ANNUAL REPORT
SMALL-BODIED FISHES MONITORING
SAN JUAN RIVER
Conducted September 2013

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San Juan River Basin Recovery Implementation Program

ANNUAL REPORT
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SAN JUAN RIVER

to

Bureau of Reclamation

From

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EXECUTIVE SUMMARY

Small-bodied fish monitoring on the San Juan River in 2013 resulted in the capture of 16 Colorado Pikeminnow *Ptychocheilus lucius*, ranging from 143-294 mm total length. Density in 2013 was similar to the prior 10-year river-wide mean (both 0.002 fish/m^2). Although Roundtail Chub *Gila robusta* was captured both in 2011 and 2012, no captures occurred in 2013. The most recent capture of Roundtail Chub, prior to 2011, was in 1999. One sub-adult Razorback Sucker *Xyrauchen texanus* (389 mm total length) was captured in 2013 but no juveniles were captured.

The data collected in 2013 allow for analysis of the distribution of Colorado Pikeminnow throughout the river and assessment of management actions including population augmentation. Although there is variation in the annual density of Colorado Pikeminnow captured during small-bodied monitoring, there is little difference in the distribution of this species between the primary channel and secondary channels. A positive relationship exists between the number of age-1 Colorado Pikeminnow captured in small-bodied monitoring and the number of age-0 fish stocked the prior year. Experimental use of block net seining did not increase the capture of endangered fishes and the fish assemblage captured with this technique was less diverse than that captured using standardized methods.

Additional sampling was conducted in restored secondary channels and in upper portions of the San Juan River in 2012 and 2013. Species richness and density of small-bodied fishes in naturally flowing and restored secondary channels appeared similar, indicating that restored secondary channels provided suitable fish habitat. Additional sampling in the San Juan River above its confluence with the Animas River did not result in the capture of Colorado Pikeminnow or Razorback Sucker despite the presence of Colorado Pikeminnow prey species.

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INTRODUCTION

The San Juan River Basin Recovery Implementation Program's (SJRIP) Long-Range Plan specifies that fish populations of the San Juan River will be monitored (Element 4; SJRIP 2013a). Task 4.1.2.2 of this plan specifies monitoring of juvenile and small-bodied fishes. The purpose of this monitoring is to provide information on fishes that occur in shallow, low velocity habitats and the relation of these data to recovery of Colorado Pikeminnow *Ptychocheilus lucius* and Razorback Sucker *Xyrauchen texanus*. Monitoring occurs in autumn to characterize the survival and recruitment of small-bodied and age-0 fishes. Recruitment of wild-spawned Colorado Pikeminnow and Razorback Sucker has yet to be documented. Therefore, small-bodied monitoring currently provides information on the survival and distribution of stocked age-0 and age-1+ Colorado Pikeminnow and the native/nonnative fish assemblage, as well as habitat use by these fishes.

Augmentation of Colorado Pikeminnow, through stocking of hatchery fish, is one of the principal management actions conducted by the SJRIP (Element 1; SJRIP 2013a). Between 1996 and 2001, experimental and opportunistic stocking occurred in the San Juan River. This resulted in the stocking of approximately 830,000 fish (Furr 2012a). In 2002, the U.S. Fish and Wildlife Service implemented a formal stocking program (Ryden 2003). Since then, approximately 3.5 million age-0 Colorado Pikeminnow have been stocked into the San Juan River (Furr 2012a). Annually, the number of fish stocked has varied between about 176,000-476,000. While Colorado Pikeminnow was captured during small-bodied monitoring in the late 1990s, but there was a three year period (2001-2003) in which no individuals were captured. Since 2003, Colorado Pikeminnow has been captured during small-bodied monitoring each year. In this report, we assessed whether the variation in the annual stocking of age-0 Colorado Pikeminnow affected the number of age-1 Colorado Pikeminnow captured during small-bodied monitoring the subsequent year.

In 2011, the SJRIP determined that an additional sampling method, block net seining, should be undertaken for a three-year period (Golden and Holden 2006). The intent of this additional sampling method was to capture more Colorado Pikeminnow and increase the potential to capture juvenile Razorback Sucker. The sampling method, as implemented, was utilized to sample faster and deeper off-shore mesohabitats. It was also designed to block faster swimming fishes from escapement. This additional method was paired with standardized methods to assess its ability to sample the small-bodied fish assemblage, increase the capture of Colorado Pikeminnow, and detect juvenile Razorback Sucker.

In 2011, The Nature Conservancy, through a grant from the New Mexico River Ecosystem Restoration Initiative (RERI) and in partnership with the Navajo Nation, US Fish and Wildlife Service, Bureau of Reclamation, and the SJRIP, restored channel complexity along portions of the San Juan River by increasing the amount of wetted secondary channel habitat. The project improved six sites, restoring 3.5 miles of secondary channels and 6.5 acres of riparian vegetation along six miles of river using channel sluicing, mechanical clearing and chemical treatment of invasive plant species, inlet re-establishment and cleaning, and excavation of secondary channels. In 2012 and 2013, sampling was conducted in these secondary channels to determine how the fish assemblage at these sites compared to naturally flowing secondary channels.

To expand the range of Colorado Pikeminnow and Razorback Sucker, hatchery stocking of these species occurs in the San Juan River upstream of its confluence with the Animas River as well as in the Animas River (Furr 2011, 2012a, 2012b). In 2012, the SJRIP expanded adult and small-bodied fish monitoring to reaches of the San Juan River upstream of the Animas River confluence. This is the first time since the mid-1990s that adult and small-bodied fish sampling has been conducted in this portion of the San Juan River by the SJRIP. Sampling in these areas is designed to determine if

Colorado Pikeminnow and Razorback Sucker augmentation can expand the range of these two species and if potential Colorado Pikeminnow prey occurs in these areas.

METHODS

Study-Site and Sampling Methods

Small-bodied fish sampling has occurred throughout much of the San Juan River downstream of the Animas River confluence every year since 1998 (Figure 1; Table 1). In 2012 and 2013, sampling effort was extended in the San Juan River upstream of the confluence with the Animas River, located at river mile (RM) 180.5 in Reach 6, and occurred from Bloomfield (RM 194.4, Reach 7) to Sand Island (RM 76.4, Reach 3) (Figure 1). This is an upstream increase in sampling of 13.9 river miles. From 1998-2010, small-bodied monitoring occurred from the San Juan River and Animas River confluence downstream to Clay Hills Crossing (RM 3.0, Reach 1). As of 2011, monitoring only occurs downstream from Sand Island to Clay Hills Crossing every fifth year; the next effort in this reach will be in 2015 (Table 1).

From 1998-1999, a secondary channel was sampled only if it occurred within the 1-mile reach to be sampled at every 3-mile interval (designated mile). This protocol excluded a large proportion of secondary channels (30 to 50%, depending upon the starting point of the designated mile). Beginning in 2000, attempts were made to sample all secondary channels >200 m in length which had surface water.

From 1998-1999, the primary channel was sampled at each sampled secondary channel or designated mile if no secondary channel was present in a 3-mile reach. Since 2000, fishes were collected from primary channel habitats at each designated mile whether or not a secondary channel was present. Small-bodied monitoring occurs in conjunction with sub-adult/adult monitoring and designated miles were coordinated to occur in miles that were not sampled by the sub-adult/adult monitoring crews. All backwaters (>50 m^2), regardless of occurrence within a designated mile, were sampled.

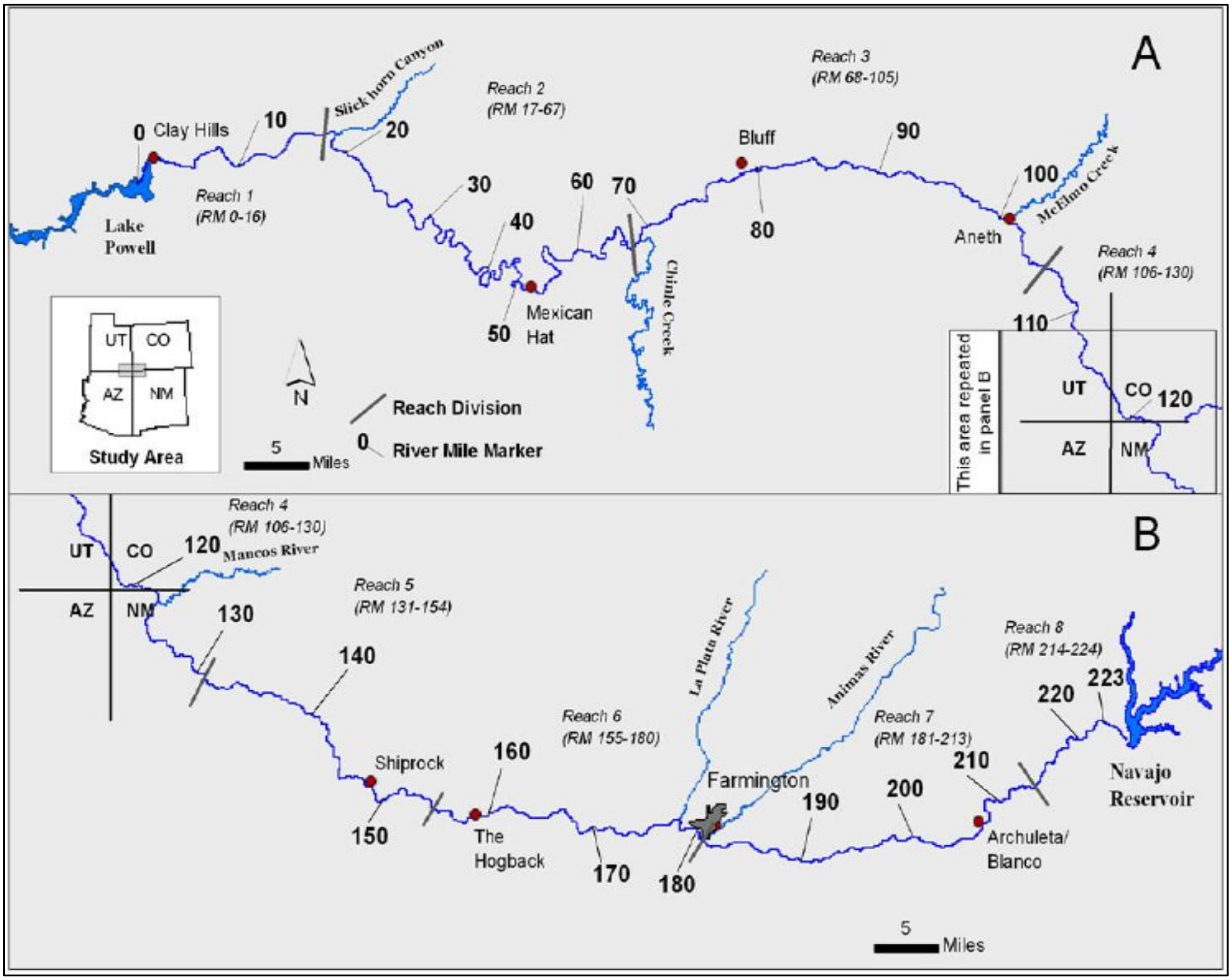

Figure 1. Map of the San Juan River including river miles and geomorphic reaches: (A) river miles 0-120, (B) river miles (120-223).

Primary channel sample sites were about 200 m long (measured along the shoreline). Lengths of secondary channel sample sites varied depending upon extent of surface water but were normally 100-200 m. River mile, geographic coordinates, and water quality (pH, dissolved oxygen, conductivity, and temperature) were recorded for each site. Within each site (primary and secondary channel), all mesohabitats (e.g. riffle, run, pool) were sampled in rough proportion to their surface area within a site (see Bliesner and Lamarra 2000 for full list of mesohabitats and definitions). Beginning in 2003, fish data from each mesohabitat within a site were recorded separately.

Table 1. River mile and geomorphic reaches sampled 1998-2013

	Extent of River Miles Sampled	Geomorphic Reaches Sampled
1998	54.0-143.9	2-5
1999	4.6-178.5	1-6
2000	4.0-165.4	1-6
2001	5.05-180.2	1-6
2002	4.5-178.7	1-6
2003	4.1-178.8	1-6
2004	5.6-179.4	1-6
2005	6.2-178.6	1-6
2006	5.3-177.4	1-6
2007	5.8-180.5	1-6
2008	4.8-180.6	1-6
2009	3.6-178.3	1-6
2010	6.9-180.5	1-6
2011	78.4-180.4	3-6
2012	78.0-194.4	3-7
2013	78.4-195.7	3-7

Most primary channel mesohabitats sampled were along stream margins, but offshore riffles and runs (<0.75 m deep) were also sampled. Secondary channel sampling occurred across the breadth of the wetted channel. All available wade-able mesohabitats within a site were sampled. Uncommon mesohabitats (e.g., debris pools and backwaters) were sampled in greater proportion to their availability than common mesohabitats (e.g., runs, riffles, shoals). At least five seine hauls (each seine haul samples a distinct mesohabitat) were made at each sample site. However, if habitat was homogeneous, as few as three seine hauls in secondary channels were made. Where there was high habitat diversity, as many as 13 seine hauls in the primary channel and eight seine hauls in secondary channels were made. Typically, two seine hauls were made in each backwater, one across its mouth and the second parallel to the long axis of the backwater. In backwaters that were not large enough to make two seine hauls, one seine haul was made from the mouth, parallel to the long axis of the backwater to the point where water was no longer present.

Fishes were collected with a 2.2 m x 1.9 m x 3.0 mm mesh drag seine (Figure 2). Each catch was inspected to determine presence of protected species. All fishes were identified to species and enumerated. Total length (TL) of each fish was measured, recorded, and the fish released. In some years, subsamples of >50 individuals of each native fish species, chosen to approximate the proportion of sizes present, were measured for each seine haul; the remainder were counted and released. This procedure was not necessary in 2013. If native fishes were too small to identify they were fixed in 10% formalin and returned to the laboratory. Nonnative fishes were removed from the river after measurements were taken and recorded. If nonnative fishes were found in such abundance that it was not feasible to measure them in the field, they were fixed in 10% formalin and returned to the laboratory.

From 2011-2013, additional experimental collections were made using two 9.1 m x 1.9 m x 6.0 mm mesh seines. With these larger seines, a "block seining" technique was used (Golden and Holden 2006; Figure 2). One seine was held at the bottom of the mesohabitat and the second seine was used to seine downstream through the mesohabitat. A single sample was made in the primary channel at most designated miles.

Following fish collection, the area (length x width) of each sampled mesohabitat was measured and recorded. For each mesohabitat, habitat type, depth in five generalized locations, and dominant substrate at each depth measurement were recorded. Any cover associated with the habitat was also recorded.

Retained specimens were identified, enumerated, and measured (total and standard length) in the laboratory. Personnel of the University of New Mexico Museum of Southwestern Biology (UNM-MSB), Division of Fishes and personnel from American Southwest Ichthyological Researchers, assisted in verification of fishes identified in the laboratory. All retained specimens were accessioned to the UNM-MSB, Division of Fishes.

Figure 2. Seining methods: drag seine (top) and block seining (middle and bottom).

Data Analysis

Catch per unit effort (CPUE) was used as an estimator of density and determined as the number of fish captured per square meter sampled at a given site. In this report, density refers to CPUE and is the number of fish captured per square meter. Due to the natural variability seen with age-0 fish populations, probability values of <0.10 were considered significant (Brown and Guy 2007); although an alpha of 0.05 was used when assessing normality. Unless otherwise indicated, statistical tests were run using SPSS® Software. Data for all years (1998-2013) are available from the U.S. Fish and Wildlife Service Program Office, Albuquerque, NM.

Colorado Pikeminnow Summary Statistics and Distribution

To determine if Colorado Pikeminnow was found in similar densities between samples, primary channel and secondary channel sites were paired. The dataset was limited to primary and secondary channel sites that were sampled within 1.0 river mile or less of one another to control for longitudinal variation. Data from river miles 69-166 were used due to the high prevalence of secondary channels in this section of river. The data were not normal and normalization could not be achieved through log transformation (+0.001) (Kolmogorov-Smirnov, $p<0.05$). Thus, a Wilcoxon signed-rank test was used to determine if the density of Colorado Pikeminnow between paired primary and secondary channel sites was significantly different.

Colorado Pikeminnow Stocking and Subsequent Captures

Numbers of age-0 Colorado Pikeminnow stocked were compared to the number of age-1 Colorado Pikeminnow captured in the subsequent year to determine if a relationship existed. Stocking data for 2006 and captures in 2007, as well as stocking in 2010 and captures in 2011 were excluded from the analysis due to inconsistencies in stocking procedures. Only fish captured between 100-250 mm TL were used in the analyses, as these fish were likely age-1. The annual number of fish stocked was normally distributed (Kolmogorov-Smirnov, $p>0.05$) but the number of fish captured the subsequent year required log transformation (+0.001) to achieve normality (Kolmogorov-Smirnov, $p>0.05$). A Pearson product-moment correlation was initially used to determine if there was a correlation between the two variables. A linear regression was then used to further describe the relationship. A power regression, which uses the log transformation of both variables, was used to determine the slope of the linear relationship. This provides a ratio comparing the change in number of age-1 fish captured to the number of age-0 fish stocked the previous year.

Comparison of Drag Seining and Block Net Seining

We compared collections of fishes using a two meter drag seine and a nine meter block net seine as described above. All block net seining occurred in the primary channel and most often in run habitats. To make paired comparisons between this method and the two meter drag seine method, all samples made in the primary channel in run type habitats using a drag seine were included in the analysis. Because only a single block seine sample was made at a single site, CPUE was calculated as the number of fish captured, divided by the entire area seined (m^2). CPUE for the drag seine samples was calculated as the sum of fish captured divided by the sum of the entire area (m^2) of all seine hauls made in run type habitats at each site.

To determine if there were differences in fish collections between the two different capture techniques, multiple statistical and summary analyses were used. A non-metric dimensional scaling (NMDS) analysis was used to graphically summarize the difference in the fish assemblage collected using both capture techniques. This analysis was applied to all fishes captured and then to a subset of the data which only include large-bodied species (Colorado Pikeminnow, Flannelmouth Sucker *Catostomus latipinnis*, Bluehead Sucker *Catostomus* d*iscobolus* , and Channel Catfish *Ictalurus punctatus*). This subset was used to exclude the influence of small-bodied species and because both endangered fishes are large-bodied species. Neither set of data were normal (Kolmogorov-Smirnov, $p<0.05$). Thus, a permutational multivariate analysis of variance (PMANOVA; R package Vegan/Adonis) was used to determine if there were differences in the fish assemblage between the two fish capture techniques using both data sets. When differences were present, an indicator species analysis (Dufrene-Legendre) was conducted to discern the nature of the differences (R package Labdsv/Indval). To determine if there was a difference in the ability of one technique to capture endangered fish, a simple analysis of variance (ANOVA) was applied to the collections of Colorado Pikeminnow. The data were log transformed (+0.001) to approximate normality. Since Razorback Sucker was not captured using either technique, an ANOVA was not used for this species. These analyses were conducted in the R statistical language (R Development Core Team 2011).

River Ecosystem Restoration Initiative Secondary Channels and San Juan River Upstream of Animas Confluence

Due to the limited size and scope of the data sets for RERI sites and the San Juan River upstream of the Animas River confluence detailed statistical analyses were not conducted. However, information and observations from these sampling efforts are included below.

RESULTS

River-wide Summary

Almost 83% of small-bodied fish captures in 2013 were native (Table 2). Even though Reaches 1 and 2 and a portion of Reach 3 (river miles 0.0-76.4) were not sampled in 2013, the total number of native fishes captured in 2013 was higher than the prior 10-year mean (2003-2012). Captures of nonnative fishes in 2013 were the second lowest recorded since 2002 (Table 2). The lowest capture numbers of nonnative fishes (N = 787) occurred in 2006 with a total of 787 individual fish captured. Fewer individual Colorado Pikeminnow were captured in 2013 (N = 16) compared to the 10-year mean. A single Razorback Sucker was captured in 2013 (TL = 389 mm). This fish was stocked into the Animas River on 16 October 2012 with a passive integrated transponder (PIT) tag. At time of stocking, this fish was 350 mm TL. This is the second sub-adult Razorback Sucker captured during small-bodied monitoring. No other captures of Razorback Sucker occurred in 2013. No Roundtail Chub *Gila robusta* was captured in the San Juan River in 2013.

The river-wide mean density of fishes was lower in 2013 compared to the prior 10-year mean (Table 2) due to the overall decrease in the mean density of non-native fishes (2013 = 0.132, SE 0.293; 2003-2012 = 0.868, SE = 0.293). Red Shiner *Cyprinella lutrensis* declined in all channels types sampled (primary channel, secondary channels, and backwaters) and drove the decrease in the density of nonnative fishes (Appendix II-Appendix IV). The mean density of native fishes was similar between 2013 (Mean = 0.331, SE = 0.055) and the prior 10-year mean (Mean=0.395, SE=0.064). The mean density of individual native species captured in the primary channel, secondary channels and backwaters was within the range observed in prior years (Appendix II-Appendix IV).

Table 2. 2013 summary of fish captures and prior 10-year mean and range.

	Number Captured			Density				
	2013	**2003- 2012 Mean**	**2003 – 2012 Range**	**2013**	**SE**	**2003- 2012 Mean**	**SE**	**2003 – 2012 Range**
Total Fishes	5,047	8,359	3,795 - 29,750	0.434	0.076	1.164	0.328	0.358-3.692
Native Fishes	4,169	3,206	1,130 – 6,845	0.331	0.055	0.395	0.064	0.107-0.846
Nonnative Fishes	878	5,149	787 – 22,904	0.132	0.450	0.868	0.293	0.134-3.021
Colorado Pikeminnow	16	22	0-62	0.002	0.000	0.002	0.001	0.000-0.007
Razorback Sucker	1	0	0-1	0.000	0.000	0.000	0.000	0.000
Roundtail Chub	0	0	0-2	0.000	0.000	0.000	0.000	0.000

Colorado Pikeminnow Summary Statistics and Distribution

Since 1998, Colorado Pikeminnow was captured during small-bodied monitoring each year, with the exception of 2001 through 2003 (Appendix V). A total of 16 individual Colorado Pikeminnow was captured in 2013 (Table 2). The river-wide CPUE for Colorado Pikeminnow in 2013 was 0.001 fish/m^2 with a standard error of 0.000 fish/m^2 (Figure 3), similar to the prior 10-year river-wide mean (Mean = 0.002, SE = 0.001) (Table 2).

Although Colorado Pikeminnow was captured throughout the portion of the river sampled, the CPUE at river miles where captures occur varies annually (Figure 4). This was true for captures in 2013; although Colorado Pikeminnow was captured throughout the sampled portions of the river (Figure 4). While the distribution and density of Colorado Pikeminnow throughout the river appears varied, there was no difference in the density of this species between paired samples collected in the primary channel and secondary channels (2004-2012; ANOVA, $p = 0.556$).

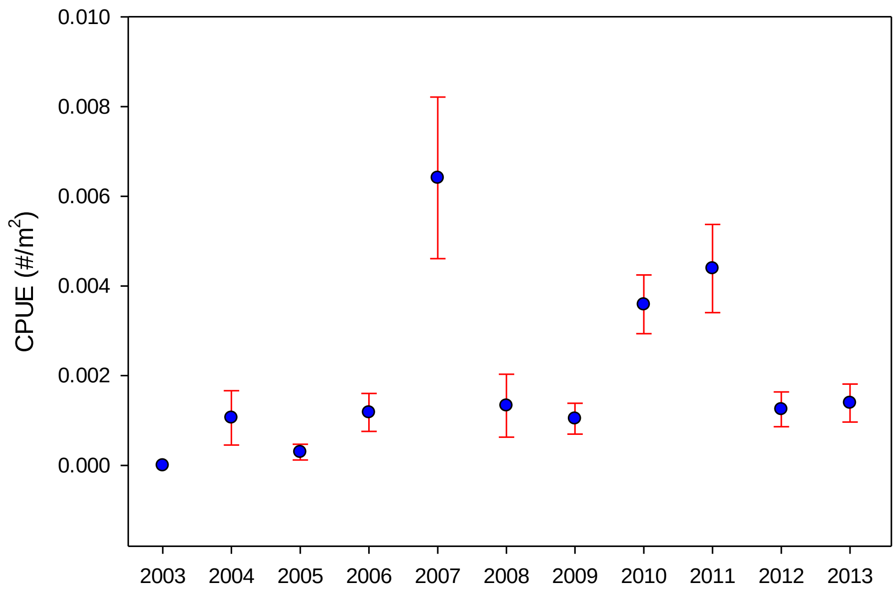

Figure 3. Mean CPUE of Colorado Pikeminnow (2003-2013), ±1 SE

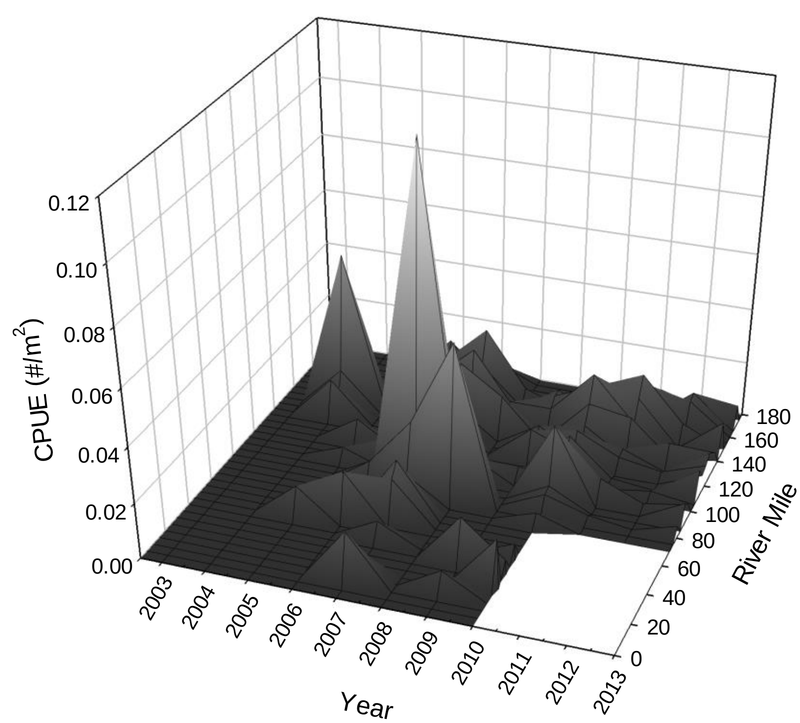

Figure 4. Distribution of Colorado Pikeminnow captures (2003-2013).

Colorado Pikeminnow captured in 2013 ranged in size from 143-294 mm TL (Table 3). The 2013 mean and median size of fish captured was the largest on record (mean = 216.20 mm TL; median 211.00 mm TL; SE = 10.27 mm TL; Table 3). No young-of-year Colorado Pikeminnow were captured in 2013. Young-of-year Colorado Pikeminnow was only captured during small-bodied monitoring in 2007 when they were stocked simultaneously with monitoring efforts (Table 3).

Table 3. Annual Colorado Pikeminnow captures and total lengths (mm TL) (2003-2013).

Year	Total Captures	Mean TL	+/- 1 SE TL	Median TL	Minimum TL	Maximum TL	Range TL
2003	0	-	-	-	-	-	-
2004	8	187.63	8.90	181.00	160	233	73
2005	3	211.33	39.01	179.00	166	289	123
2006	10	180.00	13.12	176.50	136	276	140
2007	60	101.53	6.99	120.00	39	183	144
2008	10	152.40	7.07	149.00	131	210	79
2009	12	184.17	14.85	174.50	122	328	206
2010	49	162.20	4.33	155.00	118	256	138
2011	62	147.87	6.07	137.50	96	362	266
2012	26	158.62	5.08	155.50	115	203	88
2013	16	216.20	10.27	211.00	143	294	151

Colorado Pikeminnow Stocking and Subsequent Captures

The number of age-1 Colorado Pikeminnow captured during small-bodied monitoring appears to be dependent on the number of age-0 fish stocked the prior year (Pearson's correlation test; $p = 0.002$). The Pearson's r was 0.681, indicating a positive correlation between the two variables. A linear regression resulted in a significant relationship ($p = 0.043$, $r^2 = 0.464$) (Figure 5). Since a power regression did not require log transformation of values, it was used to try and determine more specifically how the number of fish stocked impacted the number of fish captured the next year. The p-value of the power regression was significant (p-value of 0.053) and provided the formula $y = 2^{-08}x^{1.562}$. The exponent is >1 and indicates the relationship between number of fish stocked and number captured the next year is not constant (Table 4 and Figure 6).

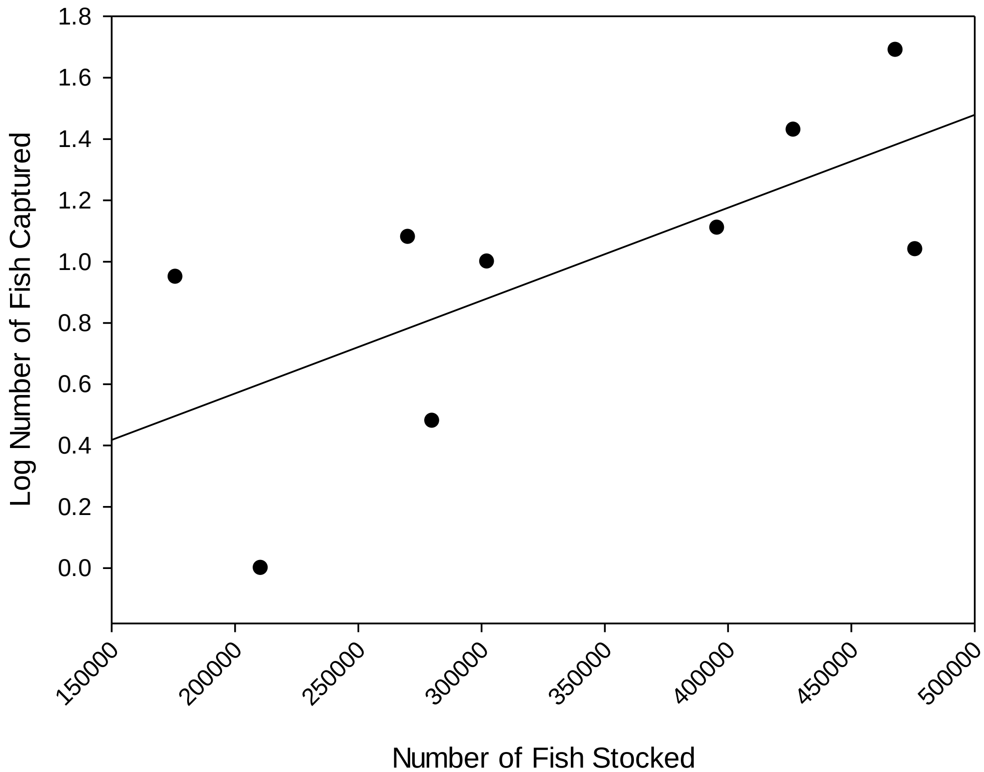

Figure 5. Regression of age-1 Colorado Pikeminnow and stocking of age-0 fish (2002-2013).

Table 4. Number of age-1 fish captured the next year (x) using the power regression equation $y = 2^{-08}x^{1.562}$ where y = number of fish stocked.

If y =	x =
100,000	1.291
200,000	3.813
300,000	7.182
400,000	11.258
500,000	15.952

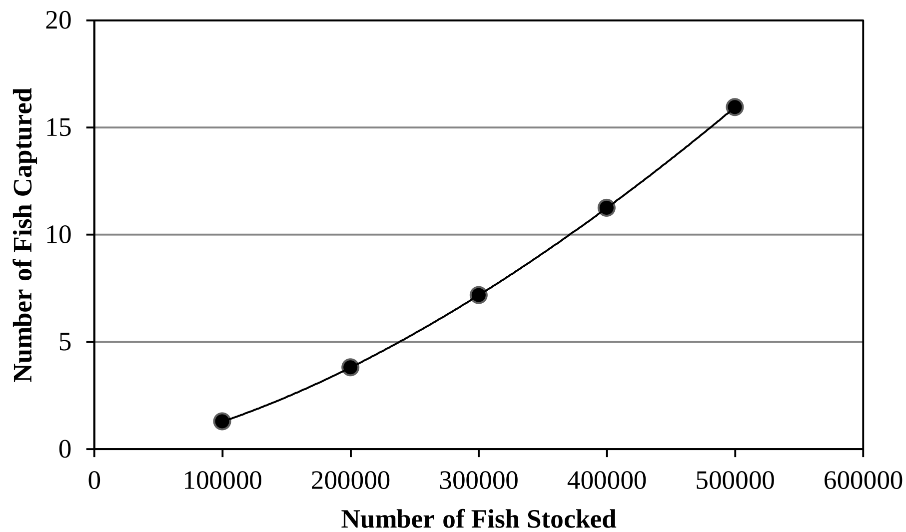

Figure 6. Relationship between number of age-0 fish stocked (y) and number of age-1 fish captured the next year (x) using the power regression equation $y = 2^{-08}x^{1.562}$.

Comparison of Drag Seining and Block Seining

Sampling using block net seining paired with drag net seining occurred in each year 2011-2013. More paired sites were sampled in 2012 (N=32) compared to 2011 (N=20) and 2013 (N=7). All species captured with block net seining were captured using the drag net seine (Appendix VII). More Colorado Pikeminnow was captured in drag net seines (N=18) than in block net seines (N=12). When densities were compared, there was no difference in the ability of a gear type to capture Colorado Pikeminnow (Wilcoxon Sign Rank, p=0.272). No juvenile Razorback Sucker was captured using either sampling technique.

There was a difference in the ability of the two gear types to sample the entire fish community present. Using the entire dataset, NMDS indicated there was overlap between the fish assemblage captured using block net seining versus drag net seining (Figure 7). However, when the PMANOVA was applied, the p-value was <0.001, indicating a difference in the fish assemblage sampled between the two methods. The Dufrene-Legendre indicator species analysis showed Speckled Dace *Rhinichthys osculus*, Red Shiner and Mosquitofish *Gambusia affinis* as more indicative of a sample collected using a drag net seine. When only large-bodied fish species were used, the NMDS resulted in a much stronger overlap between collections (Figure 8). The PMANOVA applied to this subset of data, resulted in p=0.107, indicating that there was no statistical difference between the ability of either sampling techniques to capture age-0+ large-bodied fishes.

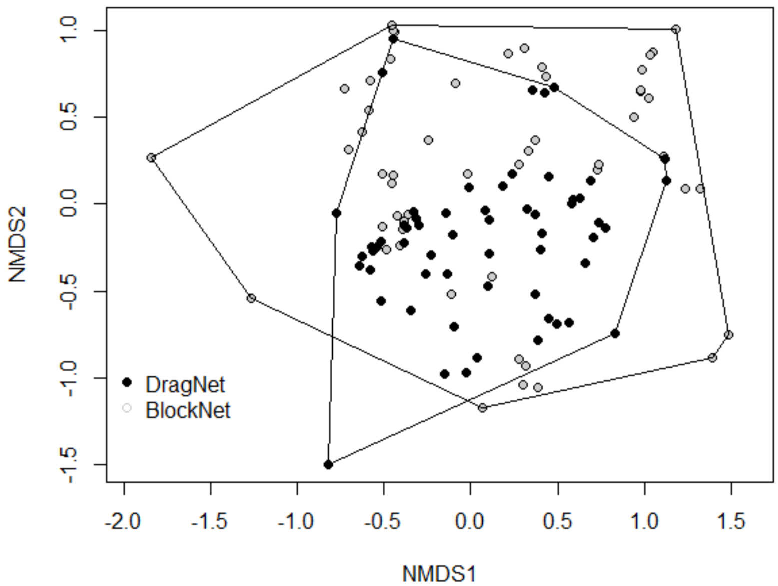

Figure 7. NMDS- all species captured in paired sampling of drag net and block net seining.

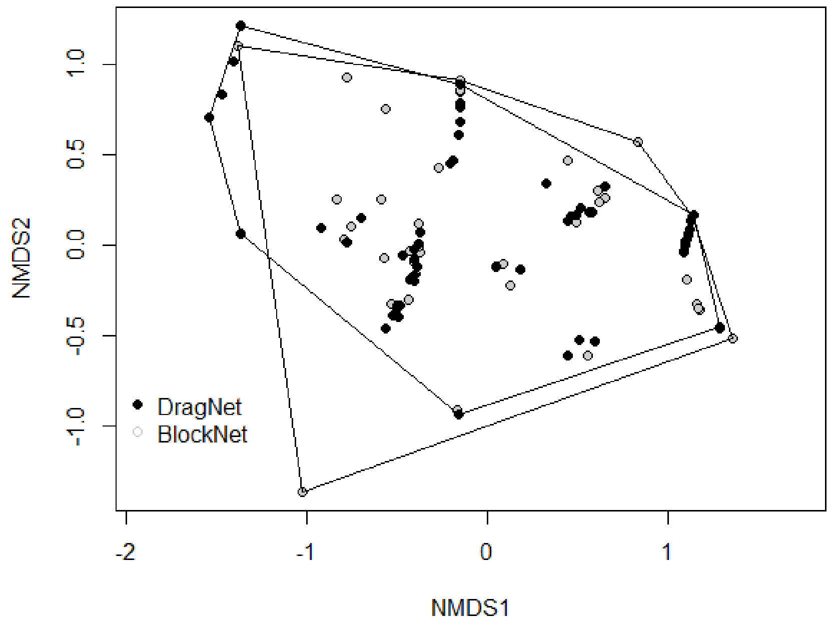

Figure 8. NMDS- large-bodied species captured in paired sampling of drag net and block net seining.

River Ecosystem Restoration Initiative Secondary Channels

Four of six RERI sites were sampled in 2013 (Figure 9 and Table 5). The secondary channel at RM 130.7B was flowing too quickly to be sampled and the secondary channel at RM 128.6 could not be located for the second year in a row. Two reference, secondary channels were available to sample in 2013. In 2013, all channels were sampled on 20 September when flows at the Four Corner's gage, downstream of the RERI sites, were near 9,000 cfs (Figure 10). All located RERI channels had flowing water at the time of sampling.

Figure 9. Location of RERI sites (circles) and reference sample sites (triangles).

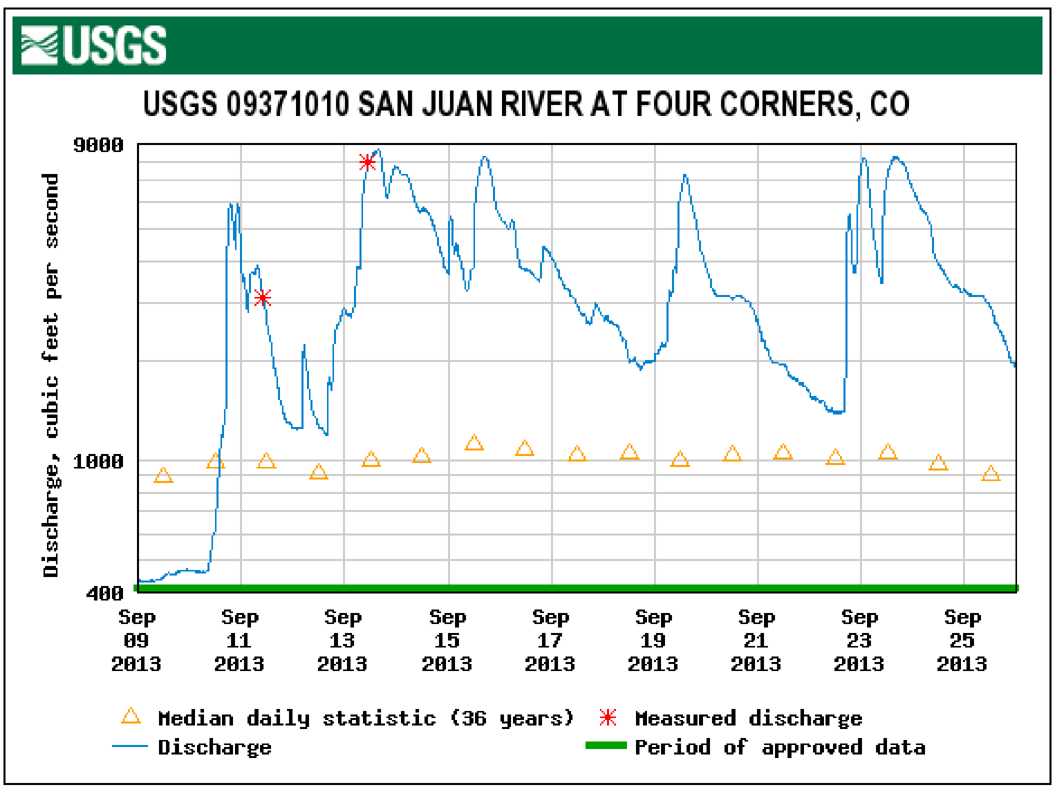

Figure 10. Daily discharge in the San Juan River at Four Corners during 2013 monitoring.

Fishes were captured in all four RERI sites sampled in 2013. A single individual of both Colorado Pikeminnow and Razorback Sucker were collected (Appendix VI). This is the second consecutive year that Colorado Pikeminnow was captured in a RERI site. The Razorback Sucker captured was a PIT tagged sub-adult which had been stocked into the river, as was previously described. Only native fishes were captured in the RM 130.7 and 132.2 sites (Appendix VI). The most species- rich site was RM 132 where six species were captured (Appendix VI), half of which were native. The fish assemblages observed in 2013 at RERI and reference channels were similar to one another (Figure 11). This was also observed in 2012 (Figure 11). In 2013, some species such as Flannelmouth Sucker, Red Shiner and Channel Catfish had higher densities in reference channels than the RERI sites; although this was not observed in the 2012 sampling (Figure 11).

Table 5. RERI and reference sites and occurrence of sampling (2012-2013).

Site Type	River Mile	2012	Notes	2013	Notes
Reference	134.3	Sampled		Not Sampled	Flow greater than definition of secondary channel
Reference	133.5	Sampled		Not Sampled	Flow greater than definition of secondary channel
RERI	132.2	Sampled		Sampled	
RERI	132	Not Sampled	Dry	Sampled	
Reference	130.1	Sampled		Sampled	
RERI	130.7A	Sampled		Sampled	
RERI	130.7B	Sampled		Not Sampled	Flow too fast for safe sampling
RERI	128.6	Not Sampled	Not Located	Not Sampled	Not located
RERI	127.2	Sampled		Sampled	
Reference	122.7	Sampled		Sampled	

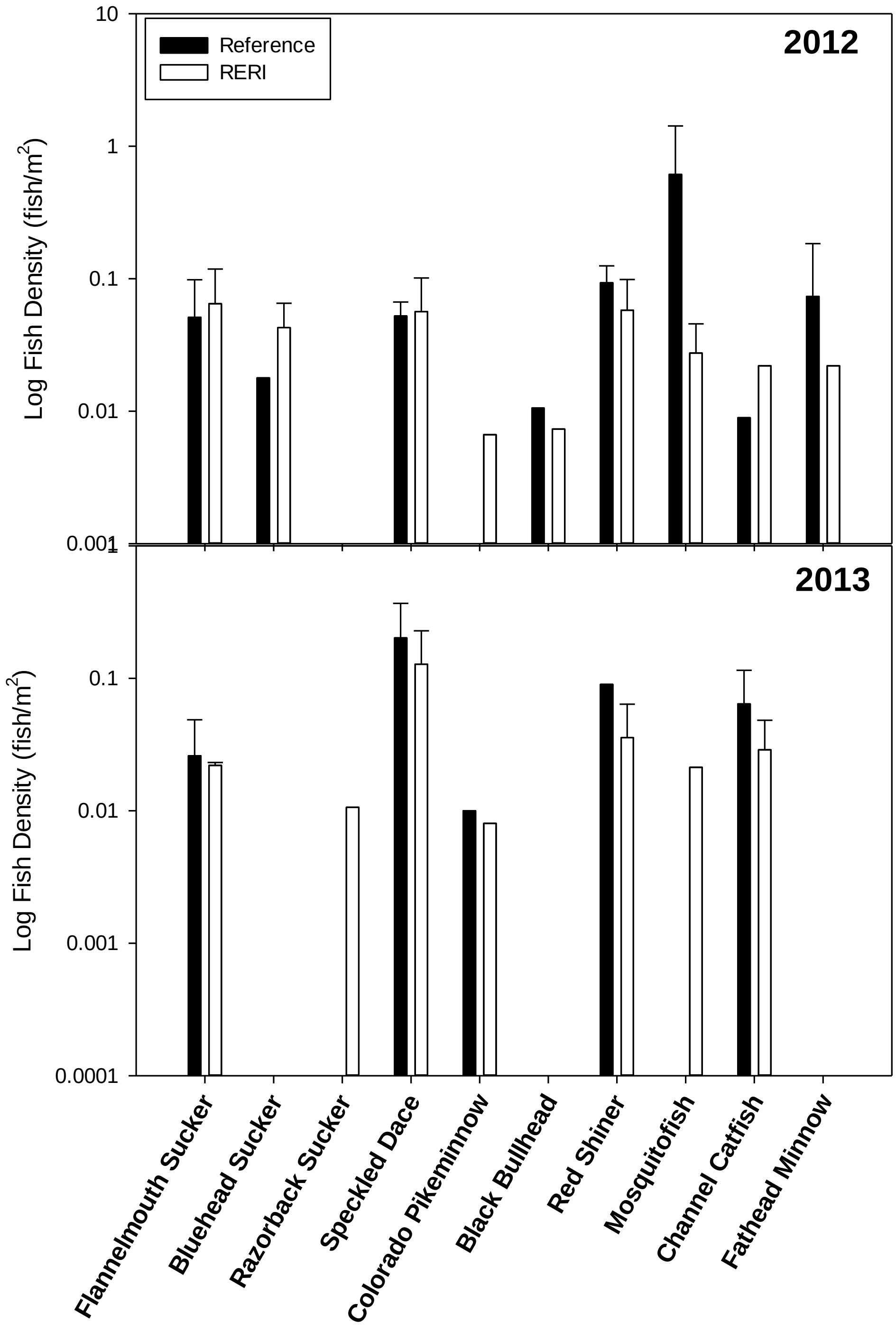

Figure 11. Fish density in RERI and reference sites (2012-2013), +1SE.

San Juan River Upstream of San Juan- Animas Confluence

Sampling effort 13.9 river miles upstream and downstream of the San Juan River and its confluence with the Animas River was comparable in 2013. Eight sites were sampled upstream compared to six sites sampled downstream. More seine hauls were made upstream (N=51) compared to downstream (N=31). The percent of upstream seine hauls in 2013 without fish was greater upstream than downstream. In upstream sites 7.8% of seine hauls had no fish compared to 3.2% downstream. The 2013 percent of seine hauls without fish was lower than that observed in 2012 (30% upstream and 22% downstream).

The fish assemblage observed in San Juan River in 2013 upstream and downstream of the confluence with the Animas River was similar and this was comparable to what was observed in 2012 (Figure 12). In these reaches, more species of nonnative fishes were present compared to native fishes (7 versus 4 in 2012; 6 versus 5 in 2013). Densities of common native species, such as Flannelmouth Sucker, Bluehead Sucker and Speckled Dace, were similar between reaches in both years. The densities of nonnative species appeared similar between reaches in both years; although the densities of nonnative fishes did not appear to be greater in one reach over another. Colorado Pikeminnow was rare in both reaches in both years and no Razorback Sucker was captured in either year. In both years, Mottled Sculpin *Cottus bairdii* were only captured in the upstream reach.

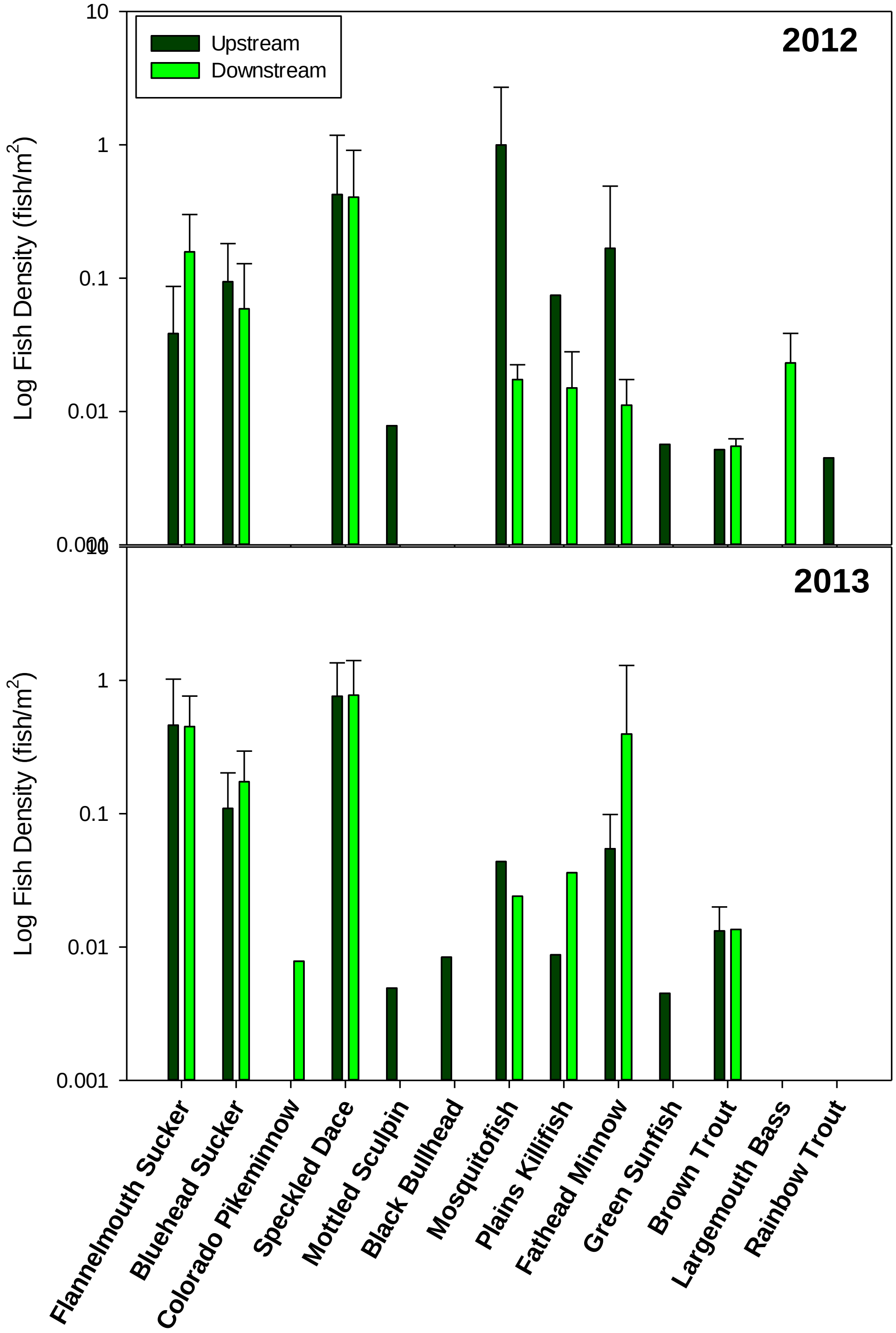

Figure 12. Fish Density in the San Juan River upstream and downstream of the confluence with the Animas River (2012-2013), +1SE.

DISCUSSION

Small-bodied fish monitoring data are used to determine and assess SJRIP management actions (SJRIP 2012b). The captures of juvenile Colorado Pikeminnow as well as other native and nonnative fishes are used to identify and characterize rearing areas and habitat used by juvenile Colorado Pikeminnow and Razorback Sucker. Management actions that the SJRIP has undertaken in the most recent years include: 1) augmentation of Colorado Pikeminnow and Razorback Sucker in the upper reaches of the San Juan River, 2) support of the River Ecosystem Restoration Initiative, and 3) implementation of an experimental small-bodied fish sampling technique. This report provides details on the populations of small-bodied fishes in the San Juan River to inform these management actions and progress of the recovery of Colorado Pikeminnow and Razorback Sucker.

Colorado Pikeminnow was the only rare juvenile fish captured by small-bodied monitoring in 2013. Collections of juvenile Razorback Sucker has yet to occur and Roundtail Chub is infrequently captured. The density of Colorado Pikeminnow in 2013 was similar to prior years and indicates fish are surviving through the first over-winter period. The mean size of Colorado Pikeminnow captured in 2013 was the largest observed since 2003. Larger fish may have been using low velocity habitats, sampled by small-bodied monitoring, as refuge from the 8,000-9,000 cfs flows experienced during the sampling period. It is also possible that fish grew quickly during the 2012-2013 over-winter period and larger fish were more abundant than in prior years.

Despite variation in the presence and density of Colorado Pikeminnow throughout the San Juan River, current data indicate that there is no difference in the density of this species between samples collected in the primary channel and those of secondary channels. Analysis of the river-wide density of this species, between the two channel types, resulted in no difference (Gilbert 2013). A discriminant function analysis, of the entire fish community sampled from the primary channel and secondary channels, resulted in a coefficient for Colorado Pikeminnow that was near 0.0 (Gilbert 2013). This indicated that the presence of Colorado Pikeminnow in a sample did not infer a greater likelihood that the sample was collected from either the primary channel or a secondary channel. In the current report, a paired sampled design was used to assess whether the density of Colorado Pikeminnow was different between the two channel types. This design paired samples from secondary channels and those from primary channels within one river mile and thus controlled for any longitudinal variation. Again, there was no difference in the density of Colorado Pikeminnow between channel types. Although the large number of samples in which Colorado Pikeminnow was absent makes it difficult to show statistical differences, three lines of evidence indicate that low velocity habitats, whether in secondary channels or the primary channel, are used in a similar manner by Colorado Pikeminnow.

It is a basic assumption that increasing the number of fish stocked into a water body will result in a greater number of fish captured in the future. However, this assumption can prove to be incorrect due to ecological factors like downstream emigration of stocked fish over a barrier or physical and biotic resource limitations. Conversely, the relationship may exist but be difficult to statistically demonstrate due to limitations in sampling methodology or rarity of the focal species. In the San Juan River, small-bodied monitoring data indicates that the number of Colorado Pikeminnow captured increases in relation to the number of Colorado Pikeminnow stocked the prior year. Two lines of evidence, correlation analysis and linear regression, indicate that this relationship exists. The power regression can provide a slope of a line fitting these variables and shows a low return on the number of fish stocked which is supported by data from passive integrated transponder tags analyses (Durst 2013).

Block net seining did not result in the capture of more endangered fishes. No juvenile Razorback Sucker was captured and, numerically, more Colorado Pikeminnow was captured using standard monitoring protocols than with the block net seine. The fish assemblage collected was more diverse using traditional methods than using the block net seine. Block net seining was used to capture small-bodied fishes in 2007 and 2008 and had indicated no significant difference between the collections made with this additional method (Paroz et al. 2009). The 2011-2013 results support previous studies.

The assemblage and density of fishes in the reaches of the San Juan River upstream and downstream of its confluence with the Animas River appear to be similar with the exception of a few species, most importantly Colorado Pikeminnow. While the overall fish community is not markedly different between the two reaches, Mottled Sculpin was only captured in the upstream reach in both 2012 and 2013 and Colorado Pikeminnow was only captured in the downstream reach. This may indicate an environmental difference between the two reaches. Although no endangered fishes were captured in the upstream portion of the San Juan River forage fishes are present and available for Colorado Pikeminnow.

While each RERI channel is unique in size, flow, substrate, and configuration and each may provide a different habitat for fishes, overall, RERI channels appear to be suitable habitat for small-bodied fishes in the San Juan River. The fish assemblage and density of fishes captured in the RERI and naturally flowing secondary channels are similar. Differences in flow conditions between 2012 and 2013 make it difficult to determine if one RERI channel is providing significantly different habitat from another. In both years, site 132.2 had the lowest species richness. This may indicate that habitat at this site is not as diverse as at other RERI sites.

Conclusion

This was the tenth consecutive year Colorado Pikeminnow was captured during small-bodied monitoring. The size of fish captured in 2013 was greater than in any other year and the density of this species was similar to prior years. There is no observable difference in the density of Colorado

Pikeminnow between channel types. Evidence indicates that annual captures of age-1 Colorado Pikeminnow are dependent on the prior year's stocking. It is recommended that block net seining be discontinued as no observable benefit was found in using this methodology over the standardized sampling method. Small-bodied monitoring in the San Juan River above the confluence with the Animas River did not detect juvenile Colorado Pikeminnow but potential prey species were present. Continued sampling of small-bodied fishes in the section of river likely will not produce any further insights into the fish assemblage but efforts to sample the small-bodied fishes of the Animas River should be a priority, given river conditions allow sampling. Based on captures of small-bodied fishes, secondary channels constructed or rehabilitated through The Nature Conservancy's efforts (RERI) appear to perform in a similar manner to secondary channels naturally present in the San Juan River. Fish sampling in these restored channels will continue as per standardized protocol which requires all secondary channels be sampled. The SJRIP's Long-Range Plan requires monitoring of fish health and incidence of hybridization. No evidence of disease, deformities, or hybridization was observed in fishes collected in 2013.

ACKNOWLEDGEMENTS

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APPENDICES

Appendix I. Six letter species abbreviations, common names, and scientific names.

Scientific Name	Common Name	Six Letter Species Code Abbreviation	Native Species
Catostomus discobolus	Bluehead Sucker	CATDIS	Native
Catostomus latipinnis	Flannelmouth Sucker	CATLAT	Native
Cottus bairdii	Mottled Sculpin	COTBAI	Native
Gila robusta	Roundtail Chub	GILROB	Native
Ptychocheilus lucius	Colorado Pikeminnow	PTYLUC	Native
Rhinichthys osculus	Speckled Dace	RHIOSC	Native
Xyrauchen texanus	Razorback Sucker	XYRTEX	Native
Ameiurus melas	Black Bullhead	AMEMEL	No
Ameiurus natalis	Yellow Bullhead	AMENAT	No
Cyprinus carpio	Common Carp	CYPCAR	No
Cyprinella lutrensis	Red Shiner	CYPLUT	No
Fundulus zebrinus	Plains Killifish	FUNZEB	No
Gambusia affinis	Mosquitofish	GAMAFF	No
Ictalurus punctatus	Channel Catfish	ICTPUN	No
Lepomis cyanellus	Green Sunfish	LEPCYA	No
Lepomis macrochirus	Bluegill	LEPMAC	No
Micropterus salmoides	Largemouth Bass	MICSAL	No
Oncorhynchus mykiss	Rainbow Trout	ONCMYK	No
Pimephales promelas	Fathead Minnow	PIMPRO	No
Salmoides trutta	Brown Trout	SALTRU	No

Appendix II. Number, Mean CPUE (fish/m^2), and +/1 SE of fishes collected in primary channel samples (2003– 2013).

	2003			*2004*			*2005*			*2006*			*2007*			*2008*		
Species	***N***	***CPUE***	***SE***	***N***	***CPUE***	***SE***	***N***	***CPUE***	***SE***	***N***	***CPUE***	***SE***	***N***	***CPUE***	***SE***	***N***	***CPUE***	***SE***
AMEMEL				2	0.0005	0.0004	1	0.0006	0.0006	3	0.0004	0.0004				1	0.0005	0.0005
AMENAT																		
CATDIS	27	0.0068	0.0021	283	0.0463	0.0056	90	0.0267	0.016	154	0.0404	0.0229	53	0.0066	0.0017	58	0.0158	0.0098
CATLAT	140	0.0622	0.0231	255	0.0441	0.0072	111	0.0289	0.0131	62	0.012	0.0028	227	0.0221	0.0073	101	0.0117	0.0039
CYPCAR				6	0.0012	0.0006	3	0.0005	0.0004							2	0.0006	0.0004
CYPLUT	1706	0.5243	0.0801	9830	1.8335	0.3551	2521	0.8478	0.2573	164	0.0357	0.0061	204	0.031	0.0072	190	0.0314	0.0084
FUNZEB	21	0.0056	0.0028	30	0.0051	0.0034	1	0.0003	0.0003							2	0.0001	0.0001
GAMAFF	37	0.0093	0.0059	127	0.0239	0.0075	16	0.0067	0.0035	4	0.0009	0.0007	8	0.0012	0.0009	5	0.0034	0.0028
ICTPUN	366	0.0912	0.0144	603	0.0887	0.0161	401	0.096	0.0245	336	0.0695	0.009	697	0.0835	0.0109	533	0.0718	0.0096
LATxDIS	1	0.0002	0.0002															
LEPCYA	2	0.0004	0.0003	1	0.0004	0.0004	1	0.0003	0.0003							1	0.0001	0.0001
MICSAL				4	0.0009	0.0005							1	0.0004	0.0004			
PIMPRO	90	0.0353	0.0137	1119	0.2416	0.0749	281	0.092	0.0322	44	0.0058	0.0049	32	0.0043	0.0026	24	0.0053	0.0036
PTYLUC				4	0.0005	0.0002	2	0.0003	0.0002	8	0.0013	0.0005	23	0.0031	0.001	3	0.0004	0.0002
RHIOSC	511	0.1655	0.0292	4690	0.7643	0.1026	1234	0.2689	0.0412	2401	0.7378	0.488	2177	0.2653	0.0377	1192	0.2007	0.0244
SALTRU																		
XYRTEX							1	0.0003	0.0003									
Total N	2913			17042			4639			3175			2766			2217		
Total Area	3994			7768			5985			5446			9038			7469		
Density	0.73			2.19			0.78			0.58			0.31			0.36		

	2009			*2010*			*2011*			*2012*			*2013*		
Species	***N***	***CPUE***	***SE***	***N***	***CPUE***	***SE***	***N***	***CPUE***	***SE***	***N***	***CPUE***	***SE***	***N***	***CPUE***	***SE***
AMEMEL							4	0.0005	0.0004						
AMENAT				4	0.0008	0.0006									
CATDIS	245	0.0289	0.0069	201	0.0218	0.0061	33	0.0059	0.0022	145	0.0102	0.0033	142	0.0232	0.0105
CATLAT	216	0.0249	0.0078	594	0.0624	0.0189	104	0.0111	0.0021	276	0.0179	0.0046	370	0.0607	0.0278
CYPCAR	1	0.0001	0.0001										1	0.0004	0.0004
CYPLUT	2568	0.3993	0.0862	218	0.0208	0.0043	250	0.04	0.0086	412	0.0236	0.0732	38	0.0061	0.0025
FUNZEB	13	0.0009	0.0009	3	0.0002	0.0002	2	0.0006	0.0004	18	0.001	0.0005	5	0.0007	0.0005
GAMAFF	39	0.0061	0.003	3	0.0004	0.0003	44	0.0093	0.0049	145	0.008	0.0025	16	0.0026	0.0015
ICTPUN	122	0.0208	0.0069	460	0.0563	0.0091	493	0.0622	0.0097	105	0.0062	0.0017	249	0.041	0.0108
LATxDIS															
LEPCYA	7	0.0009	0.0004	1	0.0001	0.0001	2	0.0003	0.0002	2	0.0002	0.0002	1	0.0002	0.0002
MICSAL	4	0.0007	0.0004				1	0.001	0.0006	3	0.0002	0.0002			
PIMPRO	62	0.0088	0.0051	12	0.0014	0.0008	3	0.0004	0.0002	33	0.0016	0.0006	26	0.005	0.0032
PTYLUC	10	0.0013	0.0005	28	0.0029	0.0008	38	0.0029	0.0007	24	0.0018	0.0006	10	0.0016	0.0007
RHIOSC	2964	0.4338	0.0609	2007	0.2105	0.0329	658	0.1033	0.0176	1485	0.1259	0.0554	1354	0.2459	0.0565
SALTRU	1	0.0001	0.0001	2	0.0001	0.0001				2	0.0002	0.0001	2	0.0005	0.0005
XYRTEX															
Total N	6252			3533			1632			2653			2214		
Total Area	8483			11292			10160			16250			6631		
Density	0.74			0.31			0.29			0.16			0.33		

Appendix III. Number, Mean CPUE (fish/m^2), and +/1 SE of fishes collected in secondary channels samples (2003– 2013).

	2003			*2004*			*2005*			*2006*			*2007*			*2008*		
Species	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*
AMEMEL	9	0.0057	0.0024	6	0.005	0.0031	3	0.0045	0.0031	4	0.0049	0.003				3	0.0018	0.0013
AMENAT							1	0.001	0.001							3	0.0017	0.0011
CATDIS	24	0.0167	0.0082	123	0.0827	0.0259	7	0.0064	0.0033	62	0.0256	0.0134	13	0.0057	0.0024	87	0.0202	0.0115
CATLAT	145	0.1103	0.0531	124	0.0899	0.0293	25	0.0278	0.0099	61	0.0296	0.0131	87	0.041	0.0205	195	0.0602	0.0295
CYPCAR	2	0.0016	0.0011	10	0.0088	0.004										5	0.0029	0.0015
CYPLUT	1636	1.6186	0.4463	7171	4.2304	0.6358	921	0.9532	0.3283	154	0.1205	0.0368	168	0.0691	0.0194	221	0.082	0.0434
FUNZEB	11	0.0048	0.0025	32	0.0295	0.0173										4	0.0021	0.0014
GAMAFF	32	0.0258	0.0099	154	0.1584	0.0618	45	0.0463	0.0437	4	0.0058	0.0038	1	0.0004	0.0004	80	0.0236	0.0088
GILROB																		
ICTPUN	79	0.0551	0.0139	116	0.0991	0.0278	114	0.2099	0.1086	42	0.0193	0.0053	225	0.0935	0.0163	110	0.0387	0.0119
LEPCYA				1	0.0007	0.0007												
MICSAL	1	0.0016	0.0016	6	0.0037	0.002										10	0.0073	0.0052
PIMPRO	325	0.2417	0.093	2239	1.88	0.7865	106	0.1218	0.0502	27	0.0347	0.0233	4	0.0017	0.0017	117	0.0383	0.0183
PTYLUC				4	0.0046	0.0023	1	0.0005	0.0005	2	0.0011	0.0008	15	0.0083	0.0027	6	0.0013	0.0006
RHIOSC	238	0.2454	0.06121	1364	7976	0.1667	172	0.2013	0.0507	251	0.2131	0.041	821	0.4256	0.1042	1017	0.5288	0.1178
XYRTEX																		
Total N	2464			11109			1400			607			1334			1858		
Area	1438			1789			1009			1679			2525			2619		
Density	1.71			6.21			1.38			0.36			0.53			0.71		

	2009			*2010*			*2011*			*2012*			*2013*		
Species	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*
AMEMEL	1	0.0009	0.0009				9	0.0024	0.0017	1	0.0004	0.0004			
AMENAT	5	0.0023	0.0016							3	0.0008	0.0005			
CATDIS	100	0.0367	0.0098	173	0.0517	0.017	218	0.0327	0.0162	47	0.0132	0.0034	36	0.0133	0.0088
CATLAT	78	0.029	0.0091	281	0.1341	0.0496	66	0.0105	0.0023	204	0.0551	0.0219	147	0.0492	0.0219
CYPCAR	4	0.0018	0.0009										1	0.0004	0.0004
CYPLUT	1869	1.0995	0.3286	378	0.1102	0.0668	194	0.0362	0.0136	36	0.0887	0.0223	43	0.0159	0.0049
FUNZEB				1	0.0004	0.0004	16	0.0022	0.0022	2	0.0005	0.0004			
GAMAFF	27	0.0148	0.0068	28	0.013	0.0082	221	0.0321	0.0275	229	0.0939	0.0521	12	0.0045	0.0019
GILROB							1	0.0007	0.0007	1	0.0002	0.0002			
ICTPUN	141	0.0823	0.0632	116	0.0449	0.0096	168	0.0383	0.0089	14	0.0035	0.0013	239	0.0652	0.0169
LEPCYA	2	0.0006	0.0006				3	0.0004	0.0002	2	0.0012	0.0012			
MICSAL	6	0.0042	0.0023	2	0.0002	0.0002	6	0.001	0.0006	6	0.0018	0.0014			
PIMPRO	18	0.0109	0.0057	50	0.0294	0.0183	22	0.003	0.0025	75	0.0273	0.0131	4	0.0013	0.0009
PTYLUC	1	0.0004	0.0004	18	0.0065	0.0019	22	0.002	0.0007	2	0.0004	0.0003	6	0.0018	0.0007
RHIOSC	1073	0.5093	0.118	886	0.3724	0.096	553	0.0918	0.0185	225	0.0607	0.012	649	0.2002	0.0406
XYRTEX													1	0.0004	0.0004
Total N	3325			1933			1499			1147			1138		
Area	2387			2760			2424			3888			3171		
Density	1.39			0.7			0.76			0.3			0.36		

Appendix IV. Number, Mean CPUE (fish/m^2), and +/1 SE of fishes collected in backwaters (2003– 2013).

	2003			*2004*			*2005*			*2006*			*2007*			*2008*		
Species	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*
AMEMEL	12	0.0472	0.0445															
AMENAT													1	0.0036	0.0036			
CATDIS	3	0.0431	0.0276	2	0.0081	0.0022	69	0.1346	0.0265				1	0.001	0.0002	6	0.0126	0.0011
CATLAT	6	0.0431	0.0276	1	0.0038	0.001	114	0.1556	0.0207				4	0.0049	0.0005	26	0.0654	0.0071
CYPLUT	301	1.7454	0.4953	1033	3.6789	0.1984	566	1.2821	0.2102	3	0.0725	0.0513	67	0.0845	0.0054	288	0.5588	0.1032
CYPCAR				3	0.0102	0.002	1	0.0053	0.0012				1	0.0032	0.0005	2	0.0051	0.0008
FUNZEB	1	0.0043	0.0043	24	0.0603	0.0098	3	0.0034	0.0008							1	0.0033	0.0033
GAMAFF	20	0.1342	0.0812	17	0.0583	0.0059	26	0.0499	0.0077							23	0.0156	0.01
ICTPUN	10	0.0373	0.0305	10	0.0411	0.005	1	0.0022	0.0005				64	0.0991	0.0061	36	0.0773	0.0078
LEPCYA	1	0.0108	0.0108													1	0.003	0.003
MICSAL							2	0.0132	0.003							6	0.0154	0.0111
PIMPRO	241	2.4151	1.3993	319	1.0457	0.0721	122	0.2182	0.0163	2	0.0394	0.0063	12	0.0129	0.0015	35	0.1122	0.0691
PTYLUC													21	0.028	0.0024	1	0.0026	0.0026
RHIOSC	4	0.0182	0.0094	10	0.0345	0.0164	12	0.0179	0.011	1	0.0242	0.0242	30	0.0407	0.0159	116	0.2098	0.1114
Total N	490			1415			876			6			198			541		
Area	245			274			489			53			723			486		
Density	2			5.16			1.79			0.11			0.27			1.11		

	2009			*2010*			*2011*			*2012*			*2013*		
Species	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*	*N*	*CPUE*	*SE*
AMEMEL	121	0.0822	0.0811	8	0.012	0.0084	6	0.0018	0.0015						
AMENAT	1	0.0011	0.0011	1	0.001	0.001	1								
CATDIS	20	0.0178	0.0113				1152	0.1703	0.134	13	0.0272	0.0247	17	0.0409	0.0409
CATLAT	39	0.043	0.0161	55	0.0644	0.0311	15	0.0016	0.0008	1	0.0024	0.0024	91	0.2163	0.2016
CYPLUT	2081	1.799	0.5392	199	0.2203	0.0965	742	0.2368	0.1578	218	0.3192	0.2745	6	0.0119	0.0082
CYPCAR	3	0.0029	0.0017	1	0.0023	0.0023									
FUNZEB				3	0.0065	0.0057	11	0.0013	0.0009	15	0.0202	0.0137	4	0.0125	0.0078
GAMAFF	440	0.3973	0.3173	24	0.0205	0.0166	163	0.0352	0.0178	460	1.0394	0.4994	16	0.0784	0.0725
ICTPUN	7	0.0071	0.0041	11	0.0104	0.0059	19	0.0029	0.0019						
LEPCYA	89	0.0741	0.0737				1	0.0001	0.0001	9	0.0139	0.0139			
MICSAL	21	0.0188	0.015												
PIMPRO	182	0.1317	0.0614	24	0.041	0.0289	88	0.01	0.0087	146	0.238	0.1653	185	0.4449	0.4449
PTYLUC	1	0.0006	0.0006	3	0.0061	0.0037	2	0.0002	0.0002						
RHIOSC	39	0.0416	0.0141	19	0.0391	0.0292	96	0.0075	0.0029	11	0.0223	0.0073	57	0.1614	0.0955
Total N	3044			348			2296			873			376		
Area	1021			728			1235			698			347		
Density	2.98			0.48			0.47			1.25			1.08		

Appendix V. Summary of 1998-2013 Colorado Pikeminnow captures in the San Juan River. Reaches 1 and 2 not sampled between 2011 and 2013.

Year	*Length Category*	*Reach* 6	5	4	3	2	1	*Grand Total*
1998	N/A		2	2	2			6
1999	40			1				4
	50							
	60							
	70							
	80							
	90				1			
	100							
	110							
	120		1					
	130							
	140							
	150							
	160							
	170							
	180							
	190							
	200							
	210							
	220		1					
2000								0
2001	N/A							0
2002	N/A							0
2003	N/A							0
2004	160		2					8
	170			1				
	180		2					
	200		1					
	210		1					
	230			1				
2005	170				1			3
	180			1				
	290					1		
2006	140	1	1					10

Year	*Length Category*	*Reach* 6	5	4	3	2	1	*Grand Total*
	150	1	1					
	180		1		1			
	190					1		
	200	1						
	210				1			
	280				1			
2007	40				6	3		60 (*29 recently stocked YOY)
	50				17	2	1	
	110	1						
	120	1						
	130		1					
	140	1	4					
	150	2	6		2			
	160	2		1	1		1	
	170	1	1	3	1			
	180		1		1			
2008	130		1					10
	140	1	1	1				
	150		2	1	1			
	170		1					
	210				1			
2009	130	1					1	12
	170		1	1		1		
	180	1		1				
	190			1				
	200			2				
	210				1			
	330		1					
2010	120		1					49
	130	2	1	1				
	140	2	2	1	3			
	150	1	3	4	1			
	160		2		2	1		
	170		3	2	1			
2010 Cont'd	180		2		1	1		
	190			1	3	1		
	200		2		1			
	210				1			

Year	*Length Category*	*Reach* 6	5	4	3	2	1	*Grand Total*
	220							
	230				1			
	240							
	250			1				
	260				1			
2011	100	2	1					
	110	4	5					
	120	3	10					
	130	5	2	2				
	140	2	7	1				
	150		5	1	1			
	160		2	1				
	170							
	180			2				
	190							
	200							
	210							62
	220							
	230		1					
	240	1		1				
	250							
	260							
	270				1			
	280							
	290							
	300				1			
	360		1					
2012	100							
	110	1						
	120	3	1					
	130							
	140	1	3	1	1			26
	150	3						
	160	2	1		1			
2012 Cont'd	170	1			1			
	180							
	190	2	1	1	2			
	200	1		1	1			

Year	*Length Category*	*Reach*						*Grand Total*
		6	*5*	*4*	*3*	*2*	*1*	
2013	140	1						**16 (one fish in Reach 4 not measured)**
	150							
	160							
	170			1				
	180							
	190			1	1			
	200			1	1			
	210		2	3	1			
	220							
	230							
	240							
	250							
	260			1				
	270							
	280				1			
	290			1				
Reach Totals		**51**	**91**	**46**	**66**	**10**	**3**	

Appendix VI. Species, number and CPUE of fishes captured at each RERI sites (2012-2013).

Year	Site (RM)	Species	Number Captured	CPUE	Comments
2012	127.2	Yellow Bullhead	1	0.00734322	
		Bluehead Sucker	8	0.05874578	
		Flannelmouth Sucker	14	0.10280511	
		Red Shiner	9	0.066089	
		Mosquito Fish	2	0.01468644	
		Channel Catfish	3	0.02202967	
		Fathead Minnow	3	0.02202967	
		Speckled Dace	14	0.10280511	
	130.7A	Bluehead Sucker	2	0.02689618	
		Flannelmouth Sucker	2	0.02689618	
		Red Shiner	7	0.09413663	
		Mosquito Fish	3	0.04034427	
		Speckled Dace	4	0.05379236	
	130.7B	Bluehead Sucker	2	0.0210926	
		Red Shiner	1	0.0105463	
		Colorado Pikeminnow	1	0.0105463	
		Speckled Dace	8	0.08437039	
	132	Red Shiner	2	0.01332978	
		Colorado Pikeminnow	1	0.00666489	
		Speckled Dace	2	0.01332978	
2013	127.2	Flannelmouth Sucker	3	0.02280328	
		Red Shiner	4	0.03040438	
		Channel Catfish	2	0.01520219	
		Speckled Dace	3	0.02280328	
	130.7	Colorado Pikeminnow	1	0.00803084	Fast High Water
		Speckled Dace	12	0.09637006	
	132	Flannelmouth Sucker	2	0.02124044	Fast High Water
		Red Shiner	1	0.01062022	
		Mosquito Fish	2	0.02124044	
		Channel Catfish	4	0.04248088	
		Speckled Dace	12	0.12744265	
		Razorback Sucker	1	0.01062022	
	132.2	Red Shiner	1	0.06587615	Deep mud
		Speckled Dace	4	0.26350461	

Appendix VII. Species and CPUE of fishes captured using drag net and block net seining.

2011 (Sites = 20)	Block Net		Drag Net	
	Mean	SE	Mean	SE
Bluehead Sucker	0.0030	0.0022	0.0076	0.0049
Flannelmouth Sucker	0.0087	0.0048	0.0112	0.0052
Red Shiner			0.0219	0.0119
Mosquito Fish			0.0019	0.0019
Channel Catfish	0.0324	0.0117	0.0556	0.0166
Fathead Minnow				
Colorado Pikeminnow	0.0017	0.0009	0.0027	0.0018
Speckled Dace	0.0054	0.0029	0.0964	0.0544
Brown Trout				
Plains Killifish				
Green Sunfish			0.0006	0.0006
Largemouth Bass				
2012 (Sites = 32)	Block Net		Drag Net	
	Mean	SE	Mean	SE
Bluehead Sucker	0.0044	0.0026	0.0104	0.0038
Flannelmouth Sucker	0.0072	0.0022	0.0262	0.0108
Red Shiner	0.0011	0.0005	0.0300	0.0116
Mosquito Fish	0.0001	0.0001	0.0028	0.0013
Channel Catfish	0.0069	0.0033	0.0090	0.0026
Fathead Minnow	0.0003	0.0002	0.0014	0.0010
Colorado Pikeminnow	0.0008	0.0004	0.0029	0.0015
Speckled Dace	0.0082	0.0044	0.1077	0.0514
Brown Trout	0.0002	0.0002		
Plains Killifish			0.0011	0.0011
Green Sunfish			0.0003	0.0003
Largemouth Bass			0.0005	0.0005
2013 (Sites = 7)	Block Net		Drag Net	
	Mean	SE	Mean	SE
Bluehead Sucker	0.0125	0.0046	0.0559	0.0334
Flannelmouth Sucker	0.0683	0.0371	0.0882	0.0333
Red Shiner	0.0029	0.0029	0.0023	0.0023
Mosquito Fish			0.0034	0.0024
Channel Catfish	0.0024	0.0024	0.0048	0.0048
Fathead Minnow	0.0021	0.0021	0.0023	0.0023
Colorado Pikeminnow				
Speckled Dace	0.0299	0.0157	0.2080	0.0900
Brown Trout				
Plains Killifish				
Green Sunfish				
Largemouth Bass				