

## BLUE RIVER BARRIER MONITORING, 2019



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## Background

Native fishes are declining throughout Arizona, primarily due to deleterious interactions with nonnative aquatic species. One tool used to curtail the decline is the construction of physical stream barriers to impede upstream migration of nonnative fish species. The Bureau of Reclamation (Reclamation) has constructed several barriers on stream sites to protect and conserve endangered and candidate/proposed species including: Loach Minnow *Tiaroga cobitis*, Spikedace *Meda fulgida*, Roundtail Chub *Gila Robusta*, Gila Topminnow *Poeciliopsis occidentalis*, and Gila Chub *Gila Intermedia*, and other aquatic wildlife including amphibians and reptiles. Reclamation is committed to monitoring stream barriers constructed in accordance with requirements related to the Central Arizona Project for a minimum of five years post-construction. The primary purpose of the monitoring is to evaluate the effectiveness of the barriers. Secondly, monitoring will also provide information on the fish/aquatic community of each stream. Funding was provided to the Arizona Fish and Wildlife Conservation Office (AZFWCO) to monitor barrier effectiveness over a 5 year period.

This report details the sixth year of monitoring on the Blue River, including barrier monitoring and sampling and data collection consistent with Arizona Game and Fish Department's annual monitoring efforts on Blue River as a whole. The Blue River is a south flowing tributary to the San Francisco River. The barrier was constructed in 2012 and is located 0.8 kilometers above the confluence with the San Francisco River. After its construction nonnative Channel Catfish *Ictalurus punctatus* and Green Sunfish *Lepomis cyanellus* removal began. The last large bodied, nonnative fish above the barrier was removed in 2016. The purpose of the barrier is to provide nonnative free habitat for Loach Minnow, Spikedace, Roundtail Chub, and other native species (Reclamation 2013).

## Methodology

### *Barrier Monitoring*

On October 29-31 monitoring occurred in Blue River both upstream and downstream of the barrier with ETS Electrofishing Systems ABP-5 backpack electrofisher. Methods roughly followed Marsh (2014), in which an area 200 m upstream and downstream of each barrier is monitored. Due to lack of permanent water immediately above the barrier the upstream site was moved upstream 250 m. Mesohabitat (length of pools, riffles, and runs) was quantified for each sampling reach. The first 25 of each species of fish, except for Spikedace, Loach Minnow, and Roundtail Chub, were measured (in millimeters [mm]) other fish were enumerated. Presence of other aquatic wildlife were noted.

### *Blue River Monitoring*

In addition to barrier monitoring, AZFWCO conducted annual monitoring of Reach 1 in the Blue River which stretches from the barrier upstream to the Pat Mesa Tributary. Annual monitoring in the Blue River followed protocols detailed in the Blue River Monitoring Plan (AZGFD et. al. 2012). Arizona Game and Fish Department divided Reach 1 of the Blue River into 24-200 m backpack electrofishing transects and labeled 22 pools deemed too deep to effectively backpack electrofish (AZGFD et. al. 2012). AZFWCO randomly selected 3-200 meter transects for backpack electrofishing (Table 1; Figure 1). Seven

randomly selected pools were also sampled upstream of the barrier using hoopnets (1 m diameter by 1 m long, with 6 mm mesh).

Transects were delineated by mesohabitat types (run, riffle, pool, and cascade) and electrofishing occurred upstream with one electrofisher and two netters. At the end of each mesohabitat within the transect, fish were identified to species, total length (TL) was measured (millimeters [mm]) and electrofishing seconds (sec) and distance (meters [m]) were recorded before sampling the next mesohabitat. Electrofishing ceased at the end of the 200 m transect.

## Results

Blue River was sampled on October 29 and 30, 2019. The USGS stream gauge at the Juan Miller Crossing USGS recorded a discharge of 2.56 cubic feet per second (cfs) and water was clear with great visibility for backpack electrofishing.

### *Barrier Monitoring*

Macro-habitat for the 200 m downstream transect was predominately comprised of run habitat with the exception of a five meter riffle and a five meter pool that comprised uppermost end of the reach. A total of 494 individuals, five native and two nonnative species, were captured in 1,000 sec of electrofishing (Table 3). No large bodied nonnative fish were captured below the barrier, so no PIT tags were put out. The only nonnative species encountered were Western Mosquitofish *Gambusia affinis* and Red Shiner *Cyprinella lutrensis*.

### *Randomly Selected Transects*

No nonnative species were encountered upstream of the barrier. The furthest downstream transect (2.29 km above the barrier) was comprised of two mesohabitats: approximately 36 m of riffle habitat and 164 m of run habitat (Table 2). A total of 581 fish, including five native species (Roundtail Chub, Spikedace, Longfin Dace *Agosia chrysogaster*, Sonora Sucker *Catostomus insignis*, and Desert Sucker *Catostomus clarki*), were captured in 1,320 sec of electrofishing (Table 3).

The middle transect (3 km above the barrier) was comprised of three mesohabitats: approximately 26 m of pool habitat, 145 m of run habitat, and 29 m of riffle habitat (Table 2). A total of 161 fish were captured in 1,128 sec of electrofishing. The majority of fish captured were Roundtail Chub, Sonora Sucker, Desert Sucker, and Spikedace. Three Loach Minnow were also captured (Table 3).

The furthest upstream transect (3.91 km above the barrier) was comprised of two habitats: approximately 87 m of riffle habitat and 113 m of run habitat (Table 2). A total of 208 fish, including all native species, were captured in 1,746 sec of electrofishing. The majority of fish captured Desert Sucker, Spikedace, Roundtail Chub, and Sonora Sucker. Eleven Loach Minnow were also captured (Table 3).

### *Population Structure*

When combining all sampling, Longfin Dace and Desert Sucker comprised the majority of the catch (Table 4). Sonora Sucker and Spikedace were the next most common species, and Loach Minnow were

the rarest species with only 17 captured. Length frequency histograms indicate that native fish span multiple size classes; suggesting long-term survival and multiple years of recruitment (Table 4; Figure 1).

## **Discussion**

During sampling this year no nonnatives were captured above the barrier. No large bodied nonnatives were captured in the pool below the barrier. However, an opportune removal of channel catfish was completed on October 2nd by Reclamation. There are still concerns about sedimentation deposition on the apron below the barrier and monitoring should continue until this issue is resolved.

An increase in CPUE for all native species occurred between 2018 and 2019 sampling events. Spikedace, Loach Minnow, and Longfin Dace CPUE were also higher in 2019 than in 2017. This year had the highest number of Loach Minnow captured in Reach 1 since sampling began 2012. These increases are likely due to a variety of factors including three years with no nonnative fish present above the barrier and sustained winter flows. Size class structure indicated multiple year classes, as well as successful recruitment and survival in the Blue River. In addition, Arizona Game and Fish Department staff sampled the San Francisco River this year and detected adult Spikedace and Roundtail Chub, indicating that the Blue River is acting as a source population for these species (Robinson, personal communication).

## **Acknowledgements**

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**Table 1. Locations of randomly selected transects and pools for backpack electrofishing and deployment of hoop nets, respectively (NAD83, 12S).**

	<b>Sampling Site</b>	<b>Easting</b>	<b>Northing</b>
<b>Transect</b>	2	668169	3676685
	15	668166	3678367
	21	668461	3678599
<b>Pool</b>	2	667769	3677263
	3	667652	3677321
	7	667496	3677648
	12	667742	3678015
	18	668565	3678515
	21	668212	3679110
	22	668122	3679184

**Table 2. Summary of backpack electrofishing effort and mesohabitat at three randomly selected transects Reach 1 of the Blue River, AZ.**

<b>Transect</b>	<b>Habitat</b>	<b>Seconds</b>	<b>Distance Sampled (m)</b>
2	Run	262	50
	Riffle	44	8
	Run	89	7
	Riffle	108	17
	Run	340	49
	Riffle	59	11
	Run	418	65
	<i>TOTAL</i>	<i>1320</i>	
15	Run	456	113
	Pool	164	26
	Riffle	181	29
	Run	90	32
	<i>TOTAL</i>	<i>891</i>	
21	Run	127	35
	Riffle	138	36
	Run	327	78
	Riffle	264	65
	<i>TOTAL</i>	<i>856</i>	

**Table 3. Summary of fish collected with backpack electrofishing at three randomly selected transects on Reach 1 of the Blue River, AZ. CPUE refers to Catch Per Second of Electrofishing in 1320, 1,128, 1746, and 1000 seconds for transects 2, 15, 20, and downstream respectively. Numbers in parentheses on mean TL refer to minimum and maximum total lengths.**

<b>Transect</b>	<b>Species</b>	<b>Number Collected</b>	<b>CPUE</b>	<b>Mean TL (mm)</b>
2	Roundtail Chub	7	0.005	62.9 (52-78)
	Spikedace	84	0.063	42.3 (23-58)
	Longfin Dace	370	0.280	48.4 (29-77)
	Desert Sucker	12	0.009	94 (32-170)
	Sonora Sucker	108	0.082	73.6 (60-94)
	<i>TOTAL</i>	<i>581</i>	<i>0.440</i>	
15	Longfin Dace	7	0.006	38.7 (31-44)
	Sonora Sucker	45	0.040	111 (42-178)
	Roundtail Chub	50	0.044	87 (33-379)
	Spikedace	21	0.019	41.9 (36-72)
	Desert Sucker	33	0.029	80.1 (42-150)
	Speckled Dace	2	0.002	48 (42-54)
	Loach Minnow	3	0.003	46 (45-47)
<i>TOTAL</i>	<i>77</i>	<i>0.142</i>		
21	Longfin Dace	2	0.001	31 (30-32)
	Sonora Sucker	31	0.018	86.4 (50-150)
	Roundtail Chub	42	0.024	79.6 (37-247)
	Spikedace	43	0.025	45.7 (31-66)
	Desert Sucker	67	0.038	95.9 (50-141)
	Speckled Dace	12	0.007	47.6 (37-64)
	Loach Minnow	11	0.006	50.8 (39-62)
<i>TOTAL</i>	<i>45</i>	<i>0.119</i>		
<b>Downstream</b>	Roundtail Chub	5	0.005	58.4 (44-78)
	Spikedace	44	0.044	37.9 (28-52)
	Longfin Dace	306	0.306	46.5 (27-79)
	Sonora Sucker	79	0.079	73 (53-92)
	Desert Sucker	56	0.056	53.5 (39-104)
	Red Shiner	1	0.001	34
	Mosquitofish	3	0.003	26.3 (19-30)
<i>TOTAL</i>	<i>494</i>	<i>0.494</i>		



**Table 4. Summary of native fish captured across all sampling conducted in Reach 1 of the Blue River, AZ.**

<b>Species</b>	<b>Number Collected</b>	<b>Relative Abundance</b>	<b>Mean TL (mm)</b>	<b>Minimum TL (mm)</b>	<b>Maximum TL (mm)</b>
Longfin Dace	379	0.31	47.4	29	77
Sonora Sucker	279	0.23	111.1	42	1157
Roundtail Chub	230	0.19	96.9	33	379
Spikedace	148	0.12	43.7	23	66
Desert Sucker	123	0.10	87.9	42	152
Speckled Dace	14	0.01	47.6	37	64
Loach Minnow	14	0.01	49.8	39	62
<b>TOTAL</b>	<b>1,226</b>				

**Table 5. CPUE data collected on the Blue River barrier over five years. Data were derived from Marsh et. al. (2012), Marsh et. al. (2013), Marsh et. al. (2014), Ehlo et al. (2017), and Ehlo (2018) respectively. CPUE refers to Catch Per Second of Electrofishing. \*Denotes a native species.**

	<b>Species</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
<b>Upstream</b>	Fathead Minnow	0.238	0.013	0.022			
	Green Sunfish	0.019	0.001				
	Red Shiner			0.002			
	Longfin Dace*	0.032	0.193	0.261	0.069	0.013	0.090
	Speckled Dace*				0.085	0.0002	0.003
	Spikedace*				0.024	0.002	0.035
	Loach Minnow*				0.001	0.0002	0.003
	Sonora Sucker*		0.003	0.009	0.06	0.007	0.044
	Desert Sucker*			0.035	0.083	0.006	0.027
	Roundtail Chub*			0.005	0.051	0.002	0.024
<b>Downstream</b>	Red Shiner			0.002	0.028		0.001
	Channel Catfish			0.004	0.005	0.003	
	Yellow Bullhead	0.031		0.006			
	Fathead Minnow	0.133			0.001		
	Green Sunfish	0.036			0.001		
	Western Mosquitofish	0.077					0.003
	Longfin Dace*	0.02	0.014	0.048	0.029	0.022	0.306
	Speckled Dace*		0.008		0.002		
	Spikedace						0.044
	Desert Sucker*			0.002	0.007	0.002	0.056
	Sonora Sucker*				0.003		0.079
<b>TOTAL</b>		<b>0.050</b>	<b>0.060</b>	<b>0.110</b>	<b>0.100</b>	<b>0.031</b>	

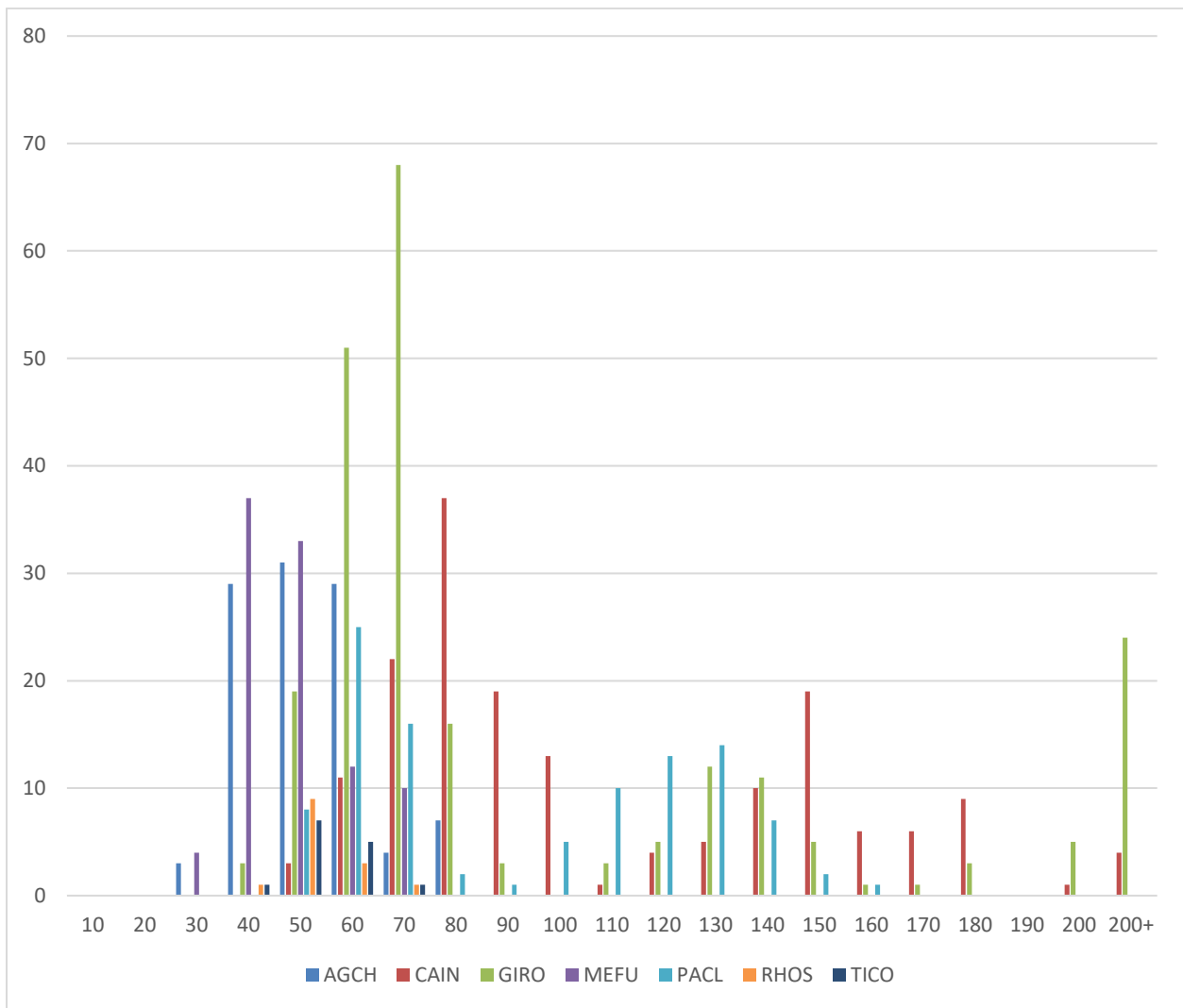


Figure 1. Length-frequency histogram of fish captured in the Blue River, AZ.

**Appendix. List of PIT Tags in nonnative fish below the Blue River Barrier.**

<b>Species</b>	<b>TL</b>	<b>PIT tags</b>
Channel Catfish	390	3DD.003C0228C5
Channel Catfish	340	3DD.003C0228AD
Channel Catfish	365	3DD.003C0228D8
Channel Catfish	90	3DD.003C0228D7