

# UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2022 ANNUAL REPORT

PROJECT: 123b

## **Project Title**

Nonnative fish control in the middle Green River

## **Bureau of Reclamation Agreement Number**

R14AP00059

## **Project/Grant Period**

Start date: 08/19/2019

End date: 09/30/2023

Reporting period end date: 09/30/2022

Is this the final report? Yes  No

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## **Abstract**

The purpose of this project is to remove nonnative fish species from the upper Colorado River basin that negatively impact the recovery of endangered native fishes through predation, competition, and hybridization. Targeted removal of Northern Pike (*Esox lucius*), Walleye (*Sander vitreus*), and White Sucker (*Catostomus commersonii*) occur in springtime utilizing boat electrofishing and fyke-netting in backwaters, tributaries, and main channel habitats. However, Colorado Pikeminnow (*Ptychocheilus lucius*) abundance estimates was our 2022 spring priority over targeted nonnative removal; nonnatives captured during these estimates are included in this report. Summer electrofishing for Smallmouth Bass (*Micropterus dolomieu*) in the middle Green River took place as usual, but at reduced levels due to staffing shortages and reallocation of effort to Desolation Canyon. Overall, in 2022 we removed 22 Northern Pike, 16 Walleye, 623 White Sucker, and 1,883 Smallmouth Bass from the middle Green River. Catch rates for all nonnatives decreased in 2022 compared to previous years, but similar trends were observed.

## **Study Schedule**

2004-Ongoing

# UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

## **Relationship to RIPRAP**

### GENERAL RECOVERY PROGRAM SUPPORT ACTION PLAN

- III. Reduce negative impacts of nonnative fishes and sportfish management activities (nonnative and sportfish management).
- III.A. Reduce negative interactions between nonnative and endangered fishes.
- III.A.2. Identify and implement viable active control measures.
- III.A.2.c. Evaluate the effectiveness (e.g., nonnative and native fish response), develop, implement, and integrate a viable active control program.

### GREEN RIVER ACTION PLAN: MAINSTEM

- III. Reduce impacts of nonnative fishes and sportfish management activities (nonnative and sportfish management).
- III.A. Reduce negative impacts to endangered fishes from sportfish management activities.
- III.A.4. Develop and implement control programs for nonnative fishes in river reaches occupied by the endangered fishes to identify required levels of control. Each control activity will be evaluated for effectiveness, and then continued as needed.
- III.A.4.a. Northern pike in the middle Green River.
- III.A.4.b. (3) Smallmouth bass in the middle and lower Green River.
- III.A.4.d. Walleye in the middle and lower Green River.

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

### Task 1. Northern Pike, White Sucker, and Walleye removal

Several strategies are utilized to remove these nonnative fishes during spring sampling. Methods include Jon boat electrofishing in main channel, tributary, and backwater habitats as well as fyke-netting in tributary and backwater areas. Tributary electrofishing to target Northern Pike (*Esox lucius*) and White Sucker (*Catostomus commersonii*) took place from 26 May to 22 June 2022 targeting Ashley Creek (river mile [RM] 299.0), Stewart Lake drain (RM 299.2), and Brush Creek (RM 304.6), comprising two hours of effort (Table 1). Fyke-netting in backwaters and tributaries to target Northern Pike and White Sucker took place from 21-22 June 2022 with a total of three overnight sets. Fyke-netting targeted the same sites as tributary electrofishing (listed above). Main channel electrofishing targeting Walleye (*Sander vitreus*) did not occur in spring of 2022, because Colorado Pikeminnow (*Ptychocheilus lucius*) abundance estimates (Project #128) were our priority. However, a notable amount of Walleye were removed during Project #128 (Table 1) from 04 April to 26 May 2022 encompassing 198 hours of electrofishing effort.

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### *Northern Pike*

A total of 22 Northern Pike were captured in 2022 in the middle Green River (RM 319.3-206.8): one during fyke-netting, 10 during Colorado Pikeminnow sampling, four during targeted Smallmouth Bass (*Micropterus dolomieu*) removal (see below), and seven during tributary electrofishing (Table 1). Size distribution was skewed towards larger individuals; all 22 Northern Pike were adults ( $\geq 300$  mm total length [TL]) and considered piscivores ( $\geq 375$  mm TL). The majority of Northern Pike were captured during electrofishing targeting Colorado Pikeminnow, with tributary electrofishing at a close second. This differs from previous years when fyke-netting and backwater electrofishing catch rates were highest (Partlow et al. 2020 and 2021). This is largely due to minimal effort in tributary areas while Colorado Pikeminnow sampling was a priority for spring sampling efforts.

### *Walleye*

In the middle Green River, 16 Walleye were captured in 2022. All but one was captured during Colorado Pikeminnow sampling (Table 1). That individual was caught during Smallmouth Bass removal in early summer. This year we removed two ripe males and no ripe females. Both males were captured near RM 250. No spawning or reproductive activity was noted this year; however, it has been observed in past years in Dinosaur National Monument between RM 319-315.8 which is upstream from where these ripe males were captured (Schelly et al. 2015). Walleye were captured from just upstream of Razorback Bar (RM 311.4) to Sand Wash (RM 216). Walleye size distribution was skewed toward larger individuals with all 16 fish in the adult and piscivore size classes ( $\geq 300$  mm TL and  $\geq 350$  mm TL, respectively; Table 1). Sub-adult and juvenile Walleye were not encountered in the middle Green River in 2022.

### *White Sucker*

In 2022, we removed a total of 623 White Suckers, a noticeable decrease from 2021, 2020 and 2019 (956, 1,021, and 1,037, respectively; Partlow et al. 2019, 2020, and 2021). Historically, targeting tributaries and backwaters for White Sucker has produced high catch rates (Skorupski et al. 2013). Electrofishing in tributaries and backwaters in 2022 produced a catch-per-unit-effort (CPUE) of 11 fish/hour, compared to 1.29 and 2.73 fish/hour for Colorado Pikeminnow sampling and targeted Smallmouth Bass removal, respectively (Table 1). Combining all sampling methods, an additional four White Sucker x Flannelmouth Sucker (*Catostomus latipinnis*) hybrids were captured along with four White Sucker x Bluehead Sucker (*C. discobolus*) hybrids (Table 2). White Sucker size distribution was skewed towards smaller individuals again in 2022 (mean TL = 183 mm, range = 72-440 mm). In southwestern Missouri, White Suckers become mature around 275 mm (Wakefield and Beckman 2005). Therefore, our goal for removing White Suckers is to reduce the proportion of the population  $\geq 275$  mm TL. In 2022, only 10.9% of White Suckers removed ( $n = 68$ ) were  $\geq 275$  mm TL.

### Task 2. Smallmouth Bass removal

Targeted Smallmouth Bass removal occurred from 27 June to 14 September 2022. The onset of Smallmouth Bass removal is typically determined by timing of flows, with a transition of the targeted species from Walleye, White Sucker, and Northern Pike to Smallmouth Bass when flows recede below 10,000 cubic feet/second (cfs). This year flows dropped below 10,000 cfs briefly from 23-27 May 2022 (Figure 1). This window was utilized for White Sucker and Northern Pike targeted removal. Flows in 2022 overall were higher than 2021 when spring peak

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flow did not surpass 10,000 cfs (Partlow et al. 2021). Following high Smallmouth Bass catch rates in Desolation Canyon in 2021 (Smith et al. 2021), principal investigators and the nonnative fish coordinator determined that reallocation of effort from Project #123b to conduct an additional removal pass in Desolation Canyon was warranted in 2022. However, to avoid confusion between projects, all Desolation Canyon removal efforts will be reported under Project #123a and no longer discussed in this report. Additionally, this year we did not participate in efforts to disturb Smallmouth Bass spawning near Island Park (RM 333.9-327.6) as we have in previous years (Partlow et al. 2020 and 2021).

### *Population size structure*

Between Split Mountain boat ramp (RM 319.3) and Tabyago Riffle (RM 206.8), 1,653 Smallmouth Bass were removed during targeted removal (Table 1). Figure 2 displays the size distribution of Smallmouth Bass captured in the middle Green River in 2022 encompassing targeted and non-targeted effort. Sub-adult Smallmouth Bass (100-199 mm TL) constituted the most abundant size class (Figure 3), comprising 59% of the catch ( $n = 1,109$ ). Adult bass ( $\geq 200$  mm TL) comprised 28% ( $n = 531$ ) of Smallmouth Bass removed, while juvenile fish ( $< 100$  mm TL) accounted for 13% ( $n = 243$ ). Of the total 2022 Smallmouth Bass catch, 3.4% ( $n = 65$ ) were in the piscivore size class ( $\geq 325$  mm TL). Average TL of Smallmouth Bass in 2022 encompassing all effort was 172.3 mm, nearly identical to last year (Partlow et al. 2021). Including Smallmouth Bass removed during Colorado Pikeminnow sampling ( $n = 228$ ) and tributary electrofishing ( $n = 2$ ), a total of 1,883 bass were removed in 2022. Smallmouth Bass were not encountered during fyke-netting this year.

### *Catch rate*

A combined CPUE of 12.72 fish/hour during targeted Smallmouth Bass removal is slightly less than 2021 and 2020 (20.73 and 20.88 fish/hour, respectively), but is closer to catch rates in 2019 (10.47 fish/hour; Partlow et al. 2019, 2020, and 2021). In 2022, CPUE for juvenile Smallmouth Bass was 1.85 fish/hour, while CPUE for sub-adult and adult fish was 7.80 fish/hour and 3.35 fish/hour, respectively (Figure 3). Furthermore, CPUE for Smallmouth Bass classified as piscivores was 0.27 fish/hour (Figure 4). Catch rates for all size classes of Smallmouth Bass are lower than 2021 (Figure 3; Partlow et al. 2021). Spatial distribution of catch rates in 2022 (Figure 5) was characterized by overall higher catch in upstream reaches, but with limited juvenile fish encounters in lower reaches. The highest sub-adult catch rates were in the uppermost reach beginning at Split Mountain boat ramp (RM 319-316). The highest sub-adult catch rates in 2021 were encountered near Nine Mile Creek (RM 215.8-210.8; Partlow et al. 2021), which was consistent with high catch rates in lower reaches in 2022 (Figure 5).

Catch rates by month were punctuated by high sub-adult CPUE in August, and almost identical adult CPUE in both August and September (Table 3; Figure 6 and 7). Highest CPUE for juveniles was in September on par with 2020 but differing from 2021 (Partlow et al. 2020 and 2021). Due to staffing shortages, sampling was not conducted in late September and early October this year which may impact comparisons of catch since a large portion of sub-adults were caught last year in October (Partlow et al. 2021).

Juvenile Smallmouth Bass numbers continue a downward trend in 2022 compared to the other two age classes. One possible explanation for this trend is that, like last year, a flow spike was

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initiated in June to disadvantage spawning and larval Smallmouth Bass (Bestgen 2018). Although we do not have direct evidence that this is the reason for decreased juvenile CPUE, 2022 is the second year this experimental release has been implemented and juvenile fish subsequently constitute a much lower percentage of our total catch (Partlow et al. 2021). Therefore, it may be beneficial to continue this practice, if possible, to disadvantage Smallmouth Bass reproduction and recruitment in the middle Green River reach in addition to the upper Green River as originally intended. In the future, it may be useful to develop a monitoring protocol to determine whether these flow spikes are in fact impacting Smallmouth Bass reproduction in the middle Green River as proposed for upstream areas. This could include seining in low-velocity habitats for juvenile fish pre- and post-flow spike, drift netting for juveniles during the high flow event, or monitoring disturbance of known nesting sites post-flow spike (Bestgen 2018).

### *Movement*

This year we did not encounter any Smallmouth Bass with floy tags from mark/recapture studies.

### **Additional Noteworthy Observations**

Ancillary captures—Table 2 lists additional nonnative fishes removed, and Table 4 lists native fishes released alive during all sampling efforts in the middle Green River in 2022.

On 27 June 2022 we caught a single Burbot (*Lota lota*; 452 mm TL) near RM 310, which is in close proximity to Razorback Bar, during targeted bass removal efforts for this project. Additionally, two Burbot were caught by local fishing guides and reported to Utah Division of Wildlife Resources. A male was caught in early October 1.5 miles below Flaming Gorge Dam and it appeared to be emaciated and blind (533 mm TL). The other individual was caught just below Flaming Gorge Dam in late October; no measurements were taken, and the fish appeared to have an expanded swim bladder. This second Burbot capture was accompanied by a deceased Lake Trout (*Salvelinus namaycush*).

Although Burbot are an invasive species of concern in the upper Colorado River basin, encounters below Flaming Gorge Dam have not been common, but sightings have become more frequent since 2019 (Partlow et al. 2019 and 2021). Initially it would seem numbers are low because we do not capture many during other nonnative fish removal efforts. However, electrofishing is not the most effective method for capturing Burbot. For example, from the Wyoming portion of the Green River, hoop netting was the most effective method with night electrofishing being a secondary method (Klein et al. 2015). Therefore, we recommend the consideration of implementing other passive sampling methods and additional angler outreach if Burbot sightings become more regular in order to better evaluate the presence of this species within the middle Green River.

### **Recommendations**

Consider incorporating monitoring areas in the middle Green River into the Smallmouth Bass Flow Spike Study Plan to investigate impacts of this management tool in reaches downstream of the currently monitored areas.

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Consider implementing passive sampling methods if Burbot sightings become more regular in the middle Green River in order to better evaluate the presence of this species.

Consider continuing to conduct a Smallmouth Bass removal pass in Desolation Canyon as needed.

### **Project Status**

On track and ongoing.

### **FY 2022 Budget Status**

Funds Provided: \$225, 670

Funds Expended: \$225, 670

Difference: -0-

Percent of the FY 2022 work completed, and projected costs to complete: 100%

Recovery Program funds spent for publication charges: -0-

### **Status of Data Submission**

Data will be uploaded into STReAMS by January 2022.

### **Signed**

Saidee J. Hyder, Michael S. Partlow, and Matthew J. Breen

Principal Investigators

12/6/2022

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### REFERENCES

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## TABLES AND FIGURES

**Table 1.** Nonnative fish removal effort summary by species and project for the middle Green River in 2022. Sampling was conducted by boat electrofishing (EL) and fyke-netting (FY). Project 123b includes springtime removal efforts in tributary, backwater, and shoreline main channel habitats targeting Northern Pike, White Sucker, and Walleye, as well as targeted removal effort in summer for Smallmouth Bass in shoreline habitats. Project 128 refers to Colorado Pikeminnow abundance estimates. Catch-per-unit-effort (CPUE; fish/hour), mean and median total lengths (mm, [TL]) are included for each species where relevant. Project 123b electrofishing from 05 May to 22 June 2022 was conducted within backwaters and tributaries.

<b>Smallmouth Bass</b>						
Project	Gear	Dates	Captures	CPUE	Mean TL	Range TL
128	EL	4/4-5/26	229	1.16	217	72-510
123b	FY	6/21-6/22	0			
123b	EL	5/26-6/22	2	1	310.5	260-361
123b	EL	6/27-9/14	1,651	12.7	165.8	42-432
<b>White Sucker</b>						
Project	Gear	Dates	Captures	CPUE	Mean TL	Range TL
128	EL	4/4-5/26	257	1.29	210.3	76-426
123b	FY	6/21-6/22	0			
123b	EL	5/26-6/22	22	11	209.6	110-290
123b	EL	6/27-9/14	344	2.73	161.5	72-440
<b>Walleye</b>						
Project	Gear	Dates	Captures	CPUE	Mean TL	Range TL
128	EL	4/4-5/26	15	0.075	557.5	484-707
123b	FY	6/21-6/22	0			
123b	EL	5/26-6/22	0			
123b	EL	6/27-9/14	1	0.008	525	525-525
<b>Northern Pike</b>						
Project	Gear	Dates	Captures	CPUE	Mean TL	Range TL
128	EL	4/4-5/26	10	0.05	641.3	576-711
123b	FY	6/21-6/22	1	0.5	650	650-650
123b	EL	5/26-6/22	7	3.5	676.7	600-817
123b	EL	6/27-9/14	4	0.03	599.5	466-736



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**Table 2.** Targeted and ancillary captures of nonnative fish species captured from the middle Green River in 2022.

Common Name	Total	Median Total Length (mm)	Length Range (mm)
Smallmouth Bass	1,883	165.0	42 - 510
White Sucker	621	171.0	72 - 440
Green Sunfish	127	90.0	51 - 177
Black Crappie	42	137.0	88 - 236
Northern Pike	22	634.5	466 - 817
Brown Trout	17	181.0	115 - 462
Walleye	16	528.0	484 - 707
Bluehead Sucker x White Sucker	4	283.5	240 - 342
Flannelmouth Sucker x White Sucker	4	298.5	236 - 410
Channel Catfish	2	667.5	555 - 780
Burbot	1	452.0	452 - 452
Creek Chub	1	98.0	98 - 98

**Table 3.** Smallmouth Bass captures and catch-per-unit-effort (CPUE) by size-class (juvenile < 100 mm total length [TL]; sub-adult 100-199 mm TL; adult > 200 mm TL) and season for the 2022 sampling period including boat electrofishing (EL) and fyke-netting (FY). Data includes both targeted Smallmouth Bass removal and non-targeted effort (Project #128).

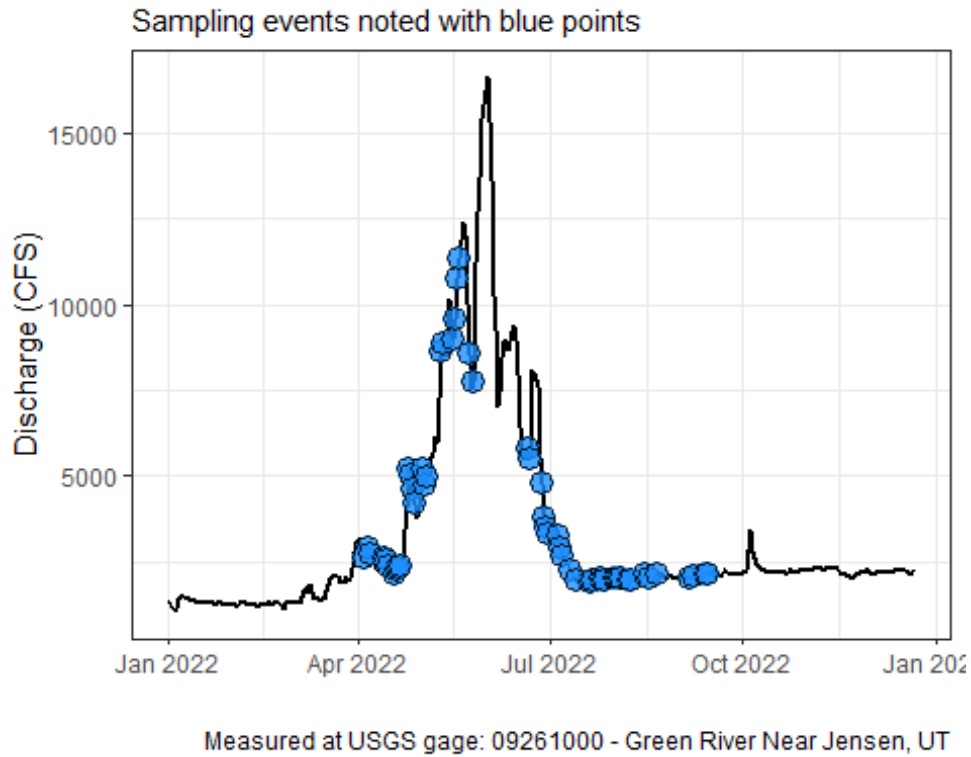
Season	Gear	Juveniles	Sub-adults	Adults	Juvenile CPUE	Sub-adult CPUE	Adult CPUE
Spring	EL	9	117	105	0.05	0.59	0.53
Early Summer	EL	42	461	127	0.63	6.97	1.92
Early Summer	FY	0	0	0	0.00	0.00	0.00
Late Summer/Fall	EL	192	530	299	3.05	8.42	4.75

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**Table 4.** Targeted and ancillary captures of native fish species in 2022 from the middle Green River.

<b>Common Name</b>	<b>Total</b>	<b>Median Total Length (mm)</b>	<b>Length Range (mm)</b>
Razorback Sucker	489	460.5	129 - 540
Colorado Pikeminnow	55	559.0	480 - 748
Bonytail	7	243.0	157 - 269
Flannelmouth Sucker x Razorback Sucker	3	514.0	474 - 520
Flannelmouth Sucker	1	497.0	497 - 497
Roundtail Chub	1	327.0	327 - 327

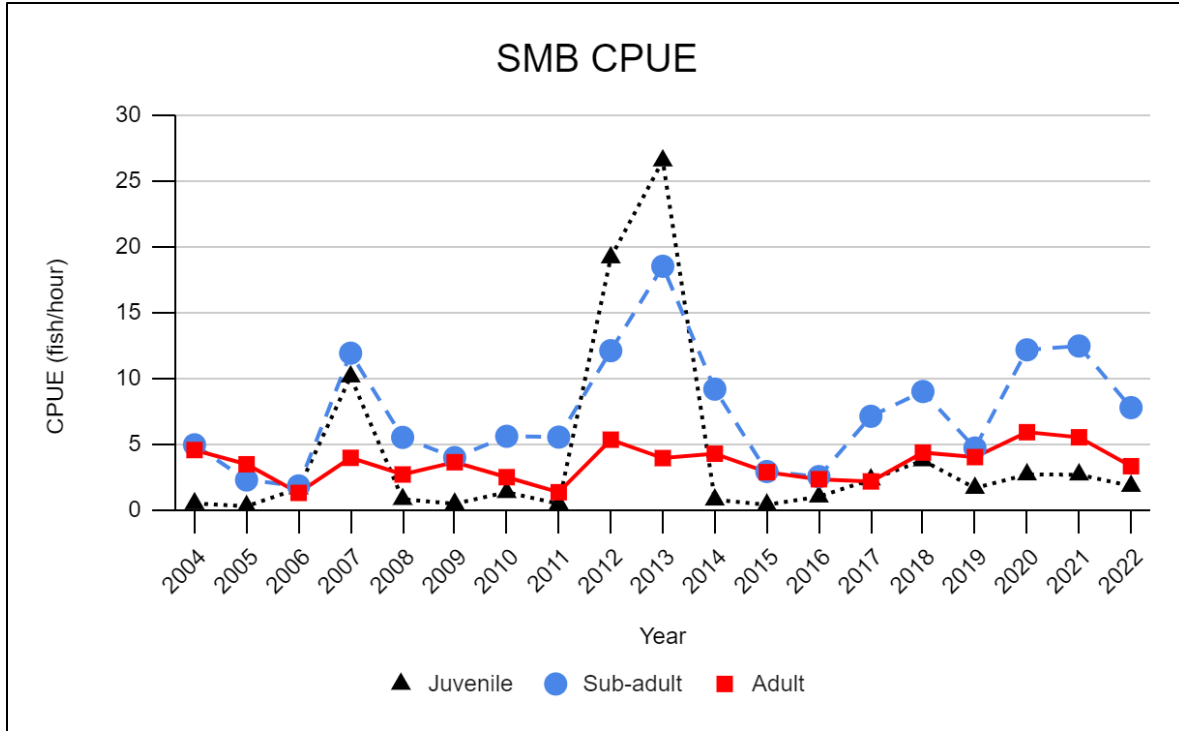
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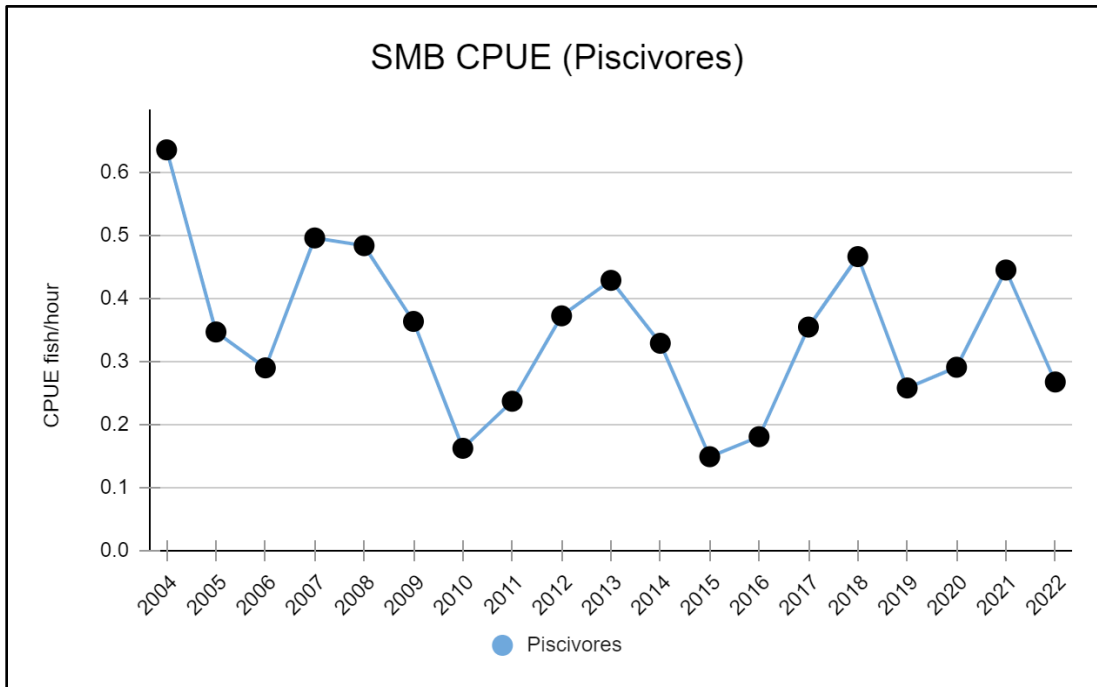
**Figure 1.** Discharge (cubic feet/second [cfs]) on the middle Green River throughout the 2022 field season. Sampling events (blue dots) include both targeted and non-targeted (Project #128) nonnative fish removal.



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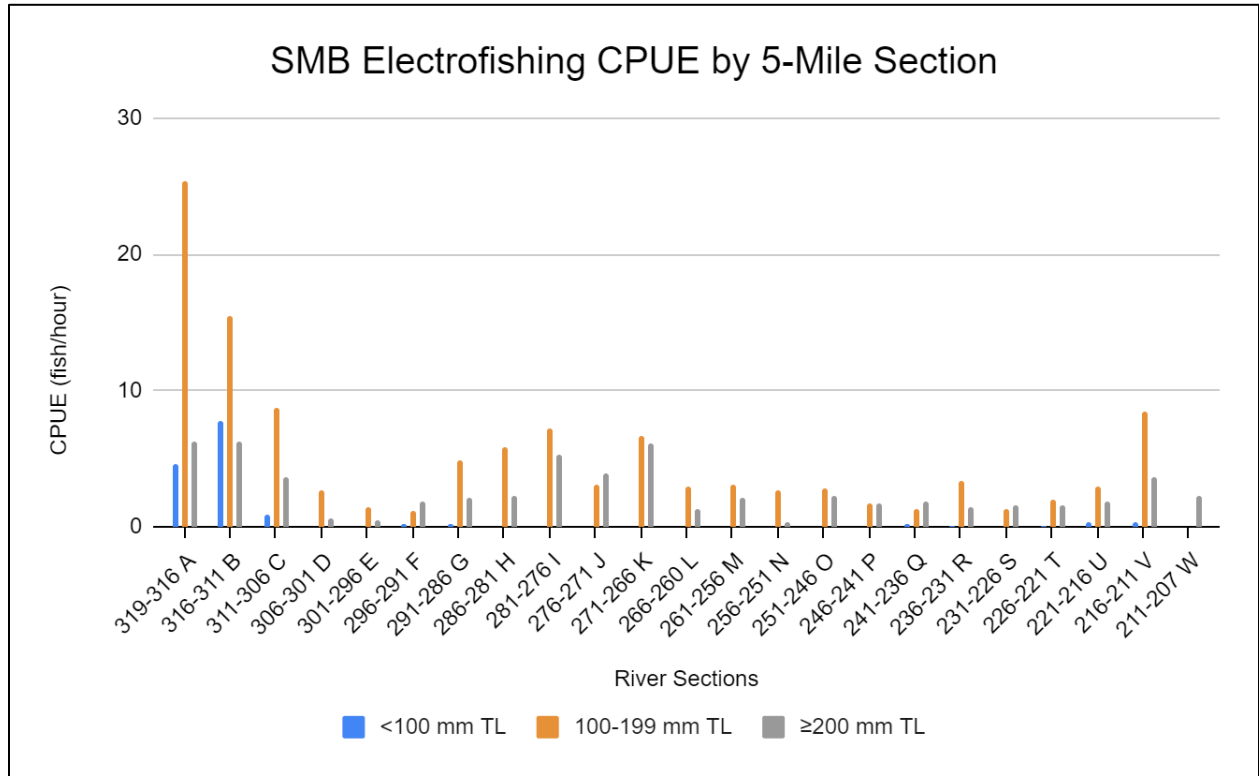


**Figure 3.** Catch-per-unit-effort (CPUE) of juvenile (<100 mm total length [TL]), sub-adult (100-199mm TL), and adult ( $\geq 200$  mm TL) Smallmouth Bass (SMB) in the middle Green River during targeted removal from 2004 to 2022.

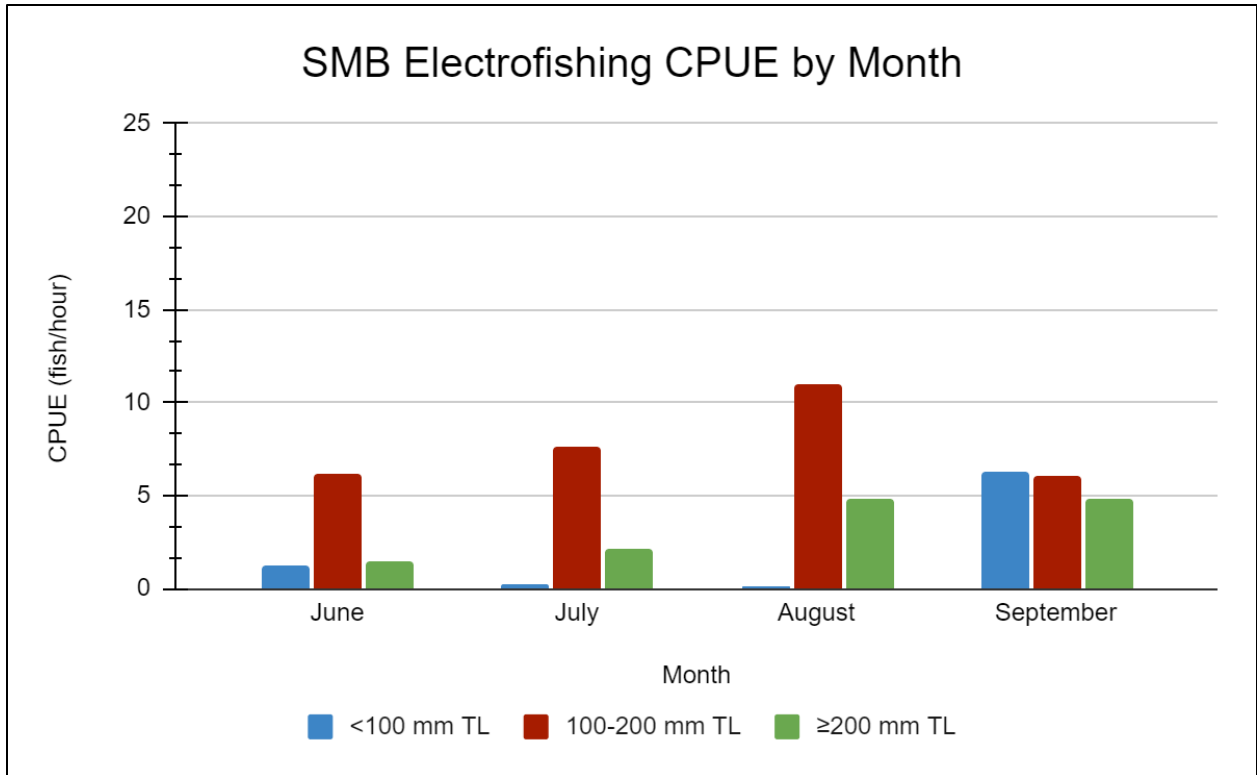


**Figure 4.** Catch-per-unit-effort (CPUE) of piscivore size ( $\geq 375$  mm total length) Smallmouth Bass (SMB) removed from the middle Green River during targeted SMB removal from 2004 to 2022.

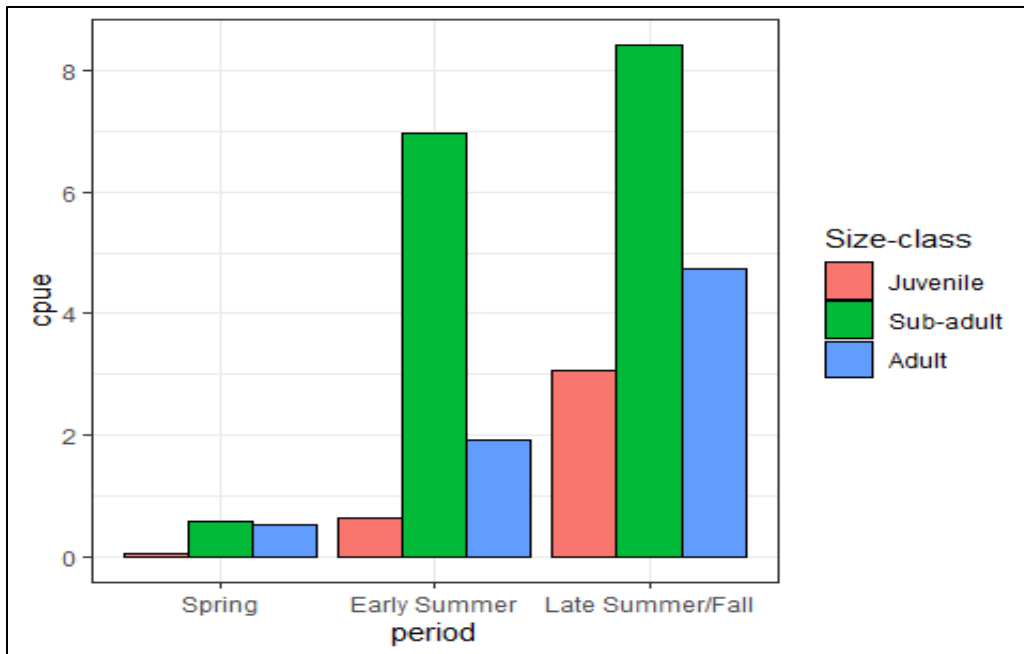
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**Figure 5.** Smallmouth Bass (SMB) juvenile (< 100 mm total length [TL]), sub-adult (100-199 mm TL), and adult (> 200 mm TL) catch-per-unit-effort (CPUE) from Split Mountain boat ramp (A) to Tabyago Riffle (W) in five-mile sections within the middle Green River from 27 June to 14 September 2022; collected during targeted Smallmouth Bass removal efforts.



**Figure 6.** Smallmouth Bass (SMB) juvenile (< 100 mm total length [TL]), sub-adult (100-199 mm TL), and adult (> 200 mm TL) catch-per-unit-effort (CPUE) by month in the middle Green River from 27 June to 14 September 2022; data collected during Smallmouth Bass targeted removal efforts.



**Figure 7.** Smallmouth Bass catch-per-unit-effort (CPUE; fish/hour) by seasonal period during 2022 sampling, including non-targeted sampling, within the middle Green River.