

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2022 ANNUAL REPORT

PROJECT: 140

Project Title:

Evaluating effects of non-native predator removal on native fishes in the Yampa River, Colorado

Bureau of Reclamation Agreement Number:

R19AP00058

Project/Grant Period:

Start date: 10/01/2018

End date: 09/30/2023

Reporting period end date: 09/30/2022

Is this the final report? No

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Abstract:

Control actions for several non-native fish predators have been implemented in rivers of the Upper Colorado River Basin. Understanding the response of the native fish community to predator removal is needed to determine if removal programs are having the desired effect. The objective of this project is to document fish community changes in response to predaceous fish removals in annually varying environmental conditions in a reach of the Yampa River, Colorado. Native species richness increased during the removal period compared to early sampling (2003-2004) conducted in this project, as has native species frequency and abundance. Increases were particularly notable in higher flow years when water temperatures were cooler and smallmouth bass were fewer. We provide summary data for 2022 here but a more complete version will be provided when data analyses are more complete. Data will also be incorporated into a comprehensive summary which will be completed in 2023.

Study Schedule:

Ongoing as needed, agreement extends through September 2023.

Relationship to RIPRAP:

REDUCE NEGATIVE IMPACTS OF NONNATIVE FISHES AND SPORTFISH MANAGEMENT ACTIVITIES (NONNATIVE AND SPORTFISH MANAGEMENT)

Green River Action Plan: Yampa and Little Snake Rivers

III.A.1. Implement Yampa Basin aquatic wildlife management plan to develop nonnative fish control programs in reaches of the Yampa River occupied by endangered fishes. Each control activity will be evaluated for effectiveness and then continued as needed.

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Green River Action Plan: Mainstem

III. Reduce negative impacts of nonnative fishes and sportfish management activities (Nonnative and sportfish management)

III.A.2.c Evaluate the effectiveness (e.g., nonnative and native fish response) and develop and implement an integrated, viable active control program.

Accomplishment of FY 2022 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

In 2022, flows were relatively low in the study area and water temperatures warmed early in the year, but not as early as in extreme low flows years including 2007 and 2021 (Figure 1). The 2022 flows and water temperatures were more similar to 2020, but were different than the high and cold flow year of 2011. A typical fish response in a warm and relatively low flow year is reduced native fish abundance and corresponding higher smallmouth bass abundance, with especially higher smallmouth bass growth rates.

In 2022, we sampled 159 locations in the Little Yampa Canyon reach (river miles 120-100) distributed among control (n = 58) and treatment (YOY smallmouth bass removal reaches; n = 72) reaches in the Yampa River study area, as well as 29 samples from isolated pools. An additional six samples were from the lower Yampa River near Deerlodge Park (river mile 46). Because we only finished sampling in October this year, data have not been fully analyzed but will be summarized here and included in the comprehensive report where data for all years will be examined.

In all samples, we captured 28,278 fish compared to 61,163 fish in the lower flow and warmer 2021. Native fishes were captured in each of the control and treatment reaches in 2022, as well as in isolated pool samples (Tables 1-4). Native species speckled dace, bluehead sucker, roundtail chub, flannelmouth sucker (only at Deerlodge), and mottled sculpin were captured; mountain whitefish have not been observed since 2020. Speckled dace were, by far, the most abundant native fish taxon captured (n = 819, 2.9% of all fishes), and were modestly abundant in the control reach (4.4% of all fishes) but comprised < 1% of all fishes captured in the treatment reach and in isolated pools. This was similar to in 2021, but unlike in 2020, where native fishes were relatively abundant and comprised over 11% of all fish captured in all reaches. The relatively high native fish abundances we observed in 2020 are atypical for that relatively low flow and warm year; 2022 and 2021 were more typical of the fish community.

Native fishes were most abundant in the control reach, and comprised 4.7% of the fish community. Smallmouth bass was the most abundant species in the control reach (52.1%); fathead minnow was 19.6% of the fish community. Native fishes were rarer in the treatment reach (2.6% of the total) and smallmouth bass (38.2%), black bullhead (18.6%), and white sucker (11.8%) were the most abundant taxa. Speckled dace, bluehead sucker, and roundtail chub were also present in the treatment reach, albeit, low in numbers (196 total specimens), and mottled sculpin was not found.

The juxtaposition of % fish abundances in control and treatment reaches—lower native fish abundance in the treatment reach where bass were removed—does not meet expectations. On the other hand, it may be a reasonable expectation given the much higher abundance of bass in the treatment section. These issues deserve additional discussion in the future after the data are more fully analyzed and compared.

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Native fishes were relatively rare in isolated pool samples, at only 2.5% of the total number captured and all were speckled dace. Smallmouth bass were similarly rare in the 29 pools sampled.

Additional future analyses will incorporate sampling effort, which may explain differences in species composition among control and treatment reaches. This is because more sampling occurred in the treatment reach than in the control reach.

We also completed sampling in the White River in 2022 (Table 5), adding to data collected in 2018-2021. Juvenile smallmouth bass were relatively abundant in 2018, the year of a flushing flow from Kenney Reservoir, but declined slightly in 2019. Further apparent reductions in bass abundance in 2020 and 2021 may have been due to altered habitat, where bass were observed escaping to a large and deep pool at the upstream portion of the site that could not be sampled efficiently. The 2020 smallmouth bass captured were relatively large with a mean length of 92 mm TL (64-117 mm TL), while 2021 bass were slightly smaller in August (mean TL = 83 mm, 65-98) but grew to 93 mm TL in October (65-124 mm). The limited sampling in 2022 showed the highest juvenile bass abundance ever at 319 fish/hr sampling; mean TL of those individuals (batches of samples not included) was relatively low at 77 mm (59-97 mm).

Recommendations:

Complete summary of data in 2022 regarding the native fish response evaluation in a comprehensive report.

Continue sampling in 2023 and out years. The reduced level of effort due to funding cuts employed in 2020-2022 was effective, and a relatively large number of samples were gathered which was made possible due to reduced data collection on individual fishes (below). Sampling each year maintains the continuity of the data to capture fish response in a variety of flow and water temperature conditions as well as their response to predator removal.

Project Status:

This project was completed with about 70% of the normal budget in 2022. This was accomplished by streamlining data collection, which was mainly collecting fewer measures of individual fish and sampling more treatment reach sites that are more accessible, so that more sites could be sampled.

Ongoing and on-track.

FY 2022 Budget Status

Funds Provided: \$68,278

Funds Expended: 67,515

Difference: 0

Percent of the FY 2022 work completed, and projected costs to complete: >95% completed, no new funds needed to complete.

Recovery Program funds spent for publication charges: 0

Status of Data Submission NA

Signed: Principal Investigator: Kevin R. Bestgen

Date: 12 Jan. 2023

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Table 1. Species composition of native and nonnative fishes captured in the Yampa River, 2022, in the control reach (no young smallmouth bass removed).

Control Reach (River miles 112-124)-58 samples		
	Number	Percent
<i>Non-natives</i>	fish	(%)
Brown Trout	1	0.0
Brook Stickleback	16	0.2
Creek Chub	646	9.3
Fathead Minnow	1,364	19.6
Green Sunfish	123	1.8
Iowa Darter	47	0.7
Northern Pike	6	0.1
Redside Shiner	9	0.1
Smallmouth Bass	3,619	52.1
Sand Shiner	319	4.6
White Sucker	483	7.0
Total	6,633	95.3
<i>Natives</i>		
Mottled Sculpin	11	0.2
Speckled Dace	304	4.4
Total	315	4.7
Grand Total	6,948	100

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Table 2. Species composition of native and nonnative fishes captured in the Yampa River, 2022, in the treatment reach (young smallmouth bass removed).

Treatment Reach (River miles 100-112)-72 samples		
	Number fish	Percent (%)
<i><u>Non-natives</u></i>		
Black bullhead	1,505	18.6
Black Crappie	1	0.0
Brook Stickleback	92	1.1
Creek Chub	795	9.8
Fathead Minnow	716	8.9
Green Sunfish	156	1.9
Iowa Darter	14	0.2
Northern Pike	14	0.2
Redside Shiner	7	0.1
Smallmouth Bass	3,086	38.2
Sand Shiner	539	6.7
White Sucker x Bluehead Sucker	1	0.0
White Sucker	951	11.8
Total	7,877	97.4
<i><u>Natives</u></i>		
Bluehead Sucker	4	0.0
Roundtail Chub	1	0.0
Speckled Dace	191	2.4
Total	196	2.6
Grand Total	8,073	100

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Table 3. Species composition of native and nonnative fishes captured in the Yampa River, 2022, in isolated pools.

Isolated Pools Species Composition (River miles 100-124)-29 samples		
<u>Non-natives</u>	Number fish	Percent (%)
Black bullhead	7,577	60.4
Brook Stickleback	238	1.9
Common Carp	1	0.0
Creek Chub	500	4.0
Fathead Minnow	3,059	24.4
Green Sunfish	10	0.1
Iowa Darter	19	0.2
Redside Shiner	2	0.0
Smallmouth Bass	317	2.5
Sand Shiner	124	1.0
White Sucker x Bluehead Sucker	1	0.0
White Sucker x Flannelmouth Sucker	1	0.0
White Sucker	388	3.1
Total	12,237	97.5
<u>Natives</u>		
Speckled Dace	317	2.5
Total	317	2.6
Grand Total	12,554	100

Table 4. Species composition of native and nonnative fishes captured in the Yampa River, 2022, in Deerlodge Park.

Deerlodge (River mile 46)-6 samples		
	Number fish	Percent (%)
<u>Non-natives</u>		
Fathead Minnow	2	0.3
Green Sunfish	1	0.1
Plains Killifish	19	2.7
Red Shiner	172	24.5
Smallmouth Bass	181	25.7
Sand Shiner	223	31.7
White Sucker	100	14.2
Total	698	99.1
<u>Natives</u>		
Flannelmouth Sucker	2	0.3
Roundtail Chub	3	0.4
Total	5	0.9
Grand Total	703	100

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Table 5. Results for White River smallmouth bass sampling in 2018-2022. SMB = smallmouth bass, CSU = Colorado State University. The catch per unit effort (CPUE) data were electric-seining conducted just downstream of Kenney Reservoir, near Rangely, Colorado. The first two passes in 2018 bracket a flushing flow event (90 minutes, 1,100 ft³/sec) from Kenney Reservoir on 19 July.

2018

Pass	Sampling Period	Agency	Effort (hrs)	Number of SMB				CPUE (#fish/hr)			
				Juv	Sub-adult	Adult	All sizes	Juv	Sub-adult	Adult	All sizes
1	10-Jul	CSU	1.48	95	76	1	172	64.2	51.4	0.7	116.2
2	24-Jul	CSU	1.29	110	44	3	157	85.3	34.1	2.3	121.7
3	21-Aug	CSU	1.44	98	6	2	106	68.1	4.2	1.4	73.6
4	3-Oct	CSU	1.22	286	15	2	303	234.4	12.3	1.6	248.4
			5.43	589	141	8	738	108.5	26.0	1.5	135.9

2019

Pass	Sampling Period	Agency	Effort (hrs)	Number of SMB				CPUE (#fish/hr)			
				Juv	Sub-adult	Adult	All sizes	Juv	Sub-adult	Adult	All sizes
1	23-Aug	CSU	2.1	185	30	1	216	88.1	14.3	0.5	102.9

2020

Pass	Sampling Period	Agency	Effort (hrs)	Number of SMB				CPUE (#fish/hr)			
				Juv	Sub-adult	Adult	All sizes	Juv	Sub-adult	Adult	All sizes
1	9/29/2020	CSU	2.16	161	27	0	188	75	13	0	87

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Table 5 continued.

2021

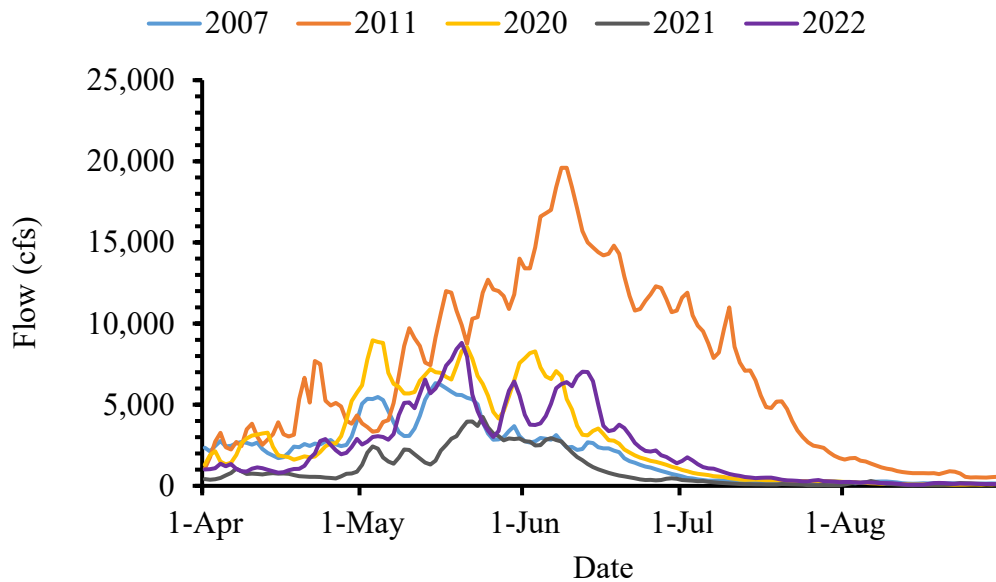
Pass	Sampling		Effort (hrs)	Number of fish				CPUE (#fish/hr)			
	Period	Agency		Juvenile	Sub- adult	Adult	All	Juvenile	Sub- adult	Adult	All
1	10- Aug	CSU- LFL	1.04	70	13	3	86	67.3	12.5	2.9	82.7
2	9-Oct	CSU- LFL	1.23	47	50	2	99	38.2	40.7	1.6	80.5
Total			2.27	117	63	5	185	51.5	27.8	2.2	81.5

2022

Pass	Sampling		Effort (hrs)	Number of fish				CPUE (#fish/hr)			
	Period	Agency		Juv.	Sub- adult	Adult	All sizes	Juv.	Sub- adult	Adult	All sizes
1	13- Sep	LFL	0.85	271	33	4	308	318.8	38.8	4.7	362.4

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A.



B.

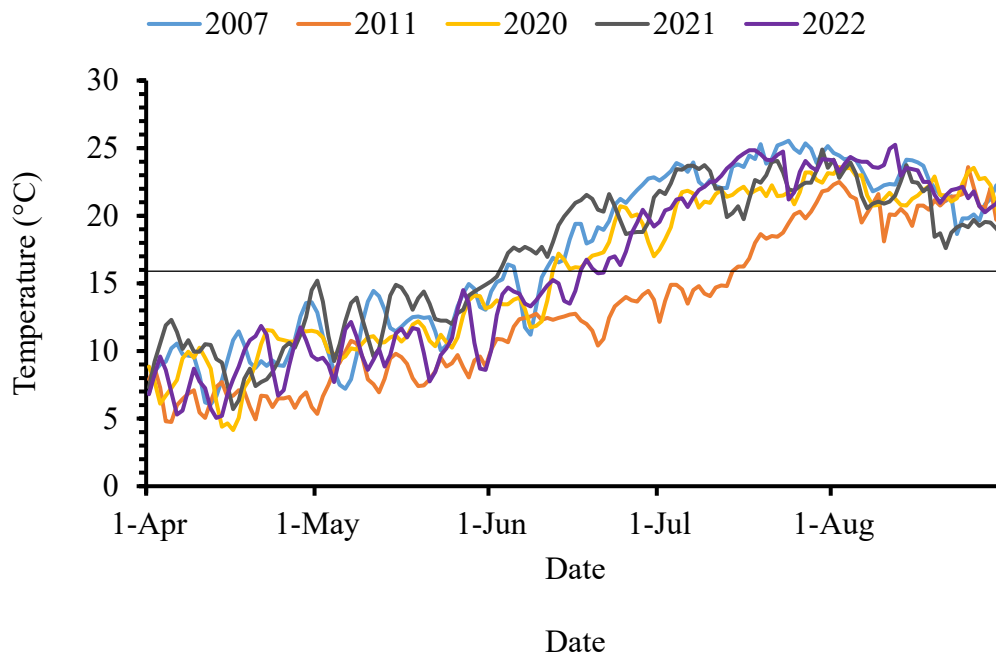


Figure 1. Flow (upper, Panel A) and water temperature (lower, Panel B) regimes for the Yampa River in 2022, at the Maybell Gauge (U.S. Geological Survey gauge 925100). Low flow and warm years (2007, 2021), a high flow and cold year (2011), and similar years 2020 and 2022 are shown for comparison. The dashed vertical line indicates the temperature level (16°C) often associated with smallmouth bass first reproduction.