Gila River Basin Native Fishes Conservation Program:

New Mexico Department of Game and Fish Native Fish Conservation Efforts

2017 Annual Report

Cooperative Agreement (15AC00046) Between

Bureau of Reclamation

And

New Mexico Department of Game and Fish

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Executive Summary

This report summarizes the Gila River Basin Native Fishes Conservation Program (GRBNFCP) tasks funded for native fish conservation in New Mexico in 2017. Work was conducted under a Cooperative Agreement (15AC00046) between the Bureau of Reclamation (BOR) and the New Mexico Department of Game and Fish (Department). In 2017 one new task began, the Middle Fork Gila River inventory and assessment. Two native fish conservation efforts were continued, the removal of nonnative fishes from the West Fork Gila River and New Mexico Threatened and Endangered (T&E) fish repatriations and monitoring. Under the new Middle Fork Gila River inventory and assessment task, the lower half of the Middle Fork Gila River was surveyed at 13 sites. At these sites seven native fish species and five nonnative fish species were present. The West Fork Gila River nonnative removal task resulted in comparatively high numbers of native fish captured, including Spikedace *Meda fulgida* and Loach Minnow *Tiaroga cobitis*, and low numbers of nonnative fishes. Under the repatriations and monitoring task Little Creek, San Francisco River, and Saliz Canyon were stocked with federally listed species, Little Creek was surveyed to assess the success of repatriation, Skeleton Canyon was investigated, and wild Loach Minnow were brought into the Arizona Game and Fish Department (AZGFD) Aquatic Research and Conservation Center (ARCC) to supplement the brood stock. Specific details of work completed and results for each native fish conservation task are included within this report.

Introduction

The GRBNFCP was established to minimize impacts on threatened and endangered fishes by the Central Arizona Project (CAP). The United States Fish and Wildlife Service (USFWS) biological opinions in 1994, 2001, and 2008 concluded that operation of the CAP will require mitigation for the negative effects on federally listed fish species within the entire Gila River basin. The GRBNFCP is focused on conservation work for five federally listed fishes: Spikedace, Loach Minnow, Gila Chub *Gila intermedia*, Gila Topminnow *Poeciliopsis occidentalis*, and Razorback Sucker *Xyrauchen texanus*. In the most recent GRBNFCP Strategic Plan (USFWS et al. 2012) the principal goals are described as: 1) achieve enhanced conservation status of federally-listed and candidate fish species to native fishes in the Gila River basin; 2) alleviate and diminish threats from extant nonnative aquatic species to native fishes; and 3) remove nonnative fishes that might enter the Gila River basin via the Central Arizona Project or other pathways. The program is funded by the BOR and is directed by the USFWS and BOR in cooperation with the Department and the AZGFD. The Department receives funds for work fitting these objectives from the BOR under Cooperative Agreement (15AC00046). As a requirement of a 2018 amendment to the agreement the Department prepares an annual report to the GRBNFCP which describes the results of the native fish conservation efforts funded during the preceding calendar year. Most New Mexico native fish conservation tasks are completed through a collaborative effort between the Department, the USFWS, and the United States Forest Service (USFS).

For each task funded in 2017 this report lists the GRBNFCP Strategic Plan (USFWS et al. 2012) goal(s) the task is linked to, as well as recovery objective(s) the task works toward in the Loach Minnow, Spikedace, and Gila Topminnow Recovery Plans (USFWS 1991, 1991, 1998) and the Gila Chub Draft Recovery Plan

(USFWS 2015). Work performed by the Department in 2017 is presented under each task. For each task, a background of the work is included followed by results, recommendations for the future, and work planned for 2018. Ongoing projects, such as the Middle Fork Gila River Inventory and Assessment, include a summary of this year's findings; more detailed results will be included in a later report upon completion of the project.

Removal of Nonnative Fishes from West Fork Gila River

Strategic Plan Goals

- Build the scientific foundation for recovery efforts
    - Goal 2. Investigate novel methods to control nonnative aquatic biota.
- Prevent extinction of rare populations and species
    - Goal 5. Chemically and/or mechanically renovate streams and other surface waters identified under the previous Recovery Need (1) to remove nonnative fishes.

Recovery objectives

- Loach Minnow Recovery Plan (1991)
    - Task 2.5 (priority 1): Monitor community composition including range of natural variation
    - Task 3.1-2 (priority 2): Identify nature and significance of interaction with non-native fishes
- Spikedace Recovery Plan (1991)
    - Task 2.5 (priority 1): Monitor community composition including range of natural variation
    - Task 3.1-2 (priority 2): Identify nature and significance of interaction with non-native fishes

Background

The West Fork Gila River supports a largely intact native fish assemblage including Federally Endangered Spikedace and Loach Minnow as well as State Endangered Roundtail Chub *Gila robusta* (previously known as Headwater Chub *Gila nigra*). In addition, federally threatened Gila Trout *Oncorhynchus gilae* are stocked in cooler months to provide a recreational fishing opportunity and support Gila Trout recovery efforts. A threat to this native fish community is the presence of nonnative fishes. Ten species of nonnative fishes have been documented in the river including Yellow Bullhead *Ameiurus natalis*, Smallmouth Bass *Micropterus dolomieu*, Rainbow Trout *Oncorhynchus mykiss*, and Brown Trout *Salmo trutta*. The Department and partners have been removing nonnative fishes from an approximately 4 km reach of the West Fork Gila River at the Department owned Heartbar Wildlife Management Area since 2006. This reach lies in the vicinity of the confluence of the Middle and East Forks of the Gila River, an area also commonly referred to as "The Forks" (Figure 10). Nonnatives are removed from the Little Creek confluence upstream to the NM15 Bridge. The removal effort consists of a single pass of sampling

by individual habitat. Pools and runs are electrofished with two shockers simultaneously, riffles are electrofished and kicknetted into a seine, and sandy shoals are seined. Although the same stretch of river is sampled annually, effort is not consistent among years. The river has changed considerably since the project began in 2006, including a major shift of the river channel and high variability in the number of braided channels encountered year to year. This effort was evaluated from 2007 to 2012 when it had successfully reduced the biomass of some nonnative species as well as benefited some native species, indicating positive results overall (Propst et al. 2014). With this documented reduction of nonnative species, the GRBNFCP decided to continue the effort. The removal requires a crew of 6 to 9 people and takes 4 to 5 days to complete; it is conducted annually in June.

Results

In 2017 Department, USFWS, and USFS staff conducted the West Fork Gila River nonnative removal from June 12th to June 16th. The effort consisted of 37,434 seconds of shocking and 11 seine hauls. Numbers and densities of fish captured in 2017, excluding unidentifiable Catostomids (<30mm), are shown in Table 1. Relative abundance of each native species as compared to all nonnative species combined is shown in Figures 1 through 8. Relative abundance for the entire project, since 2006, is included for reference. In 2017, most native species showed an increase in relative abundance with the exception of Roundtail Chub and Sonora Sucker *Catostomus insignis*. Loach Minnow were the most abundant species in the nonnative removal reach for the first time since the project began in 2006.

Table 1. Total number of individuals captured and density of all fishes in the West Fork Gila River nonnative removal in 2017.

Species	Number Caught	Density (fish/m^2)
Native		
Desert Sucker	1393	0.05
Gila Trout	12	0
Loach Minnow	1802	0.064
Longfin Dace	871	0.031
Sonora Sucker	807	0.029
Speckled Dace	692	0.025
Spikedace	495	0.018
Roundtail Chub	1	0
Nonnative		
Common Carp	3	0
Yellow Bullhead	17	0
Rainbow Trout Hybrid	1	0
Red Shiner	1	0

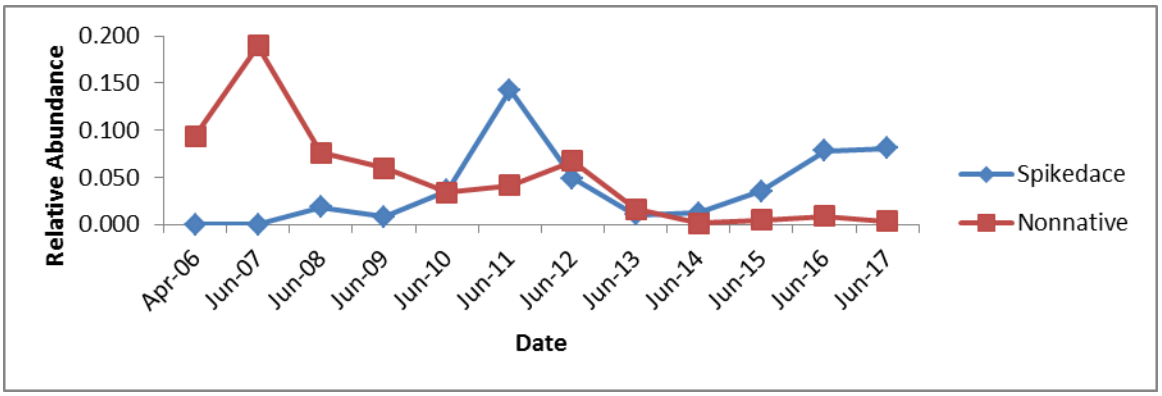

Figure 1. Relative abundance of Spikedace and all nonnative fishes combined in the West Fork Gila removal reach from 2006 to 2017.

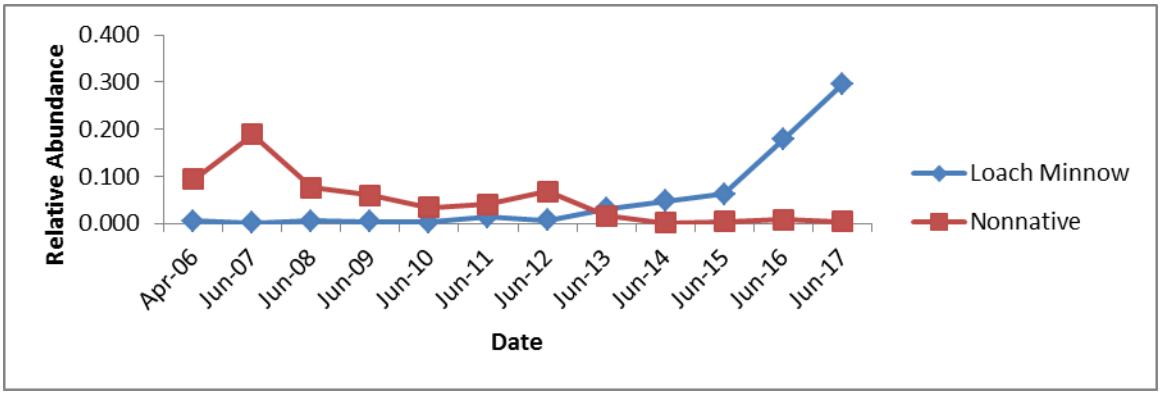

Figure 2. Relative abundance of Loach Minnow and all nonnative fishes combined in the West Fork Gila removal reach from 2006 to 2017.

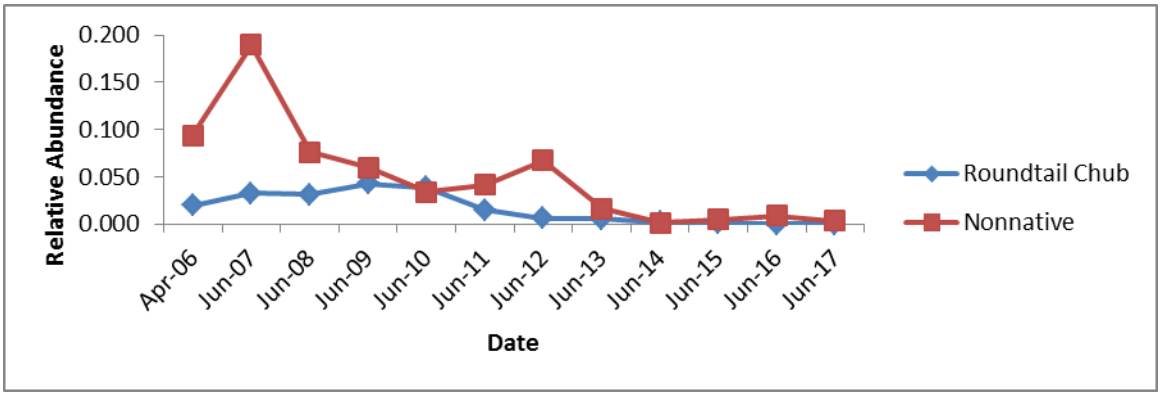

Figure 3. Relative abundance of Roundtail Chub and all nonnative fishes combined in the West Fork Gila removal reach from 2006 to 2017.

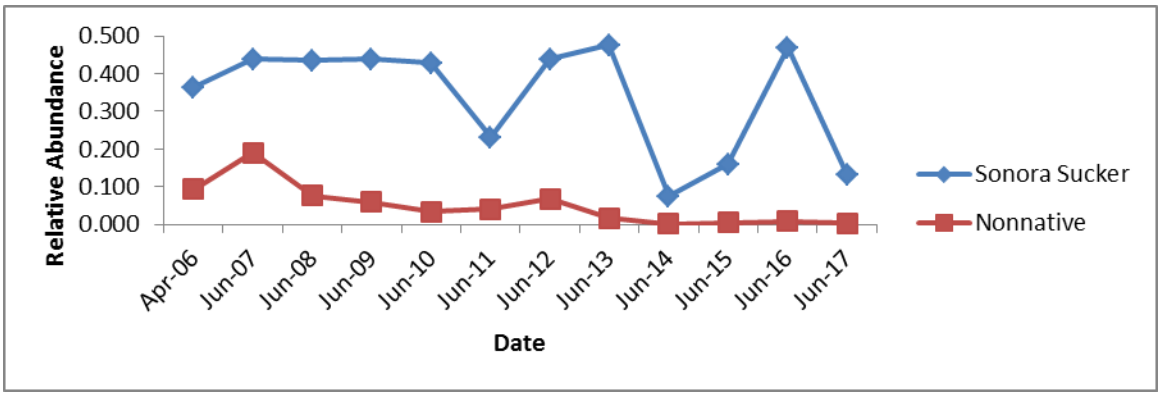

Figure 4. Relative abundance of Sonora Sucker and all nonnative fishes combined in the West Fork Gila removal reach from 2006 to 2017.

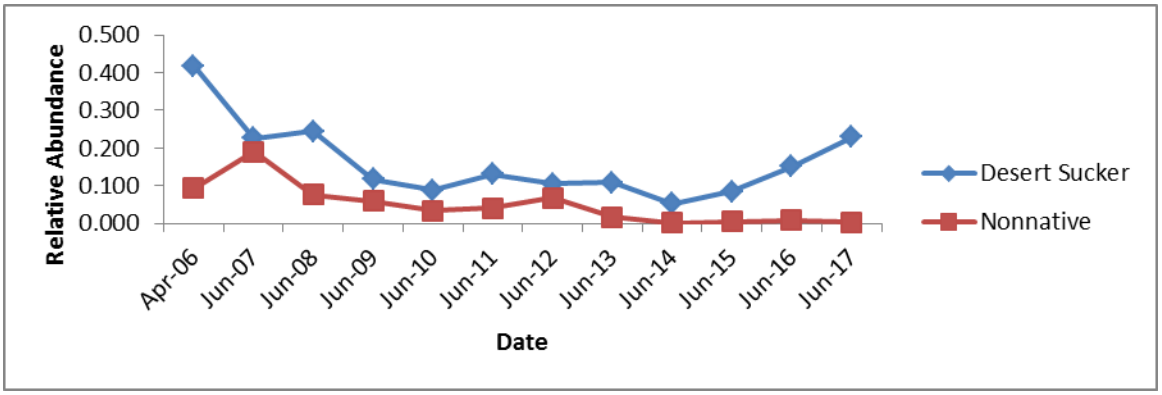

Figure 5. Relative abundance of Desert Sucker and all nonnative fishes combined in the West Fork Gila removal reach from 2006 to 2017.

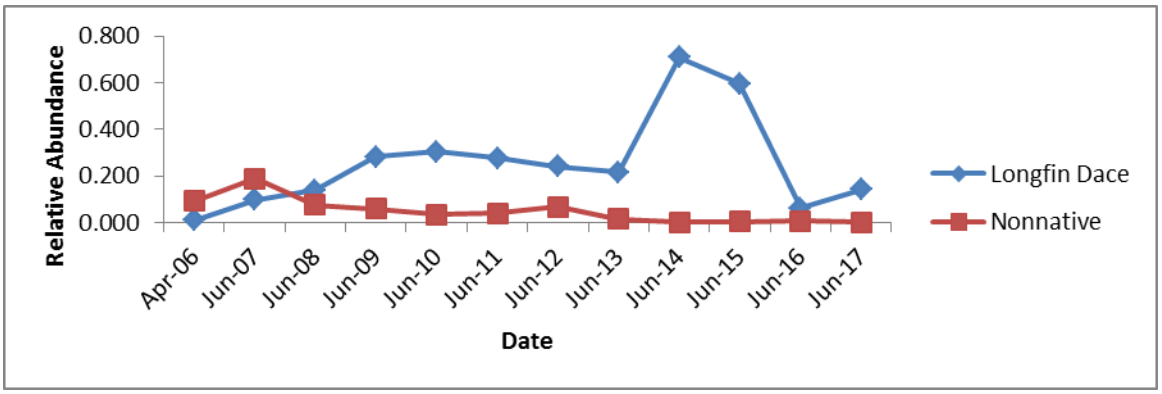

Figure 6. Relative abundance of Longfin Dace and all nonnative fishes combined in the West Fork Gila removal reach from 2006 to 2017.

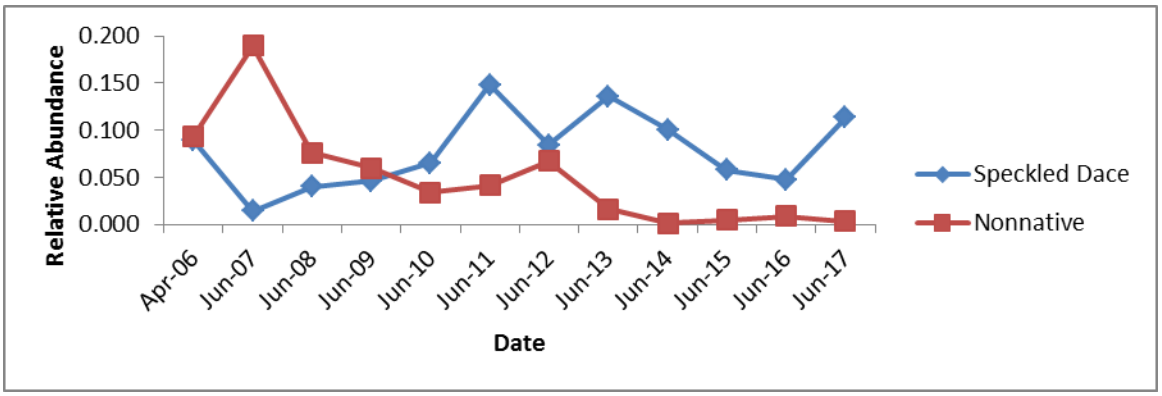

Figure 7. Relative abundance of Speckled Dace and all nonnative fishes combined in the West Fork Gila removal reach from 2006 to 2017.

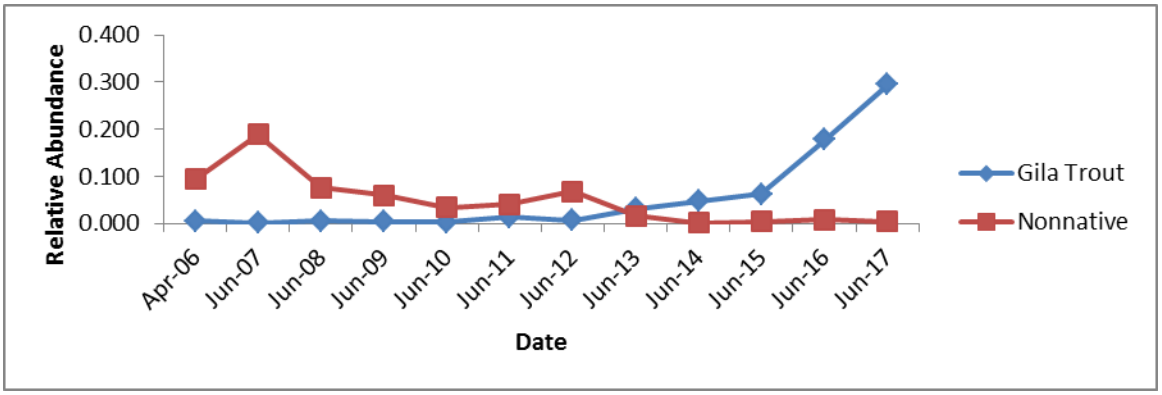

Figure 8. Relative abundance of Gila Trout and all nonnative fishes combined in the West Fork Gila removal reach from 2006 to 2017.

Recommendations

In recent years relative abundance of nonnative fish species has been negligible throughout the project reach while relative abundance of most native fish species has been increasing. Although other factors, such as elevated discharge, are suspected to have also contributed to an increase in native fish numbers, it is likely native fishes continue to benefit from the removal of nonnative piscivores. We recommend continuing nonnative removal efforts on the West Fork Gila River.

Work Planned for 2018

- Conduct West Fork Gila River nonnative removal on 4 km Heartbar Wildlife Management Area reach in June 2018.

New Mexico T&E Fish Repatriations and Monitoring

Strategic Plan Goals:

- Build the scientific foundation for recovery efforts
    - Goal 1. Identify critical streams and populations in need of protection and replication
- Prevent extinction of rare populations and species
    - Goal 1. Acquire and maintain hatchery/pond stocks of critically endangered populations as insurance against extinction in the wild and to provide sources for population replications
    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters
- Manage Toward recovery
    - Goal 4. Continue and expand repatriations of native fish communities.
    - Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats.
    - Goal 9. Periodically evaluate the success of species repatriations and surface water renovations.

Recovery objectives:

- Gila Chub Recovery Plan (2015 Draft)
    - Task 3 (priority 2): Monitor remnant and replicated populations to ensure they are persisting and threats are being managed.
- Gila Topminnow Recovery Plan (1998)
    - Task 2.1 (priority 1): Identify suitable habitats
    - Task 2.2 (priority 1): Reestablish into suitable habitats
    - Task 3.1 (priority 1): Develop standardized population and habitat monitoring protocols and implement them.
- Loach Minnow Recovery Plan (1991)
    - Task 6.2 (priority 3): Identify and prepare sites for reintroduction
    - Task 6.3-4 (priority 3): Reintroduce into selected reaches and monitor
    - Task 6.5-6 (priority 3): Determine reasons for success/failure and rectify as necessary
    - Task 8.2 (priority 3): Collect hatchery stocks
- Spikedace Recovery Plan (1991)
    - Task 6.2 (priority 3): Identify and prepare sites for reintroduction
    - Task 6.3-4 (priority 3): Reintroduce into selected reaches and monitor
    - Task 6.5-6 (priority 3): Determine reasons for success/failure and rectify as necessary
    - Task 8.2 (priority 3): Collect hatchery stocks

Background

This task is used to identify potential repatriation streams, evaluate potential donor populations and repatriation sites, conduct repatriation of identified streams, monitor streams post-repatriation, and

work with hatchery populations as needed. Repatriations consist of multiple stockings into each repatriation stream successively for 3-5 consecutive years or until monitoring of the repatriated streams determines the populations are established or considered unsustainable. Established streams are then surveyed at least once every five years. It is an ongoing effort to find and evaluate new waters where repatriation may be possible. This task encompasses all NM streams within the Gila River basin that might undergo repatriation attempts in the future. Repatriation stockings can be direct transfers of fish from a wild population or stocking from a hatchery such as ARCC. This task is also used for collecting live fish for the purposes of direct stocking, quarantine at ARCC, or development and maintenance of brood stock at ARCC.

Results

In 2017, several ongoing repatriation projects were continued, including two stream surveys. One stream was evaluated for repatriation potential, Skeleton Canyon, the last Turkey Creek tributary that had not previously been evaluated. Department staff evaluated Skeleton Canyon on June 1st and found it to be mostly dry with some isolated pools, but there was no suitable fish habitat (Figure 9). On May 23rd, 2017, Department and USFS staff surveyed Little Creek to evaluate the Loach Minnow repatriation (Table 2). Three sites were sampled near the stocking locations (Figure 10), and Loach Minnow were found in all of them. Only suitable Loach Minnow riffle habitat was targeted during the survey and each location was sampled by electrofishing into a seine. A total of 45 Loach Minnow were captured at a catch per unit effort of 35.11 fish/hour. Sizes captured ranged between 45 and 80 mm. Other species captured included Speckled Dace *Rhinicthys osculus*, Longfin Dace *Agosia chrysogaster*, Desert Sucker *Catostomus clarkii*, and Brown Trout.

Stockings

Little Creek

The Department, USFWS, and ARCC staff conducted stocking of Spikedace and Loach Minnow into repatriation streams and ARCC brood stock collection in November, 2017. Little Creek was stocked with Loach Minnow for the fourth consecutive year on November 30th, 2017. ARCC provided 159 Gila Forks Loach Minnow for stocking and another 103 Loach Minnow were translocated from the West Fork Gila River near the confluence of Little Creek. A summary of Little Creek stocking information is shown in Table 2.

Saliz Canyon

On November 29, 2017, Saliz Canyon (Figure 11) was stocked with San Francisco Loach Minnow from ARCC as shown in Table 3. Post-stocking monitoring is scheduled after three years of stocking has been completed, it will begin in 2019.

San Francisco

On November 29, 2017, the upper San Francisco was stocked with 1,000 Spikedace from ARCC (700 Gila Mainstem and 300 Gila Forks). Stocking began in the San Francisco River in 2008 (Table 4) but efforts were reset by the Whitewater Baldy Fire of 2012 and post-fire flooding. This was the first Spikedace stocking since 2014. All stockings have taken place near the same location upstream of the US 180

bridge north of Alma, NM (Figure 11). The stocking location has not been sampled since 2014, when no Spikedace were found. However, an established site at Glenwood, NM, approximately 15 miles downstream of the stocking location, is sampled annually in the fall using alternative funding. On October 2nd, 2017 four Spikedace were captured at the Glenwood site. This is the first documented Spikedace capture in the San Francisco River since 1950.

Also on November 30th, 2017, ARCC was provided with 117 Loach Minnow captured from the West Fork Gila River for the maintenance of brood stock at the captive facility.

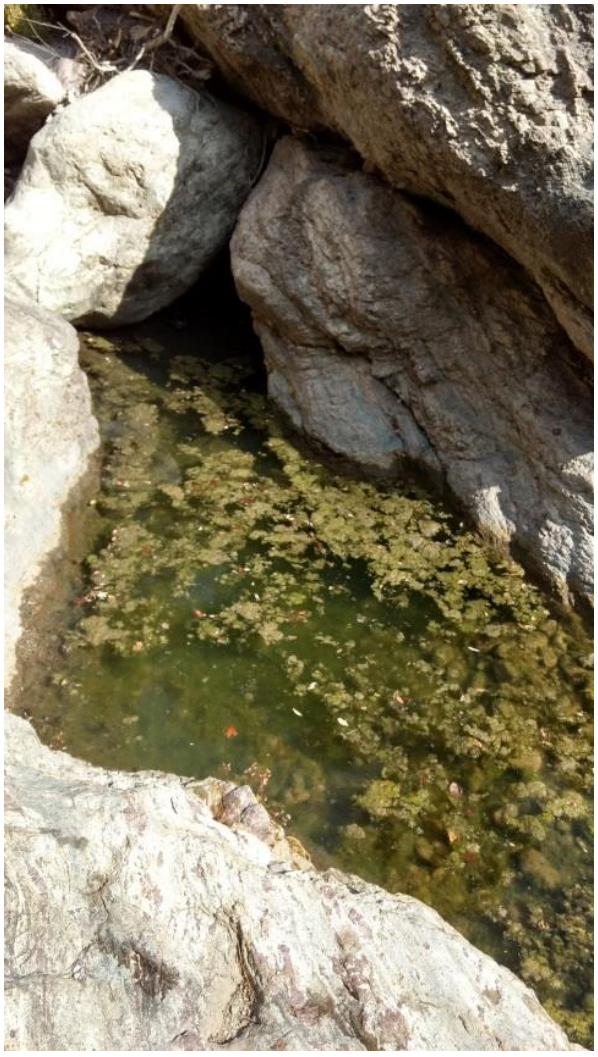

Figure 9. Isolated pool found in Skeleton Canyon.

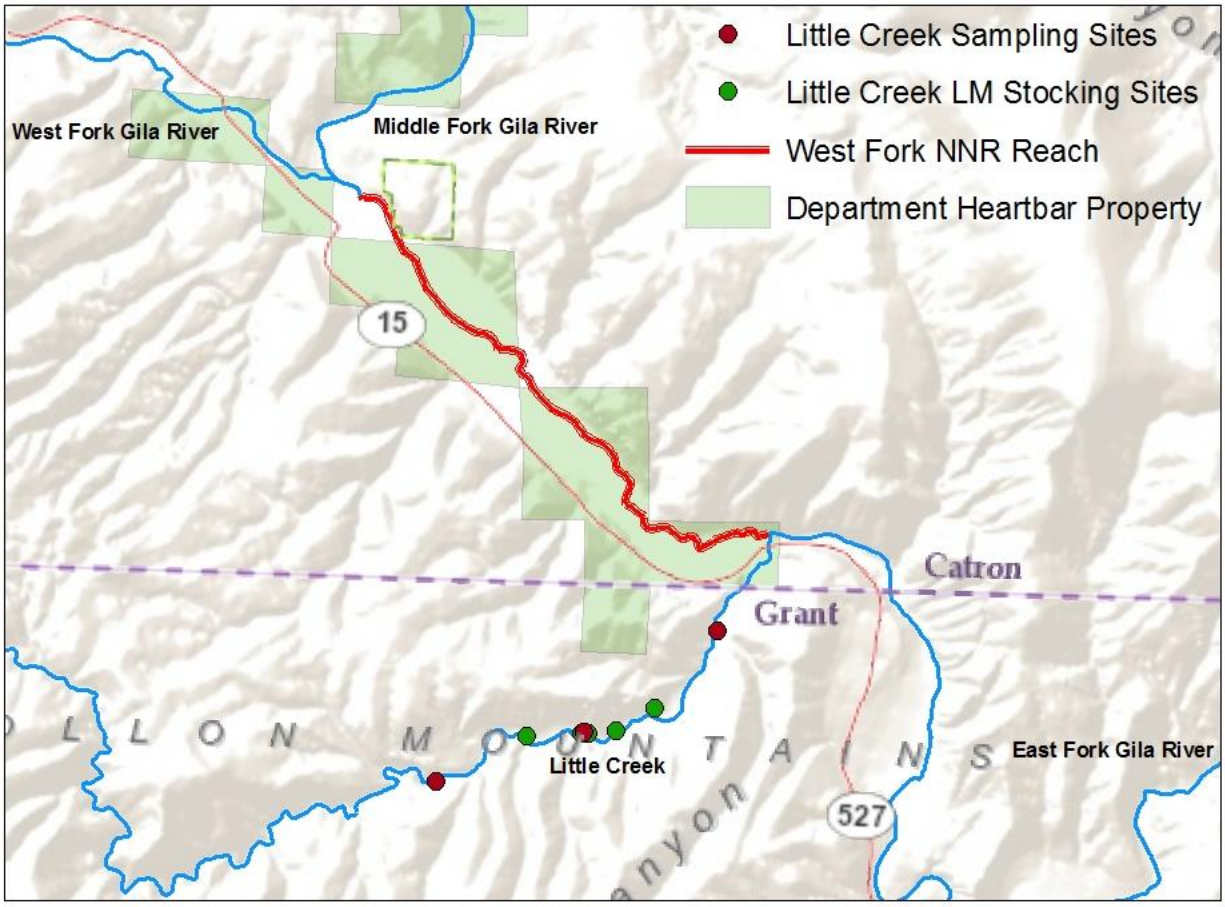

Figure 10. Map showing the location of the West Fork Gila River nonnative fish removal and Little Creek with locations of 2017 surveys and all Loach Minnow (LM) stocking sites.

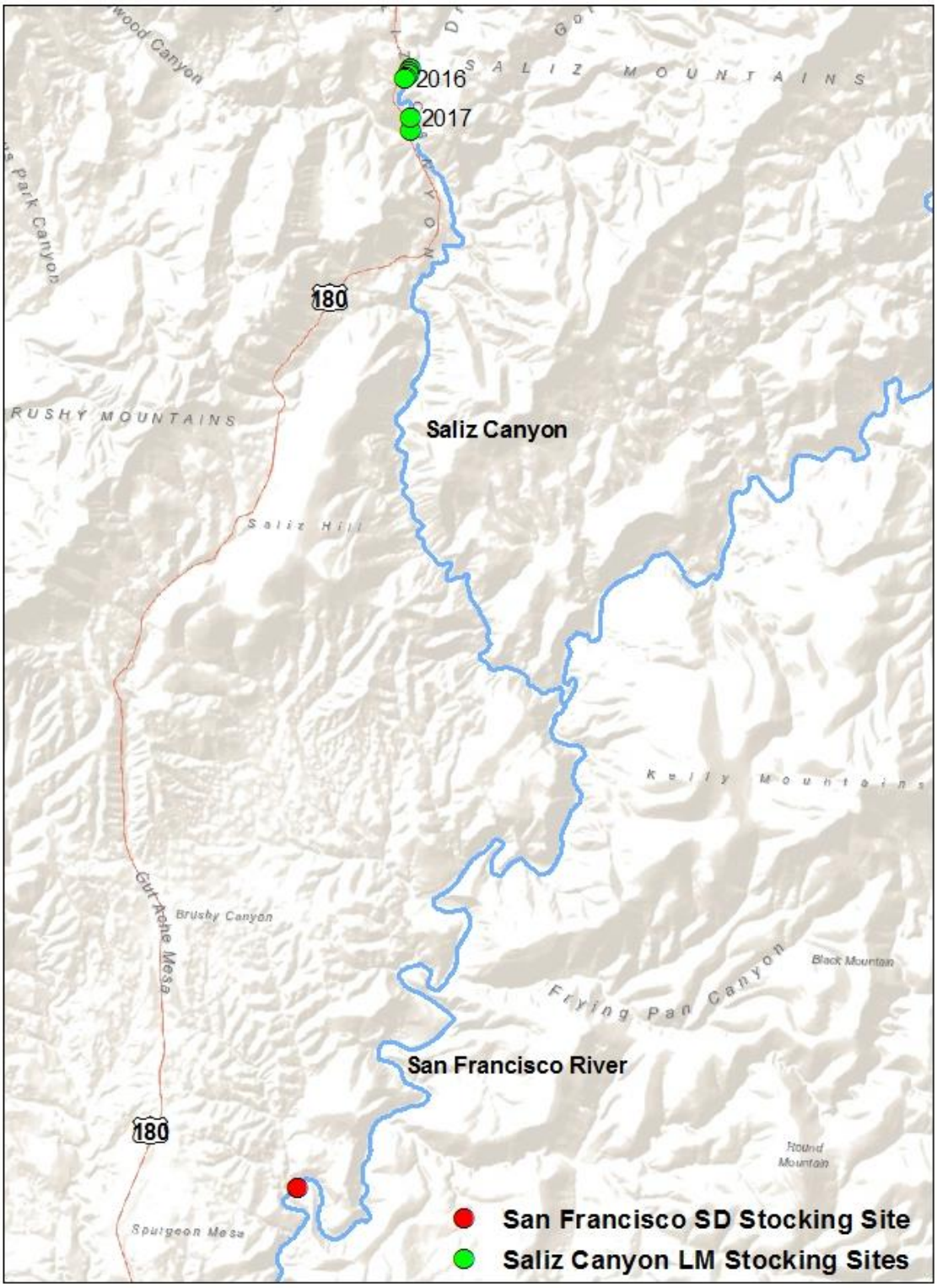

Figure 11. Map showing the location of all San Francisco Spikedace (SD) stocking and Saliz Canyon Loach Minnow (LM) stocking sites in 2016 and 2017.

Table 2. Summary of Loach Minnow stocking into Little Creek. For fish stocked from ARCC, lineage is displayed within parentheses.

Date	Number Stocked	Stocking Source
November 18th, 2014	267	ARCC (Gila Forks)
September 3rd, 2015	62	WF Gila River
November 15th, 2016	125	WF Gila River
November 30th, 2017	159	ARCC (Gila Forks)
November 30th, 2017	103	WF Gila River

Table 3. Summary of Loach Minnow stocking into Saliz Canyon. For fish stocked from ARCC, lineage is displayed within parentheses.

Date	Number Stocked	Source
November 16th, 2016	103	Tularosa River
November 29th, 2017	243	ARCC (San Francisco)

Table 4. Summary of Spikedace stocking into San Francisco River. For fish stocked from ARCC, lineage is displayed within parentheses.

Date	Number Stocked	Source
September 16th, 2008	350	ARCC (Gila Mainstem)
October 21st, 2009	112	Gila River, Gila Bird Area
October 2010	4000	ARCC (Gila Mainstem)
October 29th, 2014	1317	ARCC (Gila Mainstem)
November 29th, 2017	1000	ARCC (Gila Forks, Gila Mainstem)

Recommendations

Little Creek has received Loach Minnow for 4 years and appears to have Loach Minnow persisting from previous stockings. We recommend ending stocking and evaluating Little Creek in 2018. Stocking should continue as planned in Saliz Canyon and San Francisco River. New Loach Minnow repatriation sites need to be evaluated for Gila Forks Loach Minnow.

Work Planned for 2018

- Conduct Loach Minnow stocking into Saliz Canyon and Spikedace stocking into the San Francisco River.
- Conduct surveys of repatriated Gila Topminnow population in Burro Cienega, repatriated Roundtail Chub (previously Gila Chub) population in Mule Creek, repatriated Loach Minnow population in Little Creek and Turkey Creek Roundtail Chub (previously Gila Chub) population.
- Begin evaluation of potential repatriation streams for Gila Forks Loach Minnow.
- Transfer Loach Minnow and/or Spikedace to ARCC to supplement hatchery populations if source populations are stable.

Middle Fork Gila River Inventory and Assessment

Strategic Plan Goals:

- Build the scientific foundation for recovery efforts
    - Goal 1. Identify critical streams and populations in need of protection and replication
    - Goal 5. Survey poorly-studied stream systems to document existing fish communities.

Recovery objectives:

- Loach Minnow Recovery Plan (1991)
    - Task 1.1 (priority 1): Identify all populations and determine level of protection
    - Task 2.5 (priority 1): Monitor community composition including range of natural variation
    - Task 3.1-2 (priority 2): Identify nature and significance of interaction with nonnative fishes
    - Task 6.2 (priority 3): Identify and prepare sites for reintroduction
- Spikedace Recovery Plan (1991)
    - Task 1.1 (priority 1): Identify all populations and determine level of protection
    - Task 2.5 (priority 1): Monitor community composition including range of natural variation
    - Task 3.1-2 (priority 2): Identify nature and significance of interaction with nonnative fishes
    - Task 6.2 (priority 3): Identify and prepare sites for reintroduction

Background

Potential habitat for Roundtail Chub (previously Headwater Chub*)*, Loach Minnow, Spikedace, Desert Sucker, Sonora Sucker, Speckled Dace, Longfin Dace, and Gila Trout occur in the Middle Fork Gila River and its tributaries. There have been significant changes in the drainage since the GRBNFCP funded an inventory of the Gila River forks from 2005-2008. In that sampling, six nonnative fish species were collected in this reach: Black Bullhead *Ameiurus melas*, Yellow Bullhead, Green Sunfish *Lepomis cyanellus*, Smallmouth Bass, Rainbow Trout, and Brown Trout (Paroz et al. 2009). The most significant change was the Whitewater-Baldy Fire that burned large portions of the watershed in 2012 and resulted in catastrophic post-fire flooding in 2013. This fire eliminated nonnative fishes from at least one tributary (Willow Creek) of the Middle Fork Gila River and may have created an opportunity for native fish protection. A thorough inventory is needed to determine the effects of the Whitewater-Baldy Fire and flooding on fishes of the Middle Fork Gila River.

Results

Department, USFWS, and USFS staff surveyed the lower section of the Middle Fork Gila River from June 26th to June 30th, 2017. Staff split into two crews with the upper camp located in the Meadows area and the lower camp located downstream of Jordan Canyon. A total of 13 sites were surveyed. Nine sites were at or near previously established survey sites and 4 sites filled in gaps at new locations (Figure 12).

Sites were sampled by habitat using a backpack electrofisher and seine following the same sampling methods as the previous survey in 2008 (Paroz et al. 2009). Loach Minnow, Spikedace, Roundtail Chub, Speckled Dace, Longfin Dace and Desert Sucker all occupied more sites than in previous sampling (Table 5). Loach Minnow and Spikedace were not present at any site in 2008. In 2017 Loach Minnow were present in four of the five lowest sites and Spikedace were present in 3 of 4 lowest sites. No Loach Minnow or Spikedace were found above site 4. Loach Minnow density at sites they were found ranged from .018 to .037 fish/m^2 (Table 6). Spikedace density at sites they were found ranged from .011 to .024 fish per square meter. Roundtail Chub were found in ten of thirteen sites in 2017. Density of Roundtail Chub at sites they were found ranged from .001 to .011 fish/m^2. Nonnative Rainbow Trout were captured at most sites in 2008 but were not captured at any site in 2017. Common Carp and Western Mosquitofish were each collected at one site in 2017, but not captured at any site in 2008. Green Sunfish were captured in 2008, but were not captured in 2017. Overall, a low proportion of nonnative fish were captured (0.02%).

Recommendations

The lower section of the Middle Fork Gila River supports fair numbers of native fish and low numbers of nonnatives. The upper section of the Middle Fork Gila River and tributaries should be assessed for native and nonnative fishes.

Work Planned for 2018

- Survey the upper section of the Middle Fork Gila River and perennial tributaries, from above site 9 to the Gilita Creek confluence.

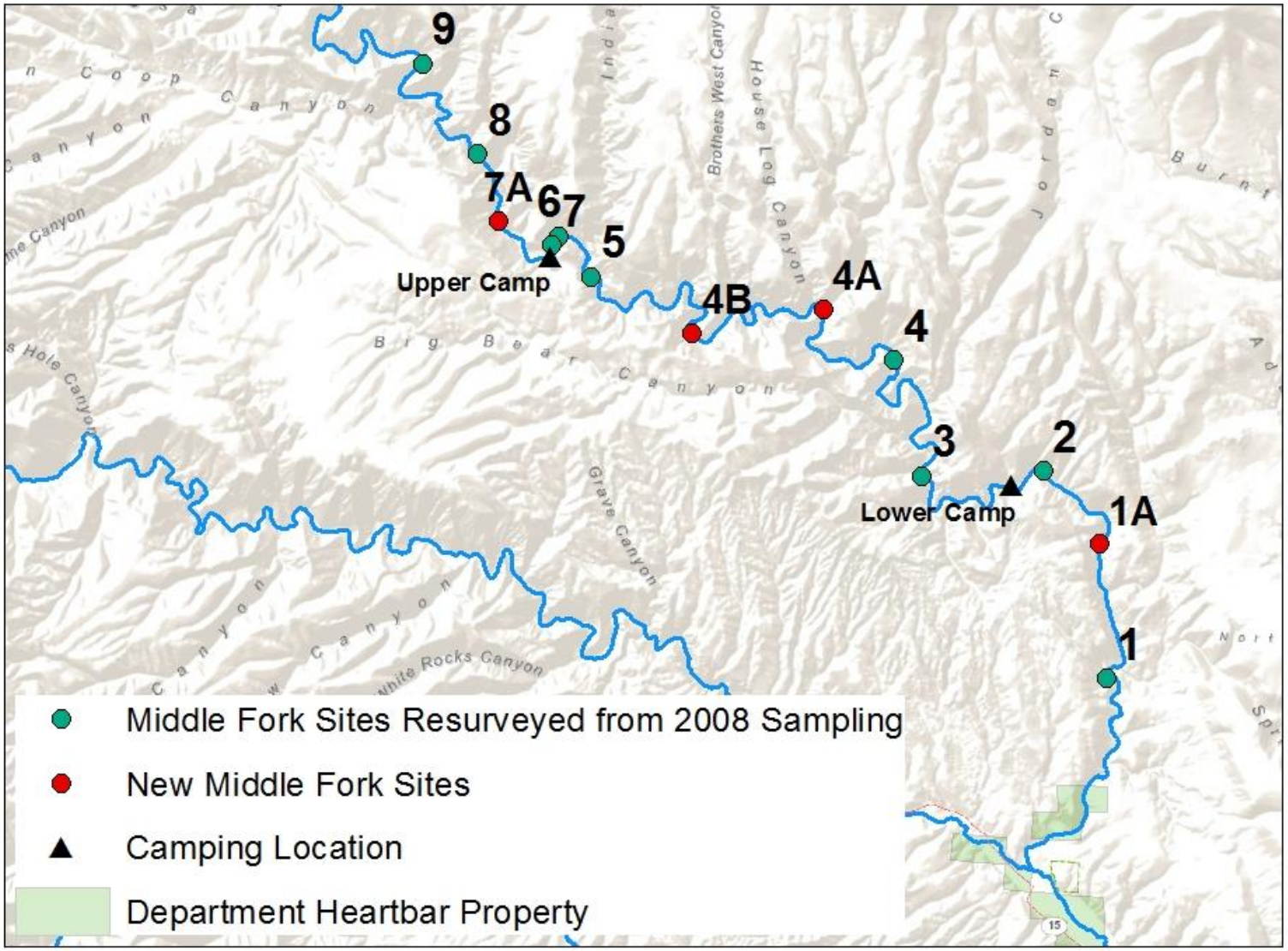

Figure 12. Map of Middle Fork Gila River showing location of sites sampled.

Table 5. Fish species captured in the Middle Fork Gila River in 2008 and 2017 by site. New sites, indicated by asterisks, were only sampled in 2017.

Site	*Loach Minnow*		*Spikedace*		*Roundtail Chub*		*Speckled Dace*		*Longfin Dace*		*Desert Sucker*		*Sonoran Sucker*		*Black Bullhead*		*Yellow Bullhead*		*Smallmouth Bass*		*Western Mosquitofish*		*Common Carp*		*Green Sunfish*		*Rainbow Trout*	
	2008	2017	2008	2017	2008	2017	2008	2017	2008	2017	2008	2017	2008	2017	2008	2017	2008	2017	2008	2017	2008	2017	2008	2017	2008	2017	2008	2017
1		X		X				X		X	X	X	X	X			X					X						
1A*	-	X	-		-		-	X	-	X	-	X	-	X	-	X	-	X	-		-		-		-		-	
2		X		X	X	X		X		X	X	X	X	X		X		X	X								X	
3				X	X	X		X		X	X	X	X	X				X									X	
4		X				X	X	X		X	X	X	X	X			X	X		X							X	
4A*	-		-		-		-	X	-	X	-	X	-	X	-		-		-		-		-		-		-	
4B*	-		-		-	X	-	X	-		-	X	-	X	-		-		-		-		-		-		-	
5						X	X	X			X	X	X	X				X									X	
6						X		X				X	X	X	X		X								X			
7					X	X	X	X		X	X	X	X	X				X									X	
7A*	-		-		-	X	-	X	-	X	-	X	-	X	-		-		-		-		-	X	-		-	
8					X	X		X			X	X	X	X													X	
9					X	X	X	X			X	x	X	X					X								X	

Table 6. Total number of individuals captured and density (fish/m2) of all fishes by site.

Site	*Loach Minnow*		*Spikedace*		*Roundtail Chub*		*Speckled Dace*		*Longfin Dace*		*Desert Sucker*		*Sonoran Sucker*		*Black Bullhead*		*Yellow Bullhead*		*Smallmouth Bass*		*Western Mosquitofish*		*Common Carp*	
	# Captured	Density	# Captured	Density	# Captured	Density	# Captured	Density	# Captured	Density	# Captured	Density	# Captured	Density	# Captured	Density	# Captured	Density	# Captured	Density	# Captured	Density	# Captured	Density
1	28	.023	13	.011	0		7	.006	6	.005	25	.021	21	.017	0		0		0		2	.002	0	
1A	29	.037	0		0		14	.018	4	.005	33	.042	43	.055	2	.003	7	.009	0		0		0	
2	17	.028	15	.024	3	.005	12	.020	9	.015	29	.047	67	.109	2	.003	6	.010	0		0		0	
3	0		15	.015	6	.006	20	.020	56	.055	61	.060	39	.039	0		1	.001	0		0		0	
4	8	.018	0		5	.011	40	.088	50	.110	60	.132	32	.070	0		2	.004	2	.004	0		0	
4A	0		0		0		40	.048	1	.001	122	.147	27	.033	0		0		0		0		0	
4B	0		0		8	.011	8	.011	0		27	.037	16	.022	0		0		0		0		0	
5	0		0		7	.007	7	.007	0		81	.083	23	.024	0		3	.003	0		0		0	
6	0		0		1	.001	1	.001			17	.022	16	.020	0		0		0		0		0	
7	0		0		2	.002	9	.010	6	.006	203	.219	102	.110	0		1	.001	0		0		0	
7A	0		0		6	.001	2	.000	13	.003	181	.036	70	.014	0		0		0		0		2	.000
8	0		0		3	.002	2	.002	0		143	.113	15	.011	0		0		0		0		0	
9	0		0		3	.002	1	.000	0		209	.153	74	.054	0		0		0		0		0	

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