.C. Wedemeyer Effort: 510.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	14
76	*Cyprinus carpio*	3
76	*Hybognathus amarus**	67
76	*Pimephales promelas*	19
76	*Platygobio gracilis*	13
76	*Rhinichthys cataractae*	9
81	*Carpiodes carpio*	33
81	*Catostomus commersonii*	6
93	*Ameiurus natalis*	3
93	*Ictalurus punctatus*	36
212	*Gambusia affinis*	15
283	*Morone chrysops*	1

***Hybognathus amarus* (age-classes):**

age-0	63
age-1	4
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage **RKD17-125**
Rio Grande, at Los Lunas Bridge crossing (NM State HWY 49), Los Lunas.

Site Number: 6 River Mile: 161.4 03 August 2017
UTM Easting: 342898 UTM Northing: 3852531 Zone: 13 Quad: Los Lunas
J.L. Kennedy, A.L. Barkalow, M.J. Chavez, A.C. Wedemeyer Effort: 541.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	99
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	224
76	*Platygobio gracilis*	1
93	*Ameiurus natalis*	3
93	*Ictalurus punctatus*	63
212	*Gambusia affinis*	3

***Hybognathus amarus* (age-classes):**

age-0	222
age-1	2
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage **RKD17-124**
Rio Grande, ca. 1.0 miles upstream of NM State HWY 309/6 bridge crossing, Belen.

Site Number: 7 River Mile: 151.5 03 August 2017
UTM Easting: 339972 UTM Northing: 3837061 Zone: 13 Quad: Tome
J.L. Kennedy, A.L. Barkalow, M.J. Chavez, A.C. Wedemeyer Effort: 529.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	171
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	14
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	35
81	*Catostomus commersonii*	1
93	*Ameiurus natalis*	4
93	*Ictalurus punctatus*	108
212	*Gambusia affinis*	190

***Hybognathus amarus* (age-classes):**

age-0	13
age-1	1
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage **RKD17-123**
Rio Grande, ca. 2.2 miles upstream of NM State HWY 346 bridge crossing, Jarales.

Site Number: 8 River Mile: 143.2 03 August 2017
UTM Easting: 338136 UTM Northing: 3827329 Zone: 13 Quad: Veguita
J.L. Kennedy, A.L. Barkalow, M.J. Chavez, A.C. Wedemeyer Effort: 545.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	135
76	*Cyprinus carpio*	6
76	*Hybognathus amarus**	35
76	*Pimephales promelas*	4
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	8
93	*Ameiurus natalis*	1
93	*Ictalurus punctatus*	57
212	*Gambusia affinis*	232

***Hybognathus amarus* (age-classes):**

age-0	35
age-1	
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage **RKD17-122**
Rio Grande, at US HWY 60 bridge crossing, Bernardo.

Site Number: 9 River Mile: 130.6 03 August 2017
UTM Easting: 334604 UTM Northing: 3809726 Zone: 13 Quad: Abeytas
J.L. Kennedy, A.L. Barkalow, M.J. Chavez, A.C. Wedemeyer Effort: 462.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	285
76	*Hybognathus amarus**	197
76	*Pimephales promelas*	7
76	*Platygobio gracilis*	3
76	*Rhinichthys cataractae*	1
81	*Carpiodes carpio*	41
93	*Ictalurus punctatus*	48
212	*Gambusia affinis*	331

***Hybognathus amarus* (age-classes):**

age-0	197
age-1	
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage **RKD17-121**
Rio Grande, ca. 3.5 miles downstream of the US HWY 60 bridge crossing, Bernardo.

Site Number: 10 River Mile: 127.0 03 August 2017
UTM Easting: 331094 UTM Northing: 3805229 Zone: 13 Quad: Abeytas
J.L. Kennedy, A.L. Barkalow, M.J. Chavez, A.C. Wedemeyer Effort: 520.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	339
76	*Cyprinus carpio*	12
76	*Hybognathus amarus**	158
76	*Pimephales promelas*	11
76	*Platygobio gracilis*	14
93	*Ameiurus natalis*	2
93	*Ictalurus punctatus*	79
212	*Gambusia affinis*	214
294	*Micropterus salmoides*	1

***Hybognathus amarus* (age-classes):**

age-0	158
age-1	
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage **RKD17-120**
Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia

Site Number: 11 River Mile: 116.8 02 August 2017
UTM Easting: 327902 UTM Northing: 3792603 Zone: 13 Quad: La Joya
W.H. Brandenburg, S.L. Clark Barkalow, A.L. Fitzgerald, M.J. Chavez Effort: 503.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	16
76	*Cyprinus carpio*	6
76	*Hybognathus amarus**	340
76	*Platygobio gracilis*	13
81	*Carpiodes carpio*	1
93	*Ameiurus natalis*	1
93	*Ictalurus punctatus*	164
212	*Gambusia affinis*	96

***Hybognathus amarus* (age-classes):**

age-0	340
age-1	
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage **RKD17-119**
Rio Grande, directly below San Acacia Diversion Dam, San Acacia.

Site Number: 12 River Mile: 116.2 02 August 2017
UTM Easting: 326162 UTM Northing: 3791977 Zone: 13 Quad: San Acacia
W.H. Brandenburg, S.L. Clark Barkalow, A.L. Fitzgerald, M.J. Chavez Effort: 520.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	11
76	*Cyprinus carpio*	26
76	*Hybognathus amarus**	165
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	91
76	*Rhinichthys cataractae*	3
93	*Ameiurus natalis*	4
93	*Ictalurus punctatus*	79

***Hybognathus amarus* (age-classes):**

age-0	162
age-1	2
age-2+	1

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage **RKD17-118**
Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia.

Site Number: 13 River Mile: 114.6 02 August 2017
UTM Easting: 325263 UTM Northing: 3790442 Zone: 13 Quad: Lemitar
W.H. Brandenburg, S.L. Clark Barkalow, A.L. Fitzgerald, M.J. Chavez Effort: 493.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	16
76	*Cyprinus carpio*	12
76	*Hybognathus amarus**	760
76	*Pimephales promelas*	5
76	*Platygobio gracilis*	19
93	*Ameiurus melas*	2
93	*Ictalurus furcatus*	1
93	*Ictalurus punctatus*	44
212	*Gambusia affinis*	16
294	*Micropterus salmoides*	2

***Hybognathus amarus* (age-classes):**

age-0	758
age-1	2
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage **RKD17-117**
Rio Grande, east of Socorro, 0.5 miles upstream of Socorro Low Flow Conveyance Channel bridge and east just upstream of Socorro Wastewater Treatment Plant, Socorro.

Site Number: 14 River Mile: 99.5 02 August 2017
UTM Easting: 327097 UTM Northing: 3771043 Zone: 13 Quad: Loma de las Canas
W.H. Brandenburg, S.L. Clark Barkalow, A.L. Fitzgerald, M.J. Chavez Effort: 560.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	2
76	*Cyprinus carpio*	3
76	*Hybognathus amarus**	1686
76	*Pimephales promelas*	4
76	*Platygobio gracilis*	114
93	*Ictalurus furcatus*	3
93	*Ictalurus punctatus*	35
212	*Gambusia affinis*	12

***Hybognathus amarus* (age-classes):**

age-0	1686
age-1	
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage **RKD17-116**
Rio Grande, ca. 4.0 miles upstream of U.S. 380 bridge crossing.

Site Number: 15 River Mile: 91.7 02 August 2017
UTM Easting: 328140 UTM Northing: 3761283 Zone: 13 Quad: San Antonio
W.H. Brandenburg, S.L. Clark Barkalow, A.L. Fitzgerald, M.J. Chavez Effort: 558.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	44
76	*Cyprinus carpio*	4
76	*Hybognathus amarus**	181
76	*Platygobio gracilis*	249
93	*Ictalurus punctatus*	70
212	*Gambusia affinis*	44
294	*Micropterus salmoides*	1

***Hybognathus amarus* (age-classes):**

age-0	173
age-1	8
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage **RKD17-115**
Rio Grande, at US HWY 380 bridge crossing, San Antonio.

Site Number: 16 River Mile: 87.1 01 August 2017
UTM Easting: 328914 UTM Northing: 3754471 Zone: 13 Quad: San Antonio
J.L. Kennedy, A.L. Fitzgerald, S.L. Clark Barkalow, M.J. Chavez Effort: 492.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	1
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	105
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	2
81	*Carpiodes carpio*	16
93	*Ictalurus furcatus*	4
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	18

***Hybognathus amarus* (age-classes):**

age-0	105
age-1	
age-2+	

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage **RKD17-114**
Rio Grande, directly east of Bosque del Apache National Wildlife Refuge Headquarters.

Site Number: 17 River Mile: 79.1 01 August 2017
UTM Easting: 327055 UTM Northing: 3740839 Zone: 13 Quad: San Antonio SE
J.L. Kennedy, A.L. Fitzgerald, S.L. Clark Barkalow, M.J. Chavez Effort: 423.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	1
76	*Hybognathus amarus**	1
81	*Carpiodes carpio*	1

***Hybognathus amarus* (age-classes):**

age-0	1
age-1	
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage **RKD17-113**
Rio Grande, at San Marcial Railroad Bridge, San Marcial.

Site Number: 18 River Mile: 68.6 01 August 2017
UTM Easting: 315284 UTM Northing: 3728347 Zone: 13 Quad: San Marcial
J.L. Kennedy, A.L. Fitzgerald, S.L. Clark Barkalow, M.J. Chavez Effort: 518.8 sq. m

FAMILY		N
69	*Dorosoma cepedianum*	3
76	*Cyprinella lutrensis*	254
76	*Cyprinus carpio*	23
76	*Hybognathus amarus**	90
76	*Platygobio gracilis*	11
81	*Carpiodes carpio*	1
93	*Ictalurus furcatus*	16
212	*Gambusia affinis*	13
294	*Pomoxis annularis*	5

***Hybognathus amarus* (age-classes):**

age-0	88
age-1	2
age-2+	

Rio Grande Silvery Minnow Population Monitoring
August 2017

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage **RKD17-112**
Rio Grande, ca. 8 miles downstream of the San Marcial railroad bridge crossing

Site Number: 19 River Mile: 60.5 01 August 2017
UTM Easting: 309487 UTM Northing: 3718178 Zone: 13 Quad: Paraje Well
J.L. Kennedy, A.L. Fitzgerald, S.L. Clark Barkalow, M.J. Chavez Effort: 559.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	8
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	26
81	*Carpiodes carpio*	3
212	*Gambusia affinis*	7
294	*Pomoxis annularis*	1

***Hybognathus amarus* (age-classes):**

age-0	26
age-1	
age-2+	

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage **RKD17-111**
Rio Grande, ca. 10 mi downstream of the San Marcial railroad bridge crossing

Site Number: 20 River Mile: 58.8 01 August 2017
UTM Easting: 307846 UTM Northing: 3716150 Zone: 13 Quad: Paraje Well
J.L. Kennedy, A.L. Fitzgerald, S.L. Clark Barkalow, M.J. Chavez Effort: 566.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	61
76	*Cyprinus carpio*	13
76	*Hybognathus amarus**	5
76	*Pimephales promelas*	1
212	*Gambusia affinis*	44
294	*Pomoxis annularis*	1

***Hybognathus amarus* (age-classes):**

age-0	5
age-1	
age-2+	