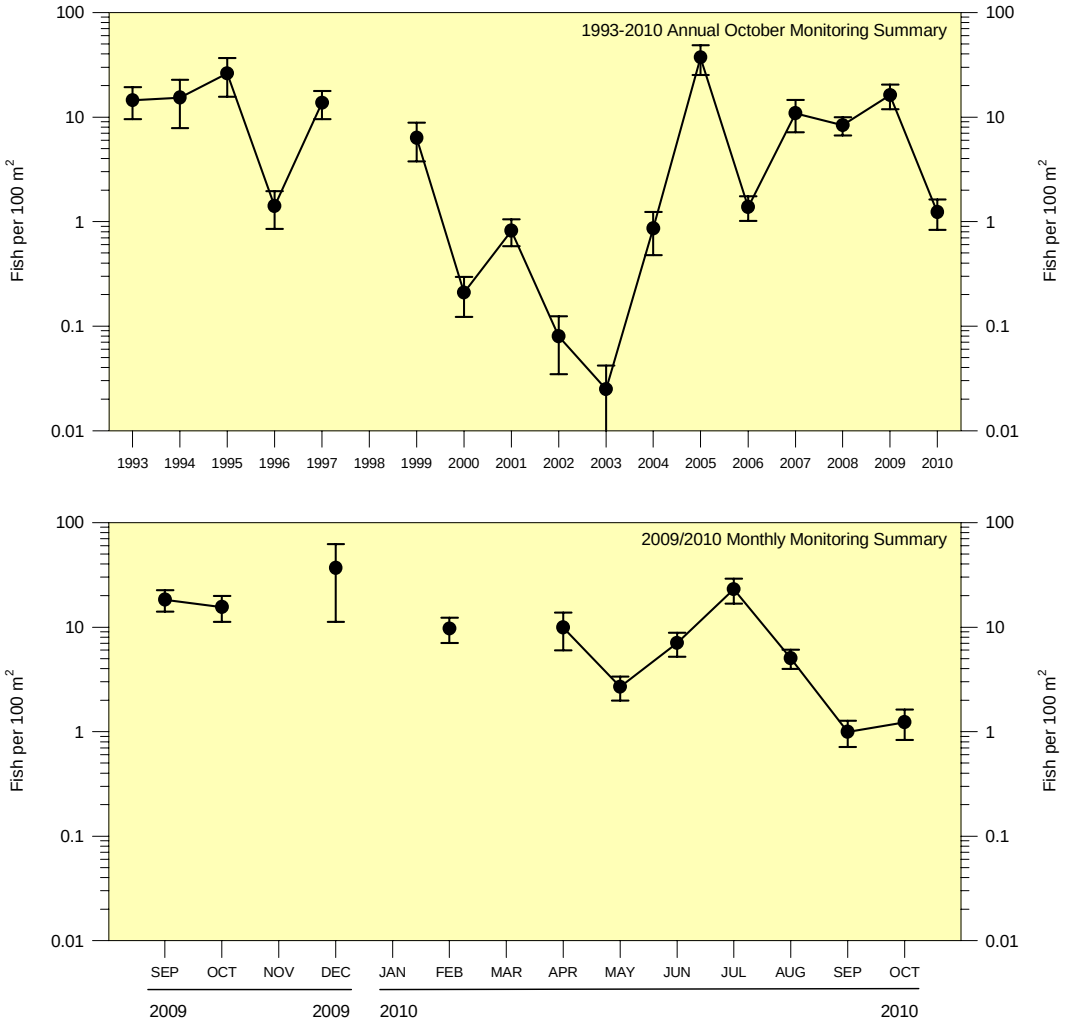
RIO GRANDE SILVERY MINNOW
POPULATION MONITORING PROGRAM RESULTS FROM
SEPTEMBER 2009 TO OCTOBER 2010

FINAL

A Middle Rio Grande Endangered Species Act
Collaborative Program Funded Research Project



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30 June 2011

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Funded through the Middle Rio Grande Endangered Species Act Collaborative Program.

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EXECUTIVE SUMMARY

Population data on Rio Grande silvery minnow and the associated ichthyofaunal community in the Middle Rio Grande (Rio Grande between Velarde, New Mexico and Elephant Butte Reservoir) have been gathered systematically since 1993. The primary objective of the September 2009 to October 2010 sampling activities was to monitor temporal trends in the abundance of Rio Grande silvery minnow at twenty sites throughout the Middle Rio Grande. Additional objectives included evaluating the influence of discharge patterns on population fluctuations, determining general habitat use patterns, documenting changes in relative abundance among fish species over time, and determining site-specific sampling variation. Seasonal and spatial differences in population structure and abundance of native and nonnative Middle Rio Grande fishes were also examined.

Rio Grande silvery minnow was collected in low numbers at the 20 sampling sites during October 2010 (N=137; 12,080.2 m^2). This species comprised 3.5% of the total catch and was present in 63 of the 299 (21.1%) seine hauls that yielded any fish. Rio Grande silvery minnow was present at 15 of 20 localities. The October cumulative catch of Rio Grande silvery minnow was composed mostly of individuals from the San Acacia Reach with the lowest numbers in the Angostura Reach.

Rio Grande silvery minnow October densities (1993-1997, 1999-2010) were significantly different among sampling years (df=16, F=18.11, p=<0.0001) with the highest densities in 2005 and the lowest densities in 2003. Population monitoring efforts demonstrated that Rio Grande silvery minnow density in October was significantly lower (p<0.05) in 2010 than in recent years (e.g., 2007, 2008, and 2009) but that it was significantly higher (p<0.05) than in 2002 and 2003. In October 2010, the San Acacia Reach yielded the highest density of Rio Grande silvery minnow and the lowest density of this species was observed in the Angostura Reach.

Linear regression analyses of October densities of Rio Grande silvery minnow from 1993-1997, 1999-2010 revealed numerous significant associations (p<0.01) with hydraulic variables. The relationships that explained the most variation in mean density were number of days with discharge >2,000 cfs or >3,000 cfs (74% and 78%, respectively), as measured at the Albuquerque gauge. October densities of Rio Grande silvery minnow also increased significantly with delayed onset of low flows and increased mean daily discharge (as measured at the San Marcial gauge). There were also significant negative relationships between Rio Grande silvery minnow densities and number of days with discharge below a certain threshold value (i.e., <200 and <100 cfs), as measured at the San Marcial gauge.

The overall distribution of sampled mesohabitats did not differ notably among the three fragmented river reaches. The actual habitats occupied by Rio Grande silvery minnow were diverse and included all of the habitats sampled. Habitats most frequently used by Rio Grande silvery minnow (relative to those sampled) included pools, shoreline pools, and shoreline runs.

The native ichthyofauna consisted of ten species (red shiner, Rio Grande silvery minnow, fathead minnow, flathead chub, longnose dace, river carpsucker, smallmouth buffalo, blue catfish, flathead catfish, and bluegill). Red shiner was the most abundant native species collected (N=23,638), followed by Rio Grande silvery minnow (N=13,856), flathead chub (N=2,628), river carpsucker (N=685), and fathead minnow (N=653). The most abundant introduced species were western mosquitofish (N=3,726), channel catfish (N=1,703), white sucker (N=1,237), and common carp (N=450).

Rio Grande silvery minnow had declined from being the 7th most common focal species in 2001 to being the least common focal species (10th) in 2002-2003. While the rank abundance of Rio Grande silvery minnow increased notably from 2003 (10th) to 2007-2009 (2nd), it dropped precipitously in 2010 (5th). The coefficient of concordance (W=0.70) for focal species indicated high overall agreement in ranks (X^2=63.1; p<0.001) over time (2001-2010) despite notable changes in ranks for some taxa (e.g., Rio Grande silvery minnow and river carpsucker).

Density of all species increased during spring or summer. Rio Grande silvery minnow abundance in samples peaked in July and then slowly declined until September. Common carp and fathead minnow also peaked in abundance during July. The highest densities of red shiner were recorded from May through July although the abundance of this taxon was relatively high throughout the year. An accounting of species-specific temporal abundance revealed similar trends and documented the seasonal presence of certain taxa (e.g., gizzard shad and walleye).

Besides temporal variation in the relative abundance of fish species within the community, there were also longitudinal changes in the densities of species among reaches. Flathead chub, longnose dace, and white sucker were most common in the Angostura Reach. Red shiner, common carp, Rio Grande silvery minnow, fathead minnow, river carpsucker, channel catfish, and western mosquitofish were most common in the Isleta Reach. Rio Grande silvery minnow was more common in the Isleta and San Acacia reaches as compared to the Angostura Reach.

An analysis of sampling variation for the entire study area (20 sites combined) over a four day period in November revealed that the overall estimate for this species was 0.17 in 2009 and 0.13 in 2010. Also, the exclusion of a single outlying value (e.g., one site on one day) was found to reduce sampling variation estimates to 0.07 in 2009 and to 0.03 in 2010. It appears that the Population Monitoring Program sampling protocols are adequate to achieve a relatively high degree of sampling precision, especially when considering the substantial changes in Rio Grande silvery minnow abundance among years. While the current sampling methodology appears to provide robust trend estimates of Rio Grande silvery minnow abundance over time, additional sampling variation data from future years (particularly during periods of extremely low abundance) will be required to adequately address the validity of this assumption.

The dramatic increases and decreases in the abundance of Rio Grande silvery minnow over the past two decades appear to be closely related to the timing, magnitude, and duration of flows during spring and summer. The physical conditions produced by prolonged and elevated flows result in overbank flooding of vegetated areas, formation of inundated habitats within the river channel, and creation of shoreline and island backwaters. These conditions combined with the delayed onset of low flows following spring runoff appear to help ensure the successful recruitment of Rio Grande silvery minnow by prolonging the persistence of warm and productive inundated habitats required by larval fishes to complete their early life history. However, there has been extensive abandonment of the floodplain, river channelization, and habitat degradation across large portions of the Middle Rio Grande, which likely limits the available habitat for the successful recruitment of Rio Grande silvery minnow. Further, prolonged low flows and river intermittency likely threaten all life stages in a variety of ways (e.g., desiccation, reduced resource availability, stress).

Other threats to the long-term persistence of Rio Grande silvery minnow include river fragmentation, intraspecific and interspecific competition/predation, poor water quality, and limited genetic diversity (i.e., low effective population size). In years with poor spawning/recruitment conditions, these and other issues are likely to directly and indirectly act in concert to manifest in the decline of Rio Grande silvery minnow. When developing strategies to help stabilize and enhance populations of Rio Grande silvery minnow it will be important to consider the synergistic effect of all threats rather than focusing exclusively on single factors.

Future study of the ecological interactions among fish species and their environment in the Middle Rio Grande should further elucidate the factors that control this complex aquatic ecosystem, which will be essential in providing the information required to develop successful management strategies. While recent strategies (e.g., stocking, salvage, LFCC pumping etc.) are essential to prevent short-term catastrophic population declines, a renewed focus on issues that could lead to self-sustaining populations of Rio Grande silvery minnow in the wild (e.g., natural flow regime, river connectivity, functional floodplains etc.) will assist in achieving the ultimate goal of long-term recovery.

INTRODUCTION

Population data on Rio Grande silvery minnow and the associated ichthyofaunal community in the Middle Rio Grande (Rio Grande between Velarde, New Mexico and Elephant Butte Reservoir) have been gathered since 1987. The first studies were conducted by Platania (1993a) from 1987-1992 to determine spatial and temporal changes in the Middle Rio Grande ichthyofaunal community and to provide resolution of species-specific habitat use patterns. An additional purpose of those preliminary studies was to provide information on the conservation status of Rio Grande silvery minnow. Sampling efforts during 1989-1990 revealed that Rio Grande silvery minnow population numbers had declined markedly since 1987-1988 (Platania, 1993a). Based on previous samples, reduced numbers of individuals indicated a rapid decline of this species in its already reduced range. The 90-95% reduction in the range of Rio Grande silvery minnow and threats to its continued persistence in the Middle Rio Grande were central to this species being listed as endangered by the U.S. Fish and Wildlife Service (U.S. Department of Interior, 1994).

From 1992 until the present, the U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, New Mexico Department of Game and Fish, and U.S. Army Corps of Engineers have cooperated to fund numerous studies of the Middle Rio Grande ichthyofauna. Among those studies was the long-term systematic monitoring of the Middle Rio Grande fish community at numerous sites between Angostura Diversion Dam and Elephant Butte Reservoir (initiated in 1993). Population monitoring efforts have documented wide fluctuations (i.e., order of magnitude increases and decreases) in the abundance of Rio Grande silvery minnow over the past two decades. The abundance of this species has generally decreased during years with low spring discharge combined with prolonged summer low-flow/drying conditions, but has generally increased following years with extended high spring flows and minimal summer low-flow/drying conditions (Dudley and Platania, 2009). While Rio Grande silvery minnow was the focus of monitoring efforts and subsequent hypothesis testing, research activities also provided information about the associated Middle Rio Grande fish community.

The primary objective of the September 2009 to October 2010 sampling activities was to monitor temporal trends in the abundance of Rio Grande silvery minnow at numerous sites throughout the Middle Rio Grande. Additional objectives included evaluating the influence of discharge patterns on population fluctuations, determining general habitat use patterns, documenting changes in relative abundance among fish species over time, and determining site-specific sampling variation. Seasonal and spatial differences in population structure and abundance of native and nonnative Middle Rio Grande fishes were also examined. This study should aid natural resource managers in obtaining a more thorough understanding of the factors that influence the conservation status and population dynamics of Rio Grande silvery minnow, both of which are important components for the recovery of this species.

STUDY AREA

The headwaters of the Rio Grande are located in the San Juan Mountains of southern Colorado. The mainstem Rio Grande flows 750 km through New Mexico, draining an area of about 68,104 km^2 (excluding closed basins). The Rio Chama is the only major perennial tributary of the Rio Grande in New Mexico and confluences with it near the city of Española. Snowmelt from southern Colorado and northern New Mexico yields the majority of water for the Rio Grande, but transmontane diversions from the San Juan River (Colorado River Basin) supplement flow by providing water in route to downstream agricultural users and municipalities. The highest flow in the Rio Grande generally occurs shortly after spring snowmelt, while the lowest flow usually occurs in late summer and early autumn prior to the cessation of irrigation season (October 31). Summer thunderstorms

periodically augment low flow in discrete reaches, but do not ensure that the river channel will remain wetted. Precipitation in the region is low, averaging <25 cm/year (Gold and Denis, 1985).

Several large dams on the Rios Chama and Grande and numerous smaller irrigation diversion dams regulate flow in the Middle Rio Grande. A complex system of ditches, drains, and conveyance channels provides water for extensive irrigated agriculture in the Rio Grande Valley. Cochiti Dam is the primary flood control structure that regulates discharge in the mainstem Middle Rio Grande. The Middle Rio Grande has been greatly modified over the last 50 years; this has led to degradation, armoring, and narrowing of the river channel and abandonment of the floodplain in various portions of the overall reach (Lagasse, 1980; Massong et al., 2006).

The Middle Rio Grande is defined as the reach between Velarde, New Mexico and Elephant Butte Reservoir. The study area (Figure 1) is a portion of the Middle Rio Grande, from Angostura Diversion Dam to the inflow of Elephant Butte Reservoir, that encompasses most of the current range of Rio Grande silvery minnow (i.e., below Cochiti Dam [although additional study is required to determine if Rio Grande silvery minnow still persist upstream of Angostura Diversion Dam] to the inflow of Elephant Butte Reservoir). The Cochiti Reach of the Rio Grande (between Cochiti Dam and Angostura Diversion Dam) passes first through Cochiti Pueblo, then Santo Domingo Pueblo, and finally San Felipe Pueblo. Access is currently restricted or unreliable in the Cochiti Reach, precluding long-term fish monitoring in this area. The last comprehensive ichthyofaunal surveys of the Rio Grande in the Cochiti Reach documented the presence, at low abundance, of Rio Grande silvery minnow on Santo Domingo and San Felipe pueblos (Platania, 1995). Rio Grande silvery minnow was not found within the boundaries of Cochiti Pueblo during similar surveys (Platania, 1993b).

Sampling localities were located from Angostura Diversion Dam to just upstream of Elephant Butte Reservoir. Most of the sampling localities were selected from a list of nearly 100 Middle Rio Grande sites, which were sampled from 1987 to 1992 (Platania, 1993a); these localities have been sampled consistently since 1993. Site locations were chosen based on spatial distribution, site accessibility, relative permanence of flow (or deep pools during drought), and the presence of adequate instream habitat. While most sites have been consistently monitored over time, several localities have been added (e.g., to increase the spatial coverage within and among reaches) or removed (e.g., loss of consistent land access) over the past decade.

Reach names were derived from the diversion structure at the upper portion of the reach. The Angostura Reach (Angostura Diversion Dam to Isleta Diversion Dam) had five sampling sites and the Isleta Reach (Isleta Diversion Dam to San Acacia Diversion Dam) had six sampling sites. There were nine sampling sites in the San Acacia Reach (San Acacia Diversion Dam to inflow of Elephant Butte Reservoir). The 20 sampling sites in the Middle Rio Grande (Appendix A, Table A-1) overlap the current documented range of Rio Grande silvery minnow.

Diel and seasonal discharge varied greatly during 2009 and 2010, especially in southern reaches of the Middle Rio Grande (Figure 2). There was a general trend of lower flow at downstream locations (e.g., U.S. Geological Survey (USGS) San Acacia Gauge [#08354900] and USGS San Marcial Gauge [#08358400]) compared to upstream locations (e.g., USGS Albuquerque Gauge [#08330000]). Mean annual discharge in the southern reaches was lower in 2010 as compared to 2009. From April 2010 until June 2010, flows were elevated and variable. Flow conditions in 2009 and 2010 included periodic intervals of very low discharge from July through October. Summer rains contributed periodic flow to the river in 2009 and 2010 with the exception of occasional pulses. As compared with the historical spring runoff (based on mean daily discharge values from 1973 [Cochiti Dam operational] to 2010), the timing of this event was early in both 2009 and 2010, the flow magnitude was relatively high in both years (especially in 2009), and the duration was truncated (especially in 2010). Summer flows in both 2009 and 2010 were relatively low over an extended period (especially in 2010) as compared with the historical flows (based on mean daily discharge values from 1973 [Cochiti Dam operational] to 2010).

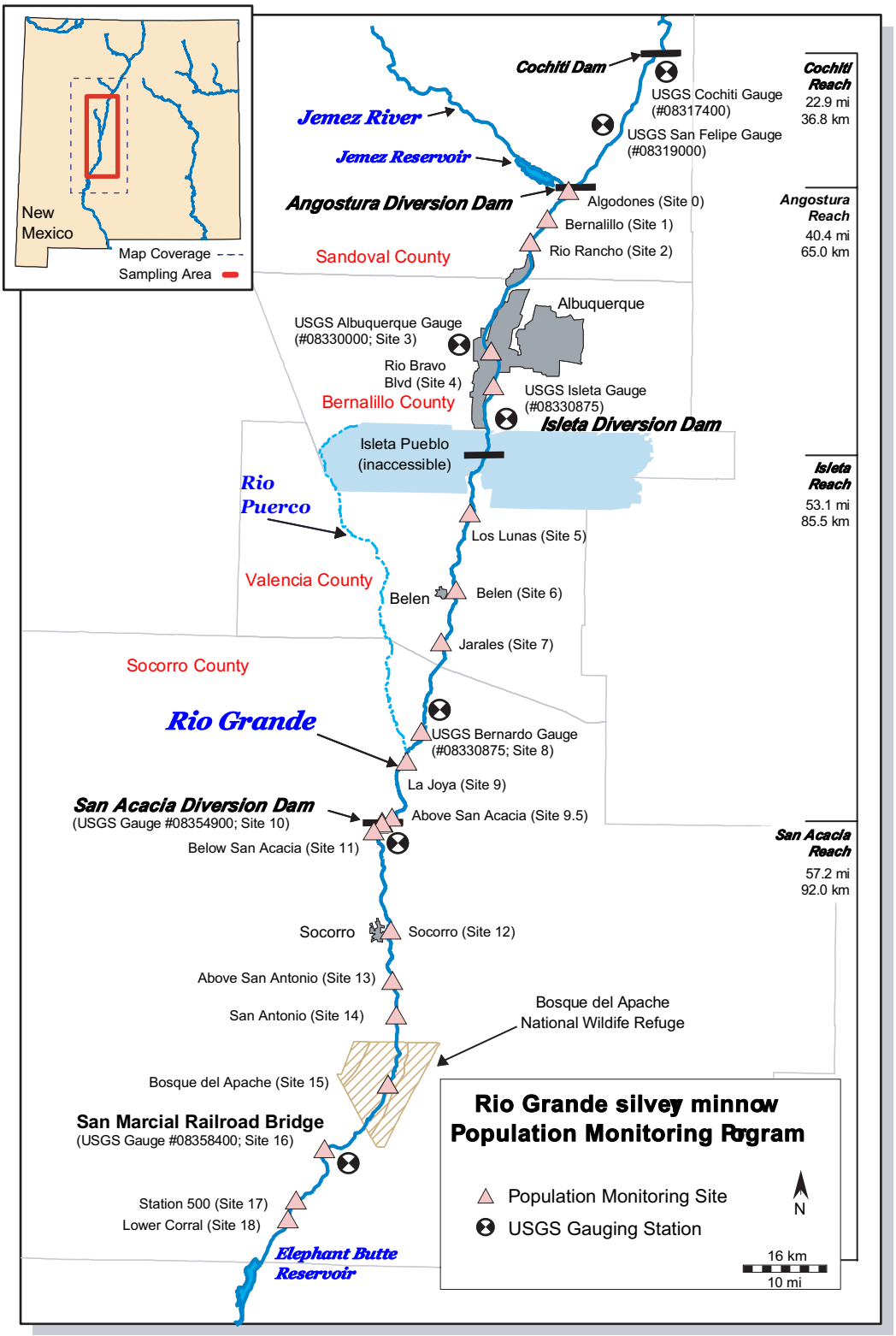

Figure 1. Map of the study area and sampling localities (numbered) for the September 2009 to October 2010 Rio Grande silvery minnow population monitoring program. Sampling locality information is provided in Appendix A (Table A-1).

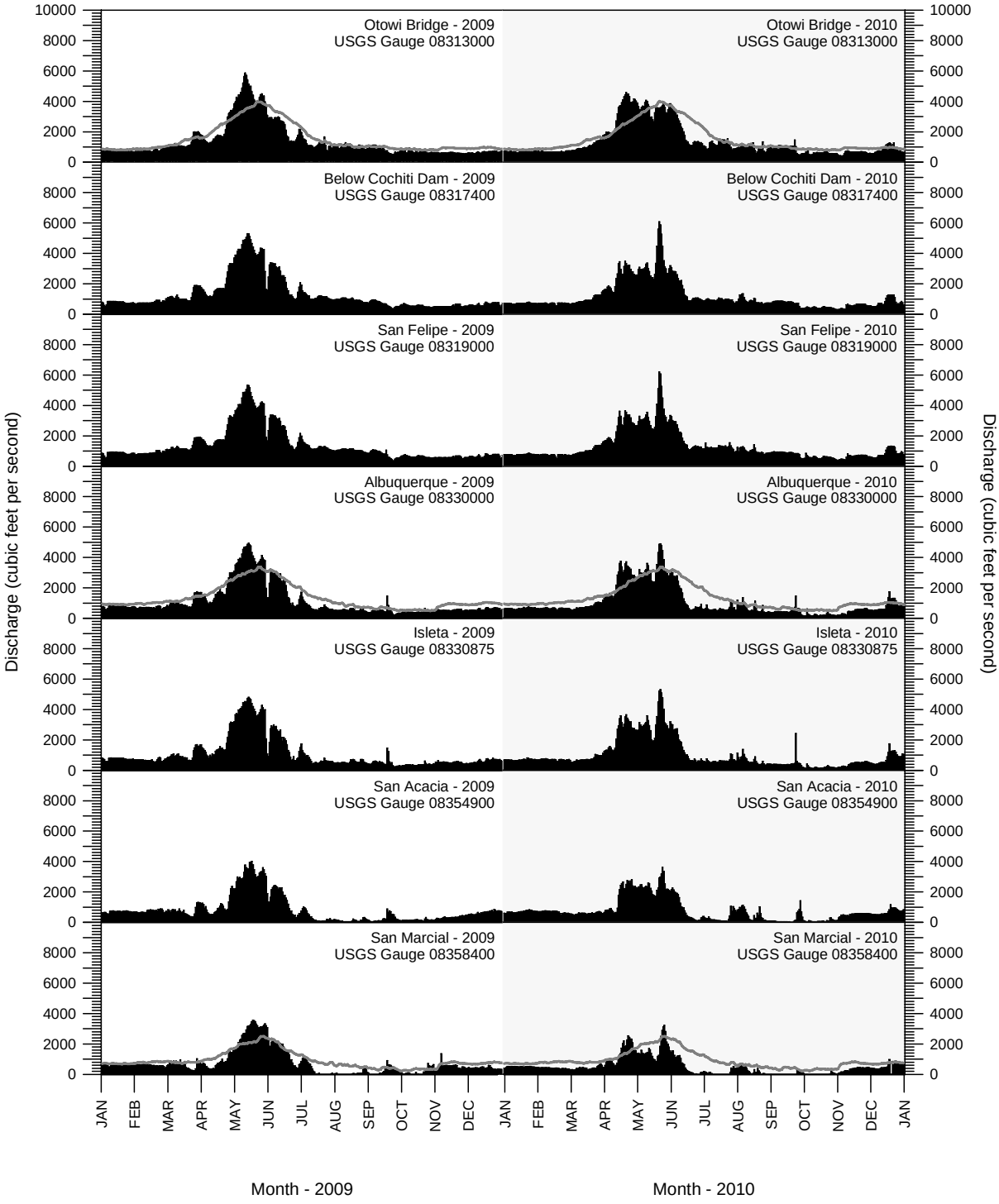

Figure 2. Discharge in the Rio Grande from January 2009 through December 2010 as recorded at seven U. S. Geological Survey (USGS) gauge stations. Solid gray lines are historical mean daily discharge values (from 1973 [Cochiti Dam operational] through 2010) from the upper, middle, and lower portions of the study area. Discharge data are provisional and subject to change.

METHODS

This investigation was structured to monitor the population of Rio Grande silvery minnow and the associated fish community in the study area over time. Monthly sampling efforts allowed for determination of general spatial and temporal changes in population structure and species abundance. Sampling was conducted at 20 sites in September 2009, October 2009, December 2009, February 2010, and monthly from April 2010 to October 2010. Additional intensive sampling was conducted during November (2009 and 2010) for characterizing sampling variation at each of the 20 sites. For the intensive sampling effort, sites were sampled once per day, using regular population monitoring sampling protocols, for four days (N=80 samples). Samples were taken at the same or similar mesohabitat locations on subsequent days.

Fish were collected by rapidly drawing a two-person 3.1 m x 1.8 m small mesh (ca. 5 mm) seine through 18 (April to October) to 20 (December and February) discrete mesohabitats (usually <15 m). Runs, pools, and shoreline pools were sampled four times at each site (when available); backwaters and riffles were sampled two times (when available); any remaining samples (to obtain a total of 18 to 20) were taken in shoreline runs. From April to October, a 1.0 m x 1.0 m fine mesh (ca. 1.5 mm) seine was used to selectively sample shallow low velocity habitats for larval fish (two samples). Mesohabitats with similar conditions (i.e., not exceeding reasonable depths/velocities for efficient seining) were sampled to ensure relatively static capture efficiencies regardless of flow. Density or catch-per-unit-effort (CPUE) was calculated for each species and each collection as the number of individuals collected per 100 m^2 (surface area) of water sampled (CPUE= #/100 m^2). Effort was calculated by multiplying the seine width during sampling (regular=2.5 m, larval=0.25 m) by the length of the seine haul. Samples obtained from isolated pools were not included in data analyses as densities in these confined habitats were artificially elevated. Prior to release, all Rio Grande silvery minnow collected were examined for Visible Implant Elastomer (VIE) tags (=stocked fish), identified to age-class (based on standard length and past length-frequency histograms during the same time of year [unpubl. data, U.S. Fish and Wildlife Service, 2010]), and measured (standard length range). Selected water quality parameters (temperature, conductivity, specific conductance, pH, salinity, and dissolved oxygen) were obtained at each sampling site (see Appendix B) as well as digital photographs of physical river conditions. Scientific names and common names (phylogenetic order) of fishes in this report follow Nelson et al. (2004; Table 1).

For parametric data analysis, fish CPUE data from all samples were log-transformed ($X' = \ln(X+1)$) based on low observed values and temporal heterogeneity of variance (Zar, 2010). Single-factor analysis of variance, with Tukey-Kramer HSD multiple comparison tests (Zar, 2010), was used to evaluate differences in mean catch rates of Rio Grande silvery minnow among years. Kendall's W (Zar, 2010) was used to test for the degree of concordance among the annual rank abundance of species (including Rio Grande silvery minnow) over time. Linear regression modeling was used to determine the strength of the relationships among autumnal Rio Grande silvery minnow densities (1993-1997, 1999-2010) and hydraulic variables (e.g., peak discharge and days > or < a threshold discharge value). Maximum discharge and days exceeding threshold discharge values in 1,000 cfs increments (days>1,000, 2,000, 3,000, 4,000, and 5,000 cubic feet per second, cfs) represented the general range of spring runoff conditions (May-June). The onset of lower flows (<200 cfs), mean daily discharge, and the lower threshold discharge values (e.g., days<200 and <100 cfs) represented the general characteristics of low flow conditions during irrigation season (March through October). A negative or positive trend in population abundance was defined as occurring when the slope of the regression was significantly different ($p<0.05$) from zero.

Site-specific sampling variation was evaluated using coefficient of variation values generated from multi-day sampling efforts at each of the 20 sites. The coefficient of variation (*CV*=ratio of the standard error to the mean, Pollack et al., 1990) was calculated for the four day sampling period. Values of *CV* were calculated for sites, reaches, and the study area.

Table 1. Scientific and common names and species codes of fish collected in the Middle Rio Grande from 1993 to 2010.

Scientific Name	Common Name	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)

Table 1. Scientific and common names and species codes of fish collected in the Middle Rio Grande from 1993 to 2010 (continued).

Scientific Name	Common Name	Code
Order Cyprinodontiformes		
Family Poeciliidae	livebearers	
Gambusia affinis	western mosquitofish [1]	(GAMAFF)
Order Perciformes		
Family Moronidae	temperate basses	
Morone chrysops	white bass	(MORCHR)
Morone saxatilis	striped bass	(MORSAX)
Order Perciformes		
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 represent the ten most commonly abundant species present in Middle Rio Grande collections; these species are illustrated in monthly plots of data.

RESULTS

Rio Grande Silvery Minnow

Population status

The September 2009 to October 2010 abundance of Rio Grande silvery minnow at reach-specific collection sites varied within and among seasons. Density of this species also varied noticeably within and among sampling reaches (Figures 3 and 4). The Isleta and San Acacia reaches generally produced the highest densities post-spawning (June-October).

Population monitoring efforts during September 2009 (9,325.9 m^2) yielded a large number of Rio Grande silvery minnow (N=1,620). This species comprised 36.8% of the total catch and was present in 201 of the 324 (62.0%) seine hauls that yielded any fish. Rio Grande silvery minnow was present at all 20 sampling localities; individuals were most abundant in the San Acacia Reach with modest numbers in the upper portions of the Angostura and Isleta reaches.

In October 2009, sampling covered 11,768.4 m^2 and Rio Grande silvery minnow (N=1,835) comprised 31.9% of the total catch. This species was present in 231 of the 333 (69.4%) seine hauls that yielded any fish. Rio Grande silvery minnow was present at 19 of 20 localities and was most abundant in the San Acacia Reach and upper portions of the Angostura and Isleta reaches.

December 2009 population monitoring efforts (10,452.8 m^2) yielded a large number of Rio Grande silvery minnow (N=4,159). This species comprised 77.7% of the total catch and was present in 198 of the 260 (76.2%) seine hauls that yielded any fish. Rio Grande silvery minnow was present at all sampling localities except Site #1. While individuals were most abundant in the Isleta Reach, this was caused primarily by the collection of a large number of Rio Grande silvery minnow from a single backwater [N = 2,980]) at Site #5.

The February 2010 cumulative catch of Rio Grande silvery minnow (N=1,068; 10,726.8 m^2) was composed mostly of individuals from the Isleta and San Acacia reaches. Overall, this species comprised 46.2% of the total catch and was present in 183 of the 235 (77.9%) seine hauls that yielded any fish. Rio Grande silvery minnow was present in samples at 18 of 20 sampling localities. Rio Grande silvery minnow density was highest in the San Acacia Reach, modest in the Isleta Reach, and lowest in the Angostura Reach.

The April 2010 sampling efforts covered 10,153.1 m^2. Rio Grande silvery minnow (N=992) was moderately abundant, comprising 27.9% of the total catch. This species was present in 173 of the 261 (66.3%) seine hauls that yielded any fish. Rio Grande silvery minnow was present in samples at 19 of 20 sampling localities. This species was most abundant in the San Acacia Reach followed by the Angostura and Isleta reaches.

During May 2010, Rio Grande silvery minnow (N=282) was infrequently captured in the 10,043.4 m^2 of water sampled. This species comprised 6.4% of the total fish catch. Rio Grande silvery minnow was present in 118 of the 292 (40.4%) seine hauls that yielded any fish. Rio Grande silvery minnow was present at 18 of 20 localities. The May cumulative catch of Rio Grande silvery minnow was composed mostly of individuals from the San Acacia Reach with lesser numbers in the Isleta and Angostura reaches.

Monitoring of Rio Grande silvery minnow during June 2010 yielded 677 individuals in 10,023.2 m^2 of aquatic habitat sampled. Rio Grande silvery minnow comprised 13.8% of the total catch. This species was present in 121 of the 302 (40.1%) seine hauls that yielded any fish. This species was collected at 18 of the 20 sampling sites. The June cumulative catch of Rio Grande silvery minnow was distributed fairly evenly among the three study reaches.

Rio Grande silvery minnow was the most abundant taxon in July 2010 (N=2,421; 10,816.8 m^2) and comprised 34.0% of the total catch. Rio Grande silvery minnow was present in 202 of the 333 (60.7%) seine hauls that yielded any fish. Rio Grande silvery minnow was collected at all 20

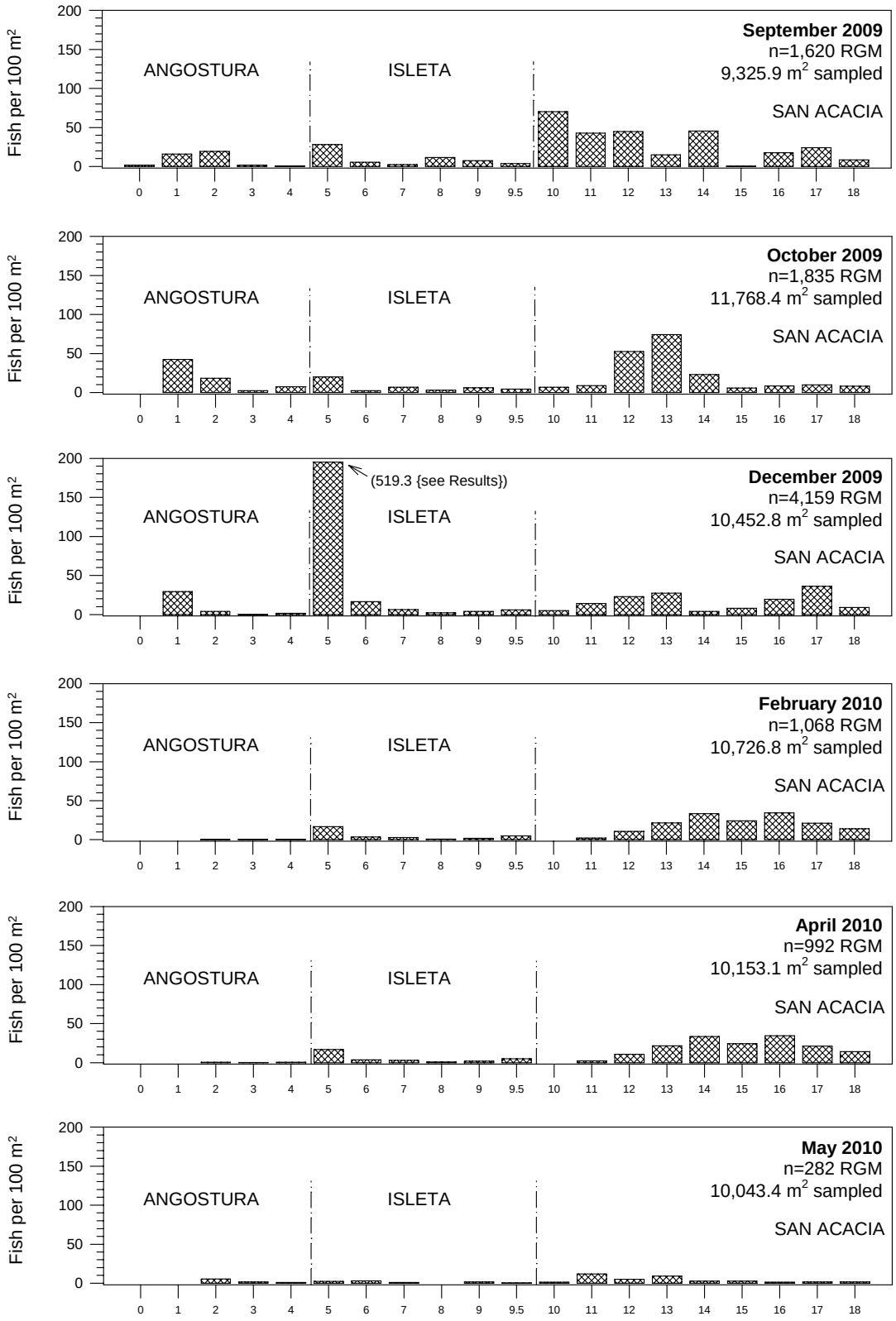

Figure 3. Rio Grande silvery minnow (RGM) densities (CPUE) from September 2009 to May 2010 for each collection locality in the Middle Rio Grande.

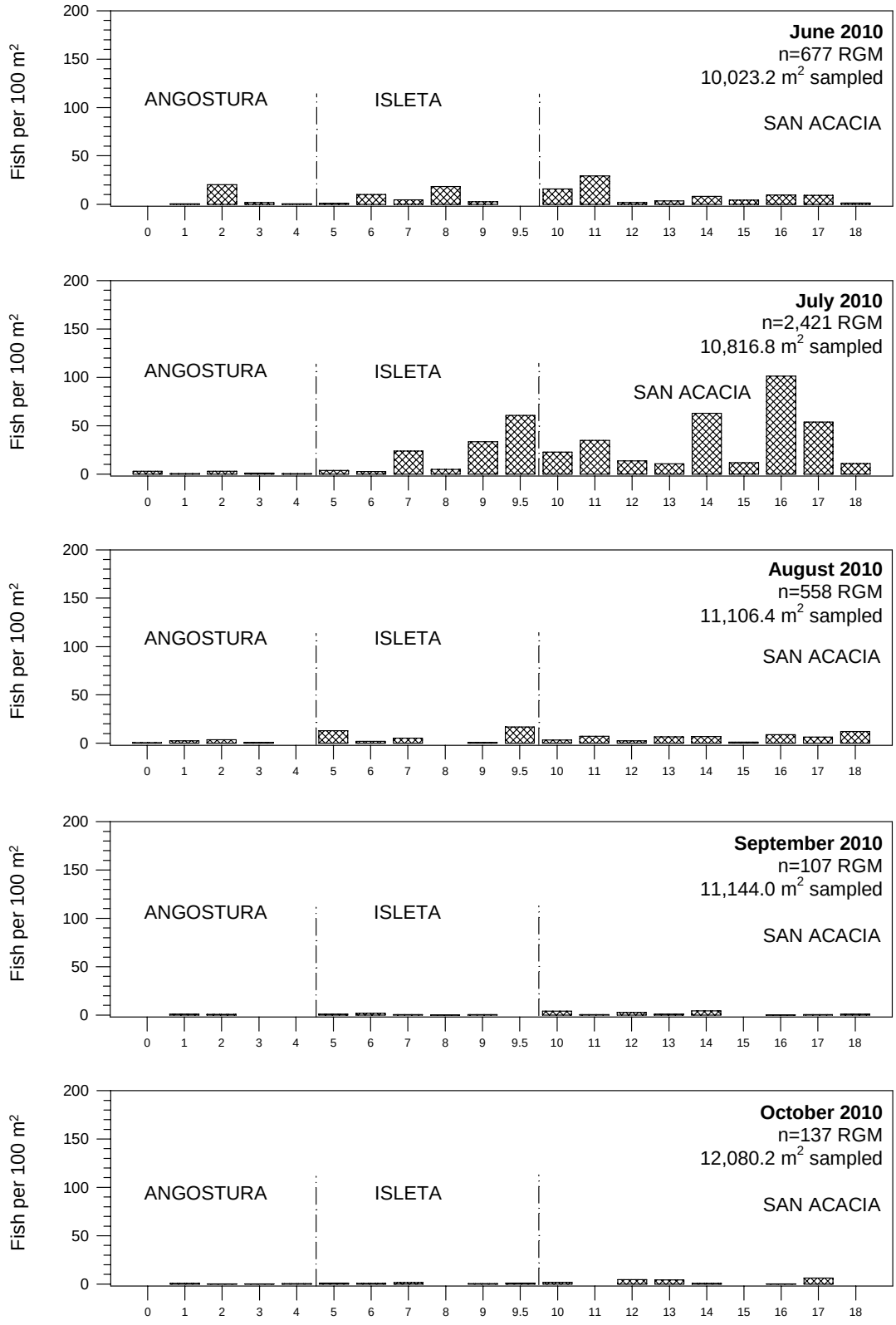

Figure 4. Rio Grande silvery minnow (RGM) densities (CPUE) from June to October 2010 for each collection locality in the Middle Rio Grande.

sampling sites. The distribution of this species was uneven; the highest densities were recorded in the Isleta and San Acacia reaches.

The August 2010 sampling effort produced a moderate number of Rio Grande silvery minnow (N=558; 11,106.4 m^2). Rio Grande silvery minnow comprised 11.5% of the total catch and was present in 132 of the 309 (42.7%) seine hauls that yielded any fish. Individuals were collected at 18 of the 20 sampling sites. The August cumulative catch of Rio Grande silvery minnow was composed mostly of individuals from the San Acacia Reach with lesser numbers in the Isleta and Angostura reaches.

Lower numbers of Rio Grande silvery minnow (N=107) were collected during September 2010, as compared to August, in the 11,144.0 m^2 (surface area) of water sampled. Rio Grande silvery minnow comprised 3.9% of the total catch. Rio Grande silvery minnow was present in 65 of the 271 (24.0%) seine hauls that yielded any fish species. Individuals were collected at 16 of the 20 sampling sites. The September cumulative catch of Rio Grande silvery minnow was composed mostly of individuals from the Isleta and San Acacia reaches.

Rio Grande silvery minnow was collected in low numbers at the 20 sampling sites during October 2010 (N=137; 12,080.2 m^2). This species comprised 3.5% of the total catch and was present in 63 of the 299 (21.1%) seine hauls that yielded any fish. Rio Grande silvery minnow was present at 15 of 20 localities. The October cumulative catch of Rio Grande silvery minnow was composed mostly of individuals from the San Acacia Reach with the lowest numbers in the Angostura Reach.

A month-by-month summary of Rio Grande silvery minnow densities provides reference to trends in relative abundance observed from September 2009 to October 2010 (Table 2). A single backwater yielded an usually large number of Rio Grande silvery minnow (N = 2,980) at site #5 during December 2009. The overall abundance of this species declined steadily during the early half of 2010. While the density of Rio Grande silvery minnow increased from April to July 2010, the abundance of this species dropped rapidly during August and September 2010.

Densities of Rio Grande silvery minnow from September 2009 to October 2010 were generally highest in the Isleta and San Acacia reaches. The San Acacia Reach yielded the most individuals (N=7,330) (Figure 5), followed by the Isleta Reach (N=5,353), and Angostura Reach (N=1,173). The abundance of Rio Grande silvery minnow was relatively high in the Isleta and San Acacia reaches by July 2010. Age-0 individuals comprised a large proportion of the catch from June through October of 2010 (Figure 6). Densities of Rio Grande silvery minnow declined over an order of magnitude from July to September.

Rio Grande silvery minnow densities in the Angostura and Isleta reaches were similar among sites over the full sampling period (Figure 7) with the exception of Site #5 and Site #15. The lowest densities of individuals in the Angostura Reach were in the upper portion of that reach. There was notable variation in densities among sites, especially within the Angostura Reach.

Population trends: 1993 to 2010

Rio Grande silvery minnow density, plotted as quarterly collections, has fluctuated dramatically over the past decade (Figure 8). While densities recorded from 2001-2004 represented a period of low abundance, more recent monitoring efforts (2007-2009) suggested an apparent rebound in the population. Rio Grande silvery minnow October densities (1993-1997, 1999-2010) were significantly different among sampling years (df=16, F=18.11, p=<0.0001) with the highest densities in 2005 and the lowest densities in 2003. Densities have declined and increased two to three orders of magnitude on several occasions within the last decade, often within the span of only two or three years. Despite seasonal fluctuations in the abundance of this species, recent samples document a stable population in 2009 but a declining population in 2010 (Figures 9 and 10). Decreases were particularly notable in the Isleta and San Acacia reaches from July to September

Table 2. Summary of the monthly catch of Rio Grande silvery minnow, by site and reach, from September 2009 to October 2010. Numerals in parenthesis*, a subset of the total catch, are the number of individuals in that sample that were marked with VIE tags (=hatchery reared [stocked] fish).

REACH Site Number Site Name	SEP	OCT	DEC	FEB	APR	MAY	JUN	JUL	AUG	SEP	OCT	TOTAL
ANGOSTURA REACH												
0 Angostura Dam	6	-	-	-	-	-	-	13	3	-	-	22
1 Bernalillo	61	204	130	-	15	-	1	3	16	6	5	441
2 Rio Rancho	70	78	19	3	142	24	96	13	19	4	2	470
3 Central Ave.	7	11	1	1	122	9	10	5	6	-	1	173
4 Rio Bravo Blvd.	3	35	8	2	9	4	1	2	-	-	3	67
Angostura Reach Total	147	328	158	6	288	37	108	36	44	10	11	1,173
ISLETA REACH												
5 Los Lunas	132	135	3,065	92	45	16	4	23	76	7	8	3,603
6 Belen	33	18	70	17	14	14	53	14	12	12	4	261
7 Jarales	15	39	33	13	21	5	20	124	18	2	9	299
8 Bernardo	53	20	11	4	29	-	75	25	-	1	-	218
9 La Joya	35	45	23	8	8	8	14	218	5	3	4	371
9.5 North of San Acacia	16	30	39	25	25	2	-	373	86	-	5	601
Isleta Reach Total	284	287	3,241	159	142	45	166	777	197	25	30	5,353
SAN ACACIA REACH												
10 San Acacia Dam	255	43	19	-	405	6	73	111	15	26	7	960
11 South of San Acacia	196	59	93	14	39	62	140	214	39	3	-	859
12 Socorro	212	400	154	60	31	24	9	79	14	14	23	1,020
13 North of San Antonio	61	392	135	130	19	60	23	59	41	8	23	951
14 San Antonio	229	147	23	165	6	12	36	317	50	10	4	999
15 South of San Antonio	2	31	40	136	12	12	20	61	7	-	-	321
16 San Marcial	80	43	94	198	16	6	48	432	48	1	2	968
17 South of San Marcial 1	112	61	155	115	24	10	49	274	38	3	37	878
18 South of San Marcial 2	42	44	47	85	10	8	5	61	65	7	-	374
San Acacia Reach Total	1,189	1,220	760	903	562	200	403	1,608	317	72	96	7,330
MONTHLY TOTALS	1,620	1,835	4,159	1,068	992	282	677	2,421	558	107	137	13,856

	SEP	OCT	DEC	FEB	APR	MAY	JUN	JUL	AUG	SEP	OCT	TOTAL

* Note: There were no VIE-tagged individuals collected from September 2009 to October 2010.

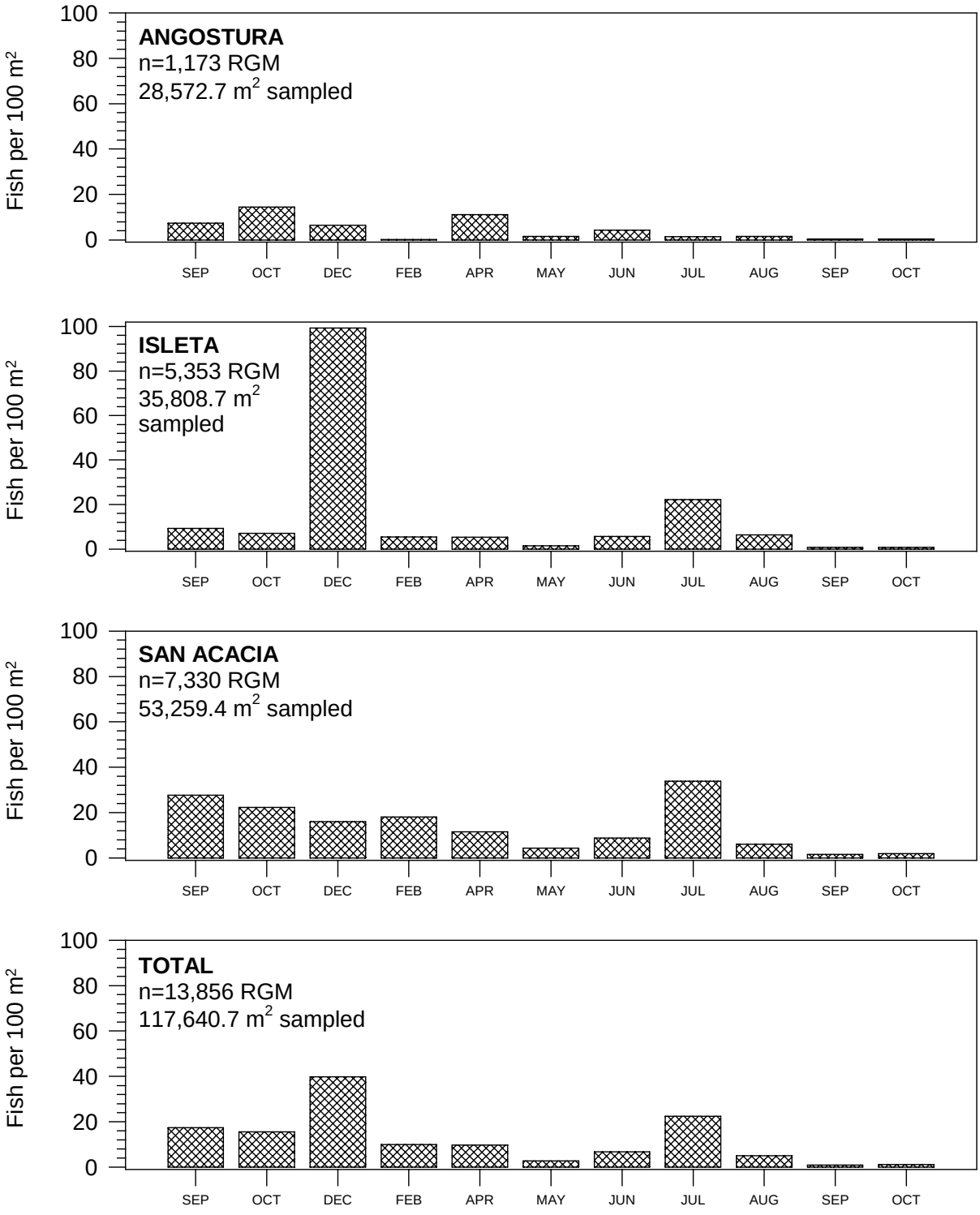

Figure 5. Rio Grande silvery minnow (RGM) densities (CPUE) by river reach for September 2009 to October 2010 samples in the Middle Rio Grande.

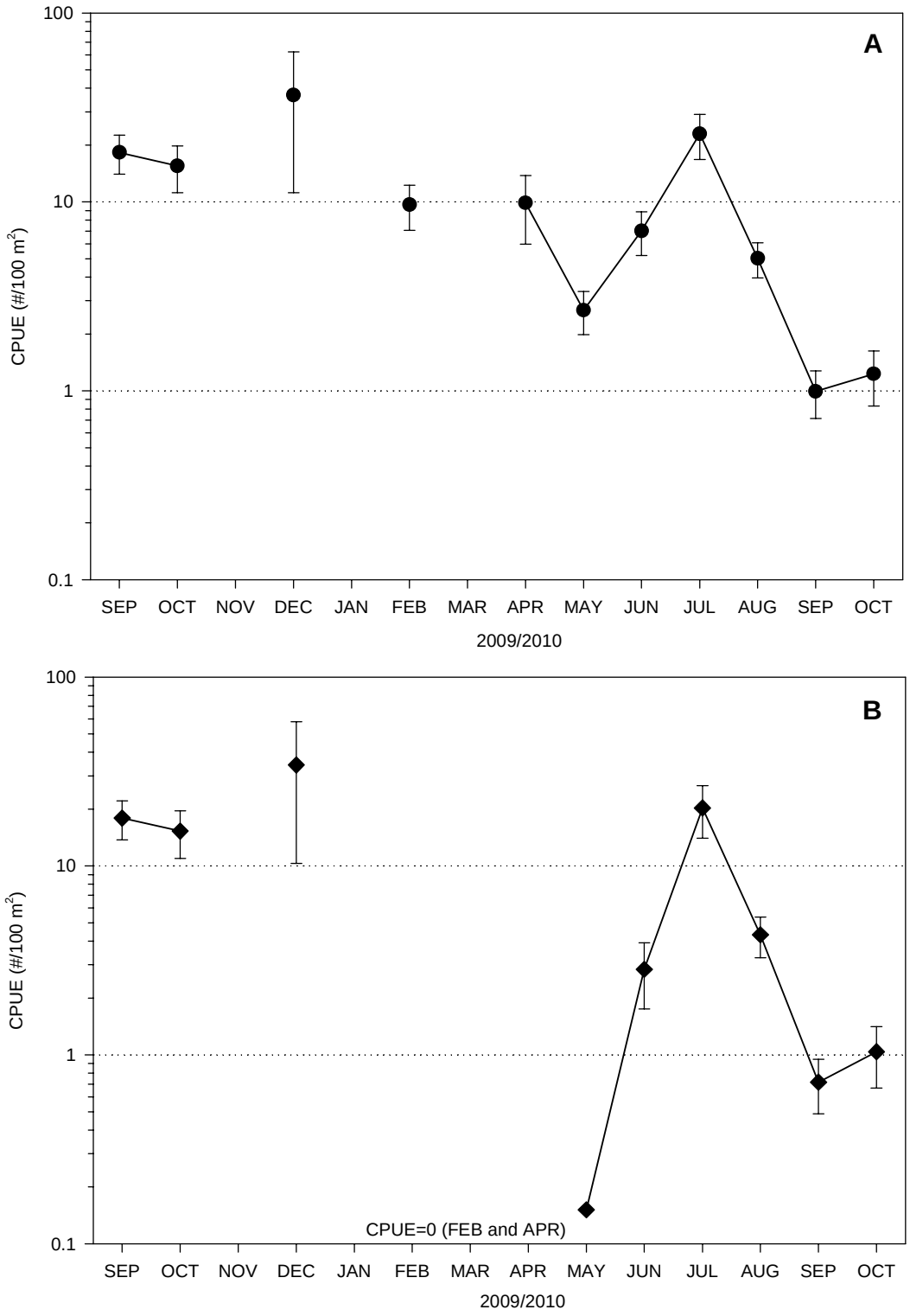

Figure 6. Inter-month fluctuations in densities of Rio Grande silvery minnow from September 2009 to October 2010 (**A**=all age-classes including age-0 [circle]; **B**=age-0 only [diamond]). Symbols represent mean value for all sites sampled (n=20); bars represent the standard error. Dotted horizontal lines represent orders of magnitude.

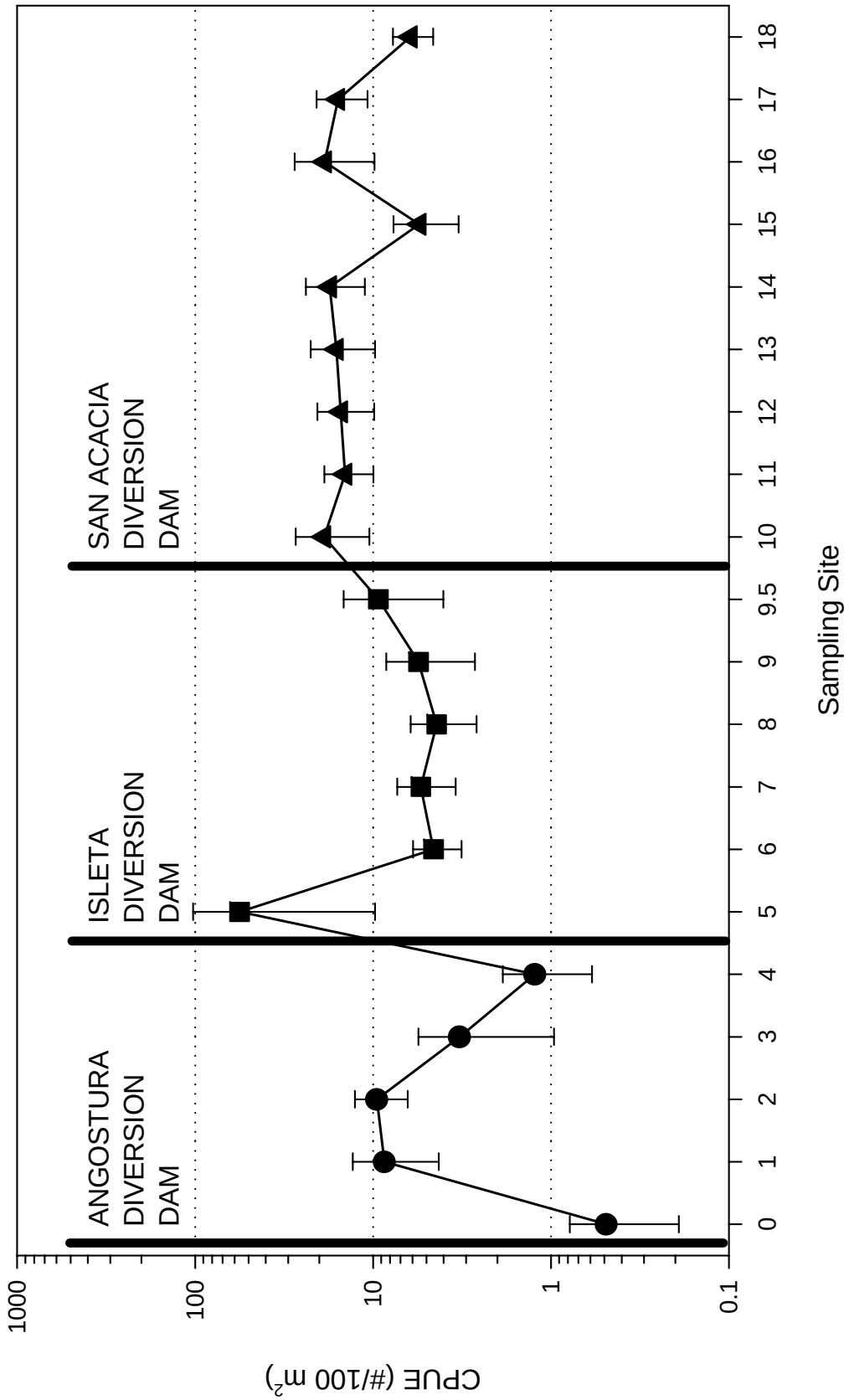

Figure 7. Inter-site comparison of Rio Grande silvery minnow densities (CPUE) by sampling locality (20 sites) and river reach (Angostura=circle, Isleta=square, San Acacia=triangle) from September 2009 to October 2010. Symbols represent mean values for all sampling months and bars represent the standard error. Dotted horizontal lines represent orders of magnitude.

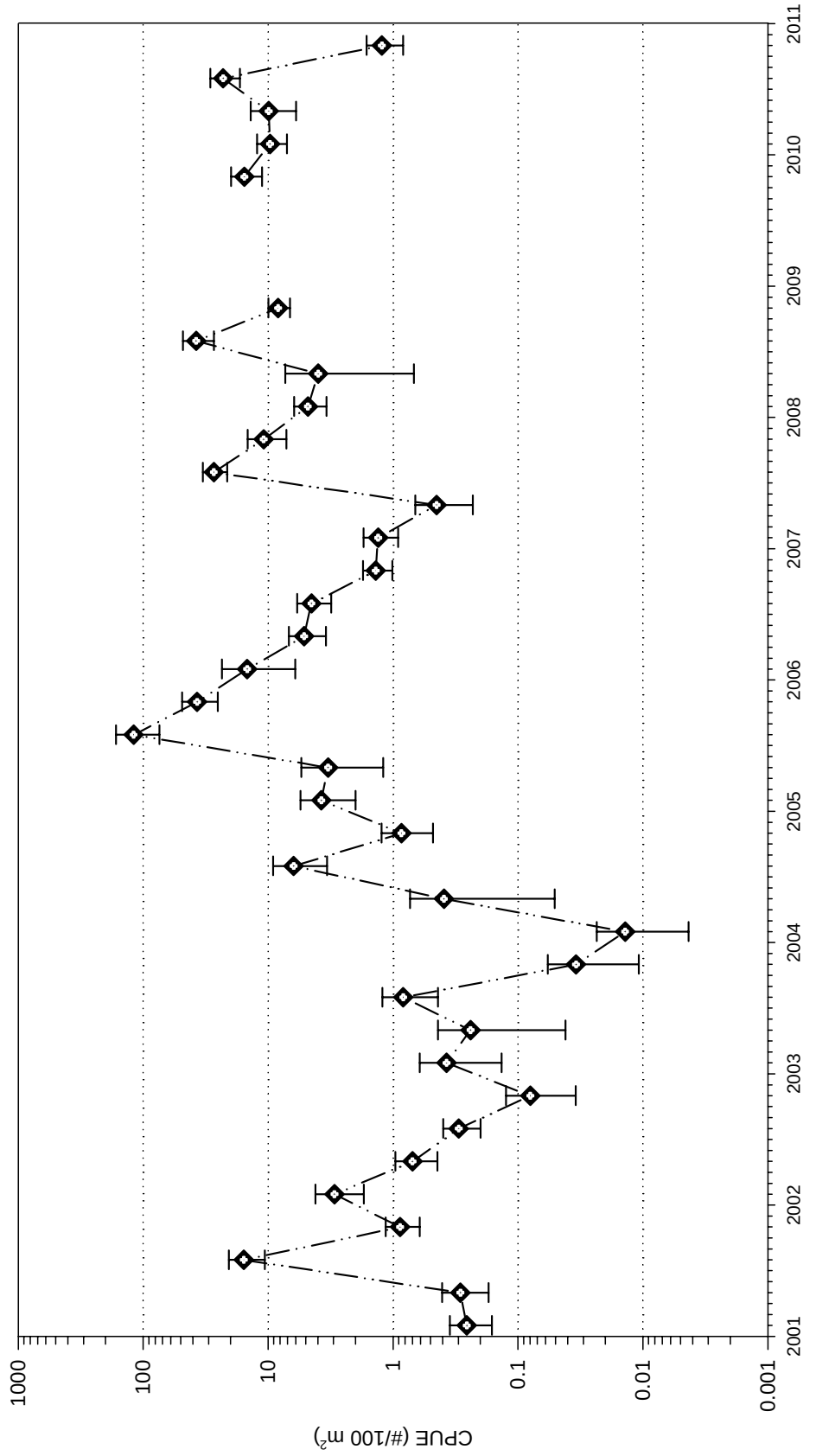

Figure 8. Time sequence of quarterly Rio Grande silvery minnow densities over the past decade (2001-2010) at population monitoring program collection sites. Hollow diamonds indicate sample means for each survey and capped-bars represent the standard error. Dotted horizontal lines represent orders of magnitude.

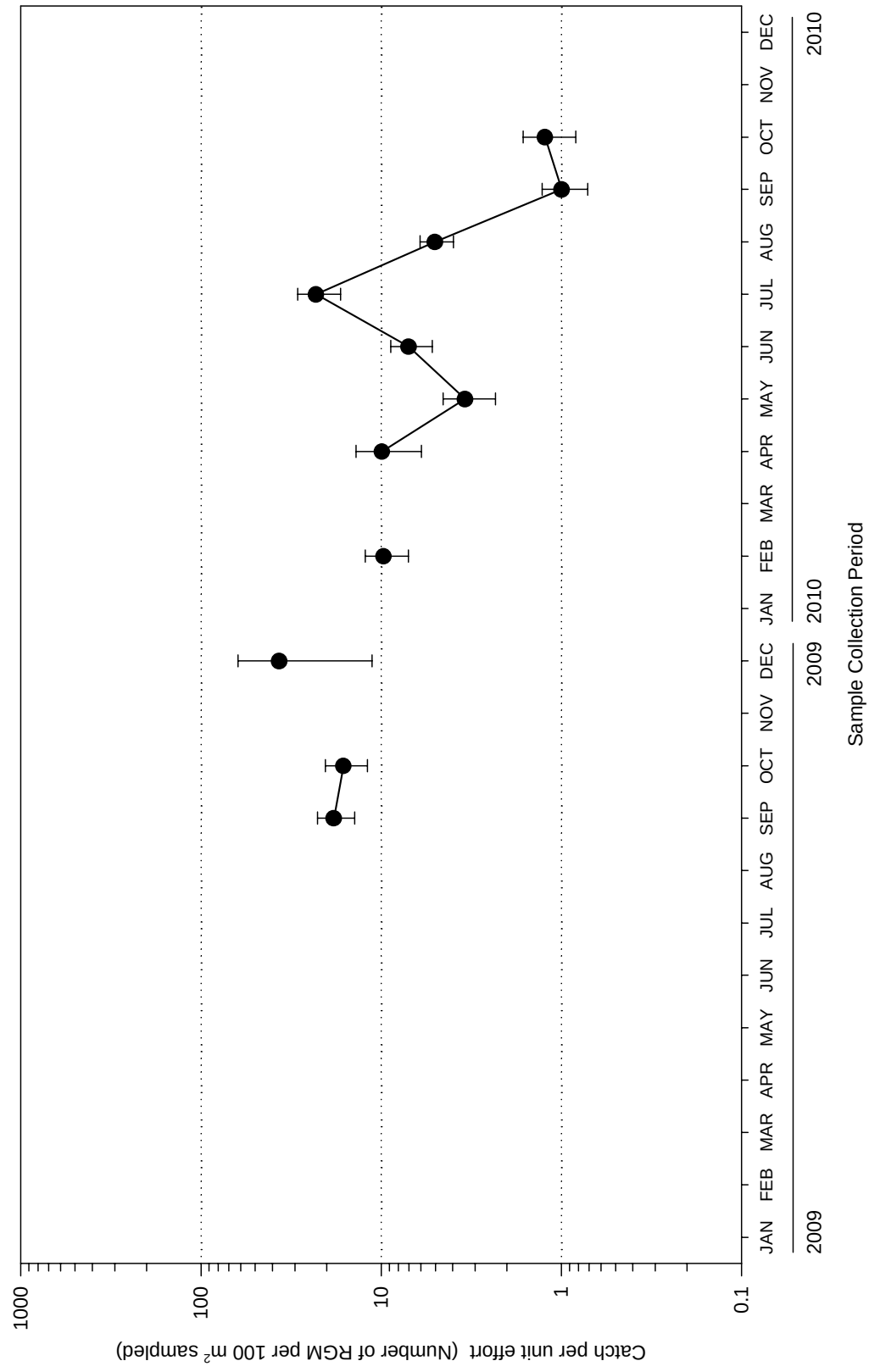

Figure 9. Monthly densities of Rio Grande silvery minnow during 2009 and through October 2010 at population monitoring program collection sites. Solid circles indicate monthly means (n=20 sites per month) and capped-bars represent the standard error. Missing symbols indicate that no individuals were collected in a particular reach during that month (i.e., no sampling). Dotted horizontal lines represent orders of magnitude.

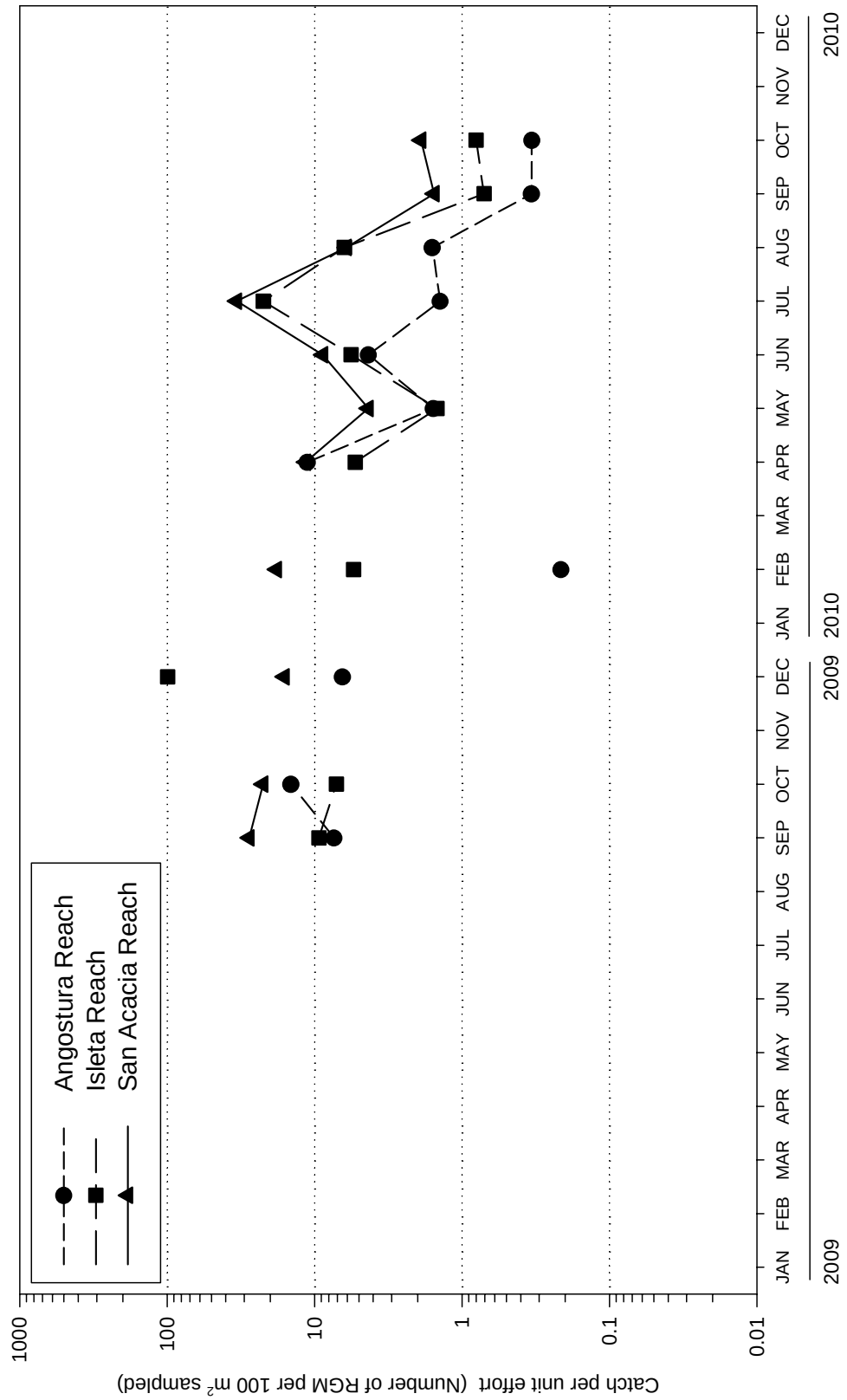

Figure 10. Monthly densities of Rio Grande silvery minnow during 2009 and through October 2010 at population monitoring program collection sites in the Angostura, Isleta, and San Acacia reaches. Missing symbols indicate that no individuals were collected in a particular reach during that month (i.e., not present or no sampling). Dotted horizontal lines represent orders of magnitude.

2010. Population monitoring efforts demonstrated that Rio Grande silvery minnow density in October was significantly lower (p<0.05) in 2010 than in recent years (e.g., 2007, 2008, and 2009) but that it was significantly higher (p<0.05) than in 2002 and 2003. October population monitoring samples illustrate that the magnitude of decline (as measured logarithmically) from 2009 to 2010 (Figure 11) was substantial and significant. Population levels in 2010 were similar to those observed following extensive river drying in 1996.

Hydraulic variables that represent different flow conditions were compared at upstream and downstream USGS gauging stations in the Middle Rio Grande. Extended periods of higher flows were recorded in 1993-1995, 1997, 1999, 2004, 2005 and 2007-2009. These years were notably different in the timing, magnitude, and duration of higher flows compared with 1996, 2000-2003, 2006, and 2010. There were fewer high flow days at downstream vs. upstream sites and, conversely, there were more low flow days at downstream vs. upstream sites for all years.

Linear regression analyses of October densities of Rio Grande silvery minnow from 1993-1997, 1999-2010 revealed significant associations with hydraulic variables. Regression analysis of Rio Grande silvery minnow October densities revealed significant relationships with several hydraulic variables. Density increased significantly (p<0.01) with maximum discharge and all combinations of number of days with discharge (as measured at the Albuquerque gauge) exceeding a threshold value (Figure 12). The relationships that explained the most variation in mean density were number of days with discharge >2,000 cfs or >3,000 cfs (74% and 78%, respectively). October densities of Rio Grande silvery minnow also increased significantly with delayed onset of low flows and increased mean daily discharge (as measured at the San Marcial gauge; Figure 13). There were also significant negative relationships between Rio Grande silvery minnow densities and number of days with discharge below a certain threshold value (i.e., <200 and <100 cfs). A striking pattern of association between changes in discharge and changes in Rio Grande silvery minnow abundance emerged when plotting the last decade of data (2001 to 2010) on a single graph (Figure 14).

Mesohabitat associations

Mesohabitats sampled in the Middle Rio Grande were classified during field sampling and given unique codes to identify their hydraulic features (Table 3). The overall distribution of mesohabitats did not differ notably among reaches although there were some exceptions (Figure 15). For example, backwaters were more commonly sampled in the Isleta Reach while riffles were more commonly sampled in the Angostura Reach. A wide variety of habitats were sampled to ensure balanced monitoring for the Middle Rio Grande ichthyofaunal community and all life stages of Rio Grande silvery minnow. The actual habitats occupied by Rio Grande silvery minnow were diverse and included all of the habitats sampled. Habitats most frequently used by Rio Grande silvery minnow (relative to those sampled) included pools, shoreline pools, and shoreline runs.

Fish Community

Population status

The ichthyofaunal community in the Middle Rio Grande between Angostura Diversion Dam and Elephant Butte Reservoir was numerically dominated by cyprinids (Table 4; Appendix C). The native ichthyofauna consisted of ten species (red shiner, Rio Grande silvery minnow, fathead minnow, flathead chub, longnose dace, river carpsucker, smallmouth buffalo, blue catfish, flathead catfish, and bluegill). Smallmouth buffalo and flathead catfish were the least abundant native fishes (N=2 for each species). Red shiner was the most abundant native species collected (N=23,638), followed by Rio Grande silvery minnow (N=13,856), flathead chub (N=2,628), river carpsucker (N=685), and

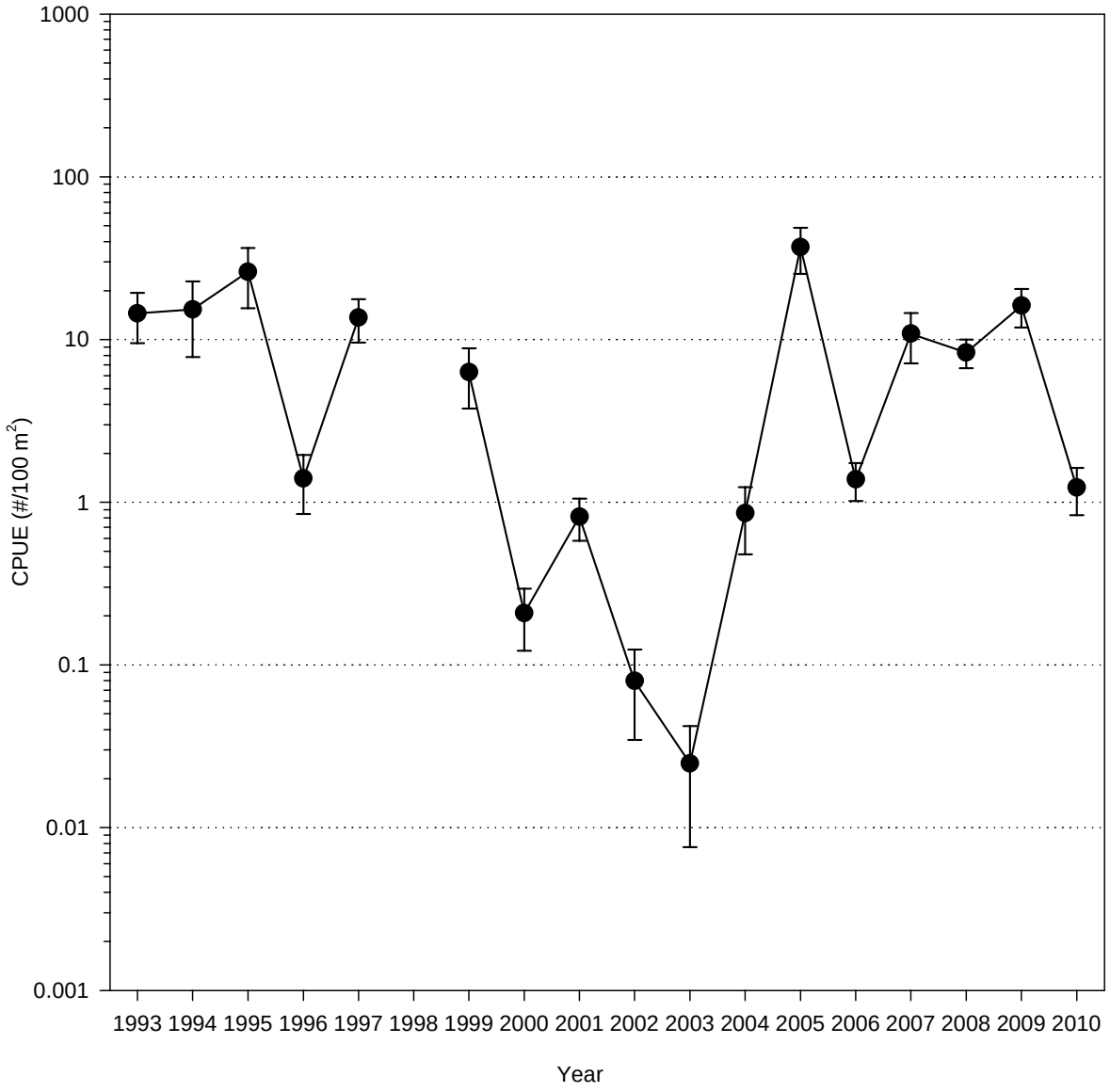

Figure 11. Rio Grande silvery minnow densities (CPUE) during October, at all sampling sites, by sampling year (1993-1997, 1999-2010). Solid circles indicate means and capped-bars represent the standard error. Dotted horizontal lines represent orders of magnitude.

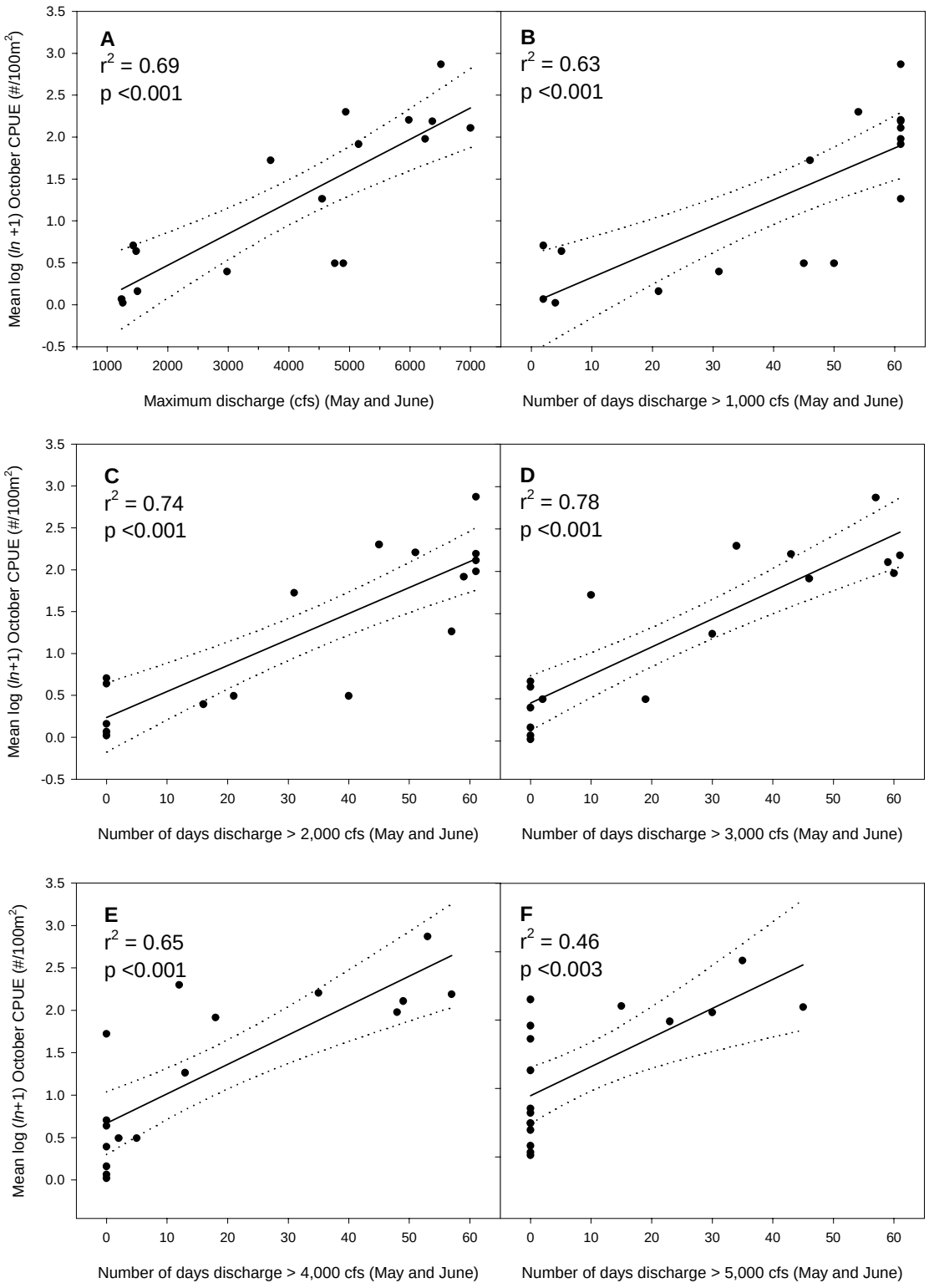

Figure 12 A-F. Regression analysis of Rio Grande silvery minnow log-transformed mean October densities (1993-1997, 1999-2010) and different hydraulic variables (during May and June) for USGS Gauge #08330000 (Rio Grande at Albuquerque, NM). Graph shows regression line (solid) and 95% confidence intervals (dotted).

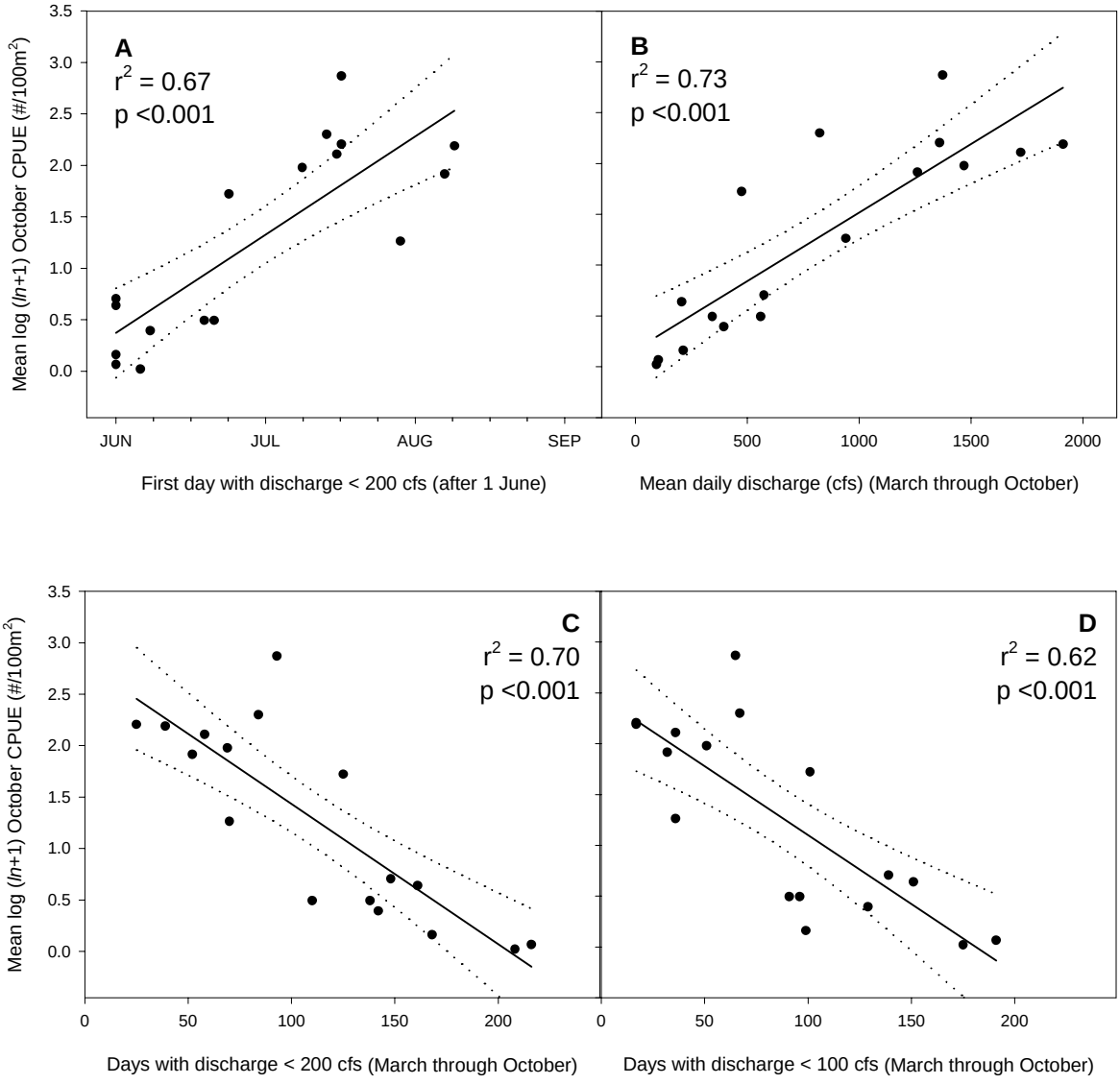

Figure 13 A-F. Regression analysis of Rio Grande silvery minnow log-transformed mean October densities (1993-1997, 1999-2010) and different hydraulic variables for USGS Gauge #08358400 (Rio Grande Floodway at San Marcial, NM). Graph shows regression line (solid) and 95% confidence intervals (dotted).

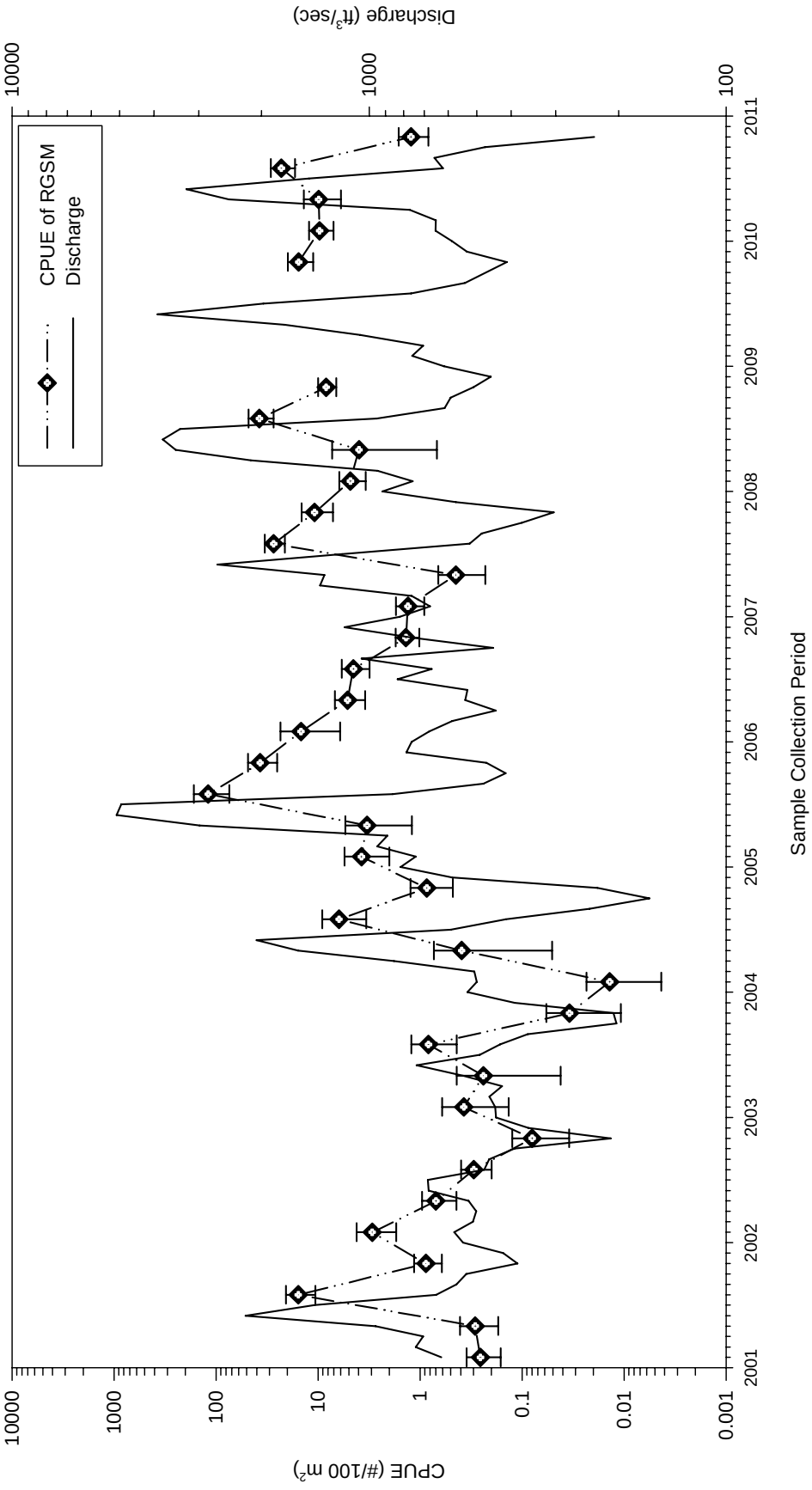

Figure 14. Time sequence of quarterly Rio Grande silvery minnow densities over the past decade (2001-2010) at population monitoring program collection sites and mean monthly discharge at USGS Gauge #08330000 (Rio Grande at Albuquerque, NM). Diamonds indicate sample means for each survey and capped-bars represent the standard error.

Table 3. Codes used for mesohabitat type classification in the Middle Rio Grande.

MESOHABITAT TYPES	
Primary	
MC	**Main channel-** the section of the river which carries the majority of the flow; there can be only one main channel.
SC	**Secondary channel-** all channels not designated as the main channel; there can be zero or several secondary channels at a site.
BW	**Backwater-** a body of water, connected to the main channel, with no appreciable flow; often created by a drop in flow which partially isolates a former channel.
DE	**Debris piles-** any habitat that has associated organic cover (e.g., grasses, woody vegetation etc.).
RI	**Riffle-** a shallow and high velocity habitat where the water surface is irregular and broken by waves; generally indicates gravel-cobble substrata.
Secondary	
SH	**Shoreline-** usually a shallower, lower velocity area that is adjacent to shore. This designation precedes other secondary mesohabitat types (e.g., MCSHRU= main channel shoreline run or SCSHPO= side channel shoreline pool).
PO	**Pool-** the portion of the river with very little velocity compared to the rest of the river channel (e.g., downstream of islands, instream sand dunes, debris piles, or shoreline peninsulas).
RU	**Run-** a reach of relatively fast velocity water with laminar flow and a non-turbulent surface.

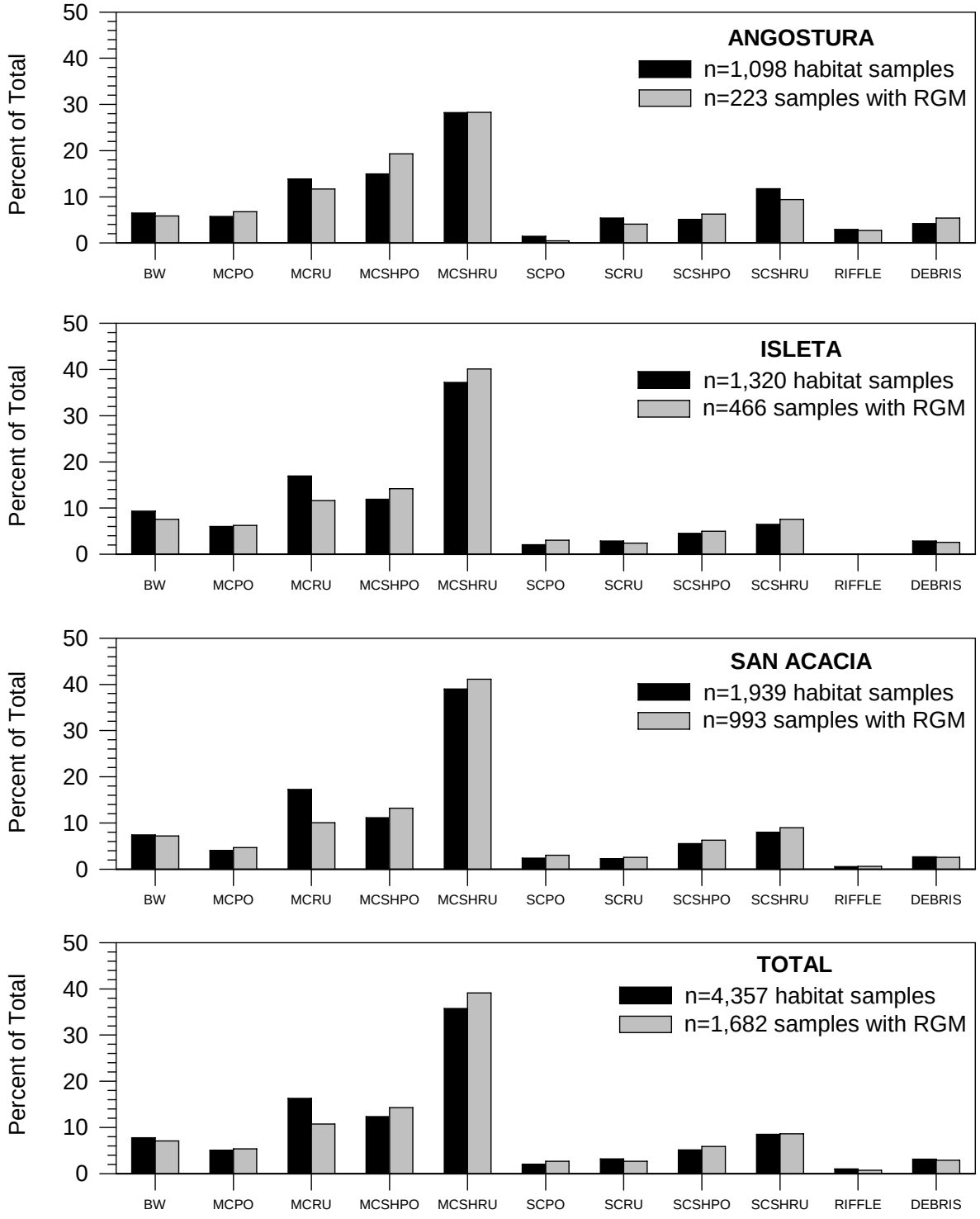

Figure 15. Percent total of mesohabitats (see Table 3 for codes) sampled and those occupied by Rio Grande silvery minnow (RGM) in the Middle Rio Grande as part of population monitoring from September 2009 to October 2010 for each river reach and the annual total.

Table 4. Summary of the Rio Grande silvery minnow population monitoring program fish collections from September 2009 to October 2010.

FAMILY	SPECIES COMMON NAME	RESIDENCE STATUS[1]	TOTAL NUMBER OF SPECIMENS	PERCENT (%) OF TOTAL	FREQUENCY OF OCCURRENCE[2]	% FREQUENCY OCCURRENCE[2]
Clupeidae	gizzard shad	N	25	0.05	12	5.45
Clupeidae	threadfin shad	I	-	-	-	-
Cyprinidae	central stoneroller	I	-	-	-	-
Cyprinidae	goldfish	I	1	0	1	0.45
Cyprinidae	red shiner	N	23,638	47.93	196	89.09
Cyprinidae	common carp	I	450	0.91	71	32.27
Cyprinidae	Rio Grande chub	N	-	-	-	-
Cyprinidae	Rio Grande silvery minnow	N	13,856	28.1	197	89.55
Cyprinidae	golden shiner	I	-	-	-	-
Cyprinidae	fathead minnow	N	653	1.32	114	51.82
Cyprinidae	bullhead minnow	I	2	0	2	0.91
Cyprinidae	flathead chub	N	2,628	5.33	163	74.09
Cyprinidae	longnose dace	N	554	1.12	47	21.36
Catostomidae	river carpsucker	N	685	1.39	83	37.73
Catostomidae	white sucker	I	1,237	2.51	54	24.55
Catostomidae	smallmouth buffalo	N	2	0	1	0.45
Ictaluridae	black bullhead	I	11	0.02	8	3.64
Ictaluridae	yellow bullhead	I	41	0.08	15	6.82
Ictaluridae	blue catfish	N	5	0.01	5	2.27
Ictaluridae	channel catfish	I	1,703	3.45	147	66.82
Ictaluridae	flathead catfish	N	2	0	2	0.91
Salmonidae	rainbow trout	I	-	-	-	-
Salmonidae	brown trout	I	-	-	-	-
Poeciliidae	western mosquitofish	I	3,726	7.56	136	61.82
Moronidae	white bass	I	14	0.03	7	3.18
Moronidae	striped bass	I	-	-	-	-
Centrarchidae	green sunfish	I	3	0.01	3	1.36
Centrarchidae	bluegill	N	21	0.04	10	4.55
Centrarchidae	longear sunfish	I	-	-	-	-
Centrarchidae	smallmouth bass	I	-	-	-	-
Centrarchidae	largemouth bass	I	31	0.06	14	6.36
Centrarchidae	white crappie	I	12	0.02	8	3.64
Centrarchidae	black crappie	I	-	-	-	-
Percidae	yellow perch	I	-	-	-	-
Percidae	bigscale logperch	I	-	-	-	-
Percidae	walleye	I	16	0.03	9	4.09
TOTAL			49,316			

[1] N = native; I = introduced

[2] Frequency and % frequency of occurrence are based on n=220 samples (i.e., 11 months at 20 sites)

fathead minnow (N=653). The most abundant introduced species were western mosquitofish (N=3,726), channel catfish (N=1,703), white sucker (N=1,237), and common carp (N=450). The 10 remaining nonnative fish species were present at much lower numbers (N<50 for each taxon) than were the aforementioned nonnative species.

Rio Grande silvery minnow comprised a higher fraction of the total ichthyofaunal community from 2005-2009 than from 2000-2004. While this percentage had dropped precipitously from 1995 to 2000 and remained low through 2004, it improved dramatically in 2005 (Figure 16). There were, however, notable declines from 2005 to 2006 and from 2009 to 2010. The magnitude of change in densities of Rio Grande silvery minnow over time is particularly evident when compared to overall fish densities (all species) over the past decade (Figure 17). Rio Grande silvery minnow had declined from being the 7th most common species in 2001 to being the 13th most common species in 2003 (Table 5). While the rank abundance of Rio Grande silvery minnow increased notably from 2003 (10th) to 2007-2009 (2nd), it dropped precipitously in 2010 (5th). The coefficient of concordance (W=0.70) for focal species indicated high overall agreement in ranks (X^2=63.1; p<0.001) over time (2001-2010) despite broad changes in ranks for some taxa (e.g., Rio Grande silvery minnow, flathead chub, and river carpsucker).

There were notable seasonal changes in the relative abundance of the 10 most abundant fish species from September 2009 to October 2010 (Figures 18 and 19). Density of all species increased during spring or summer. Rio Grande silvery minnow abundance in samples peaked in July and then slowly declined until September. Common carp and fathead minnow also peaked in abundance during July. The highest densities of red shiner were recorded from May through July although the abundance of this taxon was relatively high throughout the year. An accounting of species-specific temporal abundance revealed similar trends and documented the seasonal presence of certain taxa (e.g., gizzard shad and walleye; Table 6).

Besides temporal variation in the relative abundance of fish species within the community, there were also longitudinal changes in the densities of species among reaches (Figure 20). Flathead chub, longnose dace, and white sucker were most common in the Angostura Reach. Red shiner, common carp, Rio Grande silvery minnow, fathead minnow, river carpsucker, channel catfish, and western mosquitofish were most common in the Isleta Reach. Rio Grande silvery minnow was more common in the Isleta and San Acacia reaches as compared to the Angostura Reach.

Sampling Variation

November (2009 and 2010)

The sampling variation for Rio Grande silvery minnow in 2009 and 2010 (Figures 21 and 22, respectively) varied among sites but was relatively consistent among years. In general, the variation was most pronounced in the upstream sites of the study area during 2009. With the exception of a few sites (e.g., Site #10 and #18), sampling variation was relatively uniform in 2010. Mean densities in 2009 at occupied sites ranged from 0.95 (Site #3) to 124.78 (Site #5) individuals per 100 m^2 and the coefficient of variation (*CV*) was <0.5 at all sites except Sites #4 and #5 (0.55 and 0.63, respectively). Mean densities in 2010 at occupied sites ranged from 0.04 (Site #3) to 11.71 (Site #12) individuals per 100 m^2 and the coefficient of variation (*CV*) was <0.5 at all sites except Sites #3, #4, and #10 (1.00, 1.00, and 0.82, respectively).

Values for sampling variation among the sampling sites were relatively homogeneous when comparing all fish species in 2009 and 2010 (Figures 23 and 24, respectively). In both years, the proportional amount of variation was slightly less than it was for Rio Grande silvery minnow alone. Sites #2 and #5 had the highest site-specific variation in 2009 while Sites #8 and #18 had the highest site-specific variation in 2010. The mean density of all fish species in 2009 ranged from 1.32 (Site

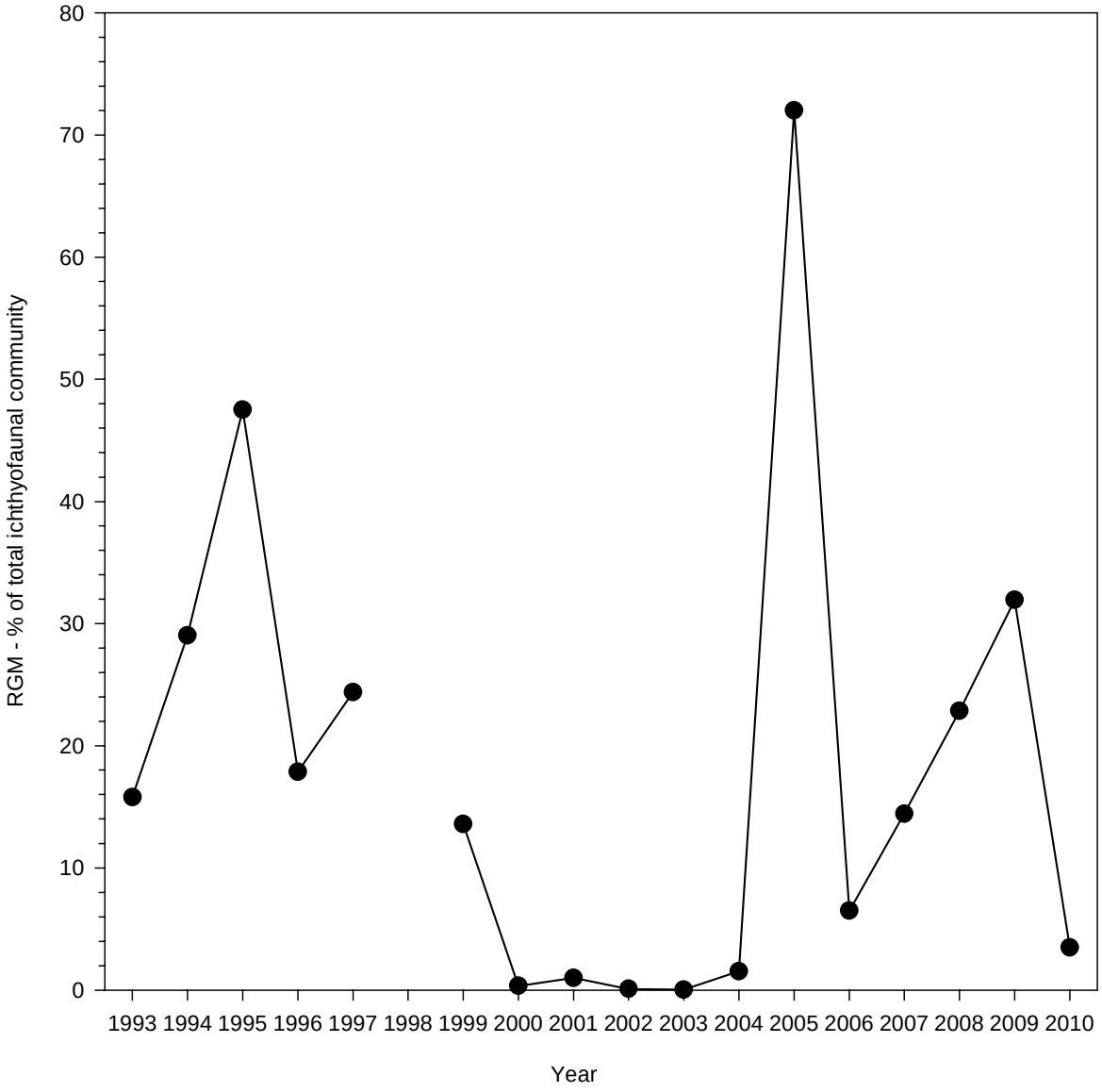

Figure 16. Relative abundance of Rio Grande silvery minnow as a percentage of the total ichthyofaunal community during October, at all sampling sites, by sampling year (1993-1997, 1999-2010).

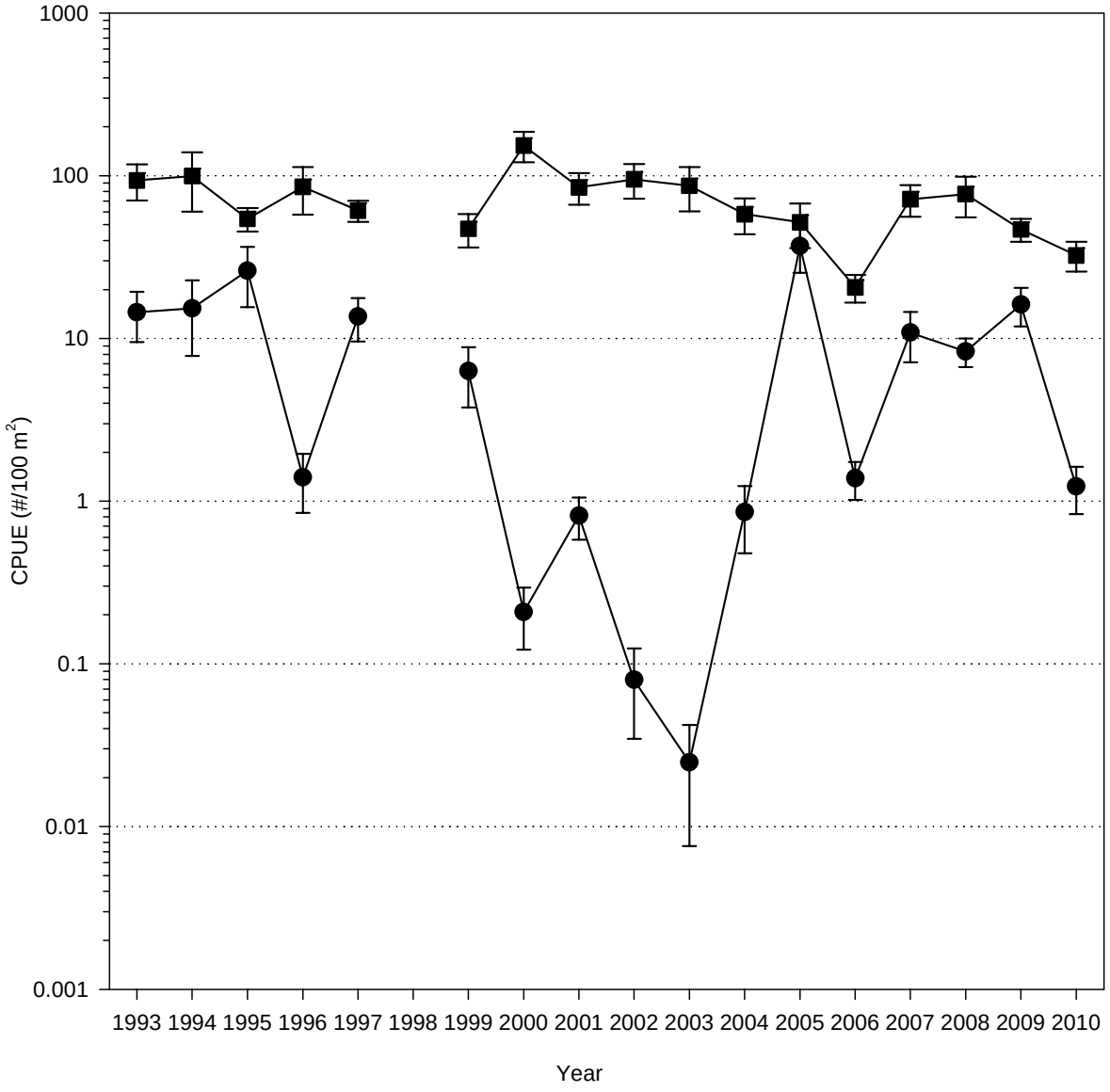

Figure 17. Densities (CPUE) of Rio Grande silvery minnow (circles) and the total ichthyofaunal community (squares) during October, at all sampling sites, by sampling year (1993-1997, 1999-2010). Solid circles or squares indicate means and capped-bars represent the standard error. Dotted horizontal lines represent orders of magnitude.

Table 5. Summary of rank abundance of focal species collected in the Rio Grande during October over the past decade (2001-2010).

SPECIES	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CARPS AND MINNOWS										
red shiner	1	1	1	1	3	1	1	1	1	1
common carp	8	9	8	9	7	10	10	7	10	9
Rio Grande silvery minnow	***7***	***10***	***10***	***5***	***1***	***4***	***2***	***2***	***2***	***5***
fathead minnow	3	3	3	3	4	6	7	5	6	6
flathead chub	6	7	4	4	5	2	4	4	5	2
longnose dace	9	5	7	8	8	7	8	8	9	7
SUCKERS										
river carpsucker	4	6	5	7	9	8	6	9	7	8
white sucker	10	8	9	10	9	8	9	10	8	10
NORTH AMERICAN CATFISHES										
channel catfish	5	4	6	6	6	5	5	6	4	4
LIVEBEARERS										
western mosquitofish	2	2	2	2	2	3	3	3	3	3

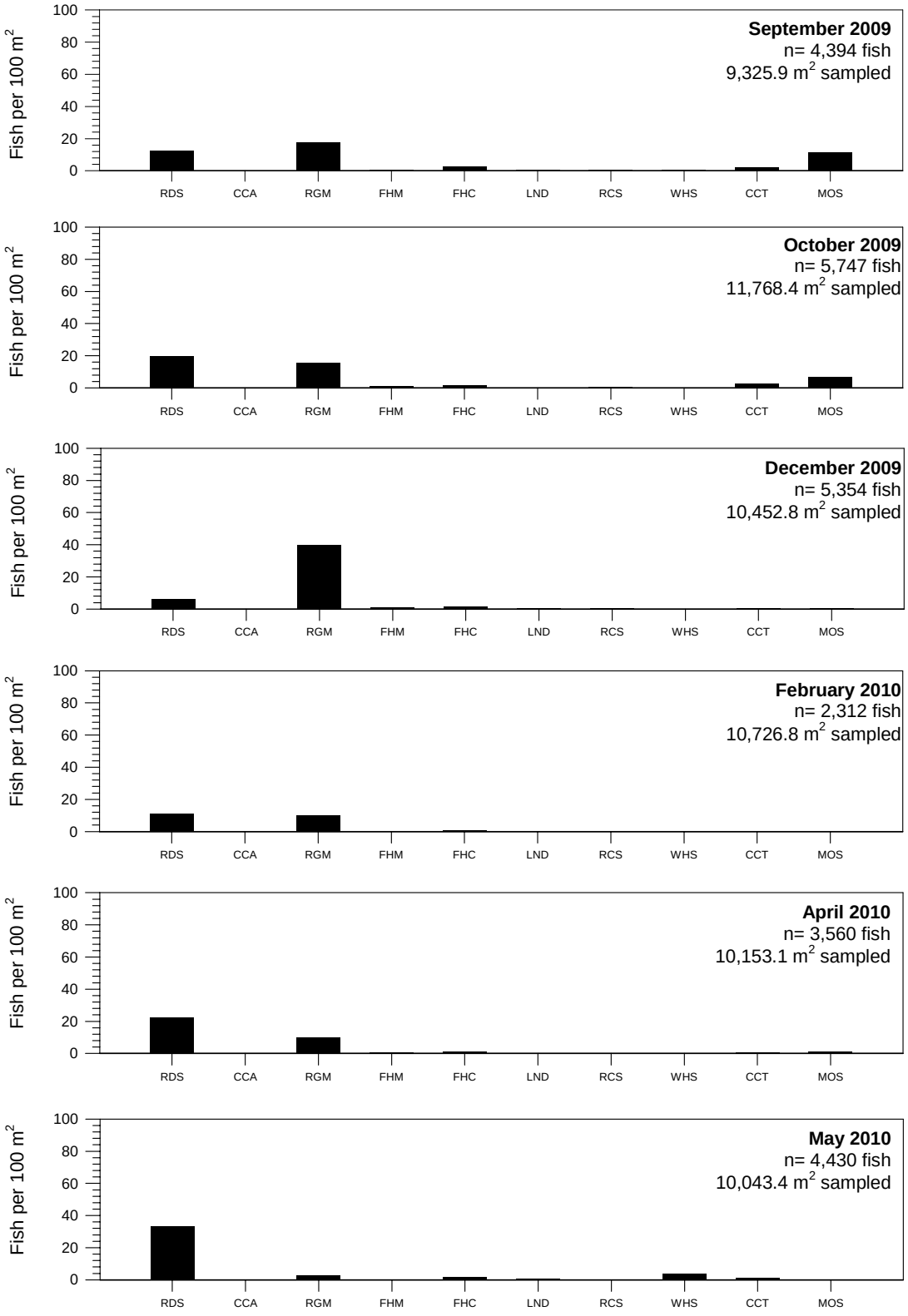

Figure 18. Fish densities (CPUE) from September 2009 to May 2010 for each focal species (see Table 1 for species codes) in the Middle Rio Grande. Rio Grande silvery minnow = RGM.

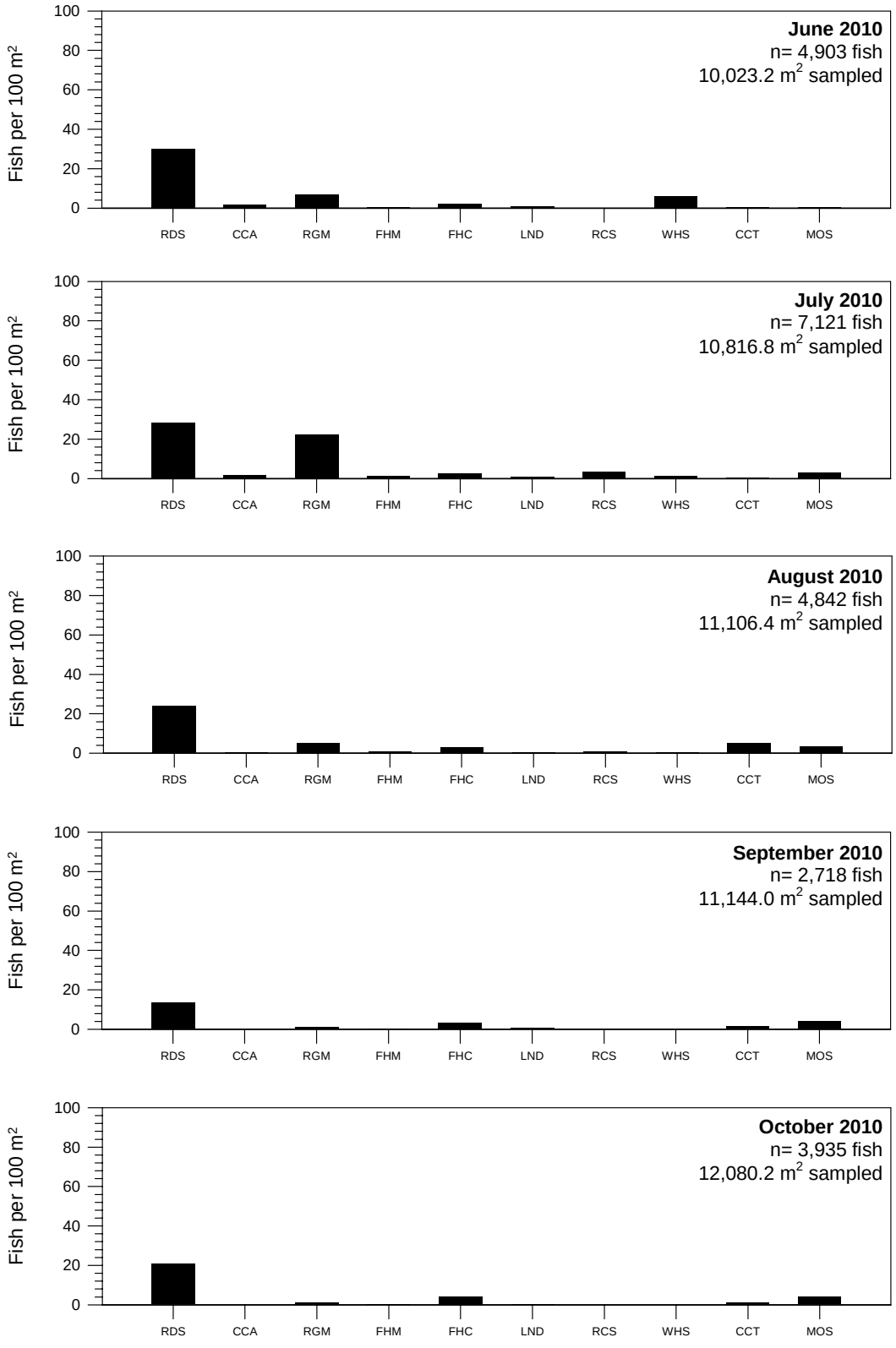

Figure 19. Fish densities (CPUE) from June to October 2010 for each focal species (see Table 1 for species codes) in the Middle Rio Grande. Rio Grande silvery minnow = RGM.

Table 6. Summary of the September 2009 to October 2010 Rio Grande silvery minnow population monitoring program fish collections.

SPECIES	SEP	OCT	DEC	FEB	APR	MAY	JUN	JUL	AUG	SEP	OCT	TOTAL
HERRINGS												
gizzard shad	1	-	-	-	-	4	1	16	1	2	-	25
threadfin shad	-	-	-	-	-	-	-	-	-	-	-	0
CARPS AND MINNOWS												
central stoneroller	-	-	-	-	-	-	-	-	-	-	-	0
goldfish	-	-	-	-	-	-	-	-	-	-	1	1
red shiner	1,146	2,314	661	1,179	2,234	3,352	3,018	3,042	2,680	1,494	2,518	23,638
common carp	9	2	1	2	2	28	167	199	28	6	6	450
Rio Grande chub	-	-	-	-	-	-	-	-	-	-	-	0
Rio Grande silvery minnow	1,620	1,835	4,159	1,068	992	282	677	2,421	558	107	137	13,856
golden shiner	-	-	-	-	-	-	-	-	-	-	-	0
fathead minnow	51	144	91	4	29	11	35	132	64	38	54	653
bullhead minnow	-	1	-	-	-	-	-	-	-	-	1	2
flathead chub	247	210	182	27	107	165	213	280	330	364	503	2,628
longnose dace	40	16	67	1	10	75	97	97	57	53	41	554
SUCKERS												
river carpsucker	29	60	45	3	9	4	19	384	92	25	15	685
white sucker	24	20	4	3	2	380	602	155	34	9	4	1,237
smallmouth buffalo	-	-	-	-	-	-	-	2	-	-	-	2
BULLHEAD CATFISHES												
black bullhead	1	1	-	-	-	-	1	1	7	-	-	11
yellow bullhead	4	3	-	-	-	-	-	2	27	3	2	41
blue catfish	-	1	-	-	-	1	1	2	-	-	-	5
channel catfish	168	320	58	9	47	107	33	45	585	169	162	1,703
flathead catfish	1	-	-	-	-	-	-	-	1	-	-	2
TROUTS												
rainbow trout	-	-	-	-	-	-	-	-	-	-	-	0
brown trout	-	-	-	-	-	-	-	-	-	-	-	0
LIVEBEARERS												
western mosquitofish	1,036	811	79	15	126	18	33	310	367	442	489	3,726
TEMPERATE BASSES												
white bass	2	-	7	-	-	1	-	3	1	-	-	14
striped bass	-	-	-	-	-	-	-	-	-	-	-	0
SUNFISHES												
green sunfish	1	-	-	-	-	-	-	1	-	1	-	3
bluegill	8	-	-	1	1	1	1	-	5	4	-	21
longear sunfish	-	-	-	-	-	-	-	-	-	-	-	0
smallmouth bass	-	-	-	-	-	-	-	-	-	-	-	0
largemouth bass	4	6	-	-	-	-	-	18	1	1	1	31
white crappie	2	3	-	-	1	1	-	1	3	-	1	12
black crappie	-	-	-	-	-	-	-	-	-	-	-	0
PERCHES												
yellow perch	-	-	-	-	-	-	-	-	-	-	-	0
bigscale logperch	-	-	-	-	-	-	-	-	-	-	-	0
walleye	-	-	-	-	-	-	5	10	1	-	-	16
TOTAL	4,394	5,747	5,354	2,312	3,560	4,430	4,903	7,121	4,842	2,718	3,935	49,316

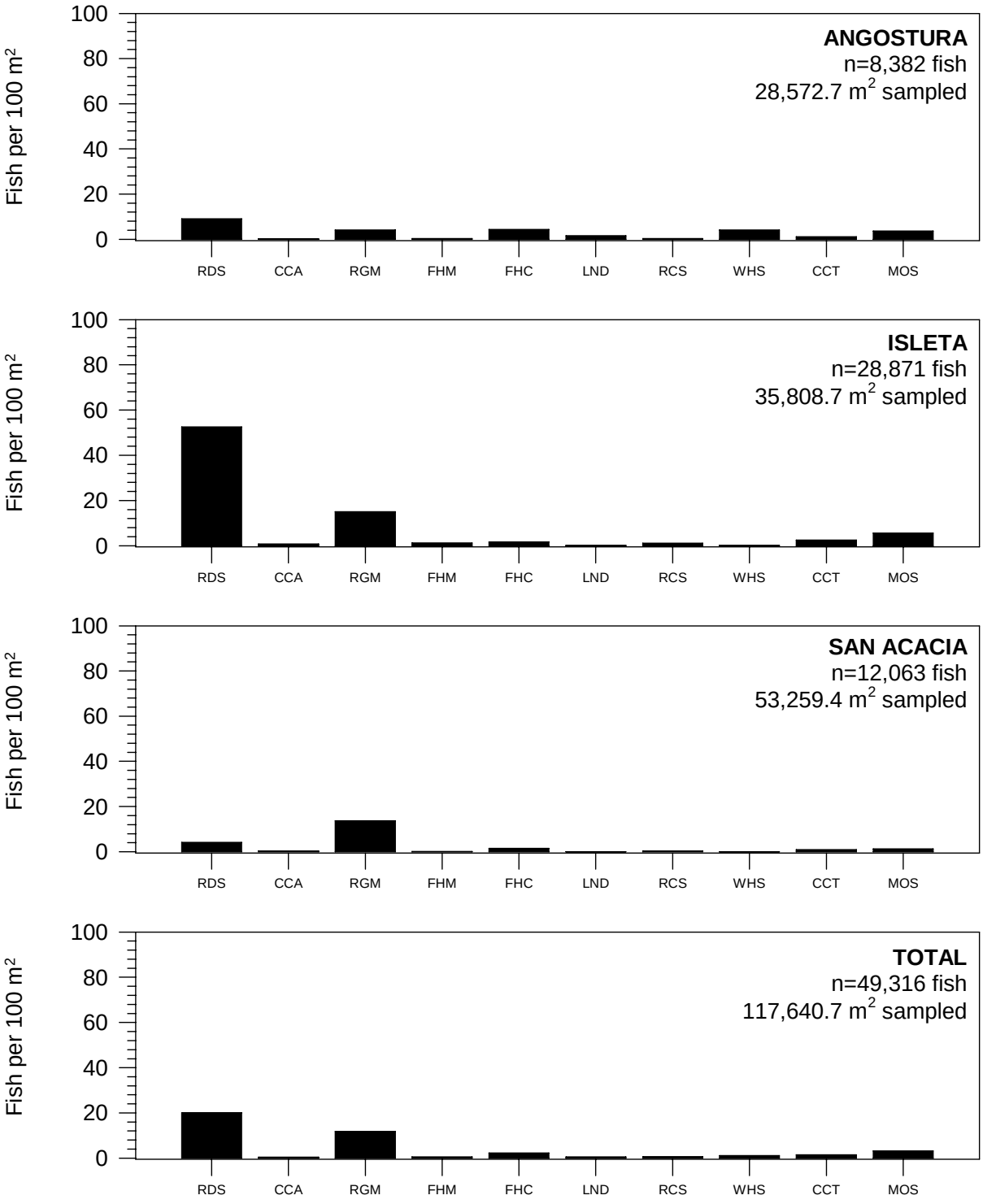

Figure 20. Fish densities (CPUE) by river reach for each focal species (see Table 1 for species codes) in the Middle Rio Grande from September 2009 to October 2010.

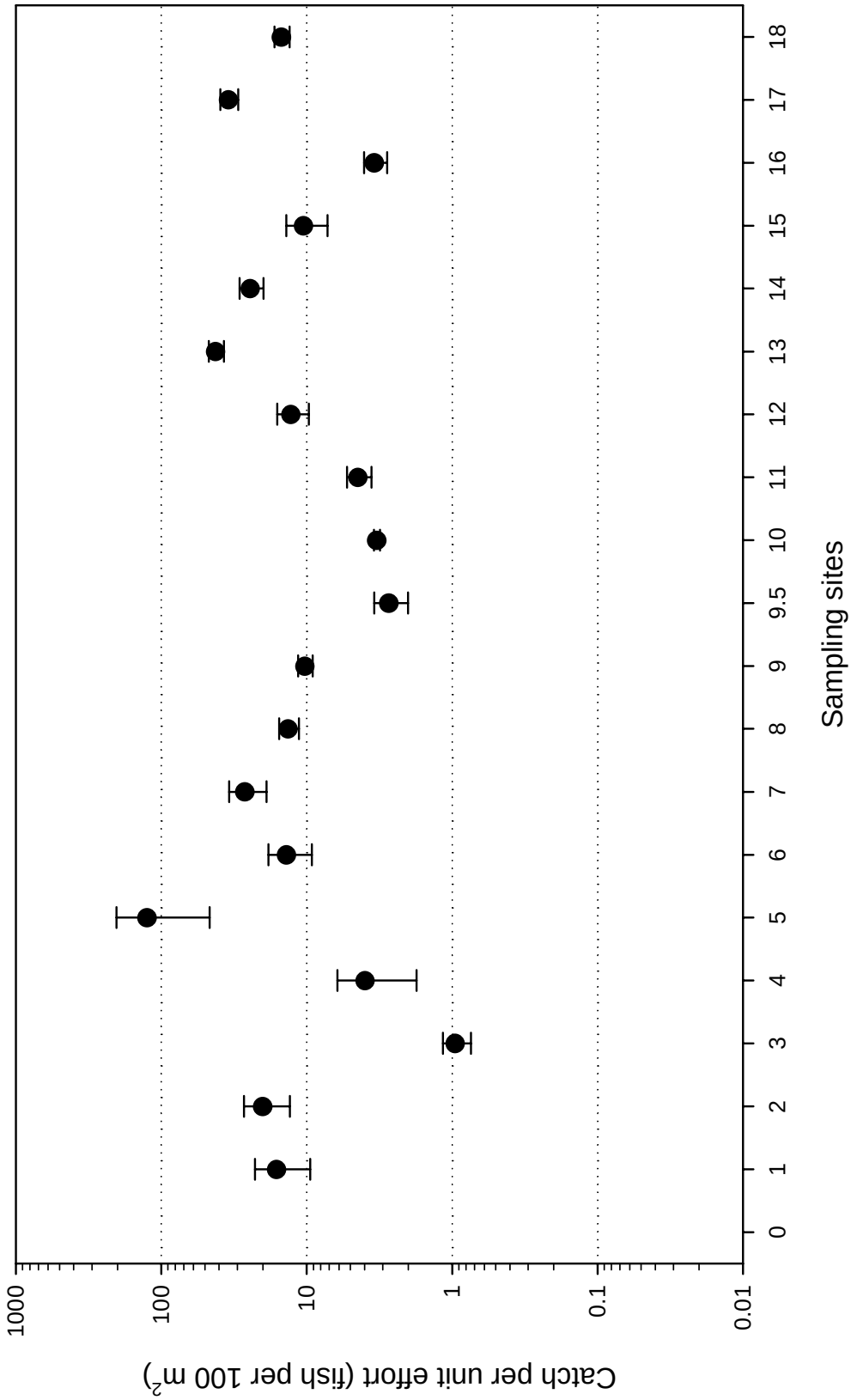

Figure 21. Variation in density values of Rio Grande silvery minnow, for each sampling site, during November 2009. Solid circles indicate means for each sampling site and capped-bars represent the standard error. Dotted horizontal lines represent orders of magnitude.

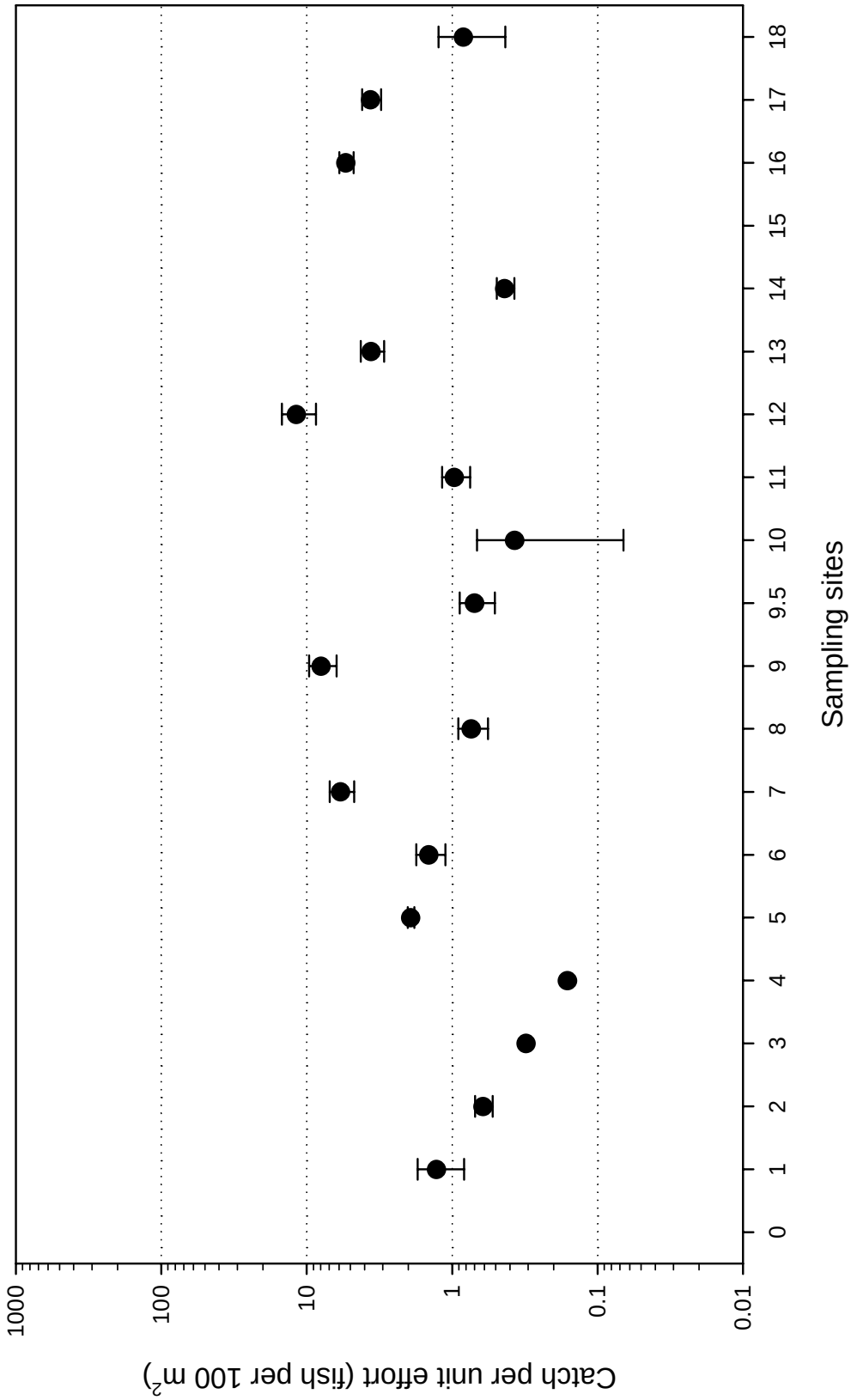

Figure 22. Variation in density values of Rio Grande silvery minnow, for each sampling site, during November 2010. Solid circles indicate means for each sampling site and capped-bars represent the standard error. Dotted horizontal lines represent orders of magnitude.

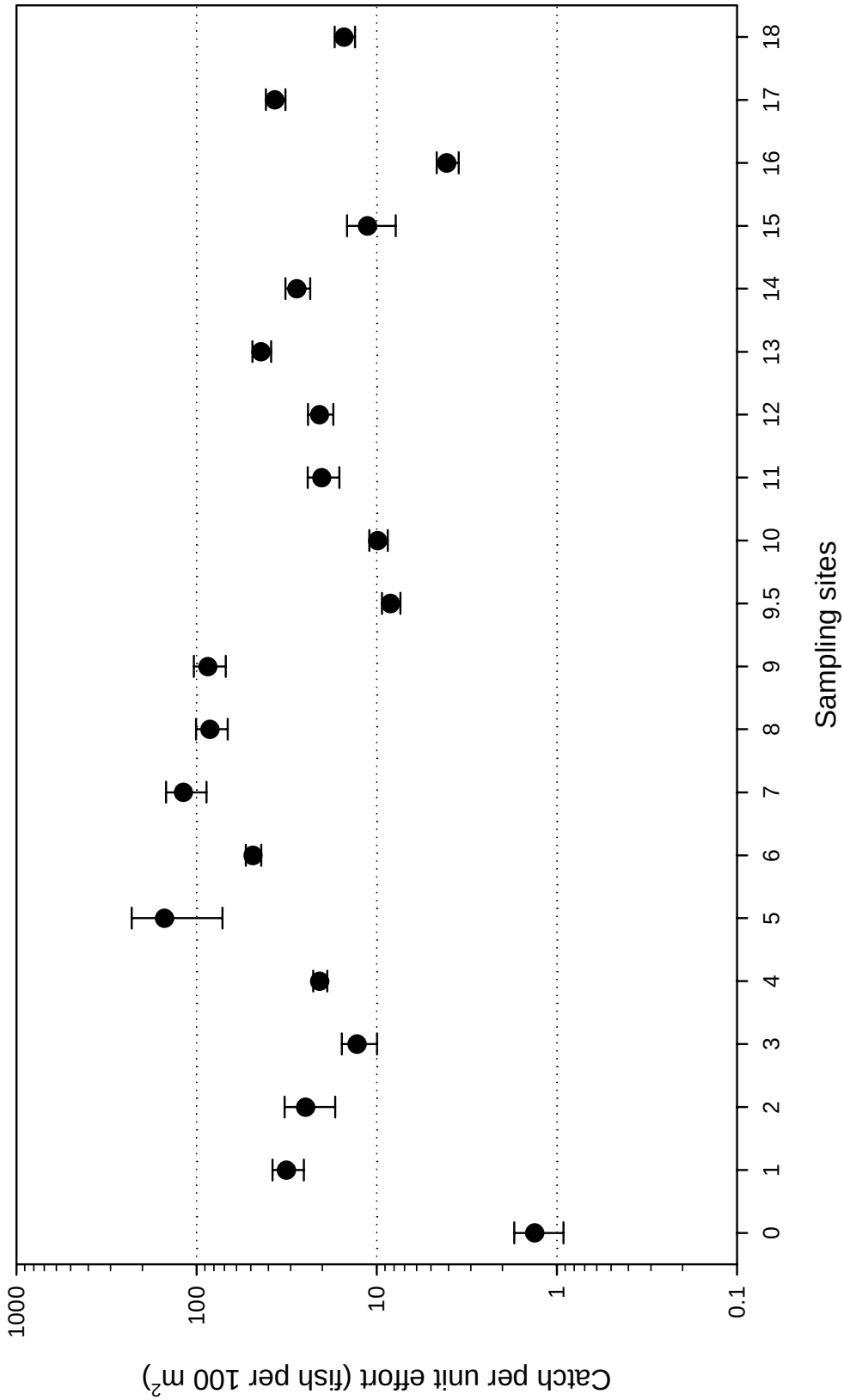

Figure 23. Variation in density values of all fish species combined, for each sampling site, during November 2009. Solid circles indicate means for each sampling site and capped-bars represent the standard error. Dotted horizontal lines represent orders of magnitude.

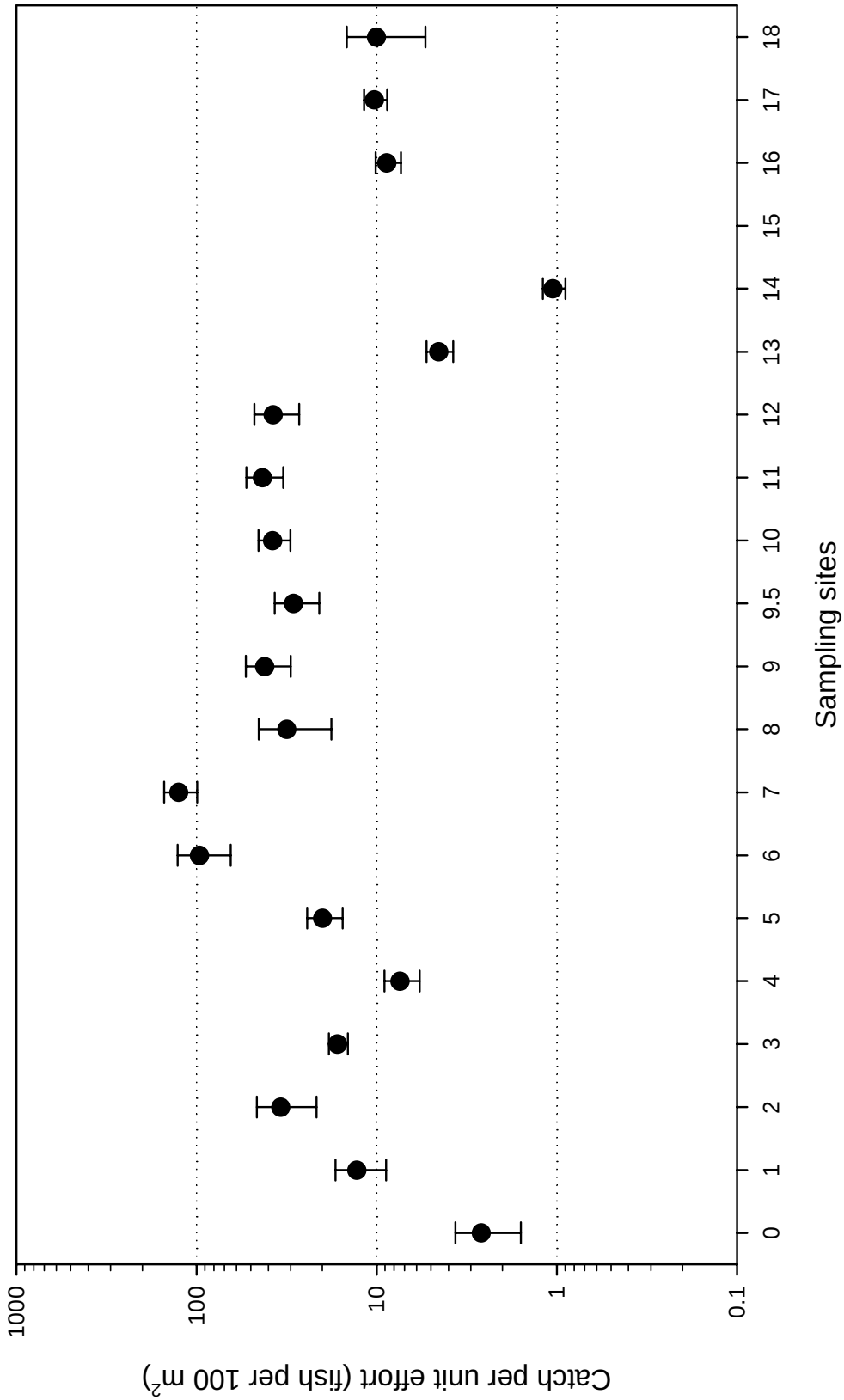

Figure 24. Variation in density values of all fish species combined, for each sampling site, during November 2010. Solid circles indicate means for each sampling site and capped-bars represent the standard error. Dotted horizontal lines represent orders of magnitude.

#0) to 150.21 (Site #5) individuals per 100 m^2 while the density of all fish species ranged from 0 (Site #15) to 125.27 (Site #7) individuals per 100 m^2 in 2010. The coefficient of variation (*CV*) in 2009 and 2010 was <0.5 at all sampling sites except Site #5 in 2009 (0.52).

Sampling variation by reach was also calculated for Rio Grande silvery minnow and all fish species combined in 2009 (Figure 25) and 2010 (Figure 26). In 2009, the total variation among reaches for Rio Grande silvery minnow was highest in the San Acacia Reach and lowest in the Angostura Reach while the reverse was true in 2010. Mean density ranged from 8.43 (Angostura) to 33.09 (Isleta) individuals per 100 m^2 in 2009 and from 0.42 (Angostura) to 0.75 (Isleta) individuals per 100 m^2 in 2010. The 2009 values of *CV* were 0.23 (Angostura), 0.43 (Isleta), and 0.48 (San Acacia). In 2010, the values of *CV* were 0.23 (Angostura), 0.12 (Isleta), and 0.08 (San Acacia). Levels of variation among all fish species were more homogeneous as compared to those for only Rio Grande silvery minnow in both 2009 and 2010. The mean density for all fish species combined ranged from 18.78 (Angostura) to 79.50 (Isleta) individuals per 100 m^2 in 2009 and from 14.09 (Angostura) to 55.92 (Isleta) individuals per 100 m^2 in 2010. The 2009 values of *CV* were 0.14 (Angostura), 0.18 (Isleta), and 0.08 (San Acacia). In 2010, the values of *CV* were 0.26 (Angostura), 0.27 (Isleta), and 0.23 (San Acacia).

A final comparison of sampling variation was made among the 10 focal taxa for the entire sampling area in 2009 and 2010 (Figures 27 and 28, respectively). The mean density of focal fish taxa in 2009 ranged between 0.05 (longnose dace: RHICAT) and 18.92 (Rio Grande silvery minnow: HYBAMA) individuals per 100 m^2 and values of *CV* ranged from 0.08 (channel catfish: ICTPUN) to 0.45 (common carp: CYPCAR). The mean density of focal fish taxa in 2010 ranged between 0.04 (longnose dace: RHICAT) and 14.99 (red shiner: CYPLUT) individuals per 100 m^2 and values of *CV* ranged from 0.09 (river carpsucker: CARCAR) to 0.49 (longnose dace: RHICAT). The overall *CV* value for all fish species combined was 0.09 in 2009 and 0.26 in 2010. In 2009, the overall *CV* value for Rio Grande silvery minnow was 0.17 but dropped to 0.07 when excluding one outlying value (Site #5 on sampling day three). In 2010, the overall *CV* value for Rio Grande silvery minnow was 0.13 but dropped to 0.03 when excluding one outlying value (Site #12 on sampling day one).

DISCUSSION

The population status of Rio Grande silvery minnow and the associated Middle Rio Grande ichthyofaunal community has been systematically monitored since 1993. The unique value of this effort has been in providing consistent sampling of fishes over a long duration. Determining trends in short-lived fish populations is best accomplished by analyzing the full suite of available data over the period of record. Long-term population monitoring sampling programs are designed so that an individual sample (or small number of samples) does not have a disproportionate effect on the results or interpretation of trends. While this study was initially designed to monitor the long-term trends of fish species in the Middle Rio Grande, the scope of this project has continued to expand to address the information needs of natural resource managers. Some of the key components that were added to this project over time include evaluating the influence of discharge patterns on population fluctuations, determining general habitat use patterns, documenting the changes in relative abundance among fish species over time, and examining seasonal and spatial differences in population structure and abundance of native and nonnative Middle Rio Grande fishes.

The use of catch-per-unit-effort (CPUE) to monitor the status of fish populations is well established in fisheries science. Some of the first important theoretical contributions were provided in the mid-1900s (Ricker 1940, 1944; Zippin 1956, 1958). The relationship between CPUE and abundance has received considerable attention in the literature (see reviews by Otis et al. 1978, Bannerot and Austin 1983). Experimental and statistical treatment of the issue has demonstrated

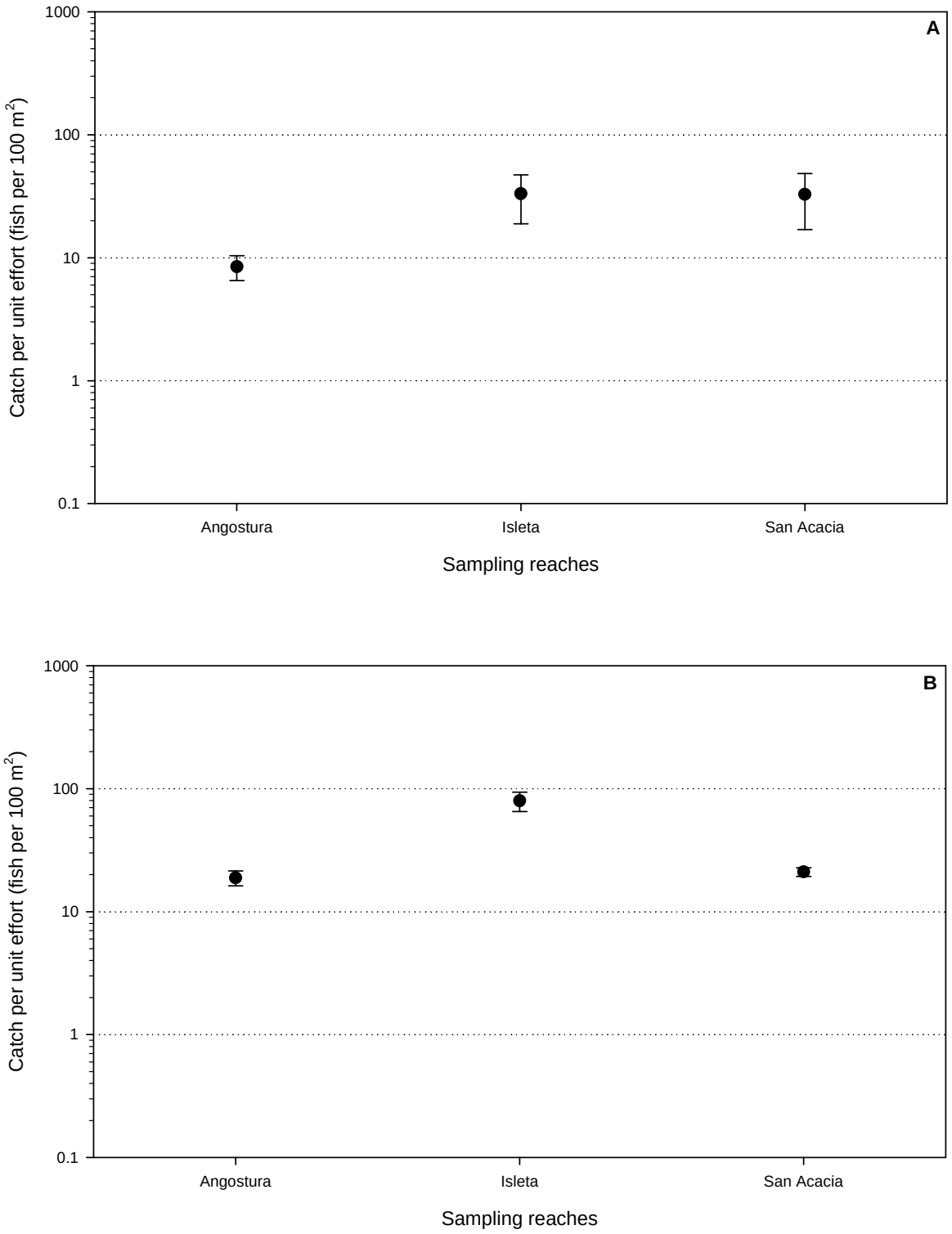

Figure 25. Variation in density values for Rio Grande silvery minnow (**A**) and for all fish species combined (**B**), in each sampling reach, during November 2009. Solid circles indicate means for each sampling reach and capped-bars represent the standard error. Dotted horizontal lines represent orders of magnitude.

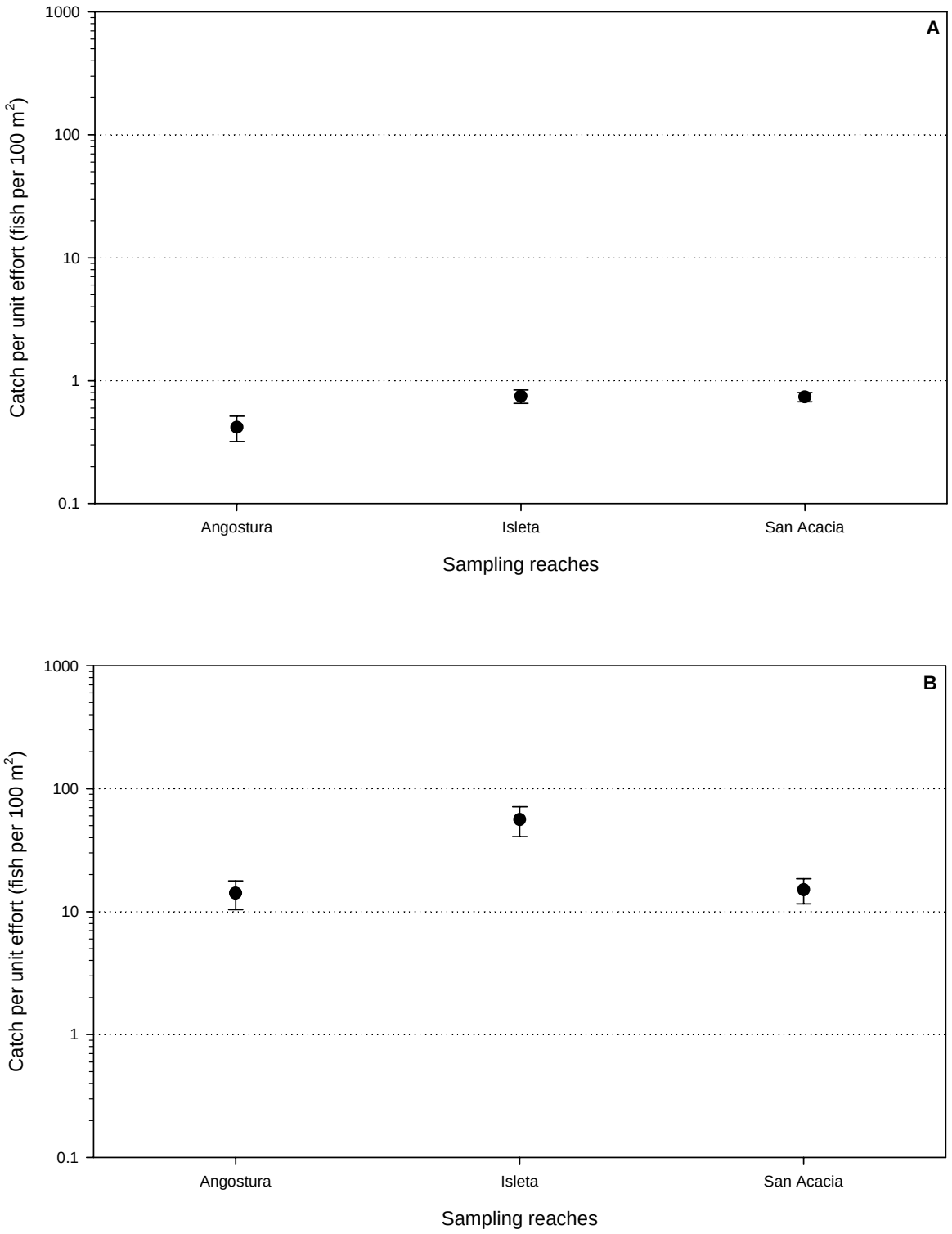

Figure 26. Variation in density values for Rio Grande silvery minnow (**A**) and for all fish species combined (**B**), in each sampling reach, during November 2010. Solid circles indicate means for each sampling reach and capped-bars represent the standard error. Dotted horizontal lines represent orders of magnitude.

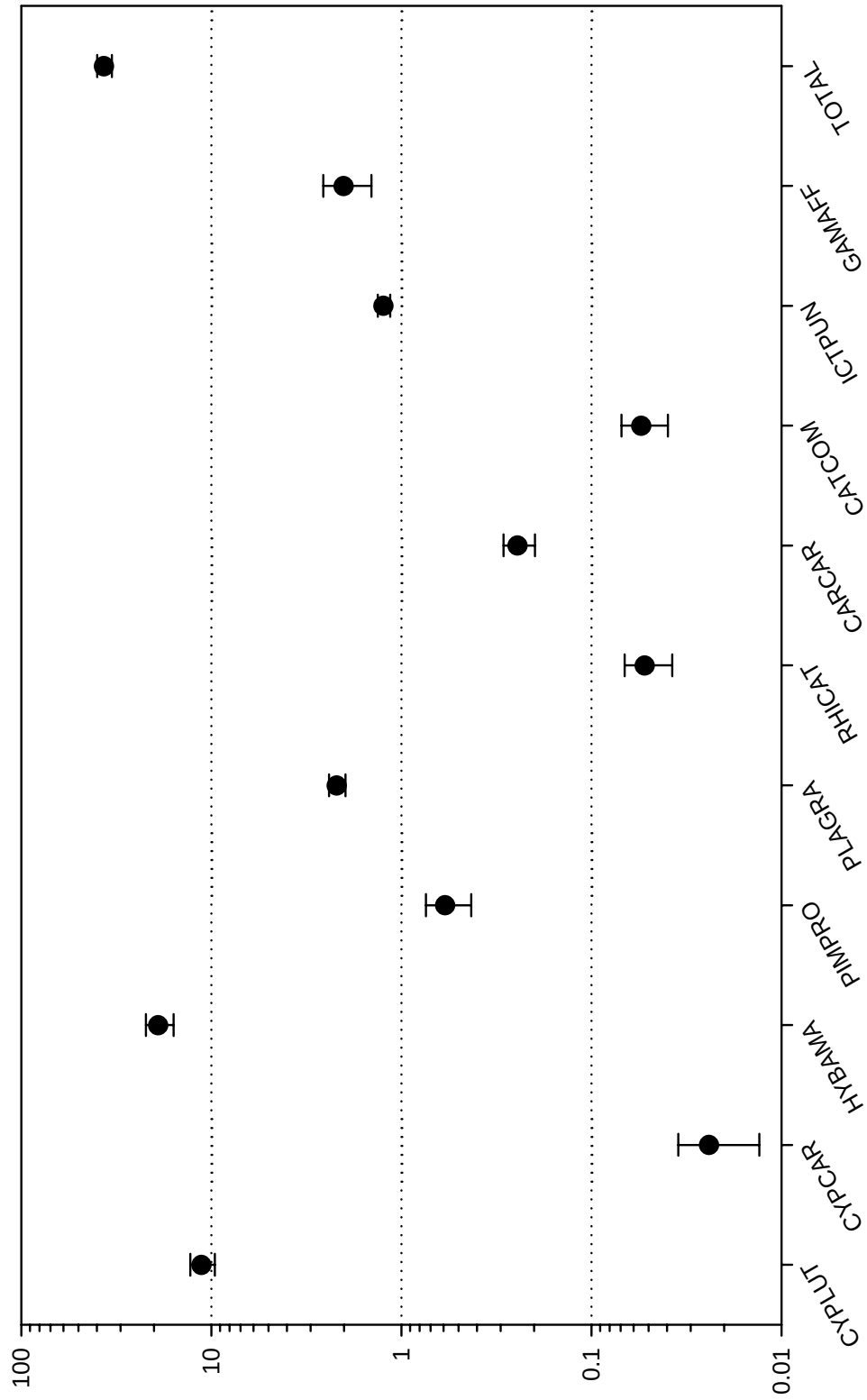

Figure 27. Variation in density values for each focal species, at all sampling sites combined, during November 2009. Solid circles indicate means for each species and capped-bars represent the standard error. Dotted horizontal lines represent orders of magnitude.

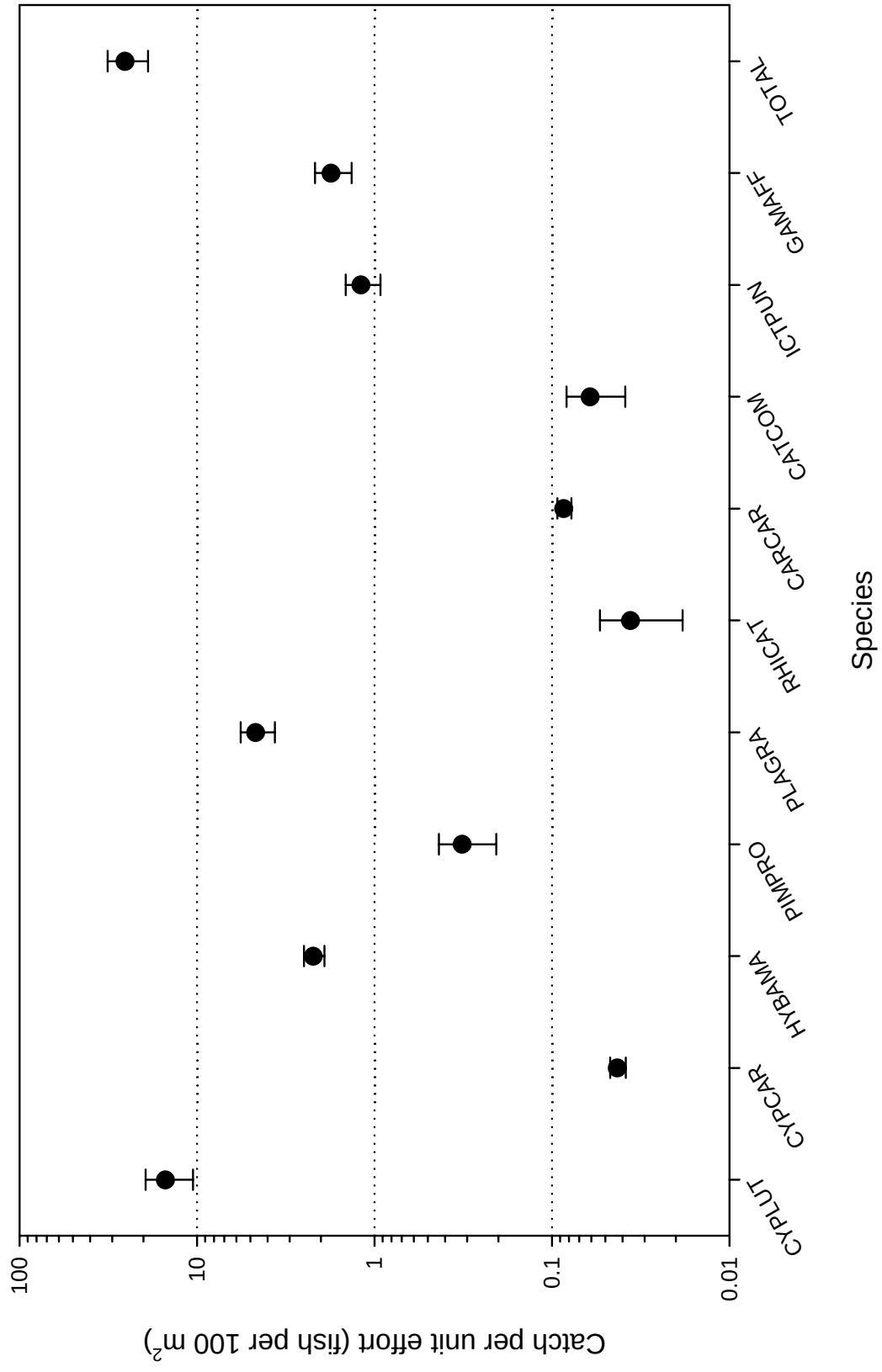

Figure 28. Variation in density values for each focal species, at all sampling sites combined, during November 2010. Solid circles indicate means for each species and capped-bars represent the standard error. Dotted horizontal lines represent orders of magnitude.

that CPUE is a valid estimator of abundance and that the relationship is often one of strict proportionality for single species (Richards and Schnute, 1986). The work of Richards and Schnute (1986, 1992) and other researchers using CPUE in fisheries applications has appeared in international reviews on the general topic of estimating animal abundance (Seber 1992). Extensive reviews of the various methods for estimating animal abundance identify CPUE as one of the most widely used and well-researched techniques in fisheries science (e.g., Seber 1992, Schwarz and Seber 1999). CPUE provides a metric by which to gauge the relative increases or decreases (trends) in populations over time and space.

Recent analyses have demonstrated a close relationship between the 2008 to 2010 population trends for Rio Grande silvery minnow obtained from Population Estimation Program and Population Monitoring Program studies (Dudley and Platania, 2011). While this suggests that the CPUE metric as employed in the Population Monitoring Program is a valid estimator of abundance (as gauged by recent Population Estimation data), additional data collected in future years will be needed to validate this hypothesis. Despite similarities in population trends obtained during the Population Estimation Program and Population Monitoring Program studies, these studies have unique objectives that address different research needs. Systematic Population Monitoring Program activities provide an assessment of recruitment success over short time periods, a basis for comparing the changes in monthly recruitment success among years, insight to seasonal mortality rates, timely information about the status of the species during periods of reduced abundance, and a valuable tool to assess the real-time effectiveness of adaptive management activities. In contrast to the Population Monitoring Program that provides year-round documentation of population trends, the Population Estimation Program provides a statistically robust annual estimate of the Rio Grande silvery minnow population during a single time-period (e.g., October).

The Population Monitoring Program has documented notable changes in densities of Rio Grande silvery minnow among years (i.e., more than several orders of magnitude [>1,000%]) since 1993. Despite large differences in the mean densities of Rio Grande silvery minnow among sampling sites and years, the overall estimates of sampling variation (based on repeated monitoring efforts over a four day period) were relatively low (CV<0.2) and consistent in 2009 and 2010. Also, the exclusion of a single outlying value (e.g., one site on one day) was found to notably reduce sampling variation estimates (CV<0.1) in both 2009 and 2010. It appears that the Population Monitoring Program sampling protocols are adequate to achieve a relatively high degree of sampling precision, especially when considering the substantial changes in Rio Grande silvery minnow abundance among years. While the current sampling methodology appears to provide a robust trend estimate of Rio Grande silvery minnow abundance over time, additional data from future years will be required to adequately address the validity of this assumption. In particular, if the coefficient of variation increases notably during years with extremely low Rio Grande silvery minnow abundance it may be more difficult to assess relative population trends during those times. It is possible that increased sampling frequency or effort will be required to detect more subtle population changes during periods of greatly reduced abundance.

A qualitative examination of the mesohabitats occupied by Rio Grande silvery minnow was provided to obtain general information on the habitat use patterns of this species. An examination of flow conditions from 1993-2010 at USGS Albuquerque Gauge [#08330000] revealed that mean October discharge was relatively consistent (455.6 +/- 44.2 cfs) when a single outlier year (1997: mean=1,802.0 cfs) was removed from the analysis. October flow conditions were similar among years and indicated that the overall distribution of mesohabitats was relatively comparable over time. While it is certain that the physical location of mesohabitats shifts around considerably among years, established sampling protocols for this study ensure that similar mesohabitats (depths and velocities) are sampled among years. In this study, a wide variety of habitats were sampled to ensure balanced monitoring for the Middle Rio Grande ichthyofaunal community and all life stages of Rio Grande

silvery minnow. However, this was a cursory study of mesohabitat associations and is no substitute for the more rigorous approach used to quantify Rio Grande ichthyofaunal habitat use (including seasonal and ontogenetic shifts) and availability in the past (e.g., Dudley and Platania, 1997).

The types of habitats occupied by Rio Grande silvery minnow in 2010 were again comparable to those occupied in past years (e.g., Dudley and Platania, 1997, 2009). The distribution of sampled habitats among reaches and the habitats occupied by Rio Grande silvery minnow among reaches were relatively consistent. Shoreline pools and shoreline runs comprised the most frequently occupied habitats (relative to those sampled) by Rio Grande silvery minnow. Main channel runs were the least occupied habitat relative to their sampled abundance. This apparent avoidance could be caused by the lack of cover and high water velocities typical of this relatively homogenous habitat. However, Rio Grande silvery minnow was found to occupy the full suite of habitats sampled, including swift main and side channel runs.

There were notable changes in the relative and rank abundance of Middle Rio Grande fish species over the past decade (2001-2010). The species that changed most in rank abundance over time included Rio Grande silvery minnow, flathead chub, and river carpsucker. The dramatic changes in rank abundance exhibited by Rio Grande silvery minnow among years (e.g., from 7th [2001] to 10th [2003] to 1st [2005]) was unmatched by any other focal species monitored. Despite these occasionally large changes in the abundance of individual species, the combined densities of Middle Rio Grande fishes remained relatively constant over time. The dynamic changes in rank abundance over time could indicate that key environmental conditions are controlling population size over time. It is possible that changes in the timing, magnitude, and duration of flows (especially during and immediately following spawning season) could be an important factor leading to some of the observed differences in fish species abundance over time and space. For the purpose of this study, an intense and focused effort was made to elucidate possible flow patterns that could account for the variation observed in the densities of Rio Grande silvery minnow over time. However, additional study will be required to determine those factors that most influence these ecological patterns.

The annual reproductive effort of Rio Grande silvery minnow normally occurs during spring and is initiated, in part, by large-scale increases in stream discharge associated with high-mountain snowmelt. Rio Grande silvery minnow releases relatively large numbers of eggs (several thousand) into the water column during spawning and these eggs are passively dispersed downstream with the current. Increased discharge as a result of spring runoff, combined with increasing water temperatures, was likely the historical source of this reproductive stimulus (Platania and Altenbach, 1998). During years of sufficient snowpack, flow in the Middle Rio Grande peaked in late spring and resulted in several months of sustained flooded habitats. However, dams and reservoirs now moderate the magnitude, amplitude, and duration of spring discharge. Water seasonally diverted from the river for agricultural and municipal purposes substantially reduce the total volume of water that would normally have flowed through the Rio Grande. This issue is further compounded in drought years when large volumes of water are diverted from the Rio Grande in early spring, reducing peak flows that stimulate Rio Grande silvery minnow spawning and facilitate recruitment.

The timing of the 2010 spring runoff was typical of this natural annual event. Runoff began in April 2010 and lasted for an extended period (months) in contrast to the artificial spike in 2003 that lasted less than one week. While flow in the river had returned to previously low levels within a week during 2003, the elevated and extended flows during other years, including 2010, likely resulted in more favorable conditions for the growth and survivorship of newly hatched Rio Grande silvery minnow larvae. It is possible that despite the relatively low numbers of eggs and larvae observed in some years (e.g., 2004), recruitment success was increased because of the extended inundation of shoreline habitats, abandoned side channels, and backwaters during spring runoff (see Dudley and

Platania, 2010). Low velocity and shallow areas provide the warm and productive habitats required by Rio Grande larval fishes to successfully complete their early life history (Pease et at., 2006).

Comparison of Rio Grande silvery minnow mean October densities (1993-1997, 1999-2010) to hydraulic variables measured at two Middle Rio Grande discharge gauges revealed several strong relationships. Peak discharge and duration of high flows during the spawning season (May-June) were positively correlated with Rio Grande silvery minnow mean October densities. In contrast, extended low flow periods were negatively correlated with Rio Grande silvery minnow mean October densities. The physical conditions produced by prolonged and elevated flows result in overbank flooding of vegetated areas, formation of inundated habitats within the river channel, and creation of shoreline and island backwaters. Overbank and other flooded habitats are well known to be essential for the successful recruitment of early life history stages of freshwater fishes throughout the world (for review see Welcomme, 1979). It is quite likely that similar processes are important for the successful survival and recruitment of the Middle Rio Grande ichthyofaunal community, including early life stages of Rio Grande silvery minnow (Pease et al., 2006; Turner et al., 2010). However, there has been extensive abandonment of the floodplain, river channelization, and habitat degradation across large portions of the Middle Rio Grande (Lagasse, 1980; Massong et al., 2006), which likely limits the available habitat for the successful recruitment of Rio Grande silvery minnow (Porter and Massong, 2004).

Another ongoing threat to Rio Grande silvery minnow is the fragmentation of its remaining range and the longitudinal transport of its propagules (drifting eggs and larvae) below instream barriers (i.e., Angostura, Isleta, and San Acacia diversion dams) and ultimately into irrigation networks or Elephant Butte Reservoir (Dudley and Platania, 2007). Considerable upstream movement of this species (>25 km) was documented though the collection of marked hatchery reared individuals (Platania, et al., 2002). In addition to repopulating upstream reaches, upstream movement of even a small portion of the population among reaches (following fish passage efforts) could be beneficial in terms of naturally maintaining genetic diversity. The sequential decline and loss of Rio Grande silvery minnow from upstream to downstream in the Middle Rio Grande appears to have been caused by a combination of the reproductive ecology of this species, fragmented reach lengths, and diversion dam placement (Platania and Altenbach, 1998). While it appears that intensive efforts to stock and relocate Rio Grande silvery minnow into upstream reaches (combined with several years of good spring runoff) have slowed (or even perhaps reversed) this trend, it is unknown how quickly Rio Grande silvery minnow would decline upstream to downstream in the absence of recent artificial population management strategies. Fragmentation of this species' range in the Middle Rio Grande by Angostura, Isleta, and San Acacia diversion dams has been identified as an important issue that requires resolution to ensure recovery of Rio Grande silvery minnow (U.S. Fish and Wildlife Service, 2010).

Other threats to the long-term persistence of Rio Grande silvery minnow include intraspecific and interspecific competition/predation, poor water quality, and limited genetic diversity (i.e., low effective population size). In years with poor spawning/recruitment conditions, these and other issues are likely directly and indirectly act in concert to manifest in the decline of Rio Grande silvery minnow. For example, a year with low spring runoff and extended low-flow/drying conditions in summer likely results in a variety of problems (e.g., desiccation, reduced resource availability, increased competition/predation, reduced water quality, stress), which may exacerbate already poor spawning and larval recruitment conditions. When developing strategies to help stabilize and enhance populations of Rio Grande silvery minnow it will be important to consider the synergistic effect of all threats rather than focusing exclusively on single factors.

Despite periodic and sometimes sustained declines in the abundance of Rio Grande silvery minnow, it is encouraging that this species can apparently rebound so quickly following years with good spawning/recruitment conditions. The dramatic increase in the abundance of Rio Grande

silvery minnow from 2006 to 2007 (nearly an order of magnitude) is indicative of the ability of this species to rebound following favorable conditions. The rapid increases in abundance documented after consecutive years of good spring runoff contrast with the equally rapid decreases in abundance documented after consecutive years of poor spring runoff and prolonged summer low-flow/drying conditions. While there have been large fluctuations in the abundance of Rio Grande silvery minnow over the past decade, the biological importance of recently larger numbers of Rio Grande silvery minnow is uncertain in the face of eroding genetic diversity (pers. comm. M. J. Osborne, UNM; Alò and Turner, 2005).

Recent decreases in the abundance of Rio Grande silvery minnow indicate that many of the problems that originally led to the precipitous decline of this species throughout its range have not been remedied. While the increased abundance of Rio Grande silvery minnow during 2005 and 2007-2009 could be a positive sign that some management strategies are working, it could simply be a reflection of recently favorable environmental conditions. Indeed, the rapid decline of Rio Grande silvery minnow in 2010 indicates that subtle changes in the timing, magnitude, and duration of flows during spring and summer could potentially have large impacts on the successful recruitment of this species. Future study of the ecological interactions among fish species and their environment in the Middle Rio Grande should further elucidate the factors that control this complex aquatic ecosystem, which will be essential in providing the information required to develop successful management strategies. While recent strategies (e.g., stocking, salvage, LFCC pumping etc.) are essential to prevent short-term catastrophic population declines, a renewed focus on issues that could lead to self-sustaining populations of Rio Grande silvery minnow in the wild (e.g., natural flow regime, river connectivity, functional floodplains etc.) will assist in achieving the ultimate goal of long-term recovery.

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Appendix A.

Middle Rio Grande fish collection localities

Table A-1. Collection localities for September 2009 to October 2010 population monitoring of Rio Grande silvery minnow.

Site #	Site Locality
	ANGOSTURA REACH SITES
0	New Mexico, Sandoval County, Rio Grande, directly below Angostura Diversion Dam, Algodones. River Mile 209.7 SAN FELIPE PUEBLO QUADRANGLE UTM Easting: 363811 UTM Northing: 3916006 Zone: 13
1	New Mexico, Sandoval County, Rio Grande, at NM State Highway 44 bridge crossing, Bernalillo. River Mile 203.8 BERNALILLO QUADRANGLE UTM Easting: 358543 UTM Northing: 3909722 Zone: 13
2	New Mexico, Sandoval County, Rio Grande, ca. 4.0 miles downstream of NM State Highway 44 bridge crossing, at Rio Rancho Wastewater Treatment Plant, Rio Rancho. River Mile 200.0 BERNALILLO QUADRANGLE UTM Easting: 354772 UTM Northing: 3905355 Zone: 13
3	New Mexico, Bernalillo County, Rio Grande, at Central Avenue bridge crossing (US Highway 66), Albuquerque. River Mile 183.4 ALBUQUERQUE WEST QUADRANGLE UTM Easting: 346840 UTM Northing: 3884094 Zone: 13
4	New Mexico, Bernalillo County, Rio Grande, at Rio Bravo Boulevard bridge crossing, (NM State Highway 500), Albuquerque. River Mile 178.3 ALBUQUERQUE WEST QUADRANGLE UTM Easting: 347554 UTM Northing: 3877163 Zone: 13
	ISLETA REACH SITES
5	New Mexico, Valencia County, Rio Grande at Los Lunas bridge crossing (NM State Highway 49), Los Lunas. River Mile 161.4 LOS LUNAS QUADRANGLE UTM Easting: 342898 UTM Northing: 3852531 Zone: 13
6	New Mexico, Valencia County, Rio Grande, ca. 1.0 miles upstream of NM State Highway 309/6 bridge crossing, Belen. River Mile 151.5 TOME QUADRANGLE UTM Easting: 339972 UTM Northing: 3837061 Zone: 13
7	New Mexico, Valencia County, Rio Grande, ca. 2.2 miles upstream of NM State Highway 346 bridge crossing, Jarales. River Mile 143.2 VEGUITA QUADRANGLE UTM Easting: 338136 UTM Northing: 3827329 Zone: 13
8	New Mexico, Socorro County, Rio Grande, at US Highway 60 bridge crossing, Bernardo. River Mile 130.6 ABEYTAS QUADRANGLE UTM Easting: 334604 UTM Northing: 3809726 Zone: 13

Table A-1. Collection localities for September 2009 to October 2010 population monitoring of Rio Grande silvery minnow (continued).

Site #	Site Locality
	ISLETA REACH SITES (continued)
9	New Mexico, Socorro County, Rio Grande, ca. 3.5 miles downstream of US Highway 60 bridge crossing, Bernardo. River Mile 127.0 ABEYTAS QUADRANGLE UTM Easting: 331094 UTM Northing: 3805229 Zone: 13
9.5	New Mexico, Socorro County, Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia River Mile 116.8 LA JOYA QUADRANGLE UTM Easting: 327902 UTM Northing: 3792603 Zone: 13
	SAN ACACIA REACH SITES
10	New Mexico, Socorro County, Rio Grande, directly below San Acacia Diversion Dam, San Acacia. River Mile 116.2 SAN ACACIA QUADRANGLE UTM Easting: 326162 UTM Northing: 3791977 Zone: 13
11	New Mexico, Socorro County, Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia. River Mile 114.6 LEMITAR QUADRANGLE UTM Easting: 325263 UTM Northing: 3790442 Zone: 13
12	New Mexico, Socorro County, Rio Grande, east of Socorro, 0.5 miles upstream of the Socorro Low Flow Conveyance Channel bridge; east and upstream of Socorro Wastewater Treatment Plant, Socorro. River Mile 99.5 LOMA DE LAS CANAS QUADRANGLE UTM Easting: 327097 UTM Northing: 3771043 Zone: 13
13	New Mexico, Socorro County, Rio Grande, ca. 4.0 miles upstream of US Highway 380 bridge crossing, San Antonio. River Mile 91.7 SAN ANTONIO QUADRANGLE UTM Easting: 328140 UTM Northing: 3761283 Zone: 13
14	New Mexico, Socorro County, Rio Grande, at US Highway 380 bridge crossing, San Antonio. River Mile 87.1 SAN ANTONIO QUADRANGLE UTM Easting: 328914 UTM Northing: 3754471 Zone: 13
15	New Mexico, Socorro County, Rio Grande, directly east of Bosque del Apache National Wildlife Refuge Headquarters, San Antonio. River Mile 79.1 SAN ANTONIO, SE QUADRANGLE UTM Easting: 327055 UTM Northing: 3740839 Zone: 13
16	New Mexico, Socorro County, Rio Grande, at San Marcial Railroad bridge crossing, San Marcial. River Mile 68.6 SAN MARCIAL QUADRANGLE UTM Easting: 315284 UTM Northing: 3728347 Zone: 13

Table A-1. Collection localities for September 2009 to October 2010 population monitoring of Rio Grande silvery minnow (continued).

Site #	Site Locality
	SAN ACACIA REACH SITES
17	New Mexico, Socorro County, Rio Grande, at its former confluence with the Low Flow Conveyance Channel; ca. 8 miles downstream of San Marcial Railroad bridge crossing. River Mile 60.5 PARAJE WELL QUADRANGLE UTM Easting: 309487 UTM Northing: 3718178 Zone: 13
18	New Mexico, Socorro County, Rio Grande, ca. 10 miles downstream of San Marcial Railroad bridge crossing. River Mile 57.7 PARAJE WELL QUADRANGLE UTM Easting: 307380 UTM Northing: 3714740 Zone: 13

Appendix B

Table B-1. Water quality* summary statistics [Mean (Standard Deviation)], by sampling unit and reach, during the September 2009 to October 2010 population monitoring of Rio Grande silvery minnow.

REACH Sampling Unit and Name	Sec.	Temp.	Sal.	D.O.	Con. T.	Con.S.	pH
ANGOSTURA REACH							
0 Angostura Dam	40.1 (28.4)	14.9 (6.9)	0.1 (0)	8.8 (2.4)	243.3 (40.5)	276.2 (49.3)	8.5 (0.2)
1 Bernalillo	31.7 (19.4)	16 (7.3)	0.2 (0)	9 (2.2)	281.7 (86.9)	312.5 (99.2)	8.6 (0.2)
2 Rio Rancho	28.3 (17.4)	17.1 (7.5)	0.2 (0.1)	8.9 (2.4)	261.8 (44)	301.5 (39.7)	8.6 (0.3)
3 Central Ave.	17.5 (8.9)	15.5 (6.9)	0.2 (0)	8.2 (2.3)	289.2 (86.2)	344 (117.3)	8.5 (0.2)
4 Rio Bravo Blvd.	17.1 (7.8)	16.1 (7.4)	0.2 (0.1)	8.3 (2.2)	278.7 (102.7)	349.1 (103.7)	8.5 (0.2)
ISLETA REACH							
5 Los Lunas	13.1 (7.1)	21 (9.3)	0.2 (0.1)	8.4 (2.3)	477.8 (185.9)	514.7 (171.8)	8.5 (0.4)
6 Belen	14.4 (12.6)	19.7 (8.7)	0.2 (0.1)	8.9 (2)	419.9 (160.6)	460.1 (136.7)	8.7 (0.4)
7 Jarales	17.2 (13)	17.3 (7.4)	0.3 (0.1)	8.9 (2)	477.5 (187.9)	549.8 (163.2)	8.6 (0.3)
8 Bernardo	17 (18.8)	16.3 (7)	0.3 (0.1)	8.5 (2.2)	460.9 (142.2)	528.6 (145)	8.6 (0.3)
9 La Joya	14.5 (16.4)	15.7 (5.7)	0.3 (0.1)	8.4 (2.4)	445 (157.1)	512.1 (169)	8.5 (0.2)
9.5 North of San Acacia	8 (3.6)	19.5 (6.9)	0.3 (0.1)	8.1 (2.4)	495.7 (218)	534.3 (208.2)	8.6 (0.3)
SAN ACACIA REACH							
10 San Acacia Dam	9.2 (4.2)	18.5 (6.1)	0.3 (0.1)	8.1 (2.4)	503.3 (208)	565.5 (225)	8.6 (0.2)
11 South of San Acacia	9.1 (3.6)	17.7 (6.3)	0.3 (0.1)	8.5 (2.6)	516.1 (245)	581.4 (254.9)	8.6 (0.2)
12 Socorro	7.6 (4.7)	17.1 (6.2)	0.3 (0.1)	8.4 (2.7)	470.9 (268.5)	532.8 (286.5)	8.6 (0.3)
13 North of San Antonio	5.8 (4.3)	16.7 (6.4)	0.3 (0.2)	7.9 (2.7)	491.6 (194.9)	543.4 (174.4)	8.6 (0.3)
14 San Antonio	5.7 (4.1)	20.8 (7.8)	0.3 (0.1)	7.7 (2)	565.3 (177.8)	628.3 (146.3)	8.7 (0.3)
15 South of San Antonio	4.4 (3.9)	19.6 (8.5)	0.3 (0.1)	7.9 (2.1)	540.5 (149.5)	599.4 (137.9)	8.7 (0.2)
16 San Marcial	5 (3.8)	18.1 (7.3)	0.3 (0.1)	8 (1.5)	569.7 (196.2)	635.7 (191.7)	8.6 (0.2)
17 South of San Marcial 1	5.4 (4.4)	17.4 (6.6)	0.3 (0.1)	7.9 (1.6)	574.3 (215.1)	654.6 (230)	8.6 (0.2)
18 South of San Marcial 2	4.3 (3.1)	16.7 (6.7)	0.3 (0.1)	7.5 (2.3)	566.8 (219.4)	641.9 (225.9)	8.6 (0.2)

*Water quality codes:
Sec. = Secchi depth (cm)
Temp. = Water Temperature (°C)
Sal. = Salinity (ppt)
D.O. = Dissolved Oxygen (mg/l)
Con. T. = True Conductivity (µs)
Con. S. = Specific Conductance (µs)
pH = pH (dimensionless measure of the acidity or basicity of a solution)

Appendix C.

Ichthyofaunal composition of the September 2009 to October 2010
Rio Grande silvery minnow population monitoring collections

Monthly trip reports and associated data are available at:
http://msb-fish.unm.edu/rgsm2009/
and
http://msb-fish.unm.edu/rgsm2010/

Rio Grande silvery minnow Population Monitoring
September 2009

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, directly below Angostura Diversion Dam, Algodones. Site Number: 0

04 September 2009 **RKD09-018** River Mile: 209.7

UTM Easting: 363811 UTM Northing: 3916006 Zone: 13 Quad: San Felipe Pueblo

R.K. Dudley, S.P. Platania, A.L. Barkalow Effort: 323.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	30
76	*Hybognathus amarus**	6
76	*Platygobio gracilis*	15
76	*Rhinichthys cataractae*	7
81	*Catostomus commersoni*	2
212	*Gambusia affinis*	76
294	*Micropterus salmoides*	2

***Hybognathus amarus* by age class:**

age-0: 5
age-1:
age-2: 1

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, at US HWY 550 (formerly NM State HWY 44) bridge crossing, Bernalillo. Site Number: 1

04 September 2009 **RKD09-019** River Mile: 203.8

UTM Easting: 358543 UTM Northing: 3909722 Zone: 13 Quad: Bernalillo

R.K. Dudley, S.P. Platania, A.L. Barkalow Effort: 387.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	45
76	*Hybognathus amarus**	61
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	51
76	*Rhinichthys cataractae*	24
81	*Catostomus commersoni*	8
93	*Ameiurus melas*	1
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0: 58
age-1: 3
age-2:

Rio Grande silvery minnow Population Monitoring
September 2009

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

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: 2
River Mile: 200.0

04 September 2009 **RKD09-020**

UTM Easting: 354772 UTM Northing: 3905355 Zone: 13 Quad: Bernalillo

R.K. Dudley, S.P. Platania, A.L. Barkalow

Effort: 365.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	21
76	*Hybognathus amarus**	70
76	*Pimephales promelas*	5
76	*Platygobio gracilis*	40
76	*Rhinichthys cataractae*	5
81	*Catostomus commersoni*	5
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	121
283	*Morone chrysops*	1
294	*Lepomis macrochirus*	5
294	*Micropterus salmoides*	1

*** *Hybognathus amarus* by age class:**

age-0: 65
age-1: 4
age-2: 1

Rio Grande silvery minnow Population Monitoring
September 2009

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Central Avenue bridge crossing (US HWY 66), Albuquerque. Site Number: 3

04 September 2009 **RKD09-017** River Mile: 183.4

UTM Easting: 346840 UTM Northing: 3884094 Zone: 13 Quad: Albuquerque West

R.K. Dudley, S.P. Platania, A.L. Barkalow Effort: 441.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	40
76	*Hybognathus amarus**	7
76	*Pimephales promelas*	3
76	*Platygobio gracilis*	12
76	*Rhinichthys cataractae*	1
81	*Carpiodes carpio*	5
81	*Catostomus commersoni*	8
93	*Ictalurus punctatus*	20
212	*Gambusia affinis*	37
294	*Lepomis macrochirus*	3

**** Hybognathus amarus*** **by age class:**

age-0: 7

age-1:

age-2:

Rio Grande silvery minnow Population Monitoring
September 2009

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Rio Bravo Blvd. Bridge crossing (NM State HWY 500) crossing, Albuquerque. Site Number: 4 River Mile: 178.3

04 September 2009 **RKD09-016**

UTM Easting: 347554 UTM Northing: 3877163 Zone: 13 Quad: Albuquerque West

R.K. Dudley, S.P. Platania, A.L. Barkalow Effort: 479.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	33
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	3
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	5
81	*Carpiodes carpio*	6
81	*Catostomus commersoni*	1
93	*Ictalurus punctatus*	21
212	*Gambusia affinis*	14
294	*Micropterus salmoides*	1
294	*Pomoxis annularis*	2

*** *Hybognathus amarus* by age class:**

age-0: 2
age-1: 1
age-2:

Rio Grande silvery minnow Population Monitoring
September 2009

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, at Los Lunas Bridge crossing (NM State HWY 6), Los Lunas. Site Number: 5

03 September 2009 **RKD09-015** River Mile: 161.4

UTM Easting: 342898 UTM Northing: 3852531 Zone: 13 Quad: Los Lunas

R.K. Dudley, A.L. Barkalow, J.L.Hester Effort: 469.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	82
76	*Hybognathus amarus**	132
76	*Platygobio gracilis*	2
76	*Rhinichthys cataractae*	1
81	*Carpiodes carpio*	3
93	*Ictalurus punctatus*	9
212	*Gambusia affinis*	48

***Hybognathus amarus* by age class:**

age-0: 130
age-1: 2
age-2:

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 1.0 miles upstream of NM State HWY 309 bridge crossing, Belen. Site Number: 6

03 September 2009 **RKD09-014** River Mile: 151.5

UTM Easting: 339972 UTM Northing: 3837061 Zone: 13 Quad: Tome

R.K. Dudley, A.L. Barkalow, J.L.Hester Effort: 598.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	113
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	33
76	*Pimephales promelas*	8
81	*Carpiodes carpio*	5
93	*Ictalurus punctatus*	14
212	*Gambusia affinis*	39
283	*Morone chrysops*	1

***Hybognathus amarus* by age class:**

age-0: 29
age-1: 4
age-2:

Rio Grande silvery minnow Population Monitoring
September 2009

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 2.2 miles upstream of NM State HWY 346 bridge crossing, Jarales. Site Number: 7

03 September 2009 **RKD09-013** River Mile: 143.2

UTM Easting: 338136 UTM Northing: 3827329 Zone: 13 Quad: Veguita

R.K. Dudley, A.L. Barkalow, J.L.Hester Effort: 601.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	165
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	15
81	*Carpiodes carpio*	2
93	*Ictalurus punctatus*	3
212	*Gambusia affinis*	29

***Hybognathus amarus* by age class:**

age-0: 15
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at US HWY 60 bridge crossing, Bernardo. Site Number: 8

03 September 2009 **RKD09-012** River Mile: 130.6

UTM Easting: 334604 UTM Northing: 3809726 Zone: 13 Quad: Abeytas

R.K. Dudley, A.L. Barkalow, J.L.Hester Effort: 456.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	178
76	*Hybognathus amarus**	53
76	*Pimephales promelas*	9
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	2
212	*Gambusia affinis*	238

***Hybognathus amarus* by age class:**

age-0: 51
age-1: 2
age-2:

Rio Grande silvery minnow Population Monitoring
September 2009

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 3.5 miles downstream of the US HWY 60 bridge crossing, Bernardo. Site Number: 9

03 September 2009 **RKD09-011** River Mile: 127.0

UTM Easting: 331094 UTM Northing: 3805229 Zone: 13 Quad: Abeytas

R.K. Dudley, A.L. Barkalow, J.L.Hester Effort: 463.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	51
76	*Hybognathus amarus**	35
76	*Pimephales promelas*	5
81	*Carpiodes carpio*	1
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0: 35
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia Site Number: 9.5

02 September 2009 **RKD09-010** River Mile: 116.8

UTM Easting: 327902 UTM Northing: 3792603 Zone: 13 Quad: La Joya

R.K. Dudley, S.P. Platania, A.L. Barkalow Effort: 449.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	120
76	*Hybognathus amarus**	16
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	37
93	*Ameiurus natalis*	1
93	*Ictalurus punctatus*	3
212	*Gambusia affinis*	77

***Hybognathus amarus* by age class:**

age-0: 16
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
September 2009

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly below San Acacia Diversion Dam, San Acacia. Site Number: 10

02 September 2009 **RKD09-009** River Mile: 116.2

UTM Easting: 326162 UTM Northing: 3791977 Zone: 13 Quad: San Acacia

R.K. Dudley, S.P. Platania, A.L. Barkalow Effort: 363.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	22
76	*Hybognathus amarus**	255
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	21
93	*Ameiurus natalis*	3
93	*Ictalurus punctatus*	9
212	*Gambusia affinis*	25

***Hybognathus amarus* by age class:**

age-0: 249
age-1: 6
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia. Site Number: 11

02 September 2009 **RKD09-008** River Mile: 114.6

UTM Easting: 325263 UTM Northing: 3790442 Zone: 13 Quad: Lemitar

R.K. Dudley, S.P. Platania, A.L. Barkalow Effort: 461.7 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	44
76	*Hybognathus amarus**	196
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	13
81	*Carpiodes carpio*	1
93	*Ictalurus punctatus*	7
212	*Gambusia affinis*	103

***Hybognathus amarus* by age class:**

age-0: 196
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, east of Socorro, 0.5 miles upstream of Socorro Low Flow Conveyance Site Number: 12
Channel bridge and east just upstream of Socorro Wastewater Treatment Plant, Socorro. River Mile: 99.5
02 September 2009 **RKD09-007**
UTM Easting: 327097 UTM Northing: 3771043 Zone: 13 Quad: Loma de las Canas
R.K. Dudley, S.P. Platania, A.L. Barkalow Effort: 473.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	20
76	*Hybognathus amarus**	212
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	7
81	*Carpiodes carpio*	2
93	*Ictalurus punctatus*	2
212	*Gambusia affinis*	14

***Hybognathus amarus* by age class:**

age-0: 207
age-1: 5
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 4.0 miles upstream of U.S. 380 bridge crossing. Site Number: 13
02 September 2009 **RKD09-006** River Mile: 91.7
UTM Easting: 328140 UTM Northing: 3761283 Zone: 13 Quad: San Antonio
R.K. Dudley, S.P. Platania, A.L. Barkalow Effort: 414.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	11
76	*Hybognathus amarus**	61
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	7
76	*Rhinichthys cataractae*	2
81	*Carpiodes carpio*	2
93	*Ictalurus punctatus*	10
212	*Gambusia affinis*	80

***Hybognathus amarus* by age class:**

age-0: 61
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
September 2009

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 380 bridge crossing, San Antonio. Site Number: 14
01 September 2009 **RKD09-005** River Mile: 87.1
UTM Easting: 328914 UTM Northing: 3754471 Zone: 13 Quad: San Antonio
R.K. Dudley, S.P. Platania, A.L. Barkalow, J.L.Hester Effort: 506.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	14
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	229
76	*Platygobio gracilis*	27
93	*Ictalurus punctatus*	24
212	*Gambusia affinis*	30

***Hybognathus amarus* by age class:**

age-0: 229
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, directly east of Bosque del Apache National Wildlife Refuge Headquarters, San Antonio. Site Number: 15
River Mile: 79.1
01 September 2009 **RKD09-004**
UTM Easting: 327055 UTM Northing: 3740839 Zone: 13 Quad: San Antonio SE
R.K. Dudley, S.P. Platania, A.L. Barkalow, J.L.Hester Effort: 653.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	5
76	*Hybognathus amarus**	2
93	*Ictalurus punctatus*	2
212	*Gambusia affinis*	11

***Hybognathus amarus* by age class:**

age-0: 2
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
September 2009

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at San Marcial Railroad Bridge, San Marcial. Site Number: 16
01 September 2009 **RKD09-003** River Mile: 68.6
UTM Easting: 315284 UTM Northing: 3728347 Zone: 13 Quad: San Marcial
R.K. Dudley, S.P. Platania, A.L. Barkalow, J.L.Hester Effort: 452.7 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	45
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	80
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	5
93	*Ictalurus punctatus*	10
212	*Gambusia affinis*	20
294	*Lepomis cyanellus*	1

**** Hybognathus amarus* by age class:**

age-0: 79
age-1: 1
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 8 miles downstream of the San Marcial railroad bridge crossing Site Number: 17
01 September 2009 **RKD09-002** River Mile: 60.5
UTM Easting: 309487 UTM Northing: 3718178 Zone: 13 Quad: Paraje Well
R.K. Dudley, S.P. Platania, A.L. Barkalow, J.L.Hester Effort: 465.2 sq. m

FAMILY		N
69	*Dorosoma cepedianum*	1
76	*Cyprinella lutrensis*	56
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	112
76	*Pimephales promelas*	7
76	*Platygobio gracilis*	4
93	*Ictalurus punctatus*	9
212	*Gambusia affinis*	7

**** Hybognathus amarus* by age class:**

age-0: 112
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
September 2009

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 10 mi downstream of the San Marcial railroad bridge crossing — Site Number: 18

01 September 2009 **RKD09-001** — River Mile: 58.8

UTM Easting: 307846 UTM Northing: 3716150 Zone: 13 Quad: Paraje Well

R.K. Dudley, S.P. Platania, A.L. Barkalow, J.L.Hester — Effort: 500.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	51
76	*Hybognathus amarus**	42
76	*Pimephales promelas*	3
93	*Ictalurus punctatus*	22
93	*Pylodictis olivaris*	1
212	*Gambusia affinis*	65

***Hybognathus amarus* by age class:**

age-0: 42
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, directly below Angostura Diversion Dam, Algodones. Site Number: 0

02 October 2009 **RKD09-038** River Mile: 209.7

UTM Easting: 363811 UTM Northing: 3916006 Zone: 13 Quad: San Felipe Pueblo

R.K. Dudley, M.A. Farrington, M.A. Brandenburg Effort: 402.7 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	15
76	*Pimephales promelas*	19
76	*Platygobio gracilis*	1
76	*Rhinichthys cataractae*	1
81	*Catostomus commersoni*	3
212	*Gambusia affinis*	23
294	*Micropterus salmoides*	4
294	*Pomoxis annularis*	3

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, at US HWY 550 (formerly NM State HWY 44) bridge crossing, Bernalillo. Site Number: 1

02 October 2009 **RKD09-039** River Mile: 203.8

UTM Easting: 358543 UTM Northing: 3909722 Zone: 13 Quad: Bernalillo

R.K. Dudley, M.A. Farrington, M.A. Brandenburg Effort: 481.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	30
76	*Hybognathus amarus**	204
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	46
76	*Rhinichthys cataractae*	13
81	*Catostomus commersoni*	4
93	*Ictalurus punctatus*	17

***Hybognathus amarus* by age class:**

age-0: 199
age-1: 5
age-2:

Rio Grande silvery minnow Population Monitoring
October 2009

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

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: 2
River Mile: 200.0

02 October 2009 **RKD09-040**

UTM Easting: 354772 UTM Northing: 3905355 Zone: 13 Quad: Bernalillo

R.K. Dudley, M.A. Farrington, M.A. Brandenburg

Effort: 426.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	56
76	*Hybognathus amarus**	78
76	*Pimephales promelas*	3
76	*Platygobio gracilis*	26
76	*Rhinichthys cataractae*	1
81	*Catostomus commersoni*	4
93	*Ictalurus punctatus*	18
212	*Gambusia affinis*	58

***Hybognathus amarus* by age class:**

age-0: 73
age-1: 5
age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Central Avenue bridge crossing (US HWY 66), Albuquerque. Site Number: 3

02 October 2009 **RKD09-037** River Mile: 183.4

UTM Easting: 346840 UTM Northing: 3884094 Zone: 13 Quad: Albuquerque West

R.K. Dudley, M.A. Farrington, M.A. Brandenburg Effort: 487.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	73
76	*Hybognathus amarus**	11
76	*Pimephales promelas*	4
76	*Platygobio gracilis*	10
81	*Carpiodes carpio*	5
93	*Ictalurus furcatus*	1
93	*Ictalurus punctatus*	25
212	*Gambusia affinis*	13

***Hybognathus amarus* by age class:**

age-0: 9
age-1: 2
age-2:

Rio Grande silvery minnow Population Monitoring
October 2009

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Rio Bravo Blvd. Bridge crossing (NM State HWY 500) crossing, Albuquerque. Site Number: 4 River Mile: 178.3

02 October 2009 **RKD09-036**

UTM Easting: 347554 UTM Northing: 3877163 Zone: 13 Quad: Albuquerque West

R.K. Dudley, M.A. Farrington, M.A. Brandenburg Effort: 474.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	93
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	35
76	*Pimephales promelas*	15
76	*Platygobio gracilis*	4
81	*Carpiodes carpio*	9
81	*Catostomus commersoni*	1
93	*Ameiurus natalis*	2
93	*Ictalurus punctatus*	13
212	*Gambusia affinis*	56

**** Hybognathus amarus* by age class:**

age-0: 30
age-1: 5
age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, at Los Lunas Bridge crossing (NM State HWY 49), Los Lunas. Site Number: 5

02 October 2009 **RKD09-035** River Mile: 161.4

UTM Easting: 342898 UTM Northing: 3852531 Zone: 13 Quad: Los Lunas

W.H. Brandenburg, J.L. Hester, K.M. Schaus Effort: 678.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	277
76	*Hybognathus amarus**	135
76	*Pimephales promelas*	4
76	*Platygobio gracilis*	2
81	*Carpiodes carpio*	4
81	*Catostomus commersoni*	5
93	*Ameiurus melas*	1
93	*Ictalurus punctatus*	25
212	*Gambusia affinis*	94

***Hybognathus amarus* by age class:**

age-0: 135
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 1.0 miles upstream of NM State HWY 309/6 bridge crossing, Belen. Site Number: 6

02 October 2009 **RKD09-034** River Mile: 151.5

UTM Easting: 339972 UTM Northing: 3837061 Zone: 13 Quad: Tome

W.H. Brandenburg, J.L. Hester, K.M. Schaus Effort: 767.7 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	824
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	18
76	*Pimephales promelas*	8
76	*Platygobio gracilis*	6
81	*Carpiodes carpio*	27
93	*Ictalurus punctatus*	98
212	*Gambusia affinis*	24
294	*Micropterus salmoides*	1

***Hybognathus amarus* by age class:**

age-0: 14
age-1: 2
age-2: 2

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 2.2 miles upstream of NM State HWY 346 bridge crossing, Jarales. Site Number: 7

02 October 2009 **RKD09-033** River Mile: 143.2

UTM Easting: 338136 UTM Northing: 3827329 Zone: 13 Quad: Veguita

W.H. Brandenburg, J.L. Hester, K.M. Schaus Effort: 568.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	347
76	*Hybognathus amarus**	39
76	*Pimephales promelas*	21
76	*Platygobio gracilis*	2
81	*Carpiodes carpio*	11
81	*Catostomus commersoni*	3
93	*Ictalurus punctatus*	27
212	*Gambusia affinis*	125

**** Hybognathus amarus* by age class:**

age-0: 39
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at US HWY 60 bridge crossing, Bernardo. Site Number: 8

02 October 2009 **RKD09-032** River Mile: 130.6

UTM Easting: 334604 UTM Northing: 3809726 Zone: 13 Quad: Abeytas

W.H. Brandenburg, J.L. Hester, K.M. Schaus Effort: 630.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	269
76	*Hybognathus amarus**	20
76	*Pimephales promelas*	10
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	1
93	*Ictalurus punctatus*	16
212	*Gambusia affinis*	8

**** Hybognathus amarus* by age class:**

age-0: 20
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 3.5 miles downstream of the US HWY 60 bridge crossing, Bernardo. Site Number: 9

02 October 2009 **RKD09-031** River Mile: 127.0

UTM Easting: 331094 UTM Northing: 3805229 Zone: 13 Quad: Abeytas

W.H. Brandenburg, J.L. Hester, K.M. Schaus Effort: 726.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	271
76	*Hybognathus amarus**	45
76	*Pimephales promelas*	51
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	1
93	*Ictalurus punctatus*	16
212	*Gambusia affinis*	73
294	*Micropterus salmoides*	1

**** Hybognathus amarus* by age class:**

age-0: 44
age-1: 1
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia Site Number: 9.5

02 October 2009 **RKD09-030** River Mile: 116.8

UTM Easting: 327902 UTM Northing: 3792603 Zone: 13 Quad: La Joya

W.H. Brandenburg, A.L. Barkalow, J.L. Hester, K.M. Schaus Effort: 660.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	6
76	*Hybognathus amarus**	30
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	29
81	*Carpiodes carpio*	1
93	*Ictalurus punctatus*	5
212	*Gambusia affinis*	234

**** Hybognathus amarus* by age class:**

age-0: 30
age-1:
age-2:

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NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly below San Acacia Diversion Dam, San Acacia. Site Number: 10

02 October 2009 **RKD09-029** River Mile: 116.2

UTM Easting: 326162 UTM Northing: 3791977 Zone: 13 Quad: San Acacia

W.H. Brandenburg, A.L. Barkalow, J.L. Hester, K.M. Schaus Effort: 621.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	8
76	*Hybognathus amarus**	43
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	27
76	*Rhinichthys cataractae*	1
93	*Ameiurus natalis*	1
93	*Ictalurus punctatus*	13
212	*Gambusia affinis*	1

**** Hybognathus amarus* by age class:**

age-0: 43
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia. Site Number: 11

01 October 2009 **RKD09-028** River Mile: 114.6

UTM Easting: 325263 UTM Northing: 3790442 Zone: 13 Quad: Lemitar

W.H. Brandenburg, A.L. Barkalow, J.L. Hester, K.M. Schaus Effort: 684.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	14
76	*Hybognathus amarus**	59
76	*Platygobio gracilis*	33
93	*Ictalurus punctatus*	19
212	*Gambusia affinis*	72

**** Hybognathus amarus* by age class:**

age-0: 59
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
October 2009

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, east of Socorro, 0.5 miles upstream of Socorro Low Flow Conveyance Site Number: 12
Channel bridge and east just upstream of Socorro Wastewater Treatment Plant, Socorro. River Mile: 99.5
01 October 2009 **RKD09-027**
UTM Easting: 327097 UTM Northing: 3771043 Zone: 13 Quad: Loma de las Canas
W.H. Brandenburg, A.L. Barkalow, J.L. Hester, K.M. Schaus Effort: 763.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	3
76	*Hybognathus amarus**	400
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	14
81	*Carpiodes carpio*	1
93	*Ictalurus punctatus*	10
212	*Gambusia affinis*	13

*** *Hybognathus amarus* by age class:**

age-0: 399
age-1: 1
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 4.0 miles upstream of U.S. 380 bridge crossing. Site Number: 13
01 October 2009 **RKD09-026** River Mile: 91.7
UTM Easting: 328140 UTM Northing: 3761283 Zone: 13 Quad: San Antonio
W.H. Brandenburg, A.L. Barkalow, J.L. Hester, K.M. Schaus Effort: 527.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	2
76	*Hybognathus amarus**	392
76	*Platygobio gracilis*	1
93	*Ictalurus punctatus*	2
212	*Gambusia affinis*	3

*** *Hybognathus amarus* by age class:**

age-0: 392
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 380 bridge crossing, San Antonio. Site Number: 14
01 October 2009 **RKD09-025** River Mile: 87.1
UTM Easting: 328914 UTM Northing: 3754471 Zone: 13 Quad: San Antonio
R.K. Dudley, M.A. Farrington, R.C. Keller Effort: 645.9 sq. m

FAMILY		N
76	*Hybognathus amarus**	147
76	*Pimephales promelas*	1
76	*Pimephales vigilax*	1
76	*Platygobio gracilis*	4
93	*Ictalurus punctatus*	11
212	*Gambusia affinis*	12

***Hybognathus amarus* by age class:**

age-0: 147
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, directly east of Bosque del Apache National Wildlife Refuge Headquarters, San Antonio. Site Number: 15
River Mile: 79.1
01 October 2009 **RKD09-024**
UTM Easting: 327055 UTM Northing: 3740839 Zone: 13 Quad: San Antonio SE
R.K. Dudley, M.A. Farrington, R.C. Keller Effort: 527.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	10
76	*Hybognathus amarus**	31
76	*Pimephales promelas*	3
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0: 31
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at San Marcial Railroad Bridge, San Marcial. Site Number: 16
01 October 2009 **RKD09-023** River Mile: 68.6
UTM Easting: 315284 UTM Northing: 3728347 Zone: 13 Quad: San Marcial
R.K. Dudley, M.A. Farrington, R.C. Keller Effort: 519.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	1
76	*Hybognathus amarus**	43
93	*Ictalurus punctatus*	2
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0: 43
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 8 miles downstream of the San Marcial railroad bridge crossing Site Number: 17
01 October 2009 **RKD09-022** River Mile: 60.5
UTM Easting: 309487 UTM Northing: 3718178 Zone: 13 Quad: Paraje Well
R.K. Dudley, M.A. Farrington, R.C. Keller Effort: 632.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	13
76	*Hybognathus amarus**	61
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	3

***Hybognathus amarus* by age class:**

age-0: 61
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 10 mi downstream of the San Marcial railroad bridge crossing — Site Number: 18

01 October 2009 **RKD09-021** — River Mile: 58.8

UTM Easting: 307846 UTM Northing: 3716150 Zone: 13 Quad: Paraje Well

R.K. Dudley, M.A. Farrington, R.C. Keller — Effort: 541.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	2
76	*Hybognathus amarus**	44
93	*Ictalurus punctatus*	2

***Hybognathus amarus* by age class:**

age-0: 44

age-1:

age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, directly below Angostura Diversion Dam, Algodones. Site Number: 0

03 December 2009 **RKD09-159** River Mile: 209.7

UTM Easting: 363811 UTM Northing: 3916006 Zone: 13 Quad: San Felipe Pueblo

R.K. Dudley, R.C. Keller, J.L. Hester Effort: 483.5 sq. m

FAMILY		N
81	*Catostomus commersoni*	1
212	*Gambusia affinis*	1

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, at US HWY 550 (formerly NM State HWY 44) bridge crossing, Bernalillo. Site Number: 1

03 December 2009 **RKD09-160** River Mile: 203.8

UTM Easting: 358543 UTM Northing: 3909722 Zone: 13 Quad: Bernalillo

R.K. Dudley, R.C. Keller, J.L. Hester Effort: 444.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	4
76	*Hybognathus amarus**	130
76	*Platygobio gracilis*	29
81	*Catostomus commersoni*	3
212	*Gambusia affinis*	2

***Hybognathus amarus* by age class:**

age-0: 76
age-1: 40
age-2: 14

Rio Grande silvery minnow Population Monitoring
December 2009

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

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: 2 River Mile: 200.0

03 December 2009 **RKD09-161**

UTM Easting: 354772 UTM Northing: 3905355 Zone: 13 Quad: Bernalillo

R.K. Dudley, R.C. Keller, J.L. Hester Effort: 501.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	1
76	*Hybognathus amarus**	19
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	13

***Hybognathus amarus* by age class:**

age-0: 19
age-1:
age-2:

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Central Avenue bridge crossing (US HWY 66), Albuquerque. Site Number: 3

03 December 2009 **RKD09-158** River Mile: 183.4

UTM Easting: 346840 UTM Northing: 3884094 Zone: 13 Quad: Albuquerque West

R.K. Dudley, R.C. Keller, J.L. Hester Effort: 480.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	14
76	*Hybognathus amarus**	1
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	3
76	*Rhinichthys cataractae*	1
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	19

***Hybognathus amarus* by age class:**

age-0: 1
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
December 2009

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Rio Bravo Blvd. Bridge crossing (NM State HWY 500) crossing, Albuquerque. Site Number: 4
River Mile: 178.3

03 December 2009 **RKD09-157**

UTM Easting: 347554 UTM Northing: 3877163 Zone: 13 Quad: Albuquerque West

R.K. Dudley, R.C. Keller, J.L. Hester Effort: 543.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	5
76	*Hybognathus amarus**	8
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	2
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0: 8
age-1:
age-2:

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, at Los Lunas Bridge crossing (NM State HWY 49), Los Lunas. Site Number: 5

03 December 2009 **RKD09-171** River Mile: 161.4

UTM Easting: 342898 UTM Northing: 3852531 Zone: 13 Quad: Los Lunas

A.L. Barkalow, M.A. Brandenburg, K.M. Schaus Effort: 590.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	29
76	*Hybognathus amarus**	3065
76	*Pimephales promelas*	21
76	*Rhinichthys cataractae*	63
212	*Gambusia affinis*	8

***Hybognathus amarus* by age class:**

age-0: 2870
age-1: 157
age-2: 38

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 1.0 miles upstream of NM State HWY 309/6 bridge crossing, Belen. Site Number: 6

03 December 2009 **RKD09-170** River Mile: 151.5

UTM Easting: 339972 UTM Northing: 3837061 Zone: 13 Quad: Tome

A.L. Barkalow, M.A. Brandenburg, K.M. Schaus Effort: 430.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	123
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	70
76	*Pimephales promelas*	43
76	*Platygobio gracilis*	4
81	*Carpiodes carpio*	24
93	*Ictalurus punctatus*	26
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0: 66
age-1: 4
age-2:

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 2.2 miles upstream of NM State HWY 346 bridge crossing, Jarales. Site Number: 7

03 December 2009 **RKD09-169** River Mile: 143.2

UTM Easting: 338136 UTM Northing: 3827329 Zone: 13 Quad: Veguita

A.L. Barkalow, M.A. Brandenburg, K.M. Schaus Effort: 526.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	329
76	*Hybognathus amarus**	33
76	*Pimephales promelas*	8
212	*Gambusia affinis*	3

***Hybognathus amarus* by age class:**

age-0: 32
age-1: 1
age-2:

Rio Grande silvery minnow Population Monitoring
December 2009

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 60 bridge crossing, Bernardo. Site Number: 8
03 December 2009 **RKD09-168** River Mile: 130.6
UTM Easting: 334604 UTM Northing: 3809726 Zone: 13 Quad: Abeytas
A.L. Barkalow, M.A. Brandenburg, K.M. Schaus Effort: 469.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	74
76	*Hybognathus amarus**	11
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	1
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	11

*** *Hybognathus amarus* by age class:**

age-0: 10
age-1: 1
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 3.5 miles downstream of the US HWY 60 bridge crossing, Bernardo. Site Number: 9
03 December 2009 **RKD09-167** River Mile: 127.0
UTM Easting: 331094 UTM Northing: 3805229 Zone: 13 Quad: Abeytas
A.L. Barkalow, M.A. Brandenburg, K.M. Schaus Effort: 592.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	68
76	*Hybognathus amarus**	23
76	*Pimephales promelas*	4
81	*Carpiodes carpio*	9
93	*Ictalurus punctatus*	7
212	*Gambusia affinis*	19
283	*Morone chrysops*	7

*** *Hybognathus amarus* by age class:**

age-0: 23
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
December 2009

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia — Site Number: 9.5

01 December 2009 **RKD09-166** — River Mile: 116.8

UTM Easting: 327902 UTM Northing: 3792603 Zone: 13 Quad: La Joya

A.L. Barkalow, J.L. Hester, R.C. Keller — Effort: 654.5 sq. m

FAMILY		N
76	*Hybognathus amarus**	39
76	*Platygobio gracilis*	59
81	*Carpiodes carpio*	2
93	*Ictalurus punctatus*	1

***Hybognathus amarus* by age class:**

age-0: 39
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly below San Acacia Diversion Dam, San Acacia. — Site Number: 10

01 December 2009 **RKD09-165** — River Mile: 116.2

UTM Easting: 326162 UTM Northing: 3791977 Zone: 13 Quad: San Acacia

A.L. Barkalow, J.L. Hester, R.C. Keller — Effort: 377.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	2
76	*Hybognathus amarus**	19
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	14
76	*Rhinichthys cataractae*	3
81	*Carpiodes carpio*	3
93	*Ictalurus punctatus*	2

***Hybognathus amarus* by age class:**

age-0: 15
age-1: 3
age-2: 1

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia. Site Number: 11

01 December 2009 **RKD09-164** River Mile: 114.6

UTM Easting: 325263 UTM Northing: 3790442 Zone: 13 Quad: Lemitar

A.L. Barkalow, J.L. Hester, R.C. Keller Effort: 672.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	8
76	*Hybognathus amarus**	93
76	*Pimephales promelas*	4
76	*Platygobio gracilis*	42
81	*Carpiodes carpio*	4
93	*Ictalurus punctatus*	14

***Hybognathus amarus* by age class:**

age-0: 92
age-1: 1
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, east of Socorro, 0.5 miles upstream of Socorro Low Flow Conveyance Site Number: 12

Channel bridge and east just upstream of Socorro Wastewater Treatment Plant, Socorro. River Mile: 99.5

01 December 2009 **RKD09-163**

UTM Easting: 327097 UTM Northing: 3771043 Zone: 13 Quad: Loma de las Canas

A.L. Barkalow, J.L. Hester, R.C. Keller Effort: 675.0 sq. m

FAMILY		N
76	*Hybognathus amarus**	154
76	*Platygobio gracilis*	8
93	*Ictalurus punctatus*	2
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0: 154
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
December 2009

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 4.0 miles upstream of U.S. 380 bridge crossing. Site Number: 13
01 December 2009 **RKD09-162** River Mile: 91.7
UTM Easting: 328140 UTM Northing: 3761283 Zone: 13 Quad: San Antonio
A.L. Barkalow, J.L. Hester, R.C. Keller Effort: 492.8 sq. m

FAMILY		N
76	*Hybognathus amarus**	135
76	*Platygobio gracilis*	7

***Hybognathus amarus* by age class:**
age-0: 134
age-1: 1
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 380 bridge crossing, San Antonio. Site Number: 14
01 December 2009 **RKD09-156** River Mile: 87.1
UTM Easting: 328914 UTM Northing: 3754471 Zone: 13 Quad: San Antonio
R.K. Dudley, K.M. Schaus, M.A. Brandenburg Effort: 567.3 sq. m

FAMILY		N
76	*Hybognathus amarus**	23
212	*Gambusia affinis*	11

***Hybognathus amarus* by age class:**
age-0: 21
age-1: 2
age-2:

Rio Grande silvery minnow Population Monitoring
December 2009

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly east of Bosque del Apache National Wildlife Refuge Headquarters. Site Number: 15

01 December 2009 **RKD09-155** River Mile: 79.1

UTM Easting: 327055 UTM Northing: 3740839 Zone: 13 Quad: San Antonio SE

R.K. Dudley, K.M. Schaus, M.A. Brandenburg Effort: 506.8 sq. m

FAMILY		N
76	*Hybognathus amarus**	40
76	*Pimephales promelas*	2

***Hybognathus amarus* by age class:**

age-0: 35
age-1: 4
age-2: 1

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at San Marcial Railroad Bridge, San Marcial. Site Number: 16

01 December 2009 **RKD09-154** River Mile: 68.6

UTM Easting: 315284 UTM Northing: 3728347 Zone: 13 Quad: San Marcial

R.K. Dudley, K.M. Schaus, M.A. Brandenburg Effort: 481.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	2
76	*Hybognathus amarus**	94
76	*Platygobio gracilis*	1
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0: 91
age-1: 3
age-2:

Rio Grande silvery minnow Population Monitoring
December 2009

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 8 miles downstream of the San Marcial railroad bridge crossing — Site Number: 17

01 December 2009 **RKD09-153** — River Mile: 60.5

UTM Easting: 309487 UTM Northing: 3718178 Zone: 13 Quad: Paraje Well

R.K. Dudley, K.M. Schaus, M.A. Brandenburg — Effort: 430.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	1
76	*Hybognathus amarus**	155
76	*Pimephales promelas*	3
93	*Ictalurus punctatus*	2
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0: 154
age-1: 1
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 10 mi downstream of the San Marcial railroad bridge crossing — Site Number: 18

01 December 2009 **RKD09-152** — River Mile: 58.8

UTM Easting: 307846 UTM Northing: 3716150 Zone: 13 Quad: Paraje Well

R.K. Dudley, K.M. Schaus, M.A. Brandenburg — Effort: 532.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	1
76	*Hybognathus amarus**	47
93	*Ictalurus punctatus*	1

***Hybognathus amarus* by age class:**

age-0: 46
age-1: 1
age-2:

Rio Grande silvery minnow Population Monitoring
February 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage
Rio Grande, directly below Angostura Diversion Dam, Algodones. Site Number: 0
05 February 2010 **RKD10-003** River Mile: 209.7
UTM Easting: 363811 UTM Northing: 3916006 Zone: 13 Quad: San Felipe Pueblo
R.K. Dudley, A.L. Barkalow, M.A. Brandenburg Effort: 537.0 sq. m

FAMILY		N
	No Fish Collected	

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage
Rio Grande, at US HWY 550 (formerly NM State HWY 44) bridge crossing, Bernalillo. Site Number: 1
05 February 2010 **RKD10-004** River Mile: 203.8
UTM Easting: 358543 UTM Northing: 3909722 Zone: 13 Quad: Bernalillo
R.K. Dudley, A.L. Barkalow, M.A. Brandenburg Effort: 706.5 sq. m

FAMILY		N
76	*Platygobio gracilis*	4
81	*Catostomus commersoni*	1

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage
Rio Grande, ca. 4.0 miles downstream of US HWY 550 (formerly NM State HWY 44) Site Number: 2
bridge crossing, at Rio Rancho Wastewater Treatment Plant, Rio Rancho. River Mile: 200.0
05 February 2010 **RKD10-005**
UTM Easting: 354772 UTM Northing: 3905355 Zone: 13 Quad: Bernalillo
R.K. Dudley, A.L. Barkalow, M.A. Brandenburg Effort: 499.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	4
76	*Hybognathus amarus**	3
76	*Pimephales promelas*	1
76	*Rhinichthys cataractae*	1

***Hybognathus amarus* by age class:**
age-0:
age-1: 3
age-2:

Rio Grande silvery minnow Population Monitoring
February 2010

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Central Avenue bridge crossing (US HWY 66), Albuquerque. Site Number: 3

05 February 2010 **RKD10-002** River Mile: 183.4

UTM Easting: 346840 UTM Northing: 3884094 Zone: 13 Quad: Albuquerque West

R.K. Dudley, A.L. Barkalow, M.A. Brandenburg Effort: 528.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	12
76	*Hybognathus amarus**	1
76	*Platygobio gracilis*	2
81	*Catostomus commersoni*	2

***Hybognathus amarus* by age class:**

age-0:
age-1: 1
age-2:

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Rio Bravo Blvd. Bridge crossing (NM State HWY 500), Albuquerque. Site Number: 4

05 February 2010 **RKD10-001** River Mile: 178.3

UTM Easting: 347554 UTM Northing: 3877163 Zone: 13 Quad: Albuquerque West

R.K. Dudley, A.L. Barkalow, M.A. Brandenburg Effort: 546.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	7
76	*Hybognathus amarus**	2
76	*Platygobio gracilis*	3

***Hybognathus amarus* by age class:**

age-0:
age-1: 1
age-2: 1

Rio Grande silvery minnow Population Monitoring
February 2010

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, at Los Lunas Bridge crossing (NM State HWY 49), Los Lunas. Site Number: 5

08 February 2010 **RKD10-020** River Mile: 161.4

UTM Easting: 342898 UTM Northing: 3852531 Zone: 13 Quad: Los Lunas

M.A. Farrington, R.C. Keller, M.A. Brandenburg Effort: 554.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	106
76	*Hybognathus amarus**	92
212	*Gambusia affinis*	8

***Hybognathus amarus* by age class:**

age-0:
age-1: 90
age-2: 2

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 1.0 miles upstream of NM State HWY 309/6 bridge crossing, Belen. Site Number: 6

08 February 2010 **RKD10-019** River Mile: 151.5

UTM Easting: 339972 UTM Northing: 3837061 Zone: 13 Quad: Tome

M.A. Farrington, R.C. Keller, M.A. Brandenburg Effort: 496.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	46
76	*Hybognathus amarus**	17
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	1
93	*Ictalurus punctatus*	1

***Hybognathus amarus* by age class:**

age-0:
age-1: 16
age-2: 1

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 2.2 miles upstream of NM State HWY 346 bridge crossing, Jarales. Site Number: 7

08 February 2010 **RKD10-018** River Mile: 143.2

UTM Easting: 338136 UTM Northing: 3827329 Zone: 13 Quad: Veguita

M.A. Farrington, R.C. Keller, M.A. Brandenburg Effort: 467.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	517
76	*Hybognathus amarus**	13
76	*Pimephales promelas*	1
93	*Ictalurus punctatus*	4

***Hybognathus amarus* by age class:**

age-0:
age-1: 13
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at US HWY 60 bridge crossing, Bernardo. Site Number: 8

08 February 2010 **RKD10-017** River Mile: 130.6

UTM Easting: 334604 UTM Northing: 3809726 Zone: 13 Quad: Abeytas

M.A. Farrington, R.C. Keller, M.A. Brandenburg Effort: 425.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	354
76	*Hybognathus amarus**	4
212	*Gambusia affinis*	5

***Hybognathus amarus* by age class:**

age-0:
age-1: 4
age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 3.5 miles downstream of the US HWY 60 bridge crossing, Bernardo. Site Number: 9

08 February 2010 **RKD10-016** River Mile: 127.0

UTM Easting: 331094 UTM Northing: 3805229 Zone: 13 Quad: Abeytas

M.A. Farrington, R.C. Keller, M.A. Brandenburg Effort: 448.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	121
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	8
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0:
age-1: 8
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia Site Number: 9.5

05 February 2010 **RKD10-010** River Mile: 116.8

UTM Easting: 327902 UTM Northing: 3792603 Zone: 13 Quad: La Joya

M.A. Farrington, J.L. Hester, R.C. Keller Effort: 527.8 sq. m

FAMILY		N
76	*Hybognathus amarus**	25
76	*Platygobio gracilis*	2

***Hybognathus amarus* by age class:**

age-0:
age-1: 24
age-2: 1

Rio Grande silvery minnow Population Monitoring
February 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly below San Acacia Diversion Dam, San Acacia. Site Number: 10

05 February 2010 **RKD10-009** River Mile: 116.2

UTM Easting: 326162 UTM Northing: 3791977 Zone: 13 Quad: San Acacia

M.A. Farrington, J.L. Hester, R.C. Keller Effort: 447.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	3
76	*Platygobio gracilis*	1
93	*Ictalurus punctatus*	1

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia. Site Number: 11

05 February 2010 **RKD10-008** River Mile: 114.6

UTM Easting: 325263 UTM Northing: 3790442 Zone: 13 Quad: Lemitar

M.A. Farrington, J.L. Hester, R.C. Keller Effort: 596.0 sq. m

FAMILY		N
76	*Hybognathus amarus**	14
76	*Platygobio gracilis*	8
93	*Ictalurus punctatus*	1

***Hybognathus amarus* by age class:**

age-0:
age-1: 13
age-2: 1

Rio Grande silvery minnow Population Monitoring
February 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
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: 12 River Mile: 99.5
05 February 2010 **RKD10-007**
UTM Easting: 327097 UTM Northing: 3771043 Zone: 13 Quad: Loma de las Canas
M.A. Farrington, J.L. Hester, R.C. Keller Effort: 562.3 sq. m

FAMILY		N
76	*Hybognathus amarus**	60

***Hybognathus amarus* by age class:**
age-0:
age-1: 57
age-2: 3

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 4.0 miles upstream of U.S. 380 bridge crossing. Site Number: 13
05 February 2010 **RKD10-006** River Mile: 91.7
UTM Easting: 328140 UTM Northing: 3761283 Zone: 13 Quad: San Antonio
M.A. Farrington, J.L. Hester, R.C. Keller Effort: 608.0 sq. m

FAMILY		N
76	*Hybognathus amarus**	130
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**
age-0:
age-1: 130
age-2:

Rio Grande silvery minnow Population Monitoring
February 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 380 bridge crossing, San Antonio. Site Number: 14
08 February 2010 **RKD10-015** River Mile: 87.1
UTM Easting: 328914 UTM Northing: 3754471 Zone: 13 Quad: San Antonio
R.K. Dudley, A.L. Barkalow, J.L. Hester Effort: 494.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	3
76	*Hybognathus amarus**	165
76	*Platygobio gracilis*	2
93	*Ictalurus punctatus*	1

***Hybognathus amarus* by age class:**
age-0:
age-1: 164
age-2: 1

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, directly east of Bosque del Apache National Wildlife Refuge Headquarters. Site Number: 15
08 February 2010 **RKD10-014** River Mile: 79.1
UTM Easting: 327055 UTM Northing: 3740839 Zone: 13 Quad: San Antonio SE
R.K. Dudley, A.L. Barkalow, J.L. Hester Effort: 557.3 sq. m

FAMILY		N
76	*Hybognathus amarus**	136
81	*Carpiodes carpio*	1

***Hybognathus amarus* by age class:**
age-0:
age-1: 136
age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at San Marcial Railroad Bridge, San Marcial. Site Number: 16
08 February 2010 **RKD10-013** River Mile: 68.6
UTM Easting: 315284 UTM Northing: 3728347 Zone: 13 Quad: San Marcial
R.K. Dudley, A.L. Barkalow, J.L. Hester Effort: 573.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	3
76	*Hybognathus amarus**	198
76	*Platygobio gracilis*	4
81	*Carpiodes carpio*	2

***Hybognathus amarus* by age class:**
age-0:
age-1: 187
age-2: 11

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 8 miles downstream of the San Marcial railroad bridge crossing Site Number: 17
08 February 2010 **RKD10-012** River Mile: 60.5
UTM Easting: 309487 UTM Northing: 3718178 Zone: 13 Quad: Paraje Well
R.K. Dudley, A.L. Barkalow, J.L. Hester Effort: 542.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	3
76	*Hybognathus amarus**	115

***Hybognathus amarus* by age class:**
age-0:
age-1: 115
age-2:

Rio Grande silvery minnow Population Monitoring
February 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 10 mi downstream of the San Marcial railroad bridge crossing — Site Number: 18

08 February 2010 **RKD10-011** — River Mile: 58.8

UTM Easting: 307846 UTM Northing: 3716150 Zone: 13 Quad: Paraje Well

R.K. Dudley, A.L. Barkalow, J.L. Hester — Effort: 607.5 sq. m

FAMILY		N
76	*Hybognathus amarus**	85
93	*Ictalurus punctatus*	1
294	*Lepomis macrochirus*	1

***Hybognathus amarus* by age class:**

age-0:
age-1: 85
age-2:

Rio Grande silvery minnow Population Monitoring
April 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, directly below Angostura Diversion Dam, Algodones. Site Number: 0

01 April 2010 **RKD10-028** River Mile: 209.7

UTM Easting: 363811 UTM Northing: 3916006 Zone: 13 Quad: San Felipe Pueblo

M.A. Farrington, W.H. Brandenburg, M.A. Brandenburg Effort: 466.0 sq. m

FAMILY		N
76	*Platygobio gracilis*	1
76	*Rhinichthys cataractae*	1

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, at US HWY 550 (formerly NM State HWY 44) bridge crossing, Bernalillo. Site Number: 1

01 April 2010 **RKD10-029** River Mile: 203.8

UTM Easting: 358543 UTM Northing: 3909722 Zone: 13 Quad: Bernalillo

M.A. Farrington, W.H. Brandenburg, M.A. Brandenburg Effort: 641.2 sq. m

FAMILY		N
76	*Hybognathus amarus**	15
76	*Platygobio gracilis*	25
76	*Rhinichthys cataractae*	5

***Hybognathus amarus* by age class:**

age-0:
age-1: 14
age-2: 1

Rio Grande silvery minnow Population Monitoring
April 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

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: 2
River Mile: 200.0

01 April 2010 **RKD10-030**

UTM Easting: 354772 UTM Northing: 3905355 Zone: 13 Quad: Bernalillo

M.A. Farrington, W.H. Brandenburg, M.A. Brandenburg

Effort: 477.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	27
76	*Hybognathus amarus**	142
76	*Pimephales promelas*	11
76	*Platygobio gracilis*	42
76	*Rhinichthys cataractae*	4
81	*Catostomus commersoni*	2
93	*Ictalurus punctatus*	1

*** *Hybognathus amarus* by age class:**

age-0:
age-1: 132
age-2: 10

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Central Avenue bridge crossing (US HWY 66), Albuquerque.

Site Number: 3
River Mile: 183.4

01 April 2010 **RKD10-027**

UTM Easting: 346840 UTM Northing: 3884094 Zone: 13 Quad: Albuquerque West

M.A. Farrington, W.H. Brandenburg, M.A. Brandenburg

Effort: 469.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	20
76	*Hybognathus amarus**	122
76	*Platygobio gracilis*	8

*** *Hybognathus amarus* by age class:**

age-0:
age-1: 113
age-2: 9

Rio Grande silvery minnow Population Monitoring
April 2010

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Rio Bravo Blvd. Bridge crossing (NM State HWY 500) crossing, Albuquerque. Site Number: 4
River Mile: 178.3

01 April 2010 **RKD10-026**

UTM Easting: 347554 UTM Northing: 3877163 Zone: 13 Quad: Albuquerque West

M.A. Farrington, W.H. Brandenburg, M.A. Brandenburg Effort: 525.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	74
76	*Hybognathus amarus**	9
76	*Pimephales promelas*	3

*** *Hybognathus amarus* by age class:**

age-0:
age-1: 5
age-2: 4

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, at Los Lunas Bridge crossing (NM State HWY 49), Los Lunas. Site Number: 5

02 April 2010 **RKD10-035** River Mile: 161.4

UTM Easting: 342898 UTM Northing: 3852531 Zone: 13 Quad: Los Lunas

R.K. Dudley, A.L. Barkalow, and J.L. Hester Effort: 405.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	41
76	*Hybognathus amarus**	45
76	*Pimephales promelas*	7
212	*Gambusia affinis*	86
294	*Pomoxis annularis*	1

*** *Hybognathus amarus* by age class:**

age-0:
age-1: 44
age-2: 1

Rio Grande silvery minnow Population Monitoring
April 2010

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 1.0 miles upstream of NM State HWY 309/6 bridge crossing, Belen. Site Number: 6

02 April 2010 **RKD10-034** River Mile: 151.5

UTM Easting: 339972 UTM Northing: 3837061 Zone: 13 Quad: Tome

R.K. Dudley, A.L. Barkalow, and J.L. Hester Effort: 462.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	620
76	*Hybognathus amarus**	14
76	*Pimephales promelas*	1
212	*Gambusia affinis*	36

***Hybognathus amarus* by age class:**

age-0:
age-1: 13
age-2: 1

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 2.2 miles upstream of NM State HWY 346 bridge crossing, Jarales. Site Number: 7

02 April 2010 **RKD10-033** River Mile: 143.2

UTM Easting: 338136 UTM Northing: 3827329 Zone: 13 Quad: Veguita

R.K. Dudley, A.L. Barkalow, and J.L. Hester Effort: 502.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	305
76	*Hybognathus amarus**	21
93	*Ictalurus punctatus*	1

***Hybognathus amarus* by age class:**

age-0:
age-1: 21
age-2:

Rio Grande silvery minnow Population Monitoring
April 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 60 bridge crossing, Bernardo. Site Number: 8
02 April 2010 **RKD10-032** River Mile: 130.6
UTM Easting: 334604 UTM Northing: 3809726 Zone: 13 Quad: Abeytas
R.K. Dudley, A.L. Barkalow, and J.L. Hester Effort: 408.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	679
76	*Hybognathus amarus**	29
76	*Pimephales promelas*	4
76	*Platygobio gracilis*	1
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	2

***Hybognathus amarus* by age class:**

age-0:
age-1: 25
age-2: 4

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 3.5 miles downstream of the US HWY 60 bridge crossing, Bernardo. Site Number: 9
02 April 2010 **RKD10-031** River Mile: 127.0
UTM Easting: 331094 UTM Northing: 3805229 Zone: 13 Quad: Abeytas
R.K. Dudley, A.L. Barkalow, and J.L. Hester Effort: 421.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	335
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	8
93	*Ictalurus punctatus*	4
212	*Gambusia affinis*	1
294	*Lepomis macrochirus*	1

***Hybognathus amarus* by age class:**

age-0:
age-1: 8
age-2:

Rio Grande silvery minnow Population Monitoring
April 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia — Site Number: 9.5

01 April 2010 **RKD10-025** — River Mile: 116.8

UTM Easting: 327902 UTM Northing: 3792603 Zone: 13 Quad: La Joya

R.K. Dudley, A.L. Barkalow, and J.L. Hester — Effort: 482.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	112
76	*Hybognathus amarus**	25
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	8
93	*Ictalurus punctatus*	33
212	*Gambusia affinis*	1

*** *Hybognathus amarus* by age class:**

age-0:
age-1: 24
age-2: 1

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly below San Acacia Diversion Dam, San Acacia. — Site Number: 10

01 April 2010 **RKD10-024** — River Mile: 116.2

UTM Easting: 326162 UTM Northing: 3791977 Zone: 13 Quad: San Acacia

R.K. Dudley, A.L. Barkalow, and J.L. Hester — Effort: 531.7 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	3
76	*Hybognathus amarus**	405
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	2
81	*Carpiodes carpio*	3

*** *Hybognathus amarus* by age class:**

age-0:
age-1: 383
age-2: 22

Rio Grande silvery minnow Population Monitoring
April 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia. Site Number: 11

01 April 2010 **RKD10-023** River Mile: 114.6

UTM Easting: 325263 UTM Northing: 3790442 Zone: 13 Quad: Lemitar

R.K. Dudley, A.L. Barkalow, and J.L. Hester Effort: 569.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	1
76	*Hybognathus amarus**	39
76	*Platygobio gracilis*	8
93	*Ictalurus punctatus*	1

***Hybognathus amarus* by age class:**

age-0:
age-1: 38
age-2: 1

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, east of Socorro, 0.5 miles upstream of Socorro Low Flow Conveyance Site Number: 12

Channel bridge and east just upstream of Socorro Wastewater Treatment Plant, Socorro. River Mile: 99.5

01 April 2010 **RKD10-022B**

UTM Easting: 327097 UTM Northing: 3771043 Zone: 13 Quad: Loma de las Canas

R.K. Dudley, A.L. Barkalow, and J.L. Hester Effort: 511.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	1
76	*Hybognathus amarus**	31
76	*Platygobio gracilis*	2
81	*Carpiodes carpio*	1
93	*Ictalurus punctatus*	4

***Hybognathus amarus* by age class:**

age-0:
age-1: 30
age-2: 1

Rio Grande silvery minnow Population Monitoring
April 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 4.0 miles upstream of U.S. 380 bridge crossing. Site Number: 13
01 April 2010 **RKD10-021B** River Mile: 91.7
UTM Easting: 328140 UTM Northing: 3761283 Zone: 13 Quad: San Antonio
R.K. Dudley, A.L. Barkalow, and J.L. Hester Effort: 549.1 sq. m

FAMILY		N
76	*Hybognathus amarus**	19
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	1
93	*Ictalurus punctatus*	1

***Hybognathus amarus* by age class:**
age-0:
age-1: 19
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 380 bridge crossing, San Antonio. Site Number: 14
02 April 2010 **RKD10-040** River Mile: 87.1
UTM Easting: 328914 UTM Northing: 3754471 Zone: 13 Quad: San Antonio
M.A. Farrington, W.H. Brandenburg, M.A. Brandenburg Effort: 521.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	2
76	*Hybognathus amarus**	6
76	*Platygobio gracilis*	2
93	*Ictalurus punctatus*	1

***Hybognathus amarus* by age class:**
age-0:
age-1: 6
age-2:

Rio Grande silvery minnow Population Monitoring
April 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly east of Bosque del Apache National Wildlife Refuge Headquarters. Site Number: 15

02 April 2010 **RKD10-039** River Mile: 79.1

UTM Easting: 327055 UTM Northing: 3740839 Zone: 13 Quad: San Antonio SE

M.A. Farrington, W.H. Brandenburg, M.A. Brandenburg Effort: 605.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	1
76	*Hybognathus amarus**	12
81	*Carpiodes carpio*	2

***Hybognathus amarus* by age class:**

age-0:
age-1: 11
age-2: 1

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at San Marcial Railroad Bridge, San Marcial. Site Number: 16

02 April 2010 **RKD10-038** River Mile: 68.6

UTM Easting: 315284 UTM Northing: 3728347 Zone: 13 Quad: San Marcial

M.A. Farrington, W.H. Brandenburg, M.A. Brandenburg Effort: 462.6 sq. m

FAMILY		N
76	*Hybognathus amarus**	16
76	*Platygobio gracilis*	2

***Hybognathus amarus* by age class:**

age-0:
age-1: 15
age-2: 1

Rio Grande silvery minnow Population Monitoring
April 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 8 miles downstream of the San Marcial railroad bridge crossing — Site Number: 17

02 April 2010 **RKD10-037** — River Mile: 60.5

UTM Easting: 309487 UTM Northing: 3718178 Zone: 13 Quad: Paraje Well

M.A. Farrington, W.H. Brandenburg, M.A. Brandenburg — Effort: 535.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	12
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	24
76	*Platygobio gracilis*	5
81	*Carpiodes carpio*	1

***Hybognathus amarus* by age class:**

age-0:
age-1: 24
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 10 mi downstream of the San Marcial railroad bridge crossing — Site Number: 18

02 April 2010 **RKD10-036** — River Mile: 58.8

UTM Easting: 307846 UTM Northing: 3716150 Zone: 13 Quad: Paraje Well

M.A. Farrington, W.H. Brandenburg, M.A. Brandenburg — Effort: 607.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	1
76	*Hybognathus amarus**	10
81	*Carpiodes carpio*	1

***Hybognathus amarus* by age class:**

age-0:
age-1: 10
age-2:

Rio Grande silvery minnow Population Monitoring
May 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, directly below Angostura Diversion Dam, Algodones. Site Number: 0

17 May 2010 **RKD10-042** River Mile: 209.7

UTM Easting: 363811 UTM Northing: 3916006 Zone: 13 Quad: San Felipe Pueblo

R.K.Dudley, T.J.Pilger, N.B.Zerbe, M.J.Plummer Effort: 483.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	1
76	*Platygobio gracilis*	1
81	*Catostomus commersoni*	185

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, at US HWY 550 (formerly NM State HWY 44) bridge crossing, Bernalillo. Site Number: 1

17 May 2010 **RKD10-043** River Mile: 203.8

UTM Easting: 358543 UTM Northing: 3909722 Zone: 13 Quad: Bernalillo

R.K.Dudley, T.J.Pilger, N.B.Zerbe, S.C.Hands Effort: 457.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	14
76	*Platygobio gracilis*	46
76	*Rhinichthys cataractae*	48
81	*Carpiodes carpio*	1
81	*Catostomus commersoni*	1

Rio Grande silvery minnow Population Monitoring
May 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

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: 2
River Mile: 200.0

17 May 2010 **RKD10-044**

UTM Easting: 354772 UTM Northing: 3905355 Zone: 13 Quad: Bernalillo

R.K.Dudley, T.J.Pilger, N.B.Zerbe, M.J.Rooney

Effort: 457.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	19
76	*Hybognathus amarus**	24
76	*Platygobio gracilis*	11
76	*Rhinichthys cataractae*	25
81	*Catostomus commersoni*	5
294	*Lepomis macrochirus*	1

*** *Hybognathus amarus* by age class:**

age-0:
age-1: 21
age-2: 3

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Central Avenue bridge crossing (US HWY 66), Albuquerque.

Site Number: 3

17 May 2010 **RKD10-041**

River Mile: 183.4

UTM Easting: 346840 UTM Northing: 3884094 Zone: 13 Quad: Albuquerque West

R.K.Dudley, T.J.Pilger, N.B.Zerbe, R.A.Demarest

Effort: 562.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	83
76	*Hybognathus amarus**	9
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	19
81	*Catostomus commersoni*	27
212	*Gambusia affinis*	2

*** *Hybognathus amarus* by age class:**

age-0:
age-1: 9
age-2:

Rio Grande silvery minnow Population Monitoring
May 2010

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Rio Bravo Blvd. Bridge crossing (NM State HWY 500) crossing, Albuquerque. Site Number: 4
River Mile: 178.3

17 May 2010 **RKD10-045**

UTM Easting: 347554 UTM Northing: 3877163 Zone: 13 Quad: Albuquerque West

R.K.Dudley, S.P.Platania, and T.J.Pilger Effort: 412.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	253
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	4
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	3
76	*Rhinichthys cataractae*	1
81	*Catostomus commersoni*	162
212	*Gambusia affinis*	5

***Hybognathus amarus* by age class:**

age-0:
age-1: 4
age-2:

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, at Los Lunas Bridge crossing (NM State HWY 49), Los Lunas. Site Number: 5
River Mile: 161.4

18 May 2010 **RKD10-049**

UTM Easting: 342898 UTM Northing: 3852531 Zone: 13 Quad: Los Lunas

R.K.Dudley, T.J.Pilger, N.B.Zerbe, M.P.Vrabel Effort: 655.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	513
76	*Hybognathus amarus**	16
76	*Pimephales promelas*	3
76	*Platygobio gracilis*	1
212	*Gambusia affinis*	6

***Hybognathus amarus* by age class:**

age-0:
age-1: 16
age-2:

Rio Grande silvery minnow Population Monitoring
May 2010

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 1.0 miles upstream of NM State HWY 309/6 bridge crossing, Belen. Site Number: 6

18 May 2010 **RKD10-048** River Mile: 151.5

UTM Easting: 339972 UTM Northing: 3837061 Zone: 13 Quad: Tome

R.K.Dudley, T.J.Pilger, N.B.Zerbe, R.J.DeRochie Effort: 480.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	431
76	*Hybognathus amarus**	14
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	1
93	*Ictalurus punctatus*	1

***Hybognathus amarus* by age class:**

age-0:
age-1: 14
age-2:

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 2.2 miles upstream of NM State HWY 346 bridge crossing, Jarales. Site Number: 7

18 May 2010 **RKD10-047** River Mile: 143.2

UTM Easting: 338136 UTM Northing: 3827329 Zone: 13 Quad: Veguita

R.K.Dudley, T.J.Pilger, N.B.Zerbe, A.R. Archuleta Effort: 444.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	517
76	*Hybognathus amarus**	5
76	*Pimephales promelas*	1
93	*Ictalurus punctatus*	2
212	*Gambusia affinis*	2

***Hybognathus amarus* by age class:**

age-0:
age-1: 5
age-2:

Rio Grande silvery minnow Population Monitoring
May 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 60 bridge crossing, Bernardo. Site Number: 8
18 May 2010 **RKD10-046** River Mile: 130.6
UTM Easting: 334604 UTM Northing: 3809726 Zone: 13 Quad: Abeytas
R.K.Dudley and T.J.Pilger Effort: 444.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	817
76	*Cyprinus carpio*	20
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	3
76	*Rhinichthys cataractae*	1
212	*Gambusia affinis*	3
294	*Pomoxis annularis*	1

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 3.5 miles downstream of the US HWY 60 bridge crossing, Bernardo. Site Number: 9
20 May 2010 **RKD10-057** River Mile: 127.0
UTM Easting: 331094 UTM Northing: 3805229 Zone: 13 Quad: Abeytas
R.K.Dudley, S.P.Platania, and T.J. Krabbenhoft Effort: 493.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	283
76	*Hybognathus amarus**	8
76	*Pimephales promelas*	3
93	*Ictalurus punctatus*	5

***Hybognathus amarus* by age class:**
age-0:
age-1: 8
age-2:

Rio Grande silvery minnow Population Monitoring
May 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia — Site Number: 9.5
19 May 2010 **RKD10-053** — River Mile: 116.8
UTM Easting: 327902 UTM Northing: 3792603 Zone: 13 Quad: La Joya
R.K.Dudley and S.P.Platania — Effort: 528.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	269
76	*Hybognathus amarus**	2
76	*Platygobio gracilis*	36
93	*Ictalurus punctatus*	25

***Hybognathus amarus* by age class:**
age-0:
age-1: 2
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, directly below San Acacia Diversion Dam, San Acacia. — Site Number: 10
19 May 2010 **RKD10-052** — River Mile: 116.2
UTM Easting: 326162 UTM Northing: 3791977 Zone: 13 Quad: San Acacia
R.K.Dudley, S.P.Platania, and N.B.Crowell — Effort: 467.5 sq. m

FAMILY		N
69	*Dorosoma cepedianum*	3
76	*Cyprinella lutrensis*	7
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	6
76	*Platygobio gracilis*	1
93	*Ictalurus punctatus*	6
283	*Morone chrysops*	1

***Hybognathus amarus* by age class:**
age-0:
age-1: 6
age-2:

Rio Grande silvery minnow Population Monitoring
May 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia. Site Number: 11

19 May 2010 **RKD10-051** River Mile: 114.6

UTM Easting: 325263 UTM Northing: 3790442 Zone: 13 Quad: Lemitar

R.K.Dudley, S.P.Platania, and S.C.Hands Effort: 519.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	60
76	*Hybognathus amarus**	62
76	*Platygobio gracilis*	21
93	*Ictalurus punctatus*	12

***Hybognathus amarus* by age class:**

age-0:
age-1: 62
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, east of Socorro, 0.5 miles upstream of Socorro Low Flow Conveyance Site Number: 12

Channel bridge and east just upstream of Socorro Wastewater Treatment Plant, Socorro. River Mile: 99.5

19 May 2010 **RKD10-050**

UTM Easting: 327097 UTM Northing: 3771043 Zone: 13 Quad: Loma de las Canas

R.K.Dudley and S.P.Platania Effort: 488.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	12
76	*Hybognathus amarus**	24
76	*Platygobio gracilis*	11
93	*Ictalurus punctatus*	37

***Hybognathus amarus* by age class:**

age-0:
age-1: 24
age-2:

Rio Grande silvery minnow Population Monitoring
May 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 4.0 miles upstream of U.S. 380 bridge crossing. Site Number: 13
20 May 2010 **RKD10-055** River Mile: 91.7
UTM Easting: 328140 UTM Northing: 3761283 Zone: 13 Quad: San Antonio
R.K.Dudley, T.J.Krabbenhoft, and S.M. Serrano Effort: 660.1 sq. m

FAMILY		N
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	60
81	*Carpiodes carpio*	3
93	*Ictalurus punctatus*	3

***Hybognathus amarus* by age class:**

age-0: 1
age-1: 59
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 380 bridge crossing, San Antonio. Site Number: 14
20 May 2010 **RKD10-056** River Mile: 87.1
UTM Easting: 328914 UTM Northing: 3754471 Zone: 13 Quad: San Antonio
R.K.Dudley, T.J.Krabbenhoft, D.A.Tooke, and N.B.Crowell Effort: 463.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	11
76	*Hybognathus amarus**	12
76	*Platygobio gracilis*	4
93	*Ictalurus punctatus*	7

***Hybognathus amarus* by age class:**

age-0:
age-1: 12
age-2:

Rio Grande silvery minnow Population Monitoring
May 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly east of Bosque del Apache National Wildlife Refuge Headquarters. Site Number: 15

20 May 2010 **RKD10-054** River Mile: 79.1

UTM Easting: 327055 UTM Northing: 3740839 Zone: 13 Quad: San Antonio SE

R.K.Dudley, S.P.Platania, and T.J.Krabbenhoft Effort: 416.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	5
76	*Cyprinus carpio*	3
76	*Hybognathus amarus**	12

***Hybognathus amarus* by age class:**

age-0:
age-1: 12
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at San Marcial Railroad Bridge, San Marcial. Site Number: 16

21 May 2010 **RKD10-060** River Mile: 68.6

UTM Easting: 315284 UTM Northing: 3728347 Zone: 13 Quad: San Marcial

R.K.Dudley, T.J.Krabbenhoft, and M.J.Plummer Effort: 490.1 sq. m

FAMILY		N
69	*Dorosoma cepedianum*	1
76	*Cyprinella lutrensis*	12
76	*Hybognathus amarus**	6
76	*Platygobio gracilis*	5
93	*Ictalurus furcatus*	1
93	*Ictalurus punctatus*	3

***Hybognathus amarus* by age class:**

age-0:
age-1: 6
age-2:

Rio Grande silvery minnow Population Monitoring
May 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 8 miles downstream of the San Marcial railroad bridge crossing — Site Number: 17

21 May 2010 **RKD10-059** — River Mile: 60.5

UTM Easting: 309487 UTM Northing: 3718178 Zone: 13 Quad: Paraje Well

R.K.Dudley, T.J.Krabbenhoft, and J.A.Silva — Effort: 613.7 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	21
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	10
76	*Platygobio gracilis*	1

***Hybognathus amarus* by age class:**

age-0:
age-1: 10
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 10 mi downstream of the San Marcial railroad bridge crossing — Site Number: 18

21 May 2010 **RKD10-058** — River Mile: 58.8

UTM Easting: 307846 UTM Northing: 3716150 Zone: 13 Quad: Paraje Well

R.K.Dudley, S.P.Platania, and T.J. Krabbenhoft — Effort: 504.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	24
76	*Hybognathus amarus**	8
76	*Platygobio gracilis*	1
93	*Ictalurus punctatus*	6

***Hybognathus amarus* by age class:**

age-0:
age-1: 8
age-2:

Rio Grande silvery minnow Population Monitoring
June 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, directly below Angostura Diversion Dam, Algodones. Site Number: 0

04 June 2010 **RKD10-076** River Mile: 209.7

UTM Easting: 363811 UTM Northing: 3916006 Zone: 13 Quad: San Felipe Pueblo

S.P.Platania, M.A.Farrington, M.A.Brandenburg Effort: 490.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	14
76	*Rhinichthys cataractae*	18
81	*Catostomus commersoni*	183

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, at US HWY 550 (formerly NM State HWY 44) bridge crossing, Bernalillo. Site Number: 1

04 June 2010 **RKD10-077** River Mile: 203.8

UTM Easting: 358543 UTM Northing: 3909722 Zone: 13 Quad: Bernalillo

S.P.Platania, M.A.Farrington, M.A.Brandenburg Effort: 539.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	6
76	*Hybognathus amarus**	1
76	*Platygobio gracilis*	33
76	*Rhinichthys cataractae*	34
81	*Catostomus commersoni*	10

***Hybognathus amarus* by age class:**

age-0:
age-1: 1
age-2:

Rio Grande silvery minnow Population Monitoring
June 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

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: 2
River Mile: 200.0

04 June 2010 **RKD10-078**

UTM Easting: 354772 UTM Northing: 3905355 Zone: 13 Quad: Bernalillo

S.P.Platania, M.A.Farrington, M.A.Brandenburg

Effort: 472.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	136
76	*Hybognathus amarus**	96
76	*Pimephales promelas*	7
76	*Platygobio gracilis*	63
76	*Rhinichthys cataractae*	42
81	*Carpiodes carpio*	1
81	*Catostomus commersoni*	387

***Hybognathus amarus* by age class:**

age-0: 1
age-1: 94
age-2: 1

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Central Avenue bridge crossing (US HWY 66), Albuquerque.

Site Number: 3
River Mile: 183.4

04 June 2010 **RKD10-079**

UTM Easting: 346840 UTM Northing: 3884094 Zone: 13 Quad: Albuquerque West

S.P.Platania, M.A.Farrington, M.A.Brandenburg

Effort: 538.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	95
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	10
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	47
81	*Carpiodes carpio*	2
81	*Catostomus commersoni*	6
295	*Sander vitreus*	5

***Hybognathus amarus* by age class:**

age-0:
age-1: 10
age-2:

Rio Grande silvery minnow Population Monitoring
June 2010

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Rio Bravo Blvd. Bridge crossing (NM State HWY 500) crossing, Albuquerque. Site Number: 4
River Mile: 178.3

04 June 2010 **RKD10-080**

UTM Easting: 347554 UTM Northing: 3877163 Zone: 13 Quad: Albuquerque West

S.P.Platania, M.A.Farrington, M.A.Brandenburg Effort: 463.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	340
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	1
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	6
76	*Rhinichthys cataractae*	2
81	*Catostomus commersoni*	2

*** *Hybognathus amarus* by age class:**

age-0:
age-1: 1
age-2:

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, at Los Lunas Bridge crossing (NM State HWY 49), Los Lunas. Site Number: 5

04 June 2010 **RKD10-075** River Mile: 161.4

UTM Easting: 342898 UTM Northing: 3852531 Zone: 13 Quad: Los Lunas

R.K.Dudley, W.H.Brandenburg, J.L.Hester Effort: 498.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	439
76	*Cyprinus carpio*	6
76	*Hybognathus amarus**	4
81	*Catostomus commersoni*	1
212	*Gambusia affinis*	6

*** *Hybognathus amarus* by age class:**

age-0:
age-1: 4
age-2:

Rio Grande silvery minnow Population Monitoring
June 2010

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 1.0 miles upstream of NM State HWY 309/6 bridge crossing, Belen. Site Number: 6

04 June 2010 **RKD10-074** River Mile: 151.5

UTM Easting: 339972 UTM Northing: 3837061 Zone: 13 Quad: Tome

R.K.Dudley, W.H.Brandenburg, J.L.Hester Effort: 538.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	563
76	*Hybognathus amarus**	53
76	*Pimephales promelas*	4
81	*Carpiodes carpio*	3
81	*Catostomus commersoni*	5
212	*Gambusia affinis*	3

***Hybognathus amarus* by age class:**

age-0: 50
age-1: 3
age-2:

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 2.2 miles upstream of NM State HWY 346 bridge crossing, Jarales. Site Number: 7

04 June 2010 **RKD10-073** River Mile: 143.2

UTM Easting: 338136 UTM Northing: 3827329 Zone: 13 Quad: Veguita

R.K.Dudley, W.H.Brandenburg, J.L.Hester Effort: 445.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	231
76	*Cyprinus carpio*	34
76	*Hybognathus amarus**	20
76	*Pimephales promelas*	9
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	3
81	*Catostomus commersoni*	2
212	*Gambusia affinis*	8

***Hybognathus amarus* by age class:**

age-0: 17
age-1: 3
age-2:

Rio Grande silvery minnow Population Monitoring
June 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 60 bridge crossing, Bernardo. Site Number: 8
04 June 2010 **RKD10-072** River Mile: 130.6
UTM Easting: 334604 UTM Northing: 3809726 Zone: 13 Quad: Abeytas
R.K.Dudley, W.H.Brandenburg, J.L.Hester Effort: 413.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	469
76	*Cyprinus carpio*	11
76	*Hybognathus amarus**	75
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	1
76	*Rhinichthys cataractae*	1
81	*Catostomus commersoni*	1
212	*Gambusia affinis*	2

**** Hybognathus amarus* by age class:**

age-0: 72
age-1: 3
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 3.5 miles downstream of the US HWY 60 bridge crossing, Bernardo. Site Number: 9
04 June 2010 **RKD10-071** River Mile: 127.0
UTM Easting: 331094 UTM Northing: 3805229 Zone: 13 Quad: Abeytas
R.K.Dudley, W.H.Brandenburg, J.L.Hester Effort: 528.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	491
76	*Cyprinus carpio*	33
76	*Hybognathus amarus**	14
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	1
81	*Catostomus commersoni*	1
93	*Ictalurus punctatus*	1

**** Hybognathus amarus* by age class:**

age-0: 6
age-1: 8
age-2:

Rio Grande silvery minnow Population Monitoring
June 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia — Site Number: 9.5

03 June 2010 **RKD10-070** — River Mile: 116.8

UTM Easting: 327902 UTM Northing: 3792603 Zone: 13 Quad: La Joya

M.A.Farrington, W.H.Brandenburg, M.A.Brandenburg — Effort: 511.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	74
76	*Cyprinus carpio*	12
76	*Platygobio gracilis*	5
81	*Catostomus commersoni*	3
93	*Ameiurus melas*	1
212	*Gambusia affinis*	9

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly below San Acacia Diversion Dam, San Acacia. — Site Number: 10

03 June 2010 **RKD10-069** — River Mile: 116.2

UTM Easting: 326162 UTM Northing: 3791977 Zone: 13 Quad: San Acacia

M.A.Farrington, W.H.Brandenburg, M.A.Brandenburg — Effort: 465.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	4
76	*Hybognathus amarus**	73
76	*Platygobio gracilis*	3

***Hybognathus amarus* by age class:**

age-0: 1
age-1: 72
age-2:

Rio Grande silvery minnow Population Monitoring
June 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia. Site Number: 11

03 June 2010 **RKD10-068** River Mile: 114.6

UTM Easting: 325263 UTM Northing: 3790442 Zone: 13 Quad: Lemitar

M.A.Farrington, W.H.Brandenburg, M.A.Brandenburg Effort: 478.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	40
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	140
76	*Pimephales promelas*	9
76	*Platygobio gracilis*	23
81	*Carpiodes carpio*	7
93	*Ictalurus punctatus*	1

*** *Hybognathus amarus* by age class:**

age-0: 51
age-1: 89
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, east of Socorro, 0.5 miles upstream of Socorro Low Flow Conveyance Site Number: 12

Channel bridge and east just upstream of Socorro Wastewater Treatment Plant, Socorro. River Mile: 99.5

03 June 2010 **RKD10-067**

UTM Easting: 327097 UTM Northing: 3771043 Zone: 13 Quad: Loma de las Canas

M.A.Farrington, W.H.Brandenburg, M.A.Brandenburg Effort: 481.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	19
76	*Cyprinus carpio*	4
76	*Hybognathus amarus**	9
76	*Platygobio gracilis*	3
93	*Ictalurus punctatus*	21

*** *Hybognathus amarus* by age class:**

age-0:
age-1: 9
age-2:

Rio Grande silvery minnow Population Monitoring
June 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 4.0 miles upstream of U.S. 380 bridge crossing. Site Number: 13
03 June 2010 **RKD10-066** River Mile: 91.7
UTM Easting: 328140 UTM Northing: 3761283 Zone: 13 Quad: San Antonio
M.A.Farrington, W.H.Brandenburg, M.A.Brandenburg Effort: 714.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	14
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	23
76	*Platygobio gracilis*	4

***Hybognathus amarus* by age class:**

age-0:
age-1: 23
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 380 bridge crossing, San Antonio. Site Number: 14
03 June 2010 **RKD10-065** River Mile: 87.1
UTM Easting: 328914 UTM Northing: 3754471 Zone: 13 Quad: San Antonio
R.K.Dudley, A.L.Barkalow, and J.L.Hester Effort: 441.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	24
76	*Hybognathus amarus**	36
76	*Platygobio gracilis*	8
93	*Ictalurus punctatus*	3

***Hybognathus amarus* by age class:**

age-0: 1
age-1: 35
age-2:

Rio Grande silvery minnow Population Monitoring
June 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly east of Bosque del Apache National Wildlife Refuge Headquarters. Site Number: 15

03 June 2010 **RKD10-064** River Mile: 79.1

UTM Easting: 327055 UTM Northing: 3740839 Zone: 13 Quad: San Antonio SE

R.K.Dudley, A.L.Barkalow, and J.L.Hester Effort: 479.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	9
76	*Cyprinus carpio*	29
76	*Hybognathus amarus**	20
76	*Platygobio gracilis*	3
81	*Carpiodes carpio*	2
93	*Ictalurus furcatus*	1
93	*Ictalurus punctatus*	5
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0:
age-1: 20
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at San Marcial Railroad Bridge, San Marcial. Site Number: 16

03 June 2010 **RKD10-063** River Mile: 68.6

UTM Easting: 315284 UTM Northing: 3728347 Zone: 13 Quad: San Marcial

R.K.Dudley, A.L.Barkalow, and J.L.Hester Effort: 504.2 sq. m

FAMILY		N
69	*Dorosoma cepedianum*	1
76	*Cyprinella lutrensis*	22
76	*Cyprinus carpio*	18
76	*Hybognathus amarus**	48
76	*Platygobio gracilis*	3
93	*Ictalurus punctatus*	1

***Hybognathus amarus* by age class:**

age-0: 33
age-1: 15
age-2:

Rio Grande silvery minnow Population Monitoring
June 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 8 miles downstream of the San Marcial railroad bridge crossing — Site Number: 17

03 June 2010 **RKD10-062** — River Mile: 60.5

UTM Easting: 309487 UTM Northing: 3718178 Zone: 13 Quad: Paraje Well

R.K.Dudley, A.L.Barkalow, and J.L.Hester — Effort: 535.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	8
76	*Cyprinus carpio*	11
76	*Hybognathus amarus**	49
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	7
81	*Carpiodes carpio*	1
81	*Catostomus commersoni*	1
212	*Gambusia affinis*	4

***Hybognathus amarus* by age class:**

age-0: 35
age-1: 14
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 10 mi downstream of the San Marcial railroad bridge crossing — Site Number: 18

03 June 2010 **RKD10-061** — River Mile: 58.8

UTM Easting: 307846 UTM Northing: 3716150 Zone: 13 Quad: Paraje Well

R.K.Dudley, A.L.Barkalow, and J.L.Hester — Effort: 482.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	20
76	*Cyprinus carpio*	3
76	*Hybognathus amarus**	5
76	*Platygobio gracilis*	2
93	*Ictalurus punctatus*	1
294	*Lepomis macrochirus*	1

***Hybognathus amarus* by age class:**

age-0: 3
age-1: 2
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, directly below Angostura Diversion Dam, Algodones. Site Number: 0

02 July 2010 **RKD10-100** River Mile: 209.7

UTM Easting: 363811 UTM Northing: 3916006 Zone: 13 Quad: San Felipe Pueblo

R.K. Dudley, M.A. Farrington and M.A. Brandenburg Effort: 446.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	108
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	13
76	*Pimephales promelas*	1
76	*Rhinichthys cataractae*	22
81	*Catostomus commersoni*	43
295	*Sander vitreus*	1

***Hybognathus amarus* by age class:**

age-0:
age-1: 13
age-2:

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, at US HWY 550 (formerly NM State HWY 44) bridge crossing, Bernalillo. Site Number: 1

02 July 2010 **RKD10-101** River Mile: 203.8

UTM Easting: 358543 UTM Northing: 3909722 Zone: 13 Quad: Bernalillo

R.K. Dudley, M.A. Farrington and M.A. Brandenburg Effort: 524.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	59
76	*Hybognathus amarus**	3
76	*Platygobio gracilis*	84
76	*Rhinichthys cataractae*	57
81	*Carpiodes carpio*	11
81	*Catostomus commersoni*	35
294	*Micropterus salmoides*	1

***Hybognathus amarus* by age class:**

age-0: 2
age-1: 1
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

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: 2
River Mile: 200.0

02 July 2010 **RKD10-102**

UTM Easting: 354772 UTM Northing: 3905355 Zone: 13 Quad: Bernalillo

R.K. Dudley, M.A. Farrington and M.A. Brandenburg

Effort: 468.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	88
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	13
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	41
76	*Rhinichthys cataractae*	9
81	*Catostomus commersoni*	28
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	6

***Hybognathus amarus* by age class:**

age-0:
age-1: 12
age-2: 1

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Central Avenue bridge crossing (US HWY 66), Albuquerque. Site Number: 3

02 July 2010 **RKD10-099** River Mile: 183.4

UTM Easting: 346840 UTM Northing: 3884094 Zone: 13 Quad: Albuquerque West

R.K. Dudley, M.A. Farrington and M.A. Brandenburg Effort: 558.3 sq. m

FAMILY		N
69	*Dorosoma cepedianum*	4
76	*Cyprinella lutrensis*	37
76	*Cyprinus carpio*	33
76	*Hybognathus amarus**	5
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	3
81	*Carpiodes carpio*	5
81	*Catostomus commersoni*	16
212	*Gambusia affinis*	2
294	*Micropterus salmoides*	8
295	*Sander vitreus*	2

***Hybognathus amarus* by age class:**

age-0:
age-1: 5
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Rio Bravo Blvd. Bridge crossing (NM State HWY 500) crossing, Albuquerque. Site Number: 4 River Mile: 178.3

02 July 2010 **RKD10-098**

UTM Easting: 347554 UTM Northing: 3877163 Zone: 13 Quad: Albuquerque West

R.K. Dudley, M.A. Farrington and M.A. Brandenburg Effort: 566.2 sq. m

FAMILY		N
69	*Dorosoma cepedianum*	6
76	*Cyprinella lutrensis*	23
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	2
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	4
76	*Rhinichthys cataractae*	2
81	*Catostomus commersoni*	2
212	*Gambusia affinis*	17

***Hybognathus amarus* by age class:**

age-0:
age-1: 2
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, at Los Lunas Bridge crossing (NM State HWY 49), Los Lunas. Site Number: 5

02 July 2010 **RKD10-107** River Mile: 161.4

UTM Easting: 342898 UTM Northing: 3852531 Zone: 13 Quad: Los Lunas

W.H. Brandenburg, A.L. Barkalow, J.L. Hester Effort: 598.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	111
76	*Cyprinus carpio*	4
76	*Hybognathus amarus**	23
76	*Pimephales promelas*	13
81	*Carpiodes carpio*	32
93	*Ameiurus melas*	1
212	*Gambusia affinis*	4
283	*Morone chrysops*	1
294	*Lepomis cyanellus*	1

***Hybognathus amarus* by age class:**

age-0: 18
age-1: 5
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 1.0 miles upstream of NM State HWY 309/6 bridge crossing, Belen. Site Number: 6

02 July 2010 **RKD10-106** River Mile: 151.5

UTM Easting: 339972 UTM Northing: 3837061 Zone: 13 Quad: Tome

W.H. Brandenburg, A.L. Barkalow, J.L. Hester Effort: 563.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	263
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	14
76	*Pimephales promelas*	15
81	*Carpiodes carpio*	40
93	*Ictalurus punctatus*	4
212	*Gambusia affinis*	94
283	*Morone chrysops*	2
294	*Micropterus salmoides*	2
295	*Sander vitreus*	2

**** Hybognathus amarus* by age class:**

age-0: 11
age-1: 3
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 2.2 miles upstream of NM State HWY 346 bridge crossing, Jarales. Site Number: 7

02 July 2010 **RKD10-105** River Mile: 143.2

UTM Easting: 338136 UTM Northing: 3827329 Zone: 13 Quad: Veguita

W.H. Brandenburg, A.L. Barkalow, J.L. Hester Effort: 523.1 sq. m

FAMILY		N
69	*Dorosoma cepedianum*	1
76	*Cyprinella lutrensis*	934
76	*Cyprinus carpio*	7
76	*Hybognathus amarus**	124
76	*Pimephales promelas*	19
81	*Carpiodes carpio*	18
81	*Catostomus commersoni*	8
93	*Ameiurus natalis*	2
212	*Gambusia affinis*	70
295	*Sander vitreus*	1

**** Hybognathus amarus*** **by age class:**

age-0: 120
age-1: 4
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at US HWY 60 bridge crossing, Bernardo. Site Number: 8

02 July 2010 **RKD10-104** River Mile: 130.6

UTM Easting: 334604 UTM Northing: 3809726 Zone: 13 Quad: Abeytas

W.H. Brandenburg, A.L. Barkalow, J.L. Hester Effort: 538.1 sq. m

FAMILY		N
69	*Dorosoma cepedianum*	4
76	*Cyprinella lutrensis*	554
76	*Cyprinus carpio*	40
76	*Hybognathus amarus**	25
76	*Pimephales promelas*	4
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	13
81	*Catostomus commersoni*	6
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	19
294	*Micropterus salmoides*	6

*** *Hybognathus amarus* by age class:**

age-0: 24
age-1: 1
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 3.5 miles downstream of the US HWY 60 bridge crossing, Bernardo. Site Number: 9

02 July 2010 **RKD10-103** River Mile: 127.0

UTM Easting: 331094 UTM Northing: 3805229 Zone: 13 Quad: Abeytas

W.H. Brandenburg, A.L. Barkalow, J.L. Hester Effort: 653.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	331
76	*Cyprinus carpio*	8
76	*Hybognathus amarus**	218
76	*Pimephales promelas*	31
76	*Platygobio gracilis*	2
76	*Rhinichthys cataractae*	1
81	*Carpiodes carpio*	57
81	*Catostomus commersoni*	1
93	*Ictalurus punctatus*	2
212	*Gambusia affinis*	58
294	*Micropterus salmoides*	1
295	*Sander vitreus*	2

**** Hybognathus amarus* by age class:**

age-0: 218
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia — Site Number: 9.5

01 July 2010 — **RKD10-097** — River Mile: 116.8

UTM Easting: 327902 UTM Northing: 3792603 Zone: 13 Quad: La Joya

W.H. Brandenburg, A.L. Barkalow, J.L. Hester — Effort: 616.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	38
76	*Cyprinus carpio*	45
76	*Hybognathus amarus**	373
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	53
76	*Rhinichthys cataractae*	2
81	*Carpiodes carpio*	68
81	*Catostomus commersoni*	9
93	*Ictalurus punctatus*	7
212	*Gambusia affinis*	6

**** Hybognathus amarus* by age class:**

age-0: 373
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly below San Acacia Diversion Dam, San Acacia. Site Number: 10

01 July 2010 **RKD10-096** River Mile: 116.2

UTM Easting: 326162 UTM Northing: 3791977 Zone: 13 Quad: San Acacia

W.H. Brandenburg, A.L. Barkalow, J.L. Hester Effort: 487.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	43
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	111
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	2
81	*Carpiodes carpio*	3
81	*Catostomus commersoni*	2
81	*Ictiobus bubalus*	2
93	*Ictalurus furcatus*	1
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	2
294	*Pomoxis annularis*	1
295	*Sander vitreus*	1

***Hybognathus amarus* by age class:**

age-0: 8
age-1: 103
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia. Site Number: 11

01 July 2010 **RKD10-095** River Mile: 114.6

UTM Easting: 325263 UTM Northing: 3790442 Zone: 13 Quad: Lemitar

W.H. Brandenburg, A.L. Barkalow, J.L. Hester Effort: 616.1 sq. m

FAMILY		N
69	*Dorosoma cepedianum*	1
76	*Cyprinella lutrensis*	121
76	*Cyprinus carpio*	19
76	*Hybognathus amarus**	214
76	*Pimephales promelas*	3
76	*Platygobio gracilis*	31
76	*Rhinichthys cataractae*	1
81	*Carpiodes carpio*	4
93	*Ictalurus punctatus*	3
212	*Gambusia affinis*	1

**** Hybognathus amarus* by age class:**

age-0: 121
age-1: 93
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, east of Socorro, 0.5 miles upstream of Socorro Low Flow Conveyance Site Number: 12

Channel bridge and east just upstream of Socorro Wastewater Treatment Plant, Socorro. River Mile: 99.5

01 July 2010 **RKD10-094**

UTM Easting: 327097 UTM Northing: 3771043 Zone: 13 Quad: Loma de las Canas

W.H. Brandenburg, A.L. Barkalow, J.L. Hester Effort: 585.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	50
76	*Cyprinus carpio*	8
76	*Hybognathus amarus**	79
76	*Pimephales promelas*	8
76	*Platygobio gracilis*	9
81	*Carpiodes carpio*	3
93	*Ictalurus furcatus*	1
93	*Ictalurus punctatus*	3

***Hybognathus amarus* by age class:**

age-0: 63
age-1: 16
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 4.0 miles upstream of U.S. 380 bridge crossing. Site Number: 13

01 July 2010 **RKD10-093** River Mile: 91.7

UTM Easting: 328140 UTM Northing: 3761283 Zone: 13 Quad: San Antonio

W.H. Brandenburg, A.L. Barkalow, J.L. Hester Effort: 551.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	216
76	*Cyprinus carpio*	3
76	*Hybognathus amarus**	59
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	9
81	*Carpiodes carpio*	90
93	*Ictalurus punctatus*	2
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0: 42
age-1: 17
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at US HWY 380 bridge crossing, San Antonio. Site Number: 14

01 July 2010 **RKD10-092** River Mile: 87.1

UTM Easting: 328914 UTM Northing: 3754471 Zone: 13 Quad: San Antonio

R.K. Dudley, M.A. Farrington and M.A. Brandenburg Effort: 505.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	36
76	*Cyprinus carpio*	11
76	*Hybognathus amarus**	317
76	*Pimephales promelas*	14
76	*Platygobio gracilis*	36
81	*Carpiodes carpio*	30
93	*Ictalurus punctatus*	3
212	*Gambusia affinis*	23
295	*Sander vitreus*	1

*** *Hybognathus amarus* by age class:**

age-0: 317
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly east of Bosque del Apache National Wildlife Refuge Headquarters. Site Number: 15

01 July 2010 **RKD10-091** River Mile: 79.1

UTM Easting: 327055 UTM Northing: 3740839 Zone: 13 Quad: San Antonio SE

R.K. Dudley, M.A. Farrington and M.A. Brandenburg Effort: 517.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	17
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	61
76	*Pimephales promelas*	1
76	*Rhinichthys cataractae*	2
81	*Carpiodes carpio*	9
93	*Ictalurus punctatus*	2
212	*Gambusia affinis*	3

***Hybognathus amarus* by age class:**

age-0: 60
age-1: 1
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at San Marcial Railroad Bridge, San Marcial. Site Number: 16

01 July 2010 **RKD10-090** River Mile: 68.6

UTM Easting: 315284 UTM Northing: 3728347 Zone: 13 Quad: San Marcial

R.K. Dudley, M.A. Farrington and M.A. Brandenburg Effort: 426.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	1
76	*Cyprinus carpio*	11
76	*Hybognathus amarus**	432
76	*Rhinichthys cataractae*	1

***Hybognathus amarus* by age class:**

age-0: 431
age-1: 1
age-2:

Rio Grande silvery minnow Population Monitoring
July 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 8 miles downstream of the San Marcial railroad bridge crossing — Site Number: 17

01 July 2010 **RKD10-089** — River Mile: 60.5

UTM Easting: 309487 UTM Northing: 3718178 Zone: 13 Quad: Paraje Well

R.K. Dudley, M.A. Farrington and M.A. Brandenburg — Effort: 509.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	4
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	274
76	*Pimephales promelas*	15
76	*Platygobio gracilis*	1
81	*Catostomus commersoni*	5
93	*Ictalurus punctatus*	4
212	*Gambusia affinis*	3

***Hybognathus amarus* by age class:**

age-0: 273
age-1: 1
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 10 mi downstream of the San Marcial railroad bridge crossing — Site Number: 18

01 July 2010 **RKD10-088** — River Mile: 58.8

UTM Easting: 307846 UTM Northing: 3716150 Zone: 13 Quad: Paraje Well

R.K. Dudley, M.A. Farrington and M.A. Brandenburg — Effort: 559.7 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	8
76	*Hybognathus amarus**	61
76	*Platygobio gracilis*	4
81	*Carpiodes carpio*	1
93	*Ictalurus punctatus*	12
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0: 60
age-1: 1
age-2:

Rio Grande silvery minnow Population Monitoring
August 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, directly below Angostura Diversion Dam, Algodones. Site Number: 0

05 August 2010 **RKD10-125** River Mile: 209.7

UTM Easting: 363811 UTM Northing: 3916006 Zone: 13 Quad: San Felipe Pueblo

W.H. Brandenburg, A.L. Barkalow, K.M. Schaus Effort: 510.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	33
76	*Hybognathus amarus**	3
76	*Platygobio gracilis*	13
76	*Rhinichthys cataractae*	22
81	*Catostomus commersoni*	7
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	24
294	*Lepomis macrochirus*	4
294	*Pomoxis annularis*	2

***Hybognathus amarus* by age class:**

age-0:
age-1: 3
age-2:

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, at US HWY 550 (formerly NM State HWY 44) bridge crossing, Bernalillo. Site Number: 1

05 August 2010 **RKD10-126** River Mile: 203.8

UTM Easting: 358543 UTM Northing: 3909722 Zone: 13 Quad: Bernalillo

W.H. Brandenburg, A.L. Barkalow, K.M. Schaus Effort: 611.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	19
76	*Hybognathus amarus**	16
76	*Platygobio gracilis*	44
76	*Rhinichthys cataractae*	28
81	*Catostomus commersoni*	3
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0: 3
age-1: 13
age-2:

Rio Grande silvery minnow Population Monitoring
August 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

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: 2
River Mile: 200.0

05 August 2010 **RKD10-127**

UTM Easting: 354772 UTM Northing: 3905355 Zone: 13 Quad: Bernalillo

W.H. Brandenburg, A.L. Barkalow, K.M. Schaus

Effort: 544.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	83
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	19
76	*Pimephales promelas*	4
76	*Platygobio gracilis*	35
76	*Rhinichthys cataractae*	7
81	*Catostomus commersoni*	24
93	*Ameiurus melas*	3
93	*Ameiurus natalis*	6
93	*Ictalurus punctatus*	12
212	*Gambusia affinis*	35

*** *Hybognathus amarus* by age class:**

age-0: 2
age-1: 17
age-2:

Rio Grande silvery minnow Population Monitoring
August 2010

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Central Avenue bridge crossing (US HWY 66), Albuquerque. Site Number: 3

05 August 2010 **RKD10-124** River Mile: 183.4

UTM Easting: 346840 UTM Northing: 3884094 Zone: 13 Quad: Albuquerque West

W.H. Brandenburg, A.L. Barkalow, K.M. Schaus Effort: 611.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	55
76	*Hybognathus amarus**	6
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	48
81	*Carpiodes carpio*	30
93	*Ameiurus melas*	2
93	*Ictalurus punctatus*	103
212	*Gambusia affinis*	5
283	*Morone chrysops*	1
295	*Sander vitreus*	1

**** Hybognathus amarus*** **by age class:**

age-0: 1
age-1: 5
age-2:

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Rio Bravo Blvd. Bridge crossing (NM State HWY 500) crossing, Albuquerque. Site Number: 4

River Mile: 178.3

05 August 2010 **RKD10-123**

UTM Easting: 347554 UTM Northing: 3877163 Zone: 13 Quad: Albuquerque West

W.H. Brandenburg, A.L. Barkalow, K.M. Schaus Effort: 491.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	81
76	*Cyprinus carpio*	2
76	*Pimephales promelas*	14
76	*Platygobio gracilis*	4
81	*Carpiodes carpio*	5
93	*Ameiurus natalis*	10
93	*Ictalurus punctatus*	44
212	*Gambusia affinis*	30

Rio Grande silvery minnow Population Monitoring
August 2010

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, at Los Lunas Bridge crossing (NM State HWY 49), Los Lunas. Site Number: 5

05 August 2010 **RKD10-122** River Mile: 161.4

UTM Easting: 342898 UTM Northing: 3852531 Zone: 13 Quad: Los Lunas

R.K. Dudley, M.A. Farrington, R.C. Keller Effort: 586.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	205
76	*Hybognathus amarus**	76
76	*Pimephales promelas*	4
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	10
93	*Ictalurus punctatus*	107
212	*Gambusia affinis*	8

***Hybognathus amarus* by age class:**

age-0: 62
age-1: 14
age-2:

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 1.0 miles upstream of NM State HWY 309/6 bridge crossing, Belen. Site Number: 6

05 August 2010 **RKD10-121** River Mile: 151.5

UTM Easting: 339972 UTM Northing: 3837061 Zone: 13 Quad: Tome

R.K. Dudley, M.A. Farrington, R.C. Keller Effort: 631.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	775
76	*Hybognathus amarus**	12
76	*Pimephales promelas*	7
76	*Platygobio gracilis*	2
81	*Carpiodes carpio*	15
93	*Ictalurus punctatus*	55
212	*Gambusia affinis*	113
294	*Micropterus salmoides*	1

***Hybognathus amarus* by age class:**

age-0: 5
age-1: 7
age-2:

Rio Grande silvery minnow Population Monitoring
August 2010

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 2.2 miles upstream of NM State HWY 346 bridge crossing, Jarales. Site Number: 7

05 August 2010 **RKD10-120** River Mile: 143.2

UTM Easting: 338136 UTM Northing: 3827329 Zone: 13 Quad: Veguita

R.K. Dudley, M.A. Farrington, R.C. Keller Effort: 349.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	459
76	*Cyprinus carpio*	4
76	*Hybognathus amarus**	18
76	*Pimephales promelas*	13
81	*Carpiodes carpio*	8
93	*Ictalurus punctatus*	58
212	*Gambusia affinis*	72

*** *Hybognathus amarus* by age class:**

age-0: 18
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at US HWY 60 bridge crossing, Bernardo. Site Number: 8

05 August 2010 **RKD10-119** River Mile: 130.6

UTM Easting: 334604 UTM Northing: 3809726 Zone: 13 Quad: Abeytas

R.K. Dudley, M.A. Farrington, R.C. Keller Effort: 482.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	175
76	*Cyprinus carpio*	2
76	*Pimephales promelas*	2
81	*Carpiodes carpio*	5
93	*Ameiurus natalis*	2
93	*Ictalurus punctatus*	51
212	*Gambusia affinis*	3

Rio Grande silvery minnow Population Monitoring
August 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 3.5 miles downstream of the US HWY 60 bridge crossing, Bernardo. Site Number: 9

05 August 2010 **RKD10-118** River Mile: 127.0

UTM Easting: 331094 UTM Northing: 3805229 Zone: 13 Quad: Abeytas

R.K. Dudley, M.A. Farrington, R.C. Keller Effort: 571.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	247
76	*Hybognathus amarus**	5
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	7
93	*Ameiurus melas*	1
93	*Ameiurus natalis*	1
93	*Ictalurus punctatus*	38
212	*Gambusia affinis*	22
294	*Pomoxis annularis*	1

*** *Hybognathus amarus* by age class:**

age-0: 4
age-1: 1
age-2:

Rio Grande silvery minnow Population Monitoring
August 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia — Site Number: 9.5

04 August 2010 **RKD10-117** — River Mile: 116.8

UTM Easting: 327902 UTM Northing: 3792603 Zone: 13 Quad: La Joya

R.K. Dudley, M.A. Farrington, R.C. Keller — Effort: 513.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	166
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	86
76	*Pimephales promelas*	6
76	*Platygobio gracilis*	54
93	*Ameiurus natalis*	8
93	*Ictalurus punctatus*	36
212	*Gambusia affinis*	11
294	*Lepomis macrochirus*	1

***Hybognathus amarus* by age class:**

age-0: 86
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly below San Acacia Diversion Dam, San Acacia. — Site Number: 10

04 August 2010 **RKD10-116** — River Mile: 116.2

UTM Easting: 326162 UTM Northing: 3791977 Zone: 13 Quad: San Acacia

R.K. Dudley, M.A. Farrington, R.C. Keller — Effort: 460.3 sq. m

FAMILY		N
69	*Dorosoma cepedianum*	1
76	*Cyprinella lutrensis*	12
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	15
76	*Platygobio gracilis*	28
93	*Ictalurus punctatus*	20

***Hybognathus amarus* by age class:**

age-0: 12
age-1: 3
age-2:

Rio Grande silvery minnow Population Monitoring
August 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia. Site Number: 11

04 August 2010 **RKD10-115** River Mile: 114.6

UTM Easting: 325263 UTM Northing: 3790442 Zone: 13 Quad: Lemitar

R.K. Dudley, M.A. Farrington, R.C. Keller Effort: 547.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	74
76	*Cyprinus carpio*	3
76	*Hybognathus amarus**	39
76	*Platygobio gracilis*	47
93	*Ictalurus punctatus*	6
212	*Gambusia affinis*	1

***Hybognathus amarus* by age class:**

age-0: 38
age-1: 1
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, east of Socorro, 0.5 miles upstream of Socorro Low Flow Conveyance Site Number: 12

Channel bridge and east just upstream of Socorro Wastewater Treatment Plant, Socorro. River Mile: 99.5

04 August 2010 **RKD10-114**

UTM Easting: 327097 UTM Northing: 3771043 Zone: 13 Quad: Loma de las Canas

R.K. Dudley, M.A. Farrington, R.C. Keller Effort: 541.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	2
76	*Hybognathus amarus**	14
76	*Platygobio gracilis*	16
93	*Ictalurus punctatus*	20
93	*Pylodictis olivaris*	1

***Hybognathus amarus* by age class:**

age-0: 14
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
August 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 4.0 miles upstream of U.S. 380 bridge crossing. Site Number: 13
04 August 2010 **RKD10-113** River Mile: 91.7
UTM Easting: 328140 UTM Northing: 3761283 Zone: 13 Quad: San Antonio
R.K. Dudley, M.A. Farrington, R.C. Keller Effort: 616.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	175
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	41
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	29
81	*Carpiodes carpio*	3
93	*Ictalurus punctatus*	11
212	*Gambusia affinis*	2

***Hybognathus amarus* by age class:**
age-0: 38
age-1: 3
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 380 bridge crossing, San Antonio. Site Number: 14
04 August 2010 **RKD10-112** River Mile: 87.1
UTM Easting: 328914 UTM Northing: 3754471 Zone: 13 Quad: San Antonio
W.H. Brandenburg, A.L. Barkalow, K.M. Schaus Effort: 710.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	12
76	*Hybognathus amarus**	50
76	*Pimephales promelas*	3
76	*Platygobio gracilis*	4
81	*Carpiodes carpio*	6
93	*Ictalurus punctatus*	10
212	*Gambusia affinis*	14

***Hybognathus amarus* by age class:**
age-0: 45
age-1: 5
age-2:

Rio Grande silvery minnow Population Monitoring
August 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly east of Bosque del Apache National Wildlife Refuge Headquarters. Site Number: 15

04 August 2010 **RKD10-111** River Mile: 79.1

UTM Easting: 327055 UTM Northing: 3740839 Zone: 13 Quad: San Antonio SE

W.H. Brandenburg, A.L. Barkalow, K.M. Schaus Effort: 653.4 sq. m

FAMILY		N
76	*Cyprinus carpio*	6
76	*Hybognathus amarus**	7
76	*Pimephales promelas*	1
81	*Carpiodes carpio*	1
93	*Ameiurus melas*	1
93	*Ictalurus punctatus*	3

***Hybognathus amarus* by age class:**

age-0: 7
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at San Marcial Railroad Bridge, San Marcial. Site Number: 16

04 August 2010 **RKD10-110** River Mile: 68.6

UTM Easting: 315284 UTM Northing: 3728347 Zone: 13 Quad: San Marcial

W.H. Brandenburg, A.L. Barkalow, K.M. Schaus Effort: 542.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	73
76	*Hybognathus amarus**	48
76	*Pimephales promelas*	3
76	*Platygobio gracilis*	3
93	*Ictalurus punctatus*	3
212	*Gambusia affinis*	10

***Hybognathus amarus* by age class:**

age-0: 44
age-1: 4
age-2:

Rio Grande silvery minnow Population Monitoring
August 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 8 miles downstream of the San Marcial railroad bridge crossing — Site Number: 17

04 August 2010 **RKD10-109** — River Mile: 60.5

UTM Easting: 309487 UTM Northing: 3718178 Zone: 13 Quad: Paraje Well

W.H. Brandenburg, A.L. Barkalow, K.M. Schaus — Effort: 598.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	30
76	*Cyprinus carpio*	3
76	*Hybognathus amarus**	38
76	*Pimephales promelas*	3
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	2
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	10

***Hybognathus amarus* by age class:**

age-0: 38
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 10 mi downstream of the San Marcial railroad bridge crossing — Site Number: 18

04 August 2010 **RKD10-108** — River Mile: 58.8

UTM Easting: 307846 UTM Northing: 3716150 Zone: 13 Quad: Paraje Well

W.H. Brandenburg, A.L. Barkalow, K.M. Schaus — Effort: 533.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	4
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	65
93	*Ictalurus punctatus*	5
212	*Gambusia affinis*	6

***Hybognathus amarus* by age class:**

age-0: 60
age-1: 5
age-2:

Rio Grande silvery minnow Population Monitoring
September 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, directly below Angostura Diversion Dam, Algodones. Site Number: 0

08 September 2010 **RKD10-145** River Mile: 209.7

UTM Easting: 363811 UTM Northing: 3916006 Zone: 13 Quad: San Felipe Pueblo

W.H. Brandenburg, M.A. Farrington, M.A. Brandenburg Effort: 539.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	109
76	*Cyprinus carpio*	1
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	26
76	*Rhinichthys cataractae*	31
81	*Catostomus commersoni*	3
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	72
294	*Lepomis macrochirus*	2
294	*Micropterus salmoides*	1

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, at US HWY 550 (formerly NM State HWY 44) bridge crossing, Bernalillo. Site Number: 1

08 September 2010 **RKD10-146** River Mile: 203.8

UTM Easting: 358543 UTM Northing: 3909722 Zone: 13 Quad: Bernalillo

W.H. Brandenburg, M.A. Farrington, M.A. Brandenburg Effort: 586.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	47
76	*Hybognathus amarus**	6
76	*Platygobio gracilis*	140
76	*Rhinichthys cataractae*	18
81	*Catostomus commersoni*	2
212	*Gambusia affinis*	46

***Hybognathus amarus* by age class:**

age-0: 3
age-1: 3
age-2:

Rio Grande silvery minnow Population Monitoring
September 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

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: 2
River Mile: 200.0

08 September 2010 **RKD10-147**

UTM Easting: 354772 UTM Northing: 3905355 Zone: 13 Quad: Bernalillo

W.H. Brandenburg, M.A. Farrington, M.A. Brandenburg

Effort: 551.1 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	33
76	*Hybognathus amarus**	4
76	*Platygobio gracilis*	14
76	*Rhinichthys cataractae*	1
81	*Catostomus commersoni*	2
93	*Ictalurus punctatus*	2
212	*Gambusia affinis*	17
294	*Lepomis macrochirus*	2

***Hybognathus amarus* by age class:**

age-0:
age-1: 4
age-2:

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Central Avenue bridge crossing (US HWY 66), Albuquerque.

Site Number: 3
River Mile: 183.4

08 September 2010 **RKD10-144**

UTM Easting: 346840 UTM Northing: 3884094 Zone: 13 Quad: Albuquerque West

W.H. Brandenburg, M.A. Farrington, M.A. Brandenburg

Effort: 719.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	27
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	14
81	*Carpiodes carpio*	4
81	*Catostomus commersoni*	2
93	*Ictalurus punctatus*	5
212	*Gambusia affinis*	71
294	*Lepomis cyanellus*	1

Rio Grande silvery minnow Population Monitoring
September 2010

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Rio Bravo Blvd. Bridge crossing (NM State HWY 500) crossing, Albuquerque. Site Number: 4
River Mile: 178.3

08 September 2010 **RKD10-143**

UTM Easting: 347554 UTM Northing: 3877163 Zone: 13 Quad: Albuquerque West

W.H. Brandenburg, M.A. Farrington, M.A. Brandenburg Effort: 566.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	31
76	*Pimephales promelas*	3
76	*Platygobio gracilis*	6
81	*Carpiodes carpio*	1
93	*Ictalurus punctatus*	8
212	*Gambusia affinis*	66

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, at Los Lunas Bridge crossing (NM State HWY 49), Los Lunas. Site Number: 5

08 September 2010 **RKD10-142** River Mile: 161.4

UTM Easting: 342898 UTM Northing: 3852531 Zone: 13 Quad: Los Lunas

R.K. Dudley, A.L. Barkalow, and J.L.Hester Effort: 662.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	385
76	*Cyprinus carpio*	2
76	*Hybognathus amarus**	7
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	2
81	*Carpiodes carpio*	2
93	*Ameiurus natalis*	1
93	*Ictalurus punctatus*	20
212	*Gambusia affinis*	1

**** Hybognathus amarus*** **by age class:**

age-0: 5
age-1: 1
age-2: 1

Rio Grande silvery minnow Population Monitoring
September 2010

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 1.0 miles upstream of NM State HWY 309/6 bridge crossing, Belen. Site Number: 6

08 September 2010 **RKD10-141** River Mile: 151.5

UTM Easting: 339972 UTM Northing: 3837061 Zone: 13 Quad: Tome

R.K. Dudley, A.L. Barkalow, and J.L.Hester Effort: 640.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	328
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	12
76	*Pimephales promelas*	15
81	*Carpiodes carpio*	12
93	*Ictalurus punctatus*	25
212	*Gambusia affinis*	26

*** *Hybognathus amarus* by age class:**

age-0: 8
age-1: 3
age-2: 1

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 2.2 miles upstream of NM State HWY 346 bridge crossing, Jarales. Site Number: 7

08 September 2010 **RKD10-140** River Mile: 143.2

UTM Easting: 338136 UTM Northing: 3827329 Zone: 13 Quad: Veguita

R.K. Dudley, A.L. Barkalow, and J.L.Hester Effort: 511.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	144
76	*Hybognathus amarus**	2
76	*Pimephales promelas*	4
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	3
93	*Ictalurus punctatus*	3
212	*Gambusia affinis*	13

*** *Hybognathus amarus* by age class:**

age-0: 2
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
September 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 60 bridge crossing, Bernardo. Site Number: 8
08 September 2010 **RKD10-139** River Mile: 130.6
UTM Easting: 334604 UTM Northing: 3809726 Zone: 13 Quad: Abeytas
R.K. Dudley, A.L. Barkalow, and J.L.Hester Effort: 486.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	83
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	1
76	*Pimephales promelas*	10
76	*Platygobio gracilis*	3
81	*Carpiodes carpio*	2
93	*Ictalurus punctatus*	11
212	*Gambusia affinis*	56

***Hybognathus amarus* by age class:**

age-0:
age-1:
age-2: 1

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 3.5 miles downstream of the US HWY 60 bridge crossing, Bernardo. Site Number: 9
08 September 2010 **RKD10-138** River Mile: 127.0
UTM Easting: 331094 UTM Northing: 3805229 Zone: 13 Quad: Abeytas
R.K. Dudley, A.L. Barkalow, and J.L.Hester Effort: 596.7 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	35
76	*Hybognathus amarus**	3
93	*Ictalurus punctatus*	2

***Hybognathus amarus* by age class:**

age-0: 1
age-1: 2
age-2:

Rio Grande silvery minnow Population Monitoring
September 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia — Site Number: 9.5

09 September 2010 **RKD10-137** — River Mile: 116.8

UTM Easting: 327902 UTM Northing: 3792603 Zone: 13 Quad: La Joya

R.K. Dudley, W.H. Brandenburg, A.L. Barkalow, and K.B. Gido — Effort: 631.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	17
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	48
93	*Ameiurus natalis*	1
93	*Ictalurus punctatus*	15
212	*Gambusia affinis*	4

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly below San Acacia Diversion Dam, San Acacia. — Site Number: 10

09 September 2010 **RKD10-136** — River Mile: 116.2

UTM Easting: 326162 UTM Northing: 3791977 Zone: 13 Quad: San Acacia

R.K. Dudley, W.H. Brandenburg, A.L. Barkalow, and K.B. Gido — Effort: 661.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	178
76	*Hybognathus amarus**	26
76	*Platygobio gracilis*	72
76	*Rhinichthys cataractae*	3
93	*Ictalurus punctatus*	7

**** Hybognathus amarus*** **by age class:**

age-0: 26
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
September 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia. Site Number: 11

09 September 2010 **RKD10-135** River Mile: 114.6

UTM Easting: 325263 UTM Northing: 3790442 Zone: 13 Quad: Lemitar

R.K. Dudley, W.H. Brandenburg, A.L. Barkalow, and K.B. Gido Effort: 670.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	8
76	*Hybognathus amarus**	3
76	*Platygobio gracilis*	20
81	*Carpiodes carpio*	1
93	*Ictalurus punctatus*	14
212	*Gambusia affinis*	2

***Hybognathus amarus* by age class:**

age-0: 3
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, east of Socorro, 0.5 miles upstream of Socorro Low Flow Conveyance Site Number: 12

Channel bridge and east just upstream of Socorro Wastewater Treatment Plant, Socorro. River Mile: 99.5

09 September 2010 **RKD10-134**

UTM Easting: 327097 UTM Northing: 3771043 Zone: 13 Quad: Loma de las Canas

R.K. Dudley, W.H. Brandenburg, A.L. Barkalow, and K.B. Gido Effort: 539.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	14
76	*Hybognathus amarus**	14
76	*Platygobio gracilis*	1
93	*Ictalurus punctatus*	3
212	*Gambusia affinis*	2

***Hybognathus amarus* by age class:**

age-0: 11
age-1: 3
age-2:

Rio Grande silvery minnow Population Monitoring
September 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 4.0 miles upstream of U.S. 380 bridge crossing. Site Number: 13
09 September 2010 **RKD10-133** River Mile: 91.7
UTM Easting: 328140 UTM Northing: 3761283 Zone: 13 Quad: San Antonio
R.K. Dudley, W.H. Brandenburg, A.L. Barkalow, and K.B. Gido Effort: 712.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	8
76	*Hybognathus amarus**	8
76	*Platygobio gracilis*	11
93	*Ictalurus punctatus*	37
212	*Gambusia affinis*	3

***Hybognathus amarus* by age class:**
age-0: 5
age-1: 3
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 380 bridge crossing, San Antonio. Site Number: 14
07 September 2010 **RKD10-132** River Mile: 87.1
UTM Easting: 328914 UTM Northing: 3754471 Zone: 13 Quad: San Antonio
R.K. Dudley, A.L. Barkalow, and J.L.Hester Effort: 235.8 sq. m

FAMILY		N
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	10
76	*Platygobio gracilis*	3
93	*Ameiurus natalis*	1
93	*Ictalurus punctatus*	7

***Hybognathus amarus* by age class:**
age-0: 6
age-1: 4
age-2:

Rio Grande silvery minnow Population Monitoring
September 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, directly east of Bosque del Apache National Wildlife Refuge Headquarters. Site Number: 15
07 September 2010 **RKD10-131** River Mile: 79.1
UTM Easting: 327055 UTM Northing: 3740839 Zone: 13 Quad: San Antonio SE
R.K. Dudley, A.L. Barkalow, and J.L.Hester Effort: sq. m

FAMILY		N
	Site Not Sampled (Site Dry)	

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at San Marcial Railroad Bridge, San Marcial. Site Number: 16
07 September 2010 **RKD10-130** River Mile: 68.6
UTM Easting: 315284 UTM Northing: 3728347 Zone: 13 Quad: San Marcial
R.K. Dudley, A.L. Barkalow, and J.L.Hester Effort: 619.0 sq. m

FAMILY		N
69	*Dorosoma cepedianum*	1
76	*Cyprinella lutrensis*	9
76	*Hybognathus amarus**	1
76	*Platygobio gracilis*	1
93	*Ictalurus punctatus*	6
212	*Gambusia affinis*	44

*** *Hybognathus amarus* by age class:**

age-0: 1
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
September 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 8 miles downstream of the San Marcial railroad bridge crossing — Site Number: 17

07 September 2010 **RKD10-129** — River Mile: 60.5

UTM Easting: 309487 UTM Northing: 3718178 Zone: 13 Quad: Paraje Well

R.K. Dudley, A.L. Barkalow, and J.L.Hester — Effort: 552.1 sq. m

FAMILY		N
69	*Dorosoma cepedianum*	1
76	*Cyprinella lutrensis*	15
76	*Hybognathus amarus**	3
76	*Platygobio gracilis*	2
212	*Gambusia affinis*	15

*** *Hybognathus amarus* by age class:**

age-0: 3
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 10 mi downstream of the San Marcial railroad bridge crossing — Site Number: 18

07 September 2010 **RKD10-128** — River Mile: 58.8

UTM Easting: 307846 UTM Northing: 3716150 Zone: 13 Quad: Paraje Well

R.K. Dudley, A.L. Barkalow, and J.L.Hester — Effort: 659.7 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	23
76	*Hybognathus amarus**	7
93	*Ictalurus punctatus*	3
212	*Gambusia affinis*	4

*** *Hybognathus amarus* by age class:**

age-0: 6
age-1: 1
age-2:

Rio Grande silvery minnow Population Monitoring
October 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, directly below Angostura Diversion Dam, Algodones. Site Number: 0

01 October 2010 **RKD10-165** River Mile: 209.7

UTM Easting: 363811 UTM Northing: 3916006 Zone: 13 Quad: San Felipe Pueblo

R.K.Dudley, A.L.Barkalow, and R.C.Keller Effort: 532.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	17
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	99
76	*Rhinichthys cataractae*	26
81	*Carpiodes carpio*	3
81	*Catostomus commersoni*	1
212	*Gambusia affinis*	93
294	*Micropterus salmoides*	1

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

Rio Grande, at US HWY 550 (formerly NM State HWY 44) bridge crossing, Bernalillo. Site Number: 1

01 October 2010 **RKD10-166** River Mile: 203.8

UTM Easting: 358543 UTM Northing: 3909722 Zone: 13 Quad: Bernalillo

R.K.Dudley, A.L.Barkalow, and R.C.Keller Effort: 682.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	22
76	*Hybognathus amarus**	5
76	*Platygobio gracilis*	48
76	*Rhinichthys cataractae*	9
81	*Carpiodes carpio*	1
81	*Catostomus commersoni*	1
93	*Ictalurus punctatus*	5
212	*Gambusia affinis*	5

***Hybognathus amarus* by age class:**

age-0: 4
age-1: 1
age-2:

Rio Grande silvery minnow Population Monitoring
October 2010

NEW MEXICO: SANDOVAL Co., RIO GRANDE Drainage

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: 2
River Mile: 200.0

01 October 2010 **RKD10-167**

UTM Easting: 354772 UTM Northing: 3905355 Zone: 13 Quad: Bernalillo

R.K.Dudley, A.L.Barkalow, and R.C.Keller

Effort: 661.0 sq. m

FAMILY		N
76	*Carassius auratus*	1
76	*Cyprinella lutrensis*	76
76	*Hybognathus amarus**	2
76	*Platygobio gracilis*	9
76	*Rhinichthys cataractae*	1
212	*Gambusia affinis*	52

***Hybognathus amarus* by age class:**

age-0:
age-1: 1
age-2: 1

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Central Avenue bridge crossing (US HWY 66), Albuquerque.

Site Number: 3

01 October 2010 **RKD10-164**

River Mile: 183.4

UTM Easting: 346840 UTM Northing: 3884094 Zone: 13 Quad: Albuquerque West

R.K.Dudley, A.L.Barkalow, and R.C.Keller

Effort: 652.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	24
76	*Hybognathus amarus**	1
76	*Platygobio gracilis*	23
76	*Rhinichthys cataractae*	3
81	*Carpiodes carpio*	1
81	*Catostomus commersoni*	2
93	*Ictalurus punctatus*	10
212	*Gambusia affinis*	9

***Hybognathus amarus* by age class:**

age-0:
age-1:
age-2: 1

Rio Grande silvery minnow Population Monitoring
October 2010

NEW MEXICO: BERNALILLO Co., RIO GRANDE Drainage

Rio Grande, at Rio Bravo Blvd. Bridge crossing (NM State HWY 500) crossing, Albuquerque. Site Number: 4
River Mile: 178.3

01 October 2010 **RKD10-163**

UTM Easting: 347554 UTM Northing: 3877163 Zone: 13 Quad: Albuquerque West

R.K.Dudley, A.L.Barkalow, and R.C.Keller Effort: 749.4 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	49
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	3
76	*Pimephales promelas*	2
76	*Platygobio gracilis*	11
76	*Rhinichthys cataractae*	2
81	*Carpiodes carpio*	3
93	*Ameiurus natalis*	1
93	*Ictalurus punctatus*	25
212	*Gambusia affinis*	64

***Hybognathus amarus* by age class:**

age-0:
age-1: 2
age-2: 1

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, at Los Lunas Bridge crossing (NM State HWY 49), Los Lunas. Site Number: 5
River Mile: 161.4

30 September 2010 **RKD10-162**

UTM Easting: 342898 UTM Northing: 3852531 Zone: 13 Quad: Los Lunas

R.K.Dudley, A.L.Barkalow, and R.C.Keller Effort: 716.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	509
76	*Hybognathus amarus**	8
76	*Platygobio gracilis*	1
93	*Ictalurus punctatus*	22
212	*Gambusia affinis*	2

***Hybognathus amarus* by age class:**

age-0: 8
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
October 2010

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 1.0 miles upstream of NM State HWY 309/6 bridge crossing, Belen. Site Number: 6

30 September 2010 **RKD10-161** River Mile: 151.5

UTM Easting: 339972 UTM Northing: 3837061 Zone: 13 Quad: Tome

R.K.Dudley, A.L.Barkalow, and R.C.Keller Effort: 635.7 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	265
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	4
76	*Pimephales promelas*	5
81	*Carpiodes carpio*	5
93	*Ictalurus punctatus*	38
212	*Gambusia affinis*	52

***Hybognathus amarus* by age class:**

age-0: 3
age-1: 1
age-2:

NEW MEXICO: VALENCIA Co., RIO GRANDE Drainage

Rio Grande, ca. 2.2 miles upstream of NM State HWY 346 bridge crossing, Jarales. Site Number: 7

30 September 2010 **RKD10-160** River Mile: 143.2

UTM Easting: 338136 UTM Northing: 3827329 Zone: 13 Quad: Veguita

R.K.Dudley, A.L.Barkalow, and R.C.Keller Effort: 551.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	455
76	*Hybognathus amarus**	9
76	*Pimephales promelas*	8
76	*Platygobio gracilis*	1
81	*Carpiodes carpio*	1
93	*Ameiurus natalis*	1
93	*Ictalurus punctatus*	7
212	*Gambusia affinis*	36

***Hybognathus amarus* by age class:**

age-0: 5
age-1: 3
age-2: 1

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at US HWY 60 bridge crossing, Bernardo. Site Number: 8

30 September 2010 **RKD10-159** River Mile: 130.6

UTM Easting: 334604 UTM Northing: 3809726 Zone: 13 Quad: Abeytas

R.K.Dudley, A.L.Barkalow, and R.C.Keller Effort: 595.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	110
76	*Cyprinus carpio*	2
76	*Platygobio gracilis*	1
93	*Ictalurus punctatus*	8
212	*Gambusia affinis*	28

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 3.5 miles downstream of the US HWY 60 bridge crossing, Bernardo. Site Number: 9

30 September 2010 **RKD10-158** River Mile: 127.0

UTM Easting: 331094 UTM Northing: 3805229 Zone: 13 Quad: Abeytas

R.K.Dudley, A.L.Barkalow, and R.C.Keller Effort: 696.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	576
76	*Hybognathus amarus**	4
76	*Pimephales promelas*	35
76	*Platygobio gracilis*	2
93	*Ictalurus punctatus*	14
212	*Gambusia affinis*	72

***Hybognathus amarus* by age class:**

age-0: 4

age-1:

age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 0.6 miles upstream of San Acacia Diversion Dam, San Acacia — Site Number: 9.5

01 October 2010 **RKD10-157** — River Mile: 116.8

UTM Easting: 327902 UTM Northing: 3792603 Zone: 13 Quad: La Joya

M.A.Farrington, J.L.Hester, and K.M.Schaus — Effort: 539.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	10
76	*Hybognathus amarus**	5
76	*Platygobio gracilis*	211
93	*Ictalurus punctatus*	3
212	*Gambusia affinis*	8

***Hybognathus amarus* by age class:**

age-0: 5
age-1:
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly below San Acacia Diversion Dam, San Acacia. — Site Number: 10

01 October 2010 **RKD10-156** — River Mile: 116.2

UTM Easting: 326162 UTM Northing: 3791977 Zone: 13 Quad: San Acacia

M.A.Farrington, J.L.Hester, and K.M.Schaus — Effort: 364.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	86
76	*Hybognathus amarus**	7
76	*Platygobio gracilis*	18
93	*Ictalurus punctatus*	2

***Hybognathus amarus* by age class:**

age-0: 6
age-1: 1
age-2:

Rio Grande silvery minnow Population Monitoring
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NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 1.5 miles downstream of San Acacia Diversion Dam, San Acacia. Site Number: 11

01 October 2010 **RKD10-155** River Mile: 114.6

UTM Easting: 325263 UTM Northing: 3790442 Zone: 13 Quad: Lemitar

M.A.Farrington, J.L.Hester, and K.M.Schaus Effort: 565.3 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	24
76	*Platygobio gracilis*	14
93	*Ictalurus punctatus*	5
212	*Gambusia affinis*	8

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, east of Socorro, 0.5 miles upstream of Socorro Low Flow Conveyance Site Number: 12

Channel bridge and east just upstream of Socorro Wastewater Treatment Plant, Socorro. River Mile: 99.5

01 October 2010 **RKD10-154**

UTM Easting: 327097 UTM Northing: 3771043 Zone: 13 Quad: Loma de las Canas

M.A.Farrington, J.L.Hester, and K.M.Schaus Effort: 495.0 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	135
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	23
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	42
93	*Ictalurus punctatus*	2
212	*Gambusia affinis*	8

***Hybognathus amarus* by age class:**

age-0: 21
age-1: 2
age-2:

Rio Grande silvery minnow Population Monitoring
October 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, ca. 4.0 miles upstream of U.S. 380 bridge crossing. Site Number: 13
01 October 2010 **RKD10-153** River Mile: 91.7
UTM Easting: 328140 UTM Northing: 3761283 Zone: 13 Quad: San Antonio
M.A.Farrington, J.L.Hester, and K.M.Schaus Effort: 527.5 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	5
76	*Hybognathus amarus**	23
76	*Platygobio gracilis*	4
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	3

***Hybognathus amarus* by age class:**

age-0: 20
age-1: 3
age-2:

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage
Rio Grande, at US HWY 380 bridge crossing, San Antonio. Site Number: 14
30 September 2010 **RKD10-152** River Mile: 87.1
UTM Easting: 328914 UTM Northing: 3754471 Zone: 13 Quad: San Antonio
W.H.Brandenburg, J.L.Hester, and K.M.Schaus Effort: 615.2 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	2
76	*Hybognathus amarus**	4
76	*Platygobio gracilis*	2
93	*Ictalurus punctatus*	1
212	*Gambusia affinis*	9
294	*Pomoxis annularis*	1

***Hybognathus amarus* by age class:**

age-0: 2
age-1: 2
age-2:

Rio Grande silvery minnow Population Monitoring
October 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, directly east of Bosque del Apache National Wildlife Refuge Headquarters. Site Number: 15

30 September 2010 **RKD10-151** River Mile: 79.1

UTM Easting: 327055 UTM Northing: 3740839 Zone: 13 Quad: San Antonio SE

W.H.Brandenburg, J.L.Hester, and K.M.Schaus Effort: 564.7 sq. m

FAMILY		N
	No Fish Collected	

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, at San Marcial Railroad Bridge, San Marcial. Site Number: 16

30 September 2010 **RKD10-150** River Mile: 68.6

UTM Easting: 315284 UTM Northing: 3728347 Zone: 13 Quad: San Marcial

W.H.Brandenburg, J.L.Hester, and K.M.Schaus Effort: 716.8 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	30
76	*Hybognathus amarus**	2
76	*Pimephales promelas*	1
76	*Platygobio gracilis*	2
93	*Ictalurus punctatus*	2

***Hybognathus amarus* by age class:**

age-0: 2
age-1:
age-2:

Rio Grande silvery minnow Population Monitoring
October 2010

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 8 miles downstream of the San Marcial railroad bridge crossing — Site Number: 17

30 September 2010 **RKD10-149** — River Mile: 60.5

UTM Easting: 309487 UTM Northing: 3718178 Zone: 13 Quad: Paraje Well

W.H.Brandenburg, J.L.Hester, and K.M.Schaus — Effort: 591.6 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	111
76	*Cyprinus carpio*	1
76	*Hybognathus amarus**	37
76	*Pimephales promelas*	1
76	*Pimephales vigilax*	1
76	*Platygobio gracilis*	12
81	*Carpiodes carpio*	1
93	*Ictalurus punctatus*	12
212	*Gambusia affinis*	40

***Hybognathus amarus* by age class:**

age-0: 35
age-1: 1
age-2: 1

NEW MEXICO: SOCORRO Co., RIO GRANDE Drainage

Rio Grande, ca. 10 mi downstream of the San Marcial railroad bridge crossing — Site Number: 18

30 September 2010 **RKD10-148** — River Mile: 58.8

UTM Easting: 307846 UTM Northing: 3716150 Zone: 13 Quad: Paraje Well

W.H.Brandenburg, J.L.Hester, and K.M.Schaus — Effort: 625.9 sq. m

FAMILY		N
76	*Cyprinella lutrensis*	12
76	*Platygobio gracilis*	3
93	*Ictalurus punctatus*	5

DOCUMENT REVIEW COMMENTS	DATE: *3/22/11*
PROJECT TITLE: ***RIO GRANDE SILVERY MINNOW POPULATION MONITORING PROGRAM RESULTS FROM SEPTEMBER 2009 TO OCTOBER 2010 - DRAFT***	
REPORT DATE: ***January 31, 2011***	
REVIEWED BY: ***Science Work Group***	
AGENCY NAME:	

LEGEND ***(for ACTION column below)***

A-APPROVED D-DISAPPROVED C-CONCUR E-EXCEPTION

ITEM NO.	Chapter, Section, Page, Table, Figure or Drawing No.	COMMENT	ACTION
1	General Comment	The authors have the opportunity to improve the value of the population monitoring and the referenced spawning periodicity studies by expanding the literature references, analysis and discussion. The revisions and additional material would better support the Department of Interior, Fish and Wildlife Service, and Bureau of Reclamation by providing a more comprehensive scientific discussion. *This is a valid comment taken in isolation, but the style and content of this report have been progressively tailored over many years to suit the specific needs of USFWS and USBR based on their comments. There was a request for a basic presentation for an educated audience rather than an extensive scientific/statistical technical analysis that would be more appropriate for a technical/academic audience. Specific recommendations that are now followed throughout the document are based on the language set forth in the RFP and the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program.*	E Concur per COTR
2	General Comment	**Long-Term Dataset:** The authors are commended for continuing to collect and assimilate the longest ongoing dataset for the RGSM in the Middle Rio Grande. The catch rate index (CPUE) is being used by the U.S. Fish and Wildlife Service as an index of population status and trends, and some of the data are being used in Population Viability Analysis.	C
3	General Comment	**Need for More Understandable Reports:** These reports on CPUE need to be understood by scientists, managers, and administrators. The report is difficult to follow from a scientific perspective, and it is doubtful that most Collaborative Program partners fully understand the terminology, analyses, and discussion. The report is confounded by a number of analyses of the same or similar datasets (e.g., CPUE by reach, by month, by year) and by confusing text that quickly strays from the project objective. There are also numerous statements about data variation that need to be put into proper context for managers and administrators who may not fully understand the utility and limitations of the data and CPUE indices presented. Recommend to develop a format that is understandable to Program partners, or contract an independent objective scientist to assimilate, analyze, and evaluate all of the CPUE data (1993 to present) in a short, comprehensive document that is easy to read and understand. *The style and format of the report, including the type of analyses, tables, figures, and appendices, were based on the recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. The comment about having a "short, comprehensive document" seems to contradict Comment #1 which states that the report could be improved by "by expanding the literature references, analysis and discussion." The remark about data variation is the basis of a large number of later comments which are addressed in the appropriate sections.*	E Concur per COTR
4	General Comment	**Need for Greater Transparency and Reproducibility of Data Analysis:** Given the importance and significance of the CPUE index and the way in which it is being used by the Collaborative Program and its partners, there is need for a greater level of transparency and understanding of data collection, analyses, and interpretation associated with the index. The raw data used to generate each monthly and annual CPUE for RGSM since 1993 must be made available for an independent objective evaluation and understanding of this metric.	E

5	VI and VII	In the Executive Summary there is a lack of purpose / objectives for the report. How does this information / data interface or support Program objective (RPAs, Long Range Plan, Adaptive Management, Recovery Plan criteria or propagation? *Per COTR: The raw data are provided to the USBR every year and are posted on the Collaborative program website. The objectives are clearly defined in the RFP and those objectives are met in this report. The defined objectives in this report do not include an interpretation of how fish community monitoring data interface with MRGESACP management or planning documents; this is outside of the USBR Statement of Work.*	Concur per COTR
6	Introduction Page 1	*"The primary objective of the September 2009 to October 2010 sampling activities was to monitor temporal trends in the abundance of Rio Grande silvery minnow at numerous sites throughout the Middle Rio Grande. Additional objectives included evaluating the influence of discharge patterns on population fluctuations, determining general habitat use patterns, documenting changes in relative abundance among fish species over time, and determining site-specific sampling variation. Seasonal and spatial differences in population structure and abundance of native and nonnative Middle Rio Grande fishes were also examined."* This study should aid natural resource managers in obtaining a more thorough understanding of the factors that influence the conservation status and population dynamics of Rio Grande silvery minnow, both of which are important components for the recovery of this species. *Identified factors that influence the conservation status and population dynamics of Rio Grande silvery minnow (e.g., discharge patterns, habitat use patterns, population structure and abundance of native and nonnative fishes) are included (part of our objectives) and analyzed extensively within this report.*	C
7	General Comment Introduction, Page 1, Paragraph 3	**Need for Clear Statement of Purpose and Objectives:** The purpose and objectives of the Contract, Scope of Work, and Report are not clear. These are generally stated in the third paragraph of page 1 of the report, but are identified as the "primary objective" and as "Additional objectives". It is difficult to know if these objectives have been addressed in the report, since the section headings do not necessarily reflect these topics. At the least, the report should be organized in a more logical manner so that the reader can understand the objective, the methods used to address these objectives, the results of analyses, and the interpretation. The report in its current condition is difficult to follow and certain parts of the report are speculative and not supported by the data; e.g., claims about low data variation are not supported (see detailed comments below). Please describe in the report the verbatim language on Purpose and Objectives, and construct the format of the report to address each objective. *The objectives are clearly defined in the RFP "The objectives will determine changes in:* • *October RGSM population among years,* • *October fish assemblages among years,* • *RGSM distribution and abundance within a particular year, and* • *Fish assemblages within a particular year.", and we follow those objectives in this report. The style and format of the report, including the type of analyses, tables, figures, and appendices, were based on the recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. Paragraphs separate the different sub-sections and section headings delineate major topics, which are related to the objectives. The recurring remark about data variation is the basis of a large number of later comments and will be addressed in the appropriate sections.*	E Concur per COTR
8	Introduction Page 2	Much of this information appears to be from previous reports, appear to be dumped here without a purpose. *The purpose of the introductory material was to provide a brief overview of the project since its inception and outline the goals and objective of the report. We felt there was no need for a revision of this introductory material in 2010 since the general scope of the project or the circumstances that lead to its genesis haven't changed in the past year.*	E Concur per COTR
9	General Comment	**Need for a Scientifically Supported Study Design:** The present study design (i.e., sample numbers, locations, and timing) has not been subjected to a quantitative assessment to	E Concur

	Study Area, Page 2, Full Paragraph 4	identify the sampling strategy that will yield the highest level of precision, sensitivity, and accuracy possible for available funds. A number of approaches are available and recommended, including the Generalized Random Tessellation Stratified (GRTS) design (Stevens and Olsen 2004) using the program S-Draw (McDonald 2004); or a longitudinal power analysis using sample variation (Shadish et al. 2002). The precision of the current CPUE data is low and it is imperative that the Program evaluate the study design to determine if refinements in sampling design can produce higher precision. Power analysis should also be used to estimate the "cost of precision"; i.e., determine the improvement in coefficient of variation with sample size and distribution. *PER COTR: Power analysis of various techniques is being covered in other collaborative program projects. Additional power analysis is outside the scope of work in this RFP and was conducted and is presented in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring).* *This long-term ecological monitoring project might have benefited from this type of analysis in 1993. However, it has long since been decided that the value of these data are dependent on their consistency (both sampling locations and methodologies). Continuing with the original sampling strategy was based on the recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. The Population Estimation project incorporates the various approaches mentioned in this comment and is a more appropriate project for implementing these techniques. We disagree that the precision of the CPUE data were "low" since that has not been numerically defined and must be presented in the context of the methodology and overall population variation over time.*	per COTR
10	Methods Page 5	Seine hauls, how is escapement consider, is there an age class bias on sampling, do older out swim seine resulting in a higher catch rate for younger fish? What is the effectiveness (variance) between scene hauls? Are scene hauls amongst different habitat types similar of different? How does this effect CPU? *Per COTR: The sampling methods used during this study were based on the recommendations made by USBR and as set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. These questions were all addressed by implementing the more statistically rigorous Population Estimation project, which has the more specific goal of quantifying the total number of Rio Grande silvery minnow. Estimating population size of RGSM on a monthly basis is outside of the USBR Statement of Work for this project. All gear types have their biases. Gear evaluation is being conducted in a separate Collaborative Program study.*	E Concur per COTR
11	Methods Page 5	Habitat types are estimated not measured. Depth and velocity should be recorded for each habitat that would support as quantitative description of habitat and start to develop a correlation to flows. Management needs to know frequency of habitat types at a flow, number of fish supported under these conditions, per reach. This type of information allows the Program to management water for a targeted number of fish that interfaces with Recovery criteria or BO, RPAs. Without providing such information, the report has limited value to the Program. *Per COTR: The sampling methods used during this study were based on the RFP, recommendations made by USBR, and as set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document*	E Concur per COTR

		produced by the Middle Rio Grande Endangered Species Act Collaborative Program. Measuring depths/velocities of the approximately 3,600 habitats sampled annually (i.e., 20 per site, 20 sites, 9 months) and then building a habitat/fish/flow model to estimate habitat "quality" would be outside of the USBR Statement of Work for this project. If this information is required it should be addressed in the RFP.	
12	Methods Page 5	*For parametric data analysis, fish CPUE data from all samples were log-transformed (X' = ln(X+1)) based on low observed values and temporal heterogeneity of variance (Zar, 1984).* This use of data is very difficult for most readers to understand. What is needed here is a per scene hauls catch rate by mesohabitat unit. Again, variance should be calculated amongst scene hauls in one mesohabitat, evaluated, then expanded. *Per COTR: The sampling methods used during this study were based on the RFP formed from recommendations made by USBR, and as set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program.* *The individual seine haul data by mesohabitat were combined because the majority of all data prior to 2006 included fish that were preserved into a single collection for a sampling site. The long-term nature of this study (i.e., 1993-2010) means that any comparative analyses needs to be based on the single collection (all fish counted by site) sampling of data per site as opposed to the multiple-collection (all fish counted by mesohabitat) sampling of data per site. Variance by seine haul (over multiple days) is addressed in Sampling Variation section of this report.*	E Concur per COTR
13	Methods Page 5	How are different flows considered to affect the efficiency of sampling? How do flow changes alter mesohabitats, fish distribution and catch rate. Where are these considerations noted? *Per COTR: The sampling methods used during this study were based on the RFP formed from recommendations made by USBR, and as set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. Estimating population size of RGSM monthly and relating it to seasonal changes in flow/habitat would be outside of the USBR Statement of Work for this project.* *These questions were all addressed by implementing the more statistically rigorous Population Estimation project, which has the more specific goal of quantifying the total number of Rio Grande silvery minnow.*	E Concur per COTR
14	Methods, Page 5, Full Paragraph 1	The manner in which samples were taken is not entirely clear. Were there 18-20 samples from different habitats taken at EACH of 20 sites? If so, was the proportion of mesohabitats sampled equivalent to the proportion available or was sampling done randomly, arbitrarily? Clarify numbers of samples per site and criteria for mesohabitat selection. Present these data in a table. *The text was modified to clarify that 18-20 samples were taken at each of the 20 sites.* *Per COTR: Computing the proportion of mesohabitat available would require GPS mapping of the sites and subsequent post-processing of the data which is outside the scope of work for this project. This is done during the more statistically rigorous Population Estimation project, which has the more specific goal of quantifying the total number of Rio Grande silvery minnow. Sampling was not done arbitrarily but rather based on a set number of samples per mesohabitat at each site as outlined in the Methods section.*	A E Concur per COTR
15	Methods, Page 5,	Please clarify how the protocol for computing CPUE by sample has changed from computing	E

	Full Paragraph 1	CPUE by collection of multiple samples; also discuss how this might affect CPUE comparisons. Clarify as described. *There has been no change in the protocol for computing CPUE over time. For Population Monitoring, the total number of fish per site is simply divided by the total area sampled to calculate CPUE. For the repeated sampling portion of this study (to calculate sampling variation), the total number of fish per haul is divided by the total area of the seine haul.*	Concur per COTR
16	Methods, Page 5, Full Paragraph 1	Please clarify if computation of CPUE includes zeros; i.e., samples with no RGSM? Clarify as described. *Yes, the computation of CPUE includes samples that did not yield RGSM (CPUE=0).*	E Concur per COTR
17	Methods, Page 5, Full Paragraph 2	Log-transformation of data is a legitimate statistical procedure, but in this case, it is really done because the distribution of CPUEs is usually heavily skewed toward small numbers and zeros and is non-normally distributed, which precludes parametric analysis. Please state more clearly how and why this was done. The Methods states that there was "temporal heterogeneity of variance", but the results also present a spatial component—please clarify. This should not require a long diatribe about statistics, but a short explanation of heterogeneity would be helpful, especially with regard to these type of non-normally distributed data. *To conduct parametric data analysis, the data were transformed and this greatly improved the normality of the distribution and homogeneity of variance. The statistical analyses were temporal ones not spatial ones so the word "temporal" was used.*	E Concur per COTR
18	Methods, Page 5, Full Paragraph 2	Were the variances of the ln-transformed data tested for homogeneity, such as Bartlett's test for homogeneity of variance, before proceeding to further analyses? Transforming the data does not automatically address heteroscedasticity. Perform tests of homogeneity on ln-transformed data and report index of normality (e.g., Shapiro-Wilk Test). *To conduct parametric data analysis, the data were transformed and this greatly improved the normality of the distribution and homogeneity of variance. Linear regression and ANOVA are both robust statistical procedures and are not compromised by modest departures from normality and homogeneity of variance. It was determined that these procedures would be appropriate statistical analysis techniques for these transformed data.*	E Concur per COTR
19	Methods, Page 5, Full Paragraph 2	The data presented in Figures 12 and 13 are ln-transformed. The term "Linear regression modeling" suggests that one or more parameters (e.g., covariates) were added to the regression model. Is this the case, and if so, what were they? Clarify as described. *The text describes the parameters and the results illustrate the analyses. There were no additional covariates in the linear regression model (only a single dependent and a single independent variable).*	E Concur per COTR
20	Methods, Page 5, Full Paragraph 2	Regressing flow variables against CPUE is informative. Has there ever been a sensitivity analysis done on the most sensitive flow variable to use for this comparison? How was maximum discharge selected? Is it possible to identify break points in flow at which CPUE is most responsive? Describe how flow variables were chosen. *The text describes the parameters and the results illustrate the analyses. No sensitivity analysis (or break points identified) was conducted since flow variables were simply based on rounded cfs increments. As reported "Maximum discharge and days exceeding threshold discharge values in 1,000 cfs increments (days>1,000, 2,000, 3,000, 4,000, and 5,000 cubic feet per second, cfs) represented the general range of spring runoff conditions (May-June). The onset of lower flows (<200 cfs), mean daily discharge, and the lower threshold discharge values (e.g., days<200 and <100 cfs) were selected to represent low flow conditions during irrigation season (March through October)."*	E Concur per COTR
21	Methods, Page 5, Full Paragraph 2	The Methods say $p<0.05$; page 19 says $p<0.01$, and Figures 12 and 13 say $p<0.001$. If p values are set at $p<0.05$, but are actually considerably lower, then give actual p-value; otherwise stay consistent between methodology and presentation. *This is very common reporting for statistics as opposed to reporting the actual p-value, which would be quite cumbersome and confusing. As reported "A negative or positive trend in population abundance was defined as occurring when the slope of the regression was significantly different ($p<0.05$) from zero.", meaning that anything with $p<0.05$ is reported but more specific information is provided within the results (to avoid everything being*	D Concur per COTR

		p<0.05 when in fact a lower p-value was obtained).	
22	Methods, Page 5, Full Paragraph 3	Coefficient of variation (CV) is described in the Methods, but the measure of variation used in the Results and Figures is standard error (SE=SD/sq rt of n). The statistics CV and SE need to be better described as used in the report. SE is a legitimate measure of variability or data precision. However, when readers see figure of CPUE, they may unintentionally be lead to believe that SE indicates significantly similar or different means. For most readers, the most easily understood vertical bars around the mean on a figure are 95% confidence intervals (CI), or roughly SE x 1.96 (see below for additional comments). On all figures of CPUE, use arithmetic axes and 95% CI. *For a definition of CV and SE, please reference Zar, J. H. 2010 (Biostatistical Analysis. Fifth edition. Prentice Hall Inc., Upper Saddle River, New Jersey. 944 pp.) as our paper is not the appropriate venue for statistical formulae. The confusion about error bars is questionable as it is reported, "Symbols represent mean value for all sites sampled (n=20); bars represent the standard error." Logarithmic axes were used to present data that vary widely in range; otherwise the highest value dominates the axis and the reader cannot discern patterns among the lowest values.*	D Concur per COTR
23	Results, Page 8	The text on this page is redundant and unnecessary. The numbers of seine hauls at each location for each sample period with and without fish should be presented in a table. Clarify if "zero catches" are included in CPUE. *The reporting style used during this study was based on recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. The text is not redundant as each paragraph describes a different sampling month. A table for this single parameter would not save space or increase clarity. As stated previously, values of CPUE=0 are included.*	D Concur per COTR
24	Figure 3, Page 9	Please clarify that these are mean densities (CPUE) by site for that sample period using all CPUEs (including zeros). Clarify that mean CPUE is computed from raw data values and not from intermediate means. *As stated previously, values of CPUE=0 are included and values are calculated from raw data. However, the data presented on this page are not means so this comment is unclear.*	E Concur per COTR
25	Figure 3, Page 9	Note that there are 5 sites for ANG, 6 for ISL, and 9 for SA. The manner in which these sites were determined may need to be examined objectively with a statistical analysis that evaluates variance longitudinally and allocates samples accordingly. A visual examination of Figure 7 shows highest variability of mean CPUEs in the Angostura Reach, which indicates a need for more sample sites in that reach. Perform longitudinal power analysis of precision to define distribution of samples that better account for sample variation. *The sampling methods (including site selection) used during this study were based on the RFP, recommendations made by USBR, and as set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. Power analysis has already been conducted and is presented in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring).*	E Concur per COTR
26	Results Page 9	Where are habitat types? *This graph doesn't illustrate habitat types but rather "Rio Grande silvery minnow (RGM) densities (CPUE) from September 2009 to May 2010 for each collection locality in the Middle Rio Grande." Habitat types are irrelevant as the density is calculated among all habitats sampled, not stratified by a generalized mesohabitat designation.*	E Concur per COTR
27	Results Page 10	What is the confidence of these samples. Where is replication and variance amongst seine hauls? If over 10,000 square meters were sampled, what mesohabitats were present, was catch rate equally distributed amongst mesohabitats, clustered, how does changes in flow effect these numbers? *These are densities (fish per area sampled) calculated by site by month so there is not a measure of SE associated with these numbers. Habitat types are irrelevant as the density is calculated among all habitats sampled, not stratified by a generalized mesohabitat designation.*	E Concur per COTR

28	Results Page 11	What habitat types were sampled? Do all habitats types support silvery minnows equally? Are selections of sample sites bias toward collection or non-collection of silvery minnows? The raw data is needed for additional analyses to clearly understand this information. *Habitat types are irrelevant as the density is calculated among all habitats sampled, not stratified by a generalized mesohabitat designation. Further, generalized information on habitat types sampled and those with RGSM can be found on Figure 15.* *Per COTR: The sampling methods (including site selection) used during this study were based on the RFP, recommendations made by USBR, and as set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. The raw data are provided to Reclamation and posted on the program web site.*	E Concur per COTR
29	Results, Page 11	This is strong evidence of clumped distribution for RGSM and the need to examine the data for optimal sampling design relative to sampling distribution of mesohabitat types. Sample size and distribution must account for this hyperstability (Hilborn and Walters 1992). Analyze effect of clumped distribution of fish and determine if this is affected by disproportionate mesohabitat use. *Per COTR: The sampling methods (including site selection) used during this study were based on the RFP, recommendations made by USBR, and as set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. Analyzing the effect of clumped distribution of fish to determine if this is affected by disproportionate mesohabitat use is outside the Statement of Work for this project.*	D Concur per COTR
30	Results Page 12	Table 2. How is flow a factor in sampling? Where is this considered or corrected for? *Per COTR: Analyzing "how flow could be a factor in sampling" would require the collection of additional field data and would be outside the Statement of Work for this project.*	E Concur per COTR
31	Results Page 13	Is CPUE monitoring the true number of fish in the river? What is the relationship between management objectives and CPUE? *The measurement of CPUE provides population trends; a population estimate provides an estimate of fish (and the associated variance). Assessing the "relationship between management objectives and CPUE" is unclear but would be outside the USBR Statement of Work for this project.*	E Concur per COTR
32	Results page 13	How many scene hauls account for the number of fish. What is variance between scene hauls with a sampling day and amongst scene hauls throughout the year at a given reach. Are fish a density uniform throughout the reach or is there a correlation to habitat? *Seine haul information is presented in detail by month at the beginning of the Results section.* *Per COTR: Assessing the "variance between scene hauls with a sampling day and amongst scene hauls throughout the year at a given reach and determining if fish density is uniform throughout the reach (or if there a correlation to habitat)would be outside the USBR Statement of Work for this project.*	E Concur per COTR
33	Results page 14	These graphs are difficult to interpret and most viewers in the Program would extract little information. The computation of how these graphs are formed needs to be clear to the viewer. *These are density estimate graphs by sampling month. These are means with a standard error bar for the 20 sampling sites.* *Per COTR: The reporting style (including suggested figures and tables) used during this study was based on recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program.*	D Concur per COTR

34	Figure 6, Page 14	Do the points on this figure represent the mean of means--or is it a single mean from all values. These different calculations can significantly affect the standard error. The mean should use each raw CPUE, and not the means of previously computed monthly CPUEs. *"Symbols represent mean value for all sites sampled (n=20); bars represent the standard error." There is one density measurement per site and 20 sites for each month, thus the mean for each point on this figure is calculated from 20 values (not "mean of means").*	E Concur per COTR
35	Figure 6, Page 14	Use of "standard error" needs to be explained. I assume this is the standard error of the mean, which is fundamentally the standard deviation of sample means divided by the square root of the number of observations (n). Note that in Methods, you indicate that CV is used as a measure of variation, but not standard error. Describe standard error and how it is used to represent variability of the mean CPUEs; also relate to 95% CI. *The typical definition of standard error (of the mean) as used in this report can be found in Zar, J. H. 2010 (Biostatistical Analysis. Fifth edition. Prentice Hall Inc., Upper Saddle River, New Jersey. 944 pp.). In the Methods, the use of CV is associated with the four day sampling period to calculate site-specific sampling variation. The relationship between SE and 95% CI can be found in Zar, J. H. 2010 (Biostatistical Analysis. Fifth edition. Prentice Hall Inc., Upper Saddle River, New Jersey. 944 pp.); these definitions and formulae are not needed in this report.*	E Concur per COTR
36	Figure 6, Page 14	Most readers understand 95% confidence intervals around each mean to facilitate a visual comparison of means for significant differences. 95% CI are generally SE x 1.96, although this can vary depending on t-value. Use of 95% CI is recommended. On all figures of CPUE, use arithmetic axes and 95% CI. *This point has been discussed in previous responses to comments. The reporting style (including suggested figures and tables) used during this study was based on recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program.*	D Concur per COTR
37	Figure 6, Page 14	The log scale on the Y axis helps to present the wide range of mean values and variances, but it also compresses these values and can confound the reader. An arithmetic axis with 95% CI would help the reader to better understand the true scale of trend and significance of mean CPUEs over time. On all figures of CPUE, use arithmetic axes and 95% CI. *This point has been discussed in previous responses to comments. Also, the reporting style (including suggested figures and tables) used during this study was based on recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program.*	D Concur per COTR
38	Figure 6, Page 14	At this point in time, the manner in which the computations of CPUE are made and the associated variances are taken on faith. Although the data are available in Access datasets, procuring the same data partitions as used by the authors is virtually impossible. The CPUE metric derived from this work is being used to define the status and trend of the RGSM in the Middle Rio Grande. The raw data used to compute monthly and annual CPUE since 1993 must be provided to ensure confidence in this metric through evaluation and reproducibility. *Per COTR: The raw data are provided to Reclamation every year and posted on the collaborative program website.* *The CPUE metric is actually quite simple (fish per unit area) and is simply calculated from the Access dataset. However, it is important to use the most recent version of the dataset and as stated clearly in the report "Samples obtained from isolated pools were not included in data analysis as densities in these confined habitats were artificially elevated." Without specific examples, we can't address this question further.*	E Concur per COTR
39	Results Page 15	Why is the effort in sampling so different between sites? *The effort in sampling is actually very similar among sites so this question does not make sense. This graph illustrates differences in the CPUE among sites not sampling effort.*	E Concur per COTR

40	Page 16 Figure 8	Figure 8 and Figure 14 are nearly duplicate graphs. Suggest authors remove Figure 8, and use Figure 14 to illustrate the trends. *These graphs illustrate quarterly trends separately (Fig. 8) and then associated with flow (Fig. 14) and are needed for text discussions of different sections of the report to avoid confusion.*	D Concur per COTR
41	Page 17 Figure 9	Figure 9 basically duplicates Figure 6 A on page 14. Suggest the authors either merge Figure 9 with Figure 10, or remove Figure 9 and cite Figure 6 A. *These graphs illustrate trends regarding age-class (Fig. 6), monthly trends (Fig. 9), and reach trends (Fig. 10) that are needed for text discussions of different sections of the report to avoid confusion.*	D Concur per COTR
42	Results Page 17 Figure 9	It is not clear how the means are calculated and the standard error displayed by transformation is not clear to the viewers. How is this graph used as a management tool? What does this graph tell us about the management of RGSM? Does this graph provide information supported by sound scientific investigations (that can be replicated) to help the Program make informed decisions. *As stated on the figure, means are calculated from the CPUE values obtained at 20 sampling sites. There should be not confusion about error bars as it is reported, "Symbols represent mean value for all sites sampled (n=20); bars represent the standard error."* *Per COTR: Addressing how this graph affects management would be outside the USBR Statement of Work for this project.*	E Concur per COTR
43	Results Page 19	The mirrored results between years 1996 and 2010 cannot be made with any assurance with noting the variance among samples. *The wording of the sentence was changed from "mirrored" to "were similar to" to avoid confusion.*	C
44	Results Page 19	Hydrology is not the only driver on fish numbers, types of habitat and frequency of distribution of these habitats within a reach needs to be equally considered. *Per COTR: Analyzing the types of habitats and frequency of distribution of these habitats within a reach as related to population trends would be outside the Statement of Work for this project.*	D Concur per COTR
45	Results Page 19	If flows and hydrology are important in the Program, then mesohabitats need to have measurements, both depth and velocity and RGSM utilization would help. *Per COTR: This task is outside the current Statement of Work for this project.*	D Concur per COTR
46	Results Page 20 Figure 11	The log transformation helps illustrated the data, however most viewers in the Program are not aware of the compressed y axis reduces visually clarity of other statistics. Due to the importance of this figure, there needs to be clarification to how statistics are altered (visually) by the transformation, *This is a very typical reporting style and statistical definitions (of symbols/bars) are provided on every figure throughout the report.*	D Concur per COTR
47	Results Page 24	Mesohabitat types need to be further defined with measurements and their presence / absence and utilization should be tied to flow within a reach. To start managing RGSM toward Program objectives, mesohabitats need further definition within a reach over a range of flow need to be identified. *Per COTR: This task is outside the current Statement of Work for this project.*	D Concur per COTR
48	Page 25 Figure 15	If number sampled sites always exceeds minnow captured, yet minnows have utilization of multiple habitat sites, what part of this difference is sampling error or escapement from the scene? *Per COTR: This task is outside the current Statement of Work for this project. The Population Estimation project incorporates the various approaches mentioned in this comment and is a more appropriate project for implementing these techniques.*	E Concur per COTR
49	Page 27	Sample variation is discussed, however variation not defined or method of calculation is not presented. As presented, the determination of variance is not clear. Suggest establishing	E Concur

		variance amongst scene hauls to identify potential replication. *As reported in Methods section, "Additional intensive sampling was conducted during November (2009 and 2010) for characterizing sampling variation at each of the 20 sites. For the intensive sampling effort, sites were sampled once per day, using regular population monitoring sampling protocols, for four days (N=80 samples). Samples were taken at the same or similar mesohabitat locations on subsequent days… Site-specific sampling variation was evaluated using coefficient of variation values generated from multi-day sampling efforts at each of the 20 sites. The coefficient of variation (CV=ratio of the standard deviation to the mean) was calculated for the four day sampling period. Values of CV were calculated for sites, reaches, and the study area."*	per COTR
50	Page 28 Figure 16	It is not clear what management objective the graph is addressing or how this percent is important. Does this represent some type of competition or potential for predation? Where is the discussion of this figure and how this information benefits the Program? *Per COTR: The reporting style (including suggested figures and tables) used during this study was based on recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. Addressing management objectives (or Program benefits) of this figure or competition/predation hypothesis would be outside the Statement of Work for this project.*	E Concur per COTR
51	Page 29 Figure 17	The value of this graph is not clear to most viewers, what does this mean. Does this represent competition or sympatric community? ??? *Per COTR: The reporting style (including suggested figures and tables) used during this study was based on recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. Addressing management objectives (or Program benefits) of this figure or competition/predation hypothesis would be outside the Statement of Work for this project.*	E Concur per COTR
52	Page 31 Figure 18	Without knowing the variance amongst seine hauls and the type of habitat different species were collected in, there is not much useable information in the graphs. *Per COTR: The reporting style (including suggested figures and tables) used during this study was based on recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program.*	E Concur per COTR
53	Page 32 Figure 19	What does this graph tell us about the management of RGSM? Is this information an anomaly of sampling, not knowing habitats of catch rates per scene haul? *Per COTR: The reporting style (including suggested figures and tables) used during this study was based on recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. Addressing management objectives (or Program benefits) of this figure or competition/predation hypothesis would be outside the Statement of Work for this project.*	E Concur per COTR
54	Results, Page 19, Full Paragraph 2	Flow variables affect survival and recruitment, but changes in sampling conditions as a function of flow must also have a strong influence on CPUE. A covariate analysis is recommended to test for effect of flow and sampling condition? *A covariate analysis to test for the effect of flow and sampling condition (as a function of flow) would require the collection of additional field data.* *Per COTR: This task is outside the current Statement of Work for this project.*	D Concur per COTR
55	Results, Page 19, Full Paragraph 2, Last Sentence	This relationship may not be entirely driven by flow, and may be greatly influenced by sampling conditions. For example, at lower flow, the fish may be concentrated in certain habitats that are not as frequently sampled. The effect of sampling condition on this relationship needs to be determined, and may be done using flow and mesohabitat as a covariates in ANOVA or regression models. *A covariate analysis to test for the effect of flow and sampling condition (as a function of flow) would require the collection of additional field data . Per COTR: This task is outside the current Statement of Work for this project.*	D Concur per COTR

		The frequency of sampling is not altered based on the flow and in low flow conditions all mesohabitats are easily sampling. As reported in the Methods section, "Fish were collected by rapidly drawing a two-person 3.1 m x 1.8 m small mesh (ca. 5 mm) seine through 18 (April to October) to 20 (December and February) discrete mesohabitats (usually <15 m). Runs, shoreline runs, pools, and shoreline pools were sampled up to four times at each site; backwaters and riffles were sampled up to two times; any remaining samples (to obtain a total of 18-20) were taken in shoreline run habitats. From April to October, a 1.0 m x 1.0 m fine mesh (ca. 1.5 mm) seine was used to selectively sample shallow low velocity habitats for larval fish (two samples). Mesohabitats with similar conditions (i.e., not exceeding reasonable depths/velocities for efficient seining) were sampled to ensure relatively static capture efficiencies regardless of flow."	
56	Mesohabitat Associations, Page 19	A mesohabitat classification system should be adopted for the Middle Rio Grande. Existing classification systems can be used or modified. *Per COTR: This task is outside the current Statement of Work for this project.*	E Concur per COTR
57	Figure 11, Page 20	This is the figure that most readers look for and focus on. It is used by FWS to report the status and trend of the population. The figure however is deceiving with respect to differences in mean CPUEs and variances. The log Y axis tends to compress the means and variances and does not reveal true visual differences or similarities in means. As recommended above, a normal Y axis with 95% CI around each mean would help the reader to more easily see these CPUEs, associated variances, and statistical differences. Also, the authors are urged to provide a table that presents that mean CPUE, sample size, variance, standard deviation, standard error, coefficient of variation, and 95% confidence interval that would correspond with each of the annual means presented in this figure. *This is a very typical reporting style and statistical definitions (of symbols/bars) are provided on every figure throughout the report. Also, the reporting style (including suggested figures and tables) used during this study was based on recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. A table of statistics for one graph would not be an efficient use of space. Addition statistics can be generated from the Appendix report or electronic raw data provided by USBR but are not needed for this report. Also, statistical analyses of the differences among years supersede this request. As reported, "Rio Grande silvery minnow October densities (1993-1997, 1999-2010) were significantly different among sampling years (df=16, F=18.11, p=<0.0001) with the highest densities in 2005 and the lowest densities in 2003. Densities have declined and increased two to three orders of magnitude on several occasions within the last decade, often within the span of only two or three years. Despite seasonal fluctuations in the abundance of this species, recent samples document a stable population in 2009 but a declining population in 2010 (Figures 9 and 10). Decreases were particularly notable in the Isleta and San Acacia reaches from July to September 2010. Population monitoring efforts demonstrated that Rio Grande silvery minnow density in October was significantly lower (p<0.05) in 2010 than in recent years (e.g., 2007, 2008, and 2009) but that it was significantly higher (p<0.05) than in 2002 and 2003. October population monitoring samples illustrate that the magnitude of decline (as measured logarithmically) from 2009 to 2010 (Figure 11) was substantial and significant. Population levels in 2010 were similar to those observed following extensive river drying in 1996."*	D Concur per COTR
58	Figure 11, Page 20	Derivation of these CPUEs is impossible to reproduce. Reproducibility is a fundamental principle of scientific understanding. There is a great need for transparency in how these CPUEs are computed. Individuals cannot reproduce these from the Access database provided (though the database is helpful) because the criteria for data partitioning are not known and may not be the same among individuals (e.g., data for isolated pools is excluded, but other exclusions may not be identified). Data partitioning needs to be done by the authors. Please provide a simple spreadsheet with the numbers used to derive these mean CPUEs so others can reproduce these computations and see how these numbers were derived. *Per COTR: The raw data are provided to the USBR every year and posted on the*	E Concur per COTR

		Collaborative Program website. *The CPUE metric (fish per unit area) is calculated from the Access dataset. However, it is important to use the most recent version of the dataset and as stated clearly in the report "Samples obtained from isolated pools were not included in data analysis as densities in these confined habitats were artificially elevated." Without specific examples, we can't address this question further.*	
59	Table 3, Page 24	A more formal system of habitat classification should be adopted for use in the Middle Rio Grande. There are a number of scientifically derived and peer-reviewed classification methods. The most commonly used approach is a hierarchical system, such as Hawkins et al. (1993), and the most accepted terminology is by Armantrout (1998). These classification systems help to better relate mesohabitats to functional hydraulic and geomorphic development, and they establish a common set of names, codes, and definitions that can be understood and used by all. A mesohabitat classification system should be adopted for the Middle Rio Grande. Existing classification systems can be used or modified. *These mesohabitat designations are very generalized, should not be used in additional analyses, and do not warrant modeling complex habitat/flow/fish relationships. The reporting style for mesohabitats used during this study was based on recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program.*	E Concur per COTR
60	Figure 15, Page 25	A quick look at this figure suggests that the RGSM is a habitat generalist. However, a closer look shows differences in percentage of fish collected from associated percentage of mesohabitats sampled. A chi^2 type of analysis is recommended for mesohabitat availability vs mesohabitat used. There appears to be some selection, but it is difficult to see with this figure. This is important because if there is habitat selection, then sampling must be partitioned to account for that selection or there is a risk with biased sampling. A chi^2 will require that every time the RGSM is sampled, the total number of mesohabitat by site are identified and recorded (for say 1 km) to provide a measure of availability. Evaluate use of mesohabitats by RGSM to determine if sampling needs to be refined to avoid sample bias. *The additional analyses suggested are not appropriate given the generalized nature of these mesohabitat data, particularly since they don't represent use/availability (a rigorous habitat use/availability study with a robust statistical design would be required for this request). These data should not be used to measure habitat preference/selection based on the study design and collecting the additional field data necessary to do so would be outside the USBR Statement of Work for this project. The sampling methods used during this study were based on the recommendations made by USBR and as set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. As reported in the Methods section, "Fish were collected by rapidly drawing a two-person 3.1 m x 1.8 m small mesh (ca. 5 mm) seine through 18 (April to October) to 20 (December and February) discrete mesohabitats (usually <15 m). Runs, shoreline runs, pools, and shoreline pools were sampled up to four times at each site; backwaters and riffles were sampled up to two times; any remaining samples (to obtain a total of 18-20) were taken in shoreline run habitats. From April to October, a 1.0 m x 1.0 m fine mesh (ca. 1.5 mm) seine was used to selectively sample shallow low velocity habitats for larval fish (two samples). Mesohabitats with similar conditions (i.e., not exceeding reasonable depths/velocities for efficient seining) were sampled to ensure relatively static capture efficiencies regardless of flow."*	E Concur per COTR
61	Sampling Variation, Page 27, First Paragraph	The statement that "The sampling variation…was moderately low overall" is not an accurate statement. The resultant CVs associated with the mean CPUEs are quite high and reflect high variability in the data and low precision. An average overall CV of 0.67 means that the SD is 67% of the mean, which is quite high. It is difficult to discern the SE value (SD/sq rt of n) for each of the mean CPUEs presented in the figures of this report, but a visual examination indicates that the SE is about 100%, or greater, of the mean CPUE. If we multiple SE x 1.96 for 95% CI, this means that most 95% CI are 200% of the mean or greater. In other words, to detect significant differences between two mean CPUEs, the CPUE would have to double to	E Concur per COTR

		be detected 95% of the time. The meaning of CV, SE, and 95% CI should be explained in these reports so that Collaborative Program managers are not expecting a small population change can be detected as a consequence of a management action. Managers should understand the cost of precision, and the sampling design for this work should evaluate that cost and the resultant precision. Most monitoring programs strive for CV<0.15 (<15%) to have confidence that change in a population can be detected (Ward et al. 2008; Makinster et al. 2009; U.S. Fish and Wildlife Service 2002). A 'rule of thumb' for acceptable precision of population estimates is to achieve a CV of 20% or less (Pollock et al. 1990). Revise section to more clearly explain the meaning and use of CV and SE with respect to data utility and limitation. *The value of 0.67 is based on a by-site basis but the overall CV value was 0.26 (all sites combined), which is more appropriate for this discussion. However, the citations listed by the reviewer (particularly Pollock et al. 1990) indicated that the CV values reported in this report (SD/X) are not calculated in the same manner as in other reports (SE/X). While the textbook definition for CV is SD/X, population monitoring studies often use the alternative calculation for ease of presentation (e.g., values don't exceed 1.0). The values of CV given in Makinster et al. 2009 (Colorado River fishes) also follows the alternative presentation (SE/X). We decided to revise our calculations to reflect the SE/X calculation, which meant that our revised overall CV value was 0.13 in 2010. It is now reported that "In 2009, the overall CV value for Rio Grande silvery minnow was 0.17 but dropped to 0.07 when excluding one outlying value (Site #5 on sampling day three). In 2010, the overall CV value for Rio Grande silvery minnow was 0.13 but dropped to 0.03 when excluding one outlying value (Site #12 on sampling day one)." These CV values are quite low considering that RGSM often fluctuates widely (orders of magnitude (sometimes >1,000%) on an annual basis. Also, the values for CV given in the above references appear to have been developed primarily for K-selected species (not r-selected species like RGSM), and those species vary much less on an annual basis as compared with RGSM. Thus, the use of the word "moderately low" is relative and is appropriate in this situation. Also, this estimate of sampling variation is coarse and very likely to overestimate the sampling variation as there is disturbance to the habitats (and subtle changes in flow/habitat relationships) associated with sampling over a sequence of four days. It is impossible to replicate sampling conditions on consecutive days and so these estimates of sampling variation should be evaluated cautiously. These points are now included in the Discussion. Finally, a close evaluation of populations among years should now be done using data/results from the Population Estimation study not the Population Monitoring study as the former is a more rigorous statistical approach to assessing changes in estimated populations of Rio Grande silvery minnow among reaches and years.*	
62	Page 27, Last Full Sentence	The statement that "Values for sampling variation were relatively homogeneous…" contradicts the need for log-transformations described in the Methods section. Most CPUE data presented in this report are highly variable and characteristically highly skewed to low or zero CPUEs. You cannot make this statement with regard to "sampling variation" because the high CVs are revealing. Revise section to more clearly explain the meaning and use of CV and SE with respect to data utility and limitation. *These sampling-variation specific data have not been log-transformed (see Methods). Log-transformations were used to facilitate parametric analysis, which wasn't needed for this section of the report. The use of the wording "relatively homogeneous" is referring to the sampling variation for all fish species and this is reflected on Figures 23/24.*	D Concur per COTR
63	Figure 20, Page 34	The analysis of fish community composition presented in this report is appreciated and valuable in addition to the CPUEs. This analysis reveals that red shiners are very abundant, which is probably no surprise to anyone. However, red shiners have been identified by a number of researchers as one of the most severe predators of larval life stages of fish (e.g., Ruppert et al. 1993). Perhaps little can be done, other than flow management to disadvantage the red shiner, but there does not appear to be much attention to the effects of predation on early life stages of the RGSM and yet it is the most critical time for survival and recruitment by the species. Regress CPUE for RS with CPUE for RGSM to determine if predation of early life stages of RGSM is indicated by high densities of RS. *The addition of regression for "CPUE for RS with CPUE for RGSM to determine if*	D Concur per COTR

		predation of early life stages of RGSM is indicated by high densities of RS." would be outside the USBR Statement of Work for this project. This would also potentially be a poor test of the effects of predation on early life stages of RGSM as it would be predicated on numerous unsubstantiated assumptions.	
64	Page 34 Figure 20	Are habitats types uniform amongst river reaches, there is great variability in habitats along the river, without habitat types fish are collect in, there is very little information here. What are the driver behind fish density, where are they noted. *Determining the answers to the following, "Are habitats types uniform amongst river reaches, there is great variability in habitats along the river, without habitat types fish are collect in, there is very little information here.* *Per COTR: Determining driver behind fish density, would require the collection of substantially more field data and would be outside the current Statement of Work for this project.*	E Concur per COTR
65	Page 35 Figure 21	Are all sites within one reach or multiple? What are habitat types at each site, similar of different. How is variation calculated, is it the variance of all scene hauls at that site during one sampling event? Or combined over multiple sampling events. *The locations of sites relative to reaches can be seen on Figure 1. The mesohabitat types are similar because of the sampling protocols; as stated in Methods section, "Fish were collected by rapidly drawing a two-person 3.1 m x 1.8 m small mesh (ca. 5 mm) seine through 18 (April to October) to 20 (December and February) discrete mesohabitats (usually <15 m). Runs, shoreline runs, pools, and shoreline pools were sampled up to four times at each site; backwaters and riffles were sampled up to two times; any remaining samples (to obtain a total of 18-20) were taken in shoreline run habitats. From April to October, a 1.0 m x 1.0 m fine mesh (ca. 1.5 mm) seine was used to selectively sample shallow low velocity habitats for larval fish (two samples). Mesohabitats with similar conditions (i.e., not exceeding reasonable depths/velocities for efficient seining) were sampled to ensure relatively static capture efficiencies regardless of flow." For an explanation of how variance is calculated, please see Methods section; as stated "Additional intensive sampling was conducted during November (2009 and 2010) for characterizing sampling variation at each of the 20 sites. For the intensive sampling effort, sites were sampled once per day, using regular population monitoring sampling protocols, for four days (N=80 samples). Samples were taken at the same or similar mesohabitat locations on subsequent days… Site-specific sampling variation was evaluated using coefficient of variation values generated from multi-day sampling efforts at each of the 20 sites. The coefficient of variation (CV=ratio of the standard error to the mean) was calculated for the four day sampling period. Values of CV were calculated for sites, reaches, and the study area."*	E Concur per COTR
66	Figures 21-24, Pages 35-38	The SEs for the means shown in these figures seem very low, given the data previously provided, and appear to be computed as the "mean of means". Compute mean CPUE as a single mean from all raw data, and not from intermediate means. This is another reason that a spreadsheet with the data would be helpful to better understand data partitioning and analyses. *These values are not a "mean of means" but rather (as stated in the text and on the figure) "Variation in density values for each focal species, at all sampling sites combined". This is a mean from the raw data (combined over sites) as opposed to a "mean of means" from individual sites.*	D Concur per COTR
67	Page 38 Figure 24	Does this graph represent some form of community structure? How does this help the Program manage the species? Again, it is not clear how variation has been calculated, lumped or expressed by sampling event? *The title of the figure explains what is contained within the figure. Issues regarding the value to the Program (and how the estimates have been calculated) have been addressed in previous comments.*	E Concur per COTR
68	Page 39	"*Levels of variation among reaches were more homogeneous as compared to those for only Rio Grande silvery minnow in both 2009 and 2010.*" There are many confounding factors among reaches that are not acknowledged, habitats are greatly different. The statement has little value without considering the variability amongst	E Concur per COTR

		reaches. There is an assumption by the authors to transfer data across river reaches and over years, without knowing the rigor of the original data, these applications are questionable. *This was a typing error and the text has been changed from "among reaches" to "among fish species".*	
69	Page 39	*Discussion, the key components that were added need further evaluations with statistical rigor, need show transparency to process and providing raw data.* *"Some of the key components that were added to this project over time include evaluating the influence of discharge patterns on population fluctuations, determining general habitat use patterns, documenting the changes in relative abundance among fish species over time, and examining seasonal and spatial differences in population structure and abundance of native and nonnative Middle Rio Grande fishes*."Do any of these investigations have the scientific strength to produce results that can be used by management to move the Program toward downlisting or meeting other objectives? *Per COTR: The sampling methods and design used during this study were based on the RFP, recommendations made by USBR, and as set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. Issues regarding the value to the Program have been addressed in previous comments.*	E Concur per COTR
70	Discussion, Fourth Full Sentence	Agree with this statement; hence effect of flow on sampling conditions and hence CPUE should be evaluated; e.g., covariate analysis. Also, effect of clumping, as indicated by mesohabitat selection should be evaluated for its contribution to hyperstability, mean variance, and sample bias. *Per COTR: Evaluating the effect of flow on sampling conditions (and the effect of clumping, as indicated by mesohabitat selection as related to hyperstability, mean variance, and sample bias) would require the collection of additional field data and is outside the current Statement of Work for this project.*	D Concur per COTR
71	Discussion, Page 44, Paragraph 2	Most researchers would disagree with the statement that "Calculated CV values…were reasonably low (range=0.26-0.52)." Most monitoring programs strive for CV<0.12-0.15 (see Item 31 above). Revise discussion accordingly. *This issue was addressed in a previous comment.*	D Concur per COTR
72	Discussion, Page 44, Paragraph 4, Sentence 4	The fact that CPUEs may differ over time by 1,000% is not reason to abandon precision. The adjacent temporal CPUEs are being used by many in the Collaborative Program to indicate changes in the population. This report needs to discuss the utility and implications of these CPUE, including an evaluation of precision and its meaning in detecting change. A figure illustrating data distributions for two adjacent temporal samples, with means and 95% CI, would help the reader to better understand how these data can and should be used. *The observed change in CPUE values over time is not given as a rationale to abandon precision. As stated, "The Population Monitoring Program has documented notable changes in densities of Rio Grande silvery minnow among years (i.e., more than several orders of magnitude [>1,000%]) since 1993. Despite large differences in the mean densities of Rio Grande silvery minnow among sampling sites and years, the overall estimates of sampling variation (based on repeated monitoring efforts over a four day period) were relatively low (CV <0.2) and consistent in 2009 and 2010. Also, the exclusion of a single outlying value (e.g., one site on one day) was found to notably reduce sampling variation estimates (CV <0.1) in both 2009 and 2010. It has been suggested that a CV <0.2 indicates reasonable sampling precision for wildlife and fisheries studies but that cost constraints on the number of samples often preclude obtaining this goal (Pollack et al., 1990). It appears that the Population Monitoring Program sampling protocols are adequate to achieve a relatively high degree of sampling precision, especially considering the ofen substantial changes in Rio Grande silvery minnow densities among years." Further, the best data for evaluating changes in the actual population would be the Population Estimation data not the Population Monitoring data (although they appear to track trends similarly). The reporting style used during this study was based on recommendations set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A*	D Concur per COTR

		(Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program.	
73	Page 44	"*Despite large differences in the mean densities of Rio Grande silvery minnow among sampling sites and years, the overall sampling variation has been relatively low and consistent among sites over time. Calculated CV values for collections of Rio Grande silvery minnow during all sampling years (2005-2010) in the Middle Rio Grande were reasonably low (range=0.26 to 0.52). Distributions with CV>1 are often considered high-variance while distributions with CV<1, like Rio Grande silvery minnow, would be categorized as low-variance."* The raw data should be provided to other reviewers to verify results. *Per COTR: The raw data are provided to the USBR and posted on the Collaborative Program website.*	E Concur per COTR
74	Page 44	*"However, the notable changes in densities of Rio Grande silvery minnow among years (i.e., often more than several orders of magnitude [>1,000%]) greatly outweighs the reasonable value of relative precision (ca. 26-52%) observed to date during the repeated sampling effort. This indicates that the current sampling approach should provide a reasonable trend estimate of increasing or decreasing population size of Rio Grande silvery minnow over time*." With a relative precision value of 26-52%, there is not enough confidence in this value to estimate population trends. *The estimate of sampling variation is coarse and very likely to overestimate the sampling variation as there is disturbance to the habitats (and subtle changes in flow/habitat relationships) associated with sampling over a sequence of four days. It is impossible to replicate sampling conditions on consecutive days and so these estimates should be evaluated cautiously. These points are now included in the Discussion. The mean and SE of the population trends are presented and the statistical differences among years evaluated. The statement "there is not enough confidence in this value to estimate population trends" is incorrect considering CV values were <0.2 and were <0.1 when a single outlier was excluded. The CV is relatively low considering that RGSM often fluctuates widely (orders of magnitude (sometimes >1,000%) on an annual basis. Also, the values for CV used as a reference appear to have been developed primarily for K-selected species (not r-selected species like RGSM), and those species vary much less on an annual basis as compared with RGSM.*	E Concur per COTR
75	Page 44	It is not clear whether depth and velocity are measured for each scene haul or some generalization is applied to multiple scene hauls in mesohabitats? *No. Multiple profile measurements of the 400 seine hauls in different mesohabitats taken monthly for depths and velocities would be outside the current Statement of Work for this project.*	E Concur per COTR
76	Page 45, paragraph 4	Report should be strengthen by including more recent field studies examining silvery minnow spawning and nursery habitat. *Citations provided in Comment #81 are now integrated as appropriate within the Discussion.*	C
77	Page 45	*"However, additional study will be required to determine those factors that most influence these ecological patterns."* If the contractor first sampled in 1993, those factors that most influence ecological patterns should already be incorporated into investigations. *The study of ecological patterns is complex and requires long-term datasets. While this study has been ongoing for nearly two decades, we would be remiss to state that we've identified exactly how this complex system operates. The main factors that are likely to influence these ecological patterns are already including in the investigations but it is possible that future study will reveal other more periodic factors that could also be driving factors in long-term ecological changes.*	E Concur per COTR
78	Page 45	*However, this was a cursory study of mesohabitat associations and is no substitute for the more rigorous approach used to quantify Rio Grande ichthyofaunal habitat use (including seasonal and ontogenetic shifts) and availability in the past (e.g., Dudley and Platania, 1997).* If the contractor started monitoring in 1993, why are the conducting cursory mesohabitat studies at this time? *Per COTR: The sampling methods used during this study were based on the RFP,*	E Concur per COTR

		recommendations made by USBR, and as set forth in the PMP Workgroup "Fish Monitoring Plan", Appendix A (Rio Grande Fish Community Monitoring), a guidance document produced by the Middle Rio Grande Endangered Species Act Collaborative Program. Measuring depths/velocities of the approximately 3,600 habitats sampled annually (i.e., 20 per site, 20 sites, 9 months) and then building a long-term seasonality/ontogenetic model would be outside the current Statement of Work for this project.	
79	Page 45-46	Report would be improved by expanding the discussion of the observed low numbers of eggs to include other Collaborative Program studies. This would demonstrate the authors' knowledge of current monitoring and research. *We are not aware of other Collaborative Program studies that document the "observed low numbers of eggs" that we were referring to in 2004, which interestingly resulted in increased recruitment success during that year. If there are spawning periodicity studies from 2004 or at least other current ones that occur in the Rio Grande (as opposed to irrigation canals), please provide those citations (couldn't find anything at www.middleriogrande.com).*	E Concur per COTR
80	Page 46 Paragraph 1	The report would be improved with a graph showing the relationship between peak discharge, drifting eggs and the October densities. Calculating a linear regression using the cited data would add to the discussion. *These flow/egg calculations were developed for the Spawning Periodicity report and are presented in the most recent version of that report (Dudley, R. K. and S. P. Platania. 2010. Spatial spawning periodicity of Rio Grande silvery minnow during 2010. Report to the U.S. Bureau of Reclamation (Albuquerque Projects Office), Albuquerque, NM. 43 pp.). Those data are not presented here since it would be duplicative and is more appropriate for the Spawning Periodicity report.* *Per COTR: Integrating data and developing seasonal fish/flow/egg synergistic models across studies (Spawning Periodicity with Population Monitoring) would be outside the current Statement of Work for this project.*	E Concur per COTR
81	Page 46 Paragraph 1	The discussion of floodplain habitat for larval silvery minnows would be strengthened by including more recent peer reviewed references including: *Citations are now integrated as appropriate within the Discussion.*	C
		Pease, A. A., J. J. Davis, M. S. Edwards, and T. F. Turner. 2006. Habitat and resource use by larval and juvenile fishes in an arid-land river (Rio Grande, New Mexico). Freshwater Biology 51:475-486.	
		Porter, M. D., and T. Massong. 2004a. Habitat fragmentation and modifications affecting distribution of the Rio Grande silvery minnow. GIS/Spatial Analyses in Fishery and Aquatic Sciences: 421-432.	
		Porter, M. D., and T. Massong. 2004b. Analyzing changes in river channel morphology using GIS for Rio Grande silvery minnow habitat assessment. GIS/Spatial Analyses in Fishery and Aquatic Sciences: 433-446.	
		Turner, T.F., T.J. Krabbenhoft, A.S. Burdett 2010. Reproductive phenology and fish community structure in an arid-land river. Pages 427-446 in K.B. Gido and D.A. Jackson, editors. Community ecology of stream fishes: concepts, approaches, and techniques. American Fisheries Society, Symposium 73, Bethesda, Maryland.	
82	Page 46 Paragraph 2	Providing the percentage of recaptured marked silvery minnows that moved more than 25 km upstream would strengthen the discussion. *The percentage was irrelevant to this sentence as the point was that this species has been documented to move 25 km upstream (to the base of a diversion dam). The biological relevance is also addressed in the next sentence, which states that "In addition to repopulating upstream reaches, upstream movement of even a small portion of the population among reaches (following fish passage efforts) could be beneficial in terms of naturally maintaining genetic diversity."* *Per COTR: Determining the percentage of fish that moved X km upstream or downstream from the release point, with statistical confidence, would be outside the USBR Statement of Work for this project.*	E Concur per COTR

83	Page 46 Paragraph 2	The statement about maintaining genetic diversity should cite more recent analysis by the San Acacia Fish Passage Review Panel. The rigorous panel review supports the Fish and Wildlife Service's 'best science requirements' under the Endangered Species Act. *The statement posits that some upstream movement "could" be beneficial to maintaining genetic diversity. This point was not denied in the San Acacia Fish Passage Review Panel report; their conclusions were that the magnitude of these benefits was uncertain.*	E Concur per COTR
84	Page 46 Paragraph 2	The report should cite the 2010 silvery minnow recovery plan to reflect the most current Fish and Wildlife Service position on diversion dams. *The newest citation was added, which also supports the statement that "Fragmentation of this species' range in the Middle Rio Grande by Angostura, Isleta, and San Acacia diversion dams has been identified as an important issue that requires resolution to ensure recovery of Rio Grande silvery minnow".*	C
85	Page 46	*"Another ongoing threat to Rio Grande silvery minnow is the fragmentation of its remaining range and the longitudinal transport of its propagules (drifting eggs and larvae) below instream barriers (i.e., Angostura, Isleta, and San Acacia diversion dams) and ultimately into irrigation networks or Elephant Butte Reservoir (Dudley and Platania, 2007)."* This appears to be a generalized statement, is there data to support this position? Does fish salvage and propagation offset the fragmentation, unknown? *Data on the transport of Rio Grande silvery minnow propagules in different reaches of the Middle Rio Grande and at different flows are presented in Dudley and Platania (2007). We are not aware of studies that compare the magnitude of downstream transport with the potential offset provided by salvage/propagation (and which include survival/recruitment estimates etc.).* *Per COTR: This task would be outside the current Statement of Work for this project.*	E Concur per COTR
86	Page 47	*"While there have been large fluctuations in the abundance of Rio Grande silvery minnow over the past decade, the biological importance of recently larger numbers of Rio Grande silvery minnow is uncertain in the face of eroding genetic diversity (pers. comm. M. J. Osborne, UNM; Alò and Turner, 2005)."* Is there documentation that the population dynamics of RGSM are limited by genetic diversity? *We are not aware of studies that indicate the population dynamics of Rio Grande silvery minnow are or are not limited by genetic diversity. However, the point of this statement is that the documented eroding genetic diversity of this species "could" be problematic (even with higher population numbers) over time.*	E Concur per COTR
87	Discussion, Page 47	The Discussion vacillates between an interpretation of the data analyses and speculation about causation for RGSM decline. Please restrict the Discussion to conclusions that can be supported by the data. Please confine the Discussion to an interpretation of the data relative to the objectives; e.g., monitor trends in RGSM abundance. This is one reason that a clear statement of Purpose and Objectives is requested in Item 4 above. *The discussion section of this paper includes an interpretation of the data presented, including possible causes for fish community changes over time. The reasons outlined for the decreases (or increases) of Rio Grande silvery minnow are based on data collected as part of the objectives of this study and based on the results of other studies. The more detailed information provided on RGSM (as related to the some of the original listing factors) was first added to the 2006 report as the request of the Science Work Group from the extensive comments they provided at that time. The points discussed all can be supported by data provided in this study or in the studies of others that were cited. However, there are no absolutes in ecology and that is the reason that words like "could", "may", "perhaps" are often used so that the statements about possible cause and effect relationships are presented as such as opposed to something akin to a physical law. Monitoring the trends in RGSM abundance clearly was not the only objective in this study. Here are the objectives as they appear in the introduction "The primary objective of the September 2009 to October 2010 sampling activities was to monitor temporal trends in the abundance of Rio Grande silvery minnow at numerous sites throughout the Middle Rio Grande. Additional objectives included evaluating the influence of discharge patterns on population fluctuations, determining general habitat use patterns, documenting changes in relative abundance among fish species over time, and determining site-specific sampling*	E Concur per COTR

		variation. Seasonal and spatial differences in population structure and abundance of native and nonnative Middle Rio Grande fishes were also examined." These paraphrased objectives match those requested in the original RFP and as proposed in our original proposal *"Project Objectives* *1) Determine long-term (multiple year) and short-term (seasonal) trends in fish populations of the Middle Rio Grande using statistical approaches that discern spatiotemporal differences in the abundance of native and nonnative study taxa, with a focus on Rio Grande silvery minnow.* *2) Evaluate the influence of discharge timing, magnitude, and duration on population fluctuations of both native and nonnative fish species in the Middle Rio Grande over time and space, with a focus on Rio Grande silvery minnow.* *3) Determine general habitat use patterns by comparing mesohabitat type in sampled areas with and without Rio Grande silvery minnow.* *4) Compare changes in Rio Grande silvery minnow absolute and rank abundance to that of other native and nonnative fish species.* *5) Determine site-specific sampling variation."*	

These questions were from the Population Estimation comment form given to us by the Science Work Group. However, these comments are clearly for the Population Monitoring report and so we included them in this set of comments.

7	p.vi and 19, 27	RGSM was reported to be the 2nd most abundant species, but its rank abundance was 5th. Please explain the apparent contradiction. [was this a difference in numbers collected vs. CPUE?] *The overall abundance numbers were calculated for the sampling year (RGSM = 2nd) but the inter-species comparative rank abundance numbers were calculated for the month of October (RGSM = 5th). When comparing ranks, it is more appropriate to use the autumnal data since it excludes early life stages that could skew the results of the analysis.*	E Concur per COTR
8	p. 12, table 2	"numbers in parenthesis… are the number of individuals that were marked with VIE tags". There are no numbers in parenthesis. Were these numbers omitted or was it 0? If the number of VIE-tagged fish was zero for all samples, please say so. *There were no VIE-tagged fish collected during this study. However, a footnote was added to the table for clarity.*	A
9	p. 8, 5th para.	Feb. 2010 results, last sentence reads "density was highest in the San Acacia reach, modest in the Isleta Reach, and low in the Isleta Reach". Please fix (was it low in the Angostura Reach?) *This has been corrected in the text.*	A