Barrier Monitoring 2021: West Fork Black River

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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 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*, Gila Topminnow *Poeciliopsis occidentalis*, Roundtail Chub *Gila Robusta*, 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. Secondarily, monitoring will also provide information on the fish and aquatic community of each stream. Funding was provided to the Arizona Fish and Wildlife Conservation Office to monitor barrier effectiveness over a 5-year period. This report details the fourth year of monitoring on the West Fork Black River barrier (WFB). Barrier monitoring was previously conducted in 2017, 2019, and 2020 (Ehlo 2017; Love-Chezem and Ehlo 2019; Love-Chezem and Ehlo 2020) but not in 2018. Constructed in May 2016, the barrier on the WFB is located 0.6 kilometers above the confluence with the East Fork Black River. The purpose of the barrier is to provide nonnative free habitat for native Apache Trout *Oncorhynchus apache* and Loach Minnow among other native species. The waters above the barrier have yet to be renovated of nonnative fish, but a baseline survey is important in establishing the fish community structure pre- and post-renovation both upstream and downstream of the barrier.

Methodology

West Fork Black River annual monitoring was conducted August 24-26, 2021. Monitoring upstream and downstream of the barrier was conducted with a ETS ABP4 backpack electrofisher. Methods roughly followed Marsh (2014), in which 200 m upstream and downstream of the barrier was sampled. Two pools, one above the barrier and one below the barrier, were sampled using two hoopnets overnight and an antenna in each for the full sampling period, these pools are deep and hard to effectively electrofish.

Mesohabitat length was quantified for each sampling reach. Total length (TL) of the first 50 fish in each reach were measured to the nearest mm, fish were enumerated after that. All nonnative species and Roundtail Chub captured below the barrier had a 134.5 kHz Passive Integrated Transponder (PIT) tag inserted. All nonnative fish captured were scanned with a handheld scanner (BioMark HPRLite). Nonnative fish captured above the barrier were euthanized. Other aquatic wildlife was also noted.

In addition to the normal sampling, pool habitat was sampled downstream to the confluence with the Black River to increase the number of PIT tags deployed in the system.

Results

Downstream efforts

Habitat within the downstream site was primarily composed of runs with less than 1 m total of riffles interspersed. Near the upstream end of the site there were two pools separated by a short 10 m run. The lower pool was 1 m deep and 10 m long. The pool immediately below the barrier, at the most upstream end of the site, was approximately 2 m deep and 30 m long. Electrofishing efforts totaled 4,291 seconds with a total of 3 Brown Trout *Salmo trutta*, 62 Speckled Dace, 18 Desert Sucker *Catostomus clarkii*, and 18 Roundtail Chub captured (Table 1). Desert Sucker, Speckled Dace, and one Apache Trout (Figure 1) were captured in hoopnetting efforts downstream of the barrier (Table 2). All native fish were measured and returned to the water. Brown Trout were measured, implanted with a PIT tag (if large enough and in good condition), and returned to the water. One Brown Trout was released before the PIT tag was read.

No PIT tagged fish were detected on remote PIT tag antennas during the 48 hours of deployment.

Upstream efforts

The 200 m upstream transect began at the top of the 100 m long pool immediately upstream of the barrier. The entire 200 m was comprised of run habitat. Electrofishing efforts totaled 1,995 seconds with a total of 2 Brown Trout, 116 Speckled Dace, and 4 Desert Sucker being captured (Table 1). Only Speckled Dace were captured in hoopnets upstream of the barrier (Table 2). All Brown Trout captured above the barrier were euthanized.

No Brown Trout, captured upstream or downstream, had PIT tags, and no fish were detected on remote PIT tag antennas during the 48 hours of deployment.

Table 1. Summary of fish captured during backpack electrofishing efforts in West Fork Black River, upstream and downstream of the fish barrier.

Site	Species	Number Collected	CPUE (fish/sec)	Mean TL (range)
Downstream	Desert Sucker	8	0.004	115 (89-167)
	Speckled Dace	43	0.021	-
	Roundtail Chub	4	0.002	133 (114-186)
	Brown Trout	1	0.0004	286
	Total	56	0.027	-
Upstream	Desert Sucker	4	0.002	82 (80-85)
	Speckled Dace	116	0.058	54 (30-89)
	Brown Trout	2	0.001	205 (90-320)
	Total	122	0.061	-

Figure 1. Comparing Sonora and Desert suckers, and an Apache Trout captured during surveys on the West Fork Black River.

Table 2. Summary of fish captured during hoopnetting efforts in West Fork Black River, upstream and downstream of the fish barrier.

Site	Species	Number Collected	CPUE (fish/hr)	Mean TL (range)
Downstream	Desert Sucker	4	0.11	309 (241-375)
	Speckled Dace	7	0.19	67 (52-80)
	Apache Trout	1	0.03	240
	Total	12	0.32	-
Upstream	Speckled Dace	8	0.02	-
	Total	8	0.02	-

Population Structure

Mean length of Roundtail Chub was 133 mm with all individuals between 100-200, appearing to represent one year class (Figure 1). Desert Sucker have a wider range of sizes and appear to be from three-year classes; with 40% from the 0 – 100 mm size range (Figure 1; Table 1). A similar trend was seen with Brown Trout, with individual appearing to represent three separate year classes and ranging from 90 mm to 320 mm (Figure 2; Table 1). Speckled Dace had lengths between 30 mm and 89 mm; however, no Speckled Dace were measured in the downstream site (Table 1).

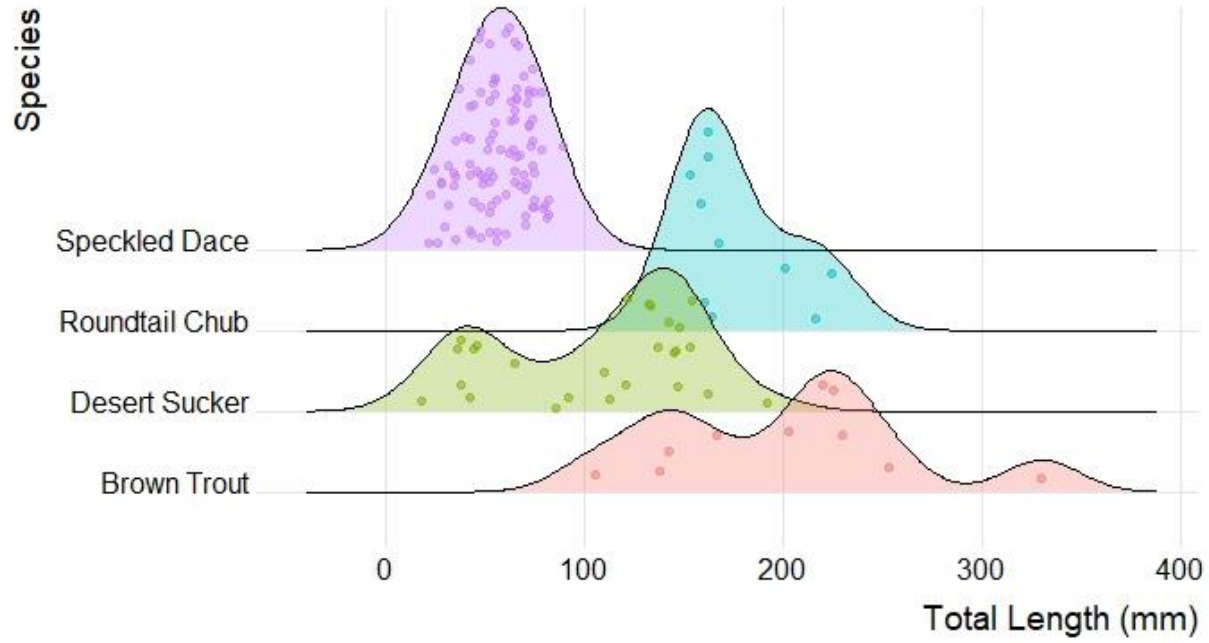

Figure 2. Length-frequency histogram of fish species captured during barrier monitoring on West Fork Black River, AZ. The dots represent individuals, and the curves represent frequency distributions. *Sonora Sucker and Apache Trout were captured but not enough individuals were captured to include on this graph.

Discussion

In 2021, catch rates were lower in the upstream reach as compared to previous years. Speckled Dace and Roundtail Chub CPUE increased in the downstream site and Desert Sucker remained the same. One Apache Trout was captured in a hoop net below the barrier. There was evidence of recent flow event that could have moved fish out of upstream site thus reducing numbers. Mean length of fish increased since the previous year also suggesting that smaller fish may have been moved downstream by high flows. Speckled Dace remained the most common species captured in both sites, and Virile Crayfish *Faxonius virilis* were present in low numbers both above and below the barrier.

No tagged Brown Trout were captured above the barrier, or anywhere within the sample reach by traditional methods or by using antennas to detect tagged fish. Only three Brown Trout were captured during sampling this year; as a result, supplementary sites were again sampled below the barrier to increase the number of tags in the system. Only a single Brown Trout was captured and tagged in these supplemental efforts. In addition, three Roundtail Chub captured below the barrier were tagged. Any tagged fish from this year and previous sampling captured above the barrier in the future would indicate the barrier is ineffective at preventing upstream movement of fish.

Appendix. List of PIT Tags inserted into Brown Trout *Salmo trutta* below the West Fork Black River Barrier.

Species	TL (mm)	PIT Tag Number
2017		
Brown Trout	262	3DD.003C0228C0
Brown Trout	282	3DD.003C0228D9
Brown Trout	260	3DD.003C0228C3
Brown Trout	233	3DD.003C0228BC
Brown Trout	208	3DD.003C022895
Brown Trout	171	3DD.003C0228C1
Brown Trout	202	3DD.003C0228D6
Brown Trout	204	3DD.003C0228A7
Brown Trout	180	3DD.003C02288E
Brown Trout	180	3DD.003C022885
Brown Trout	204	3DD.003C02289A
Brown Trout	120	3DD.003C0228CF
Brown Trout	178	3DD.003C0228B8
Brown Trout	112	3DD.003C0228C9
Brown Trout	115	3DD.003C0228E0
Brown Trout	137	3DD.003C0228BD
Brown Trout	120	3DD.003C0228BA
Brown Trout	305	3DD.003C0228CB
Brown Trout	385	3DD.003C0228B2
Brown Trout	208	3DD.003C0228AB
Brown Trout	288	3DD.003C0228D5
Brown Trout	260	3DD.003C022886
Brown Trout	410	3DD.003C0228B9
Brown Trout	256	3DD.003C0228B5
2019		
Brown Trout	365	3DD.003C0228F2
Brown Trout	233	3DD.003C0228F4
Brown Trout	474	3DD.003C0228F5
Brown Trout	193	3DD.003C02290B
Brown Trout	282	3DD.003C02291F
Brown Trout	178	3DD.003C022927
Brown Trout	172	3DD.003C02292A
Brown Trout	156	3DD.003C02292C
Brown Trout	217	3DD.003C022930
Brown Trout	142	3DD.003C022936
Brown Trout	361	3DD.003C022938
Brown Trout	169	3DD.003C02293C

Brown Trout	175	3DD.003C022943
Brown Trout	455	3DD.003C022949
Brown Trout	202	3DD.003C02294A
Brown Trout	310	3DD.003C02293B
Brown Trout	158	Not Scanned
2020		
Roundtail Chub	160	3DD.003C0228F0
Roundtail Chub	162	3DD.003C0228FA
Roundtail Chub	164	3DD.003C0228FB
Roundtail Chub	224	3DD.003C022905
Roundtail Chub	162	3DD.003C022913
Roundtail Chub	201	3DD.003C022920
Roundtail Chub	153	3DD.003C02292B
Roundtail Chub	162	3DD.003C02292E
Roundtail Chub	139	3DD.003C022937
Roundtail Chub	159	3DD.003C022942
Roundtail Chub	216	3DD.003C022947
Rainbow Trout	303	3DD.003C022935
Brown Trout	212	3DD.003C02226
Brown Trout	230	3DD.003C0228EA
Brown Trout	253	3DD.003C0228EF
Brown Trout	330	3DD.003C0228F6
Brown Trout	167	3DD.003C0228F7
Brown Trout	203	3DD.003C0228F8
Brown Trout	138	3DD.003C022900
Brown Trout	142	3DD.003C022904
Brown Trout	264	3DD.003C022906
Brown Trout	225	3DD.003C022940
2021		
Brown Trout	320	3DD.003C022840
Brown Trout	176	3DD.003C02284B
Roundtail Chub	123	3DD.003C022855
Roundtail Chub	125	3DD.003C022825
Brown Trout	286	3DD.003C022846
Roundtail Chub	186	3DD.003C022850
Apache Trout	240	3DD.003C02282B

Literature Cited

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