Project Title
Smallmouth Bass control in the lower Yampa River

Bureau of Reclamation Agreement Number:
R20PG00024

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Is this the final report? Yes _____ No X

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Abstract:

Green River Basin Fish and Wildlife Conservation Office completed four Smallmouth Bass removal passes in the lower Yampa River in 2021, removing 4,794 Smallmouth Bass. More smallmouth bass were removed in this project in 2021 than in any year on record. Although the majority of bass (78.9%) captured in 2021 were < 200 mm in length, more adults (≥ 200 mm total length) were captured than in 2020. The overall catch rate for Smallmouth Bass was the highest recorded since 2014. The number and distribution of adult and smaller juvenile bass point to successful year classes being produced in 2017, 2018, and 2020. We also sampled reaches established to monitor fish community composition. Flannelmouth and Bluehead Suckers were the most abundant species, as has been the case since these monitoring reaches were initiated. Smallmouth Bass were the third most abundant species, another indication of Smallmouth Bass expansion in Yampa Canyon within the past two years.

Study Schedule:
2004-Ongoing

Relationship to RIPRAP:
Green River Action Plan: Yampa River

III.B.2. Control nonnative fishes via mechanical removal
III.B.2.e. Remove Smallmouth Bass
III.B.2.d. Remove Northern Pike from Yampa River designated critical habitat
III.B.2.f. Control Channel Catfish in Yampa Canyon

Accomplishment of FY 2020 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Nonnative Fish Removal

Green River Basin Fish and Wildlife Conservation Office (GRB FWCO) completed four electrofishing passes encompassing 126.2 hours of effort in the lower Yampa River from 25 May to 18 June 2021. During this period, daily average flow ranged from 4,930 cfs to 976 cfs, and mean daily water temperature increased from 13.6°C to 22.2°C (USGS gauge # 9260050 located at Deerlodge Park, CO). Mean water temperature exceeded 16°C on 31 May, indicating we conducted all but three days of removal effort after the river reached the temperature threshold when Smallmouth Bass *Micropterus dolomieu* spawning is likely to commence. We began noting ripe bass on the first pass; however, most of the adults captured were not ripe. Of those expressing gametes, 68 were females and 60 were males.

We removed 4,794 Smallmouth Bass, including 2,748 fish <100mm total length (TL), 1,034 juveniles (100-199 mm TL), and 1,012 adults (≥200mm TL) (Table 1, Figure 1). More bass were removed from Yampa Canyon in 2021 than in any year on record. The overall mean TL of these fish was 129 mm (Standard Error = ±1.0 mm). Of the adults, 25 were large enough (≥325 mm TL) to be classified as piscivores posing a competitive threat to adult Colorado pikeminnow.

In 2021, overall catch rate for bass ≥100 mm TL (16.2 bass/electrofishing hr) was the highest on record since 2014 (Figure 1). (Figure 1). This catch rate is comprised of 8.2 juveniles bass/hr and 8 adult bass/hr. The 2021 adult catch rate, which includes the piscivore size class, represents the largest recorded adult catch since the study began (2004-2021). Catch rates peaked in pass 4 (Figure 2), and were driven by bass <100 mm TL (n = 1,261; Table 2).

Noticeable upticks in catch rates occurred for most size classes, but especially bass <100 mm TL, midway through the study reach (~RM 24.5) and remained high (CPUE >10 bass/hr) to the Green River confluence in all but one reach (Figure 3). This is similar to electrofishing efforts in 2017 through 2020, where we observed spawning activity in reach 6 (RM 24.5-19.7), as well as high captures of age-0 bass in the Green River downstream of the confluence (Jones 2017, Jones and Smith 2018, Smith 2019, Smith 2020). This pattern could also represent a shift in distribution compared to previous years when bass spawning occurred primarily upstream of Deerlodge Park and small bass moved into the reach the following year.

Smallmouth Bass >100 mm TL dominated length frequency in 2021 (Figure 4), and were likely produced in 2020. Although less numerous, adult bass (>200 mm TL) are also represented, which could

be explained as juvenile size classes (<200 mm) from previous years recruiting into the adult size class within the past two years (Figures 5a and 5b).

Several other nonnative fish species were collected over the course of the four passes, including Black Bullhead *Ameiurus melas*, Channel Catfish *Ictalurus punctatus*, Creek Chub *Semotilus atromaculatus*, Green Sunfish *Lepomis cyanellus*, Northern Pike *Esox lucius*, White Sucker *Catostomus commersonii*, and White Sucker hybrids *Catostomus spp.* (Table 2). A component of this project is to remove Channel Catfish >400mm. This is the length at which catfish are believed to transition to a higher level of piscivory, making them a competitive threat to Colorado pikeminnow *Ptychocheilus lucius* and a predatory threat to native fishes. We removed 4 Channel Catfish meeting this size threshold in 2021. We also captured 16 Northern Pike, and all were large enough to be classified as piscivores (TL ≥ 450 mm). Northern Pike were caught in all but three reaches in Yampa Canyon in 2021. During spring of 2020, upstream Northern Pike removal was not conducted because the COVID-19 pandemic limited field work. Lack of upstream removal in 2020 may have allowed more Northern Pike to emigrate downstream in 2020. Perhaps the result of spring removal efforts in the Green River, no Walleye *Sander vitreus* were captured in Yampa Canyon in 2021.

Sampling for Fish Community Composition

We sampled five, one-mile sub-reaches during pass 2 (1-4 June) in order to monitor fish community species composition. These reaches were established in 2002 to monitor the overall fish community response to nonnative fish removal, and were chosen specifically based on previous capture locations of humpback chub (Fuller and Modde 2002). As in previous years, native suckers (Flannelmouth Sucker *Catostomus latipinnis* and Bluehead Sucker *Catostomus discobolus*) were the two most abundant species captured (Figures 6-8). Other species captured, in decreasing abundance, were Smallmouth Bass, Channel Catfish, Roundtail Chub *Gila robusta*, White Sucker, Mottled Sculpin *Cottus bairdii*, Northern Pike, and Colorado pikeminnow (Figure 6). The proportion of Smallmouth Bass captured within monitoring reaches was higher than Roundtail Chub in 2020 and 2021 (Figures 7 and 8). This was not the case between 2015 and 2019 (Figures 7 and 8), and another indication of Smallmouth Bass expansion in Yampa Canyon within the past two years.

We encountered 23 unique Colorado pikeminnow this year. Fourteen of the pikeminnow were recaptures that already had tags, but no old frequency tags (400 kHz) were detected. Similar to Smallmouth Bass, most (n=19) of these fish were caught in the lower half of Yampa Canyon. Only two pikeminnow were noted as being ripe upon capture, and 12 were noted as being tuberculate, which suggests that our electrofishing effort occurred prior to spawning.

Roundtail Chub monitoring

Roundtail Chub marking was conducted during the initial pass (25-28 May) when flows ranged between 5,060 cfs to 3,650 cfs (USGS gauge # 9260050 located at Deerlodge Park, CO). All native chubs >120 mm TL captured in reaches 2, 4, 6, and 10 were PIT-tagged during the marking pass. We also processed all chub encountered in the same reaches in subsequent passes. In total, 189 Roundtail Chub were captured, consisting of 173 adults (≥ 200 mm TL) and 16 juveniles, and we inserted PIT tags into 104 of these fish. We also recaptured 10 Roundtail Chub that were previously tagged, three of which were tagged during this year's marking pass. All of the recaptured fish were tagged within this study reach

except for one individual that was tagged approximately two miles downstream of the Yampa-Green River confluence. Fewer small (<150 mm TL) chub were captured this year, which is hopefully related to the chub monitoring pass occurring during lower flows rather than an indication of lower juvenile survival than has been observed in the past.

Additional Noteworthy Observations:

A Razorback Sucker that was stocked in the Green River (RM 255.4) in 2011 by Ouray National Fish Hatchery was caught near Big Joe rapid (Yampa RM 22.1) on 26 May 2021. Razorback Sucker captures are rare in Yampa Canyon: the STReaMS database contains sixteen records within the past 30 years. Of those, only three occurred more than one river mile from the Green River confluence.

Recommendations:

Optimize Smallmouth Bass removal in response to the large classes of fish produced in 2018 and 2020. Effort should again focus on the period when water temperatures are likely to initiate bass spawning (>16°C).

Increased catch rates and apparent bass densities over the past two years, combined with the prospect of humpback chub reintroduction in Yampa Canyon, warrant the reconsideration of allotting more resources to nonnative removal within this project in the future.

During years with extended periods of high-water clarity and/or low flows in the Yampa River, angling should be viewed as a viable option for Smallmouth Bass removal.

Discuss whether Roundtail Chub PIT-tagging should continue as part of Project 110. Roundtail Chub marking will likely be a necessary component of future Humpback Chub monitoring efforts. However, the low Roundtail Chub recapture rates produced by this project to date warrant the examination of the utility of PIT-tagging efforts prior to Humpback Chub augmentation.

Continue fish community monitoring to characterize any changes in the overall species composition through time. This work has recently been used to make comparisons between fish communities in the regulated Lodore Canyon reach of the Green River and Yampa Canyon which is virtually unregulated. Our fish monitoring in the Yampa has also been useful in tracking native fish response to invasion by Smallmouth Bass and corresponding effects based on bass abundance.

If resources and funding are available in the future, consider expanding the scope of fish community monitoring and non-native species removal throughout Yampa Canyon and include small-bodied fish monitoring (seining) as well. This type of monitoring has been conducted on the Green River in the regulated Lodore Canyon and semi-regulated Whirlpool Canyon for years, yet our knowledge of the unregulated Yampa Canyon's fish community is much more limited.

Project Status:
On track and ongoing.

FY 2021 Budget Status
Funds Provided: $95,685

Funds Expended: $95,685
Difference: $0
Percent of the FY 2021 work completed, and projected costs to complete: 100%, $0
Recovery Program funds spent for publication charges: $0

Status of Data Submission
Data will be submitted to the STReaMS database by January 2021.

Signed:

Christian Smith
Principal Investigator
11 November 2021

References

Fuller, M. and T. Modde. 2002. Development of a Channel Catfish control program in the lower Yampa River. Project #110. Annual report to the Recovery Implementation Program, U.S. Fish and Wildlife Service, Denver, CO.

Jones, M.T. 2017. Smallmouth Bass control in the lower Yampa River. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO.

Jones, M.T. and C. Smith. 2018. Smallmouth Bass control in the lower Yampa River. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO.

Smith, C. 2019. Smallmouth Bass control in the lower Yampa River. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO.

Smith, C. 2020. Smallmouth Bass control in the lower Yampa River. Annual Report to the Upper Colorado River Endangered Fish Recovery Program. Denver, CO.

Table 1. Electrofishing removal passes and Smallmouth Bass captured by size class in Yampa Canyon 2021.

Pass	Date	<100 mm TL	Juvenile (<200 mm TL)	Adult (200-325 mm TL)	Piscivore (≥325 mm TL)
1	25-28 May	439	261	405	11
2	1-4 June	261	86	190	4
3	7-11 June	787	153	160	4
4	15-18 June	1261	534	232	6
Total		2748	1034	987	25

Table 2. Other fish species captured during electrofishing removal passes in Yampa Canyon 2021.

Species	Number Captured	Size Range (mm TL)
Colorado pikeminnow	23	474-795
Razorback Sucker	1	485
Roundtail Chub	192	106-438
Chub spp.	2	97-438
Bluehead Sucker	91	102-395
Flannelmouth Sucker	142	96-463
Flannelmouth x Razorback Sucker	1	548
Mottled Sculpin	1	100
Black Bullhead	1	178
Channel Catfish	26	259-590
Creek Chub	2	79-121
Green Sunfish	8	62-133
Northern Pike	16	510-785
White Sucker	496	32-445
White Sucker hybrids	8	86-445

Figure 1. Electrofishing catch rates of Smallmouth Bass ≥100mm in Yampa Canyon 2004-2021.

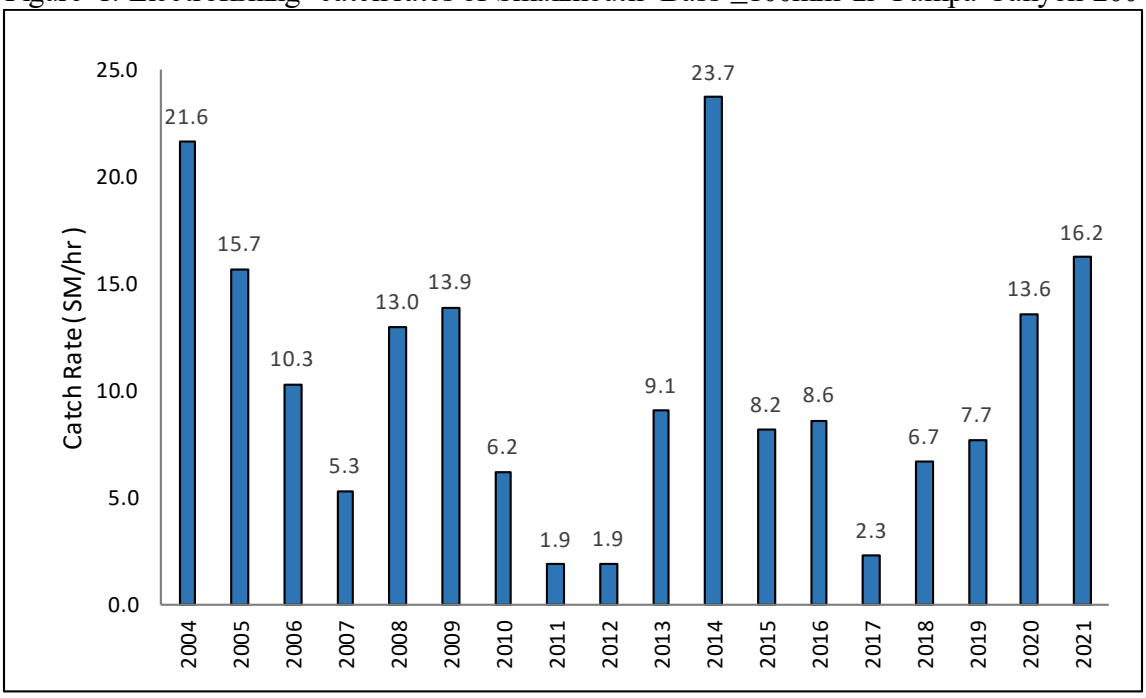


Figure 2. Electrofishing catch rates by pass for Smallmouth Bass ≥100mm in Yampa Canyon 2021.

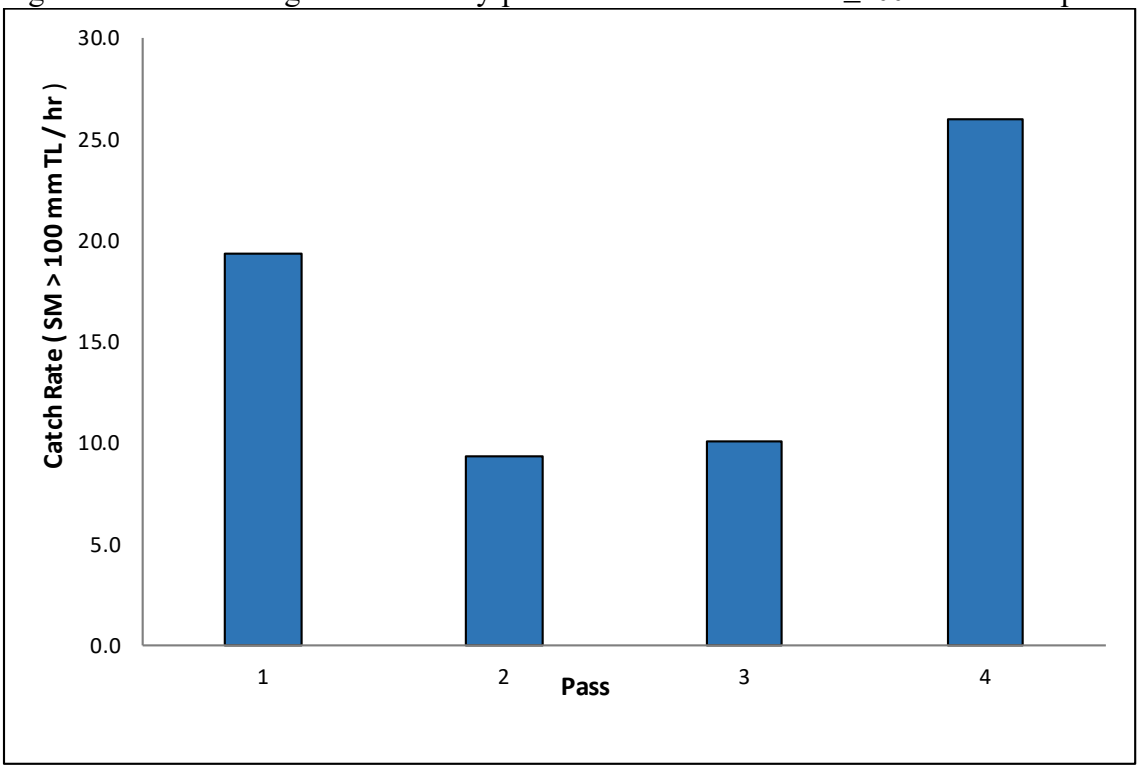


Figure 3. Electrofishing catch rates of Smallmouth Bass in Yampa Canyon by reach, 2021.

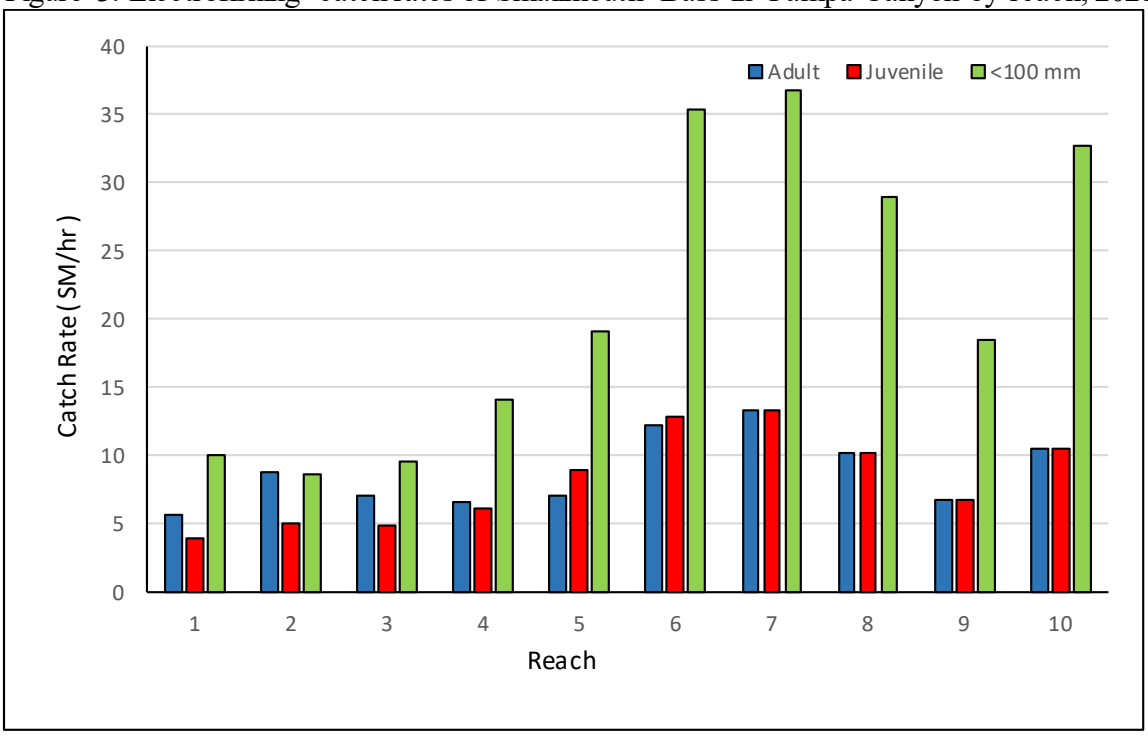
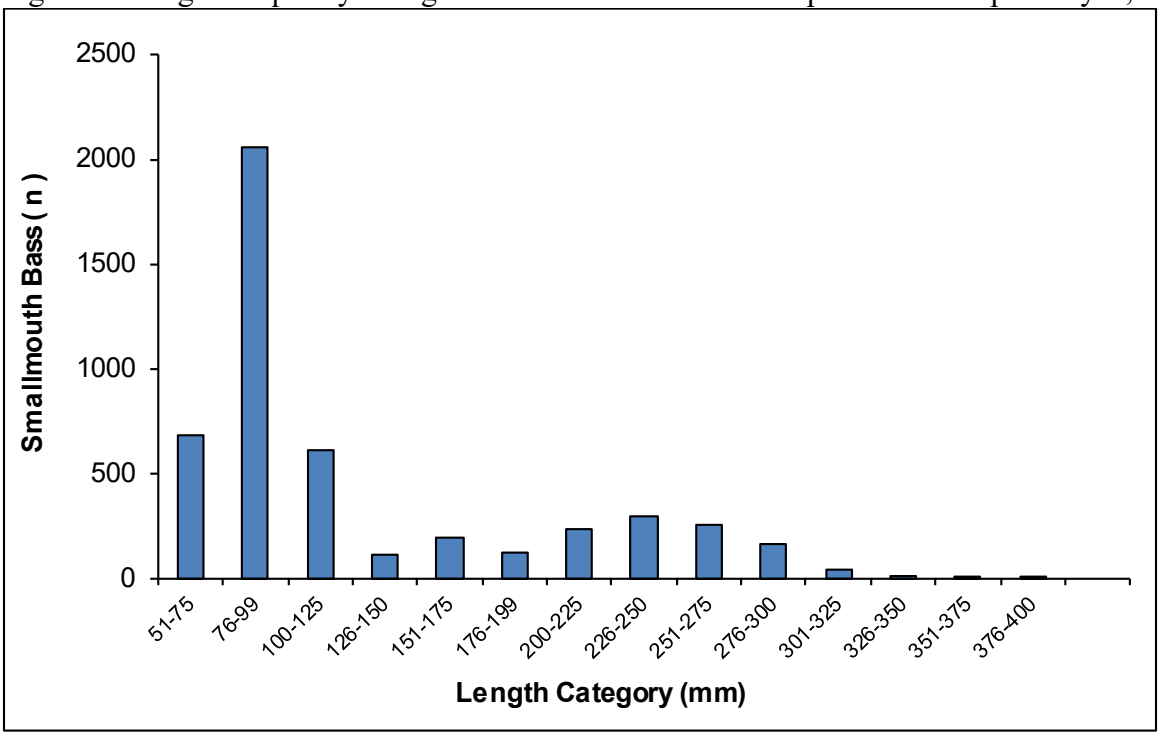
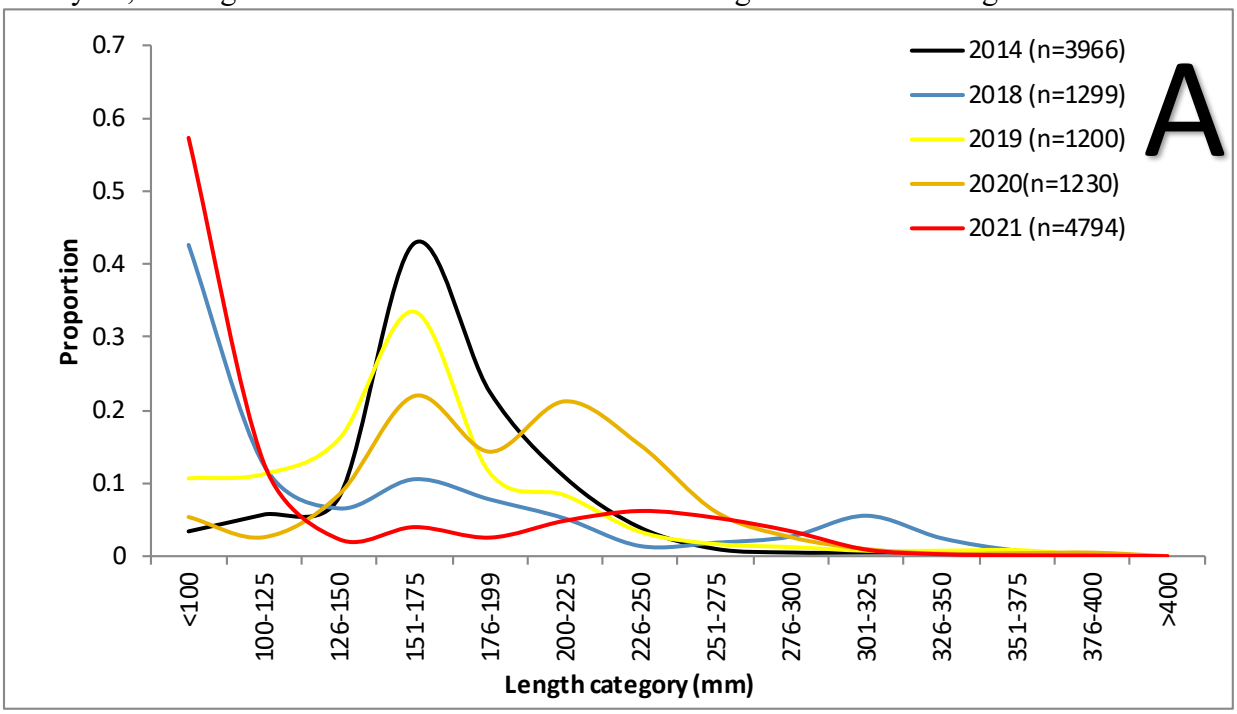


Figure 4. Length frequency histogram for Smallmouth Bass captured in Yampa Canyon, 2021.



Figures 5a-b. Length-frequencies for Smallmouth Bass captured in Yampa Canyon in 2014 and 2018-2021. Figure 5a shows percent fish caught in each size range, as a proportion of total catch each year, and Figure 5b shows total numbers of fish caught in each size range.



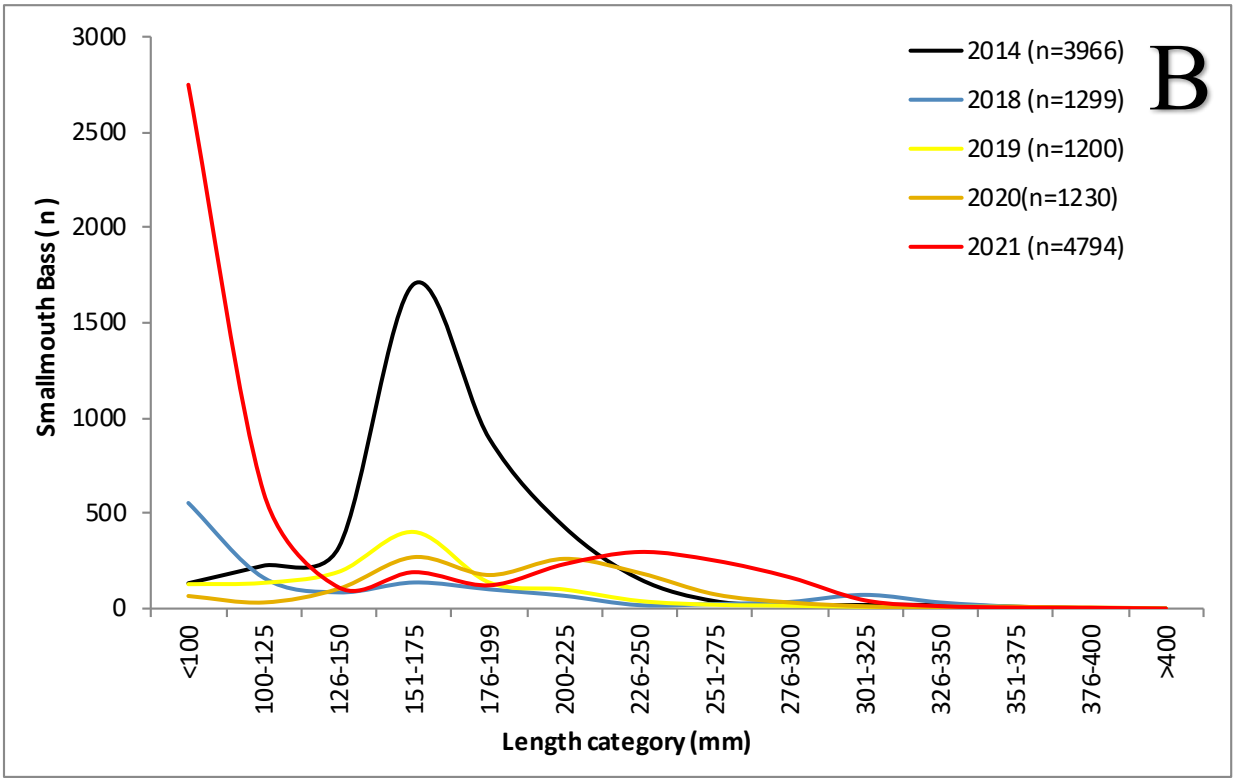


Figure 6. Total species composition for five, 1-mile monitoring reaches in Yampa Canyon 2021 using electrofishing.

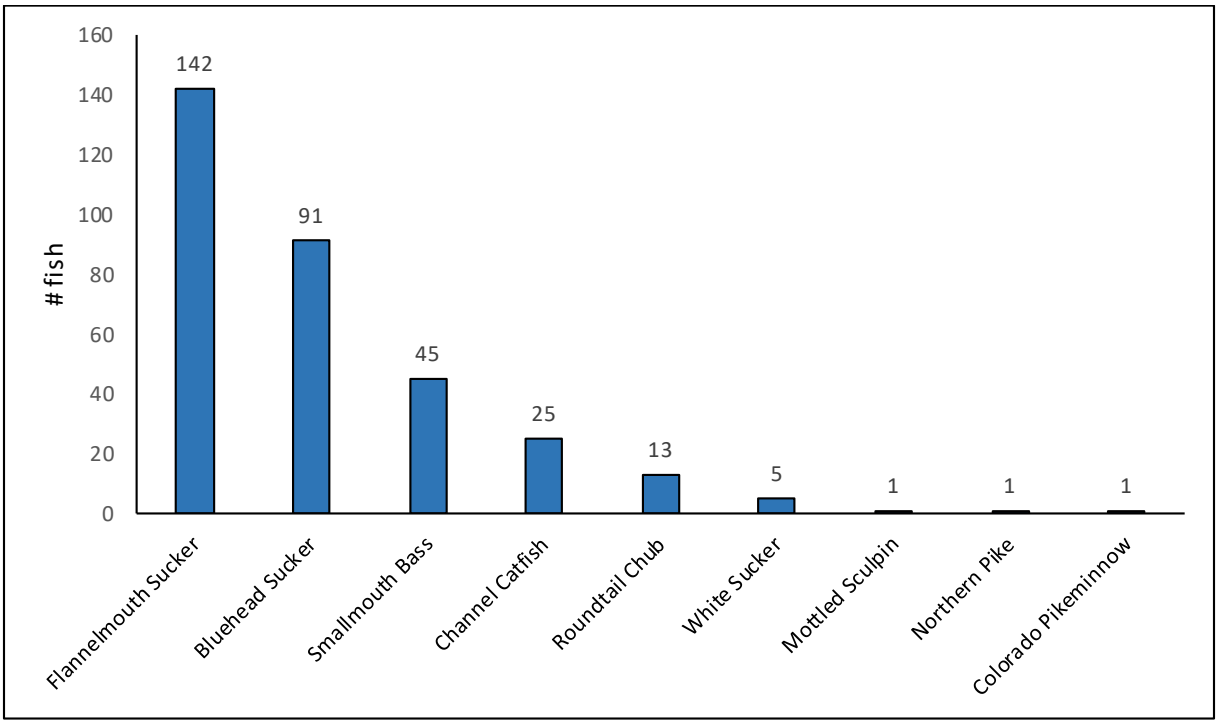


Figure 7. Annual electrofishing catch rates of five most common species found in 1-mile monitoring reaches in Yampa Canyon, 2009-2021. Species codes are BH (Bluehead Sucker), FM (Flannelmouth Sucker), CC (Channel Catfish), RT (Roundtail Chub), and SM (Smallmouth Bass).

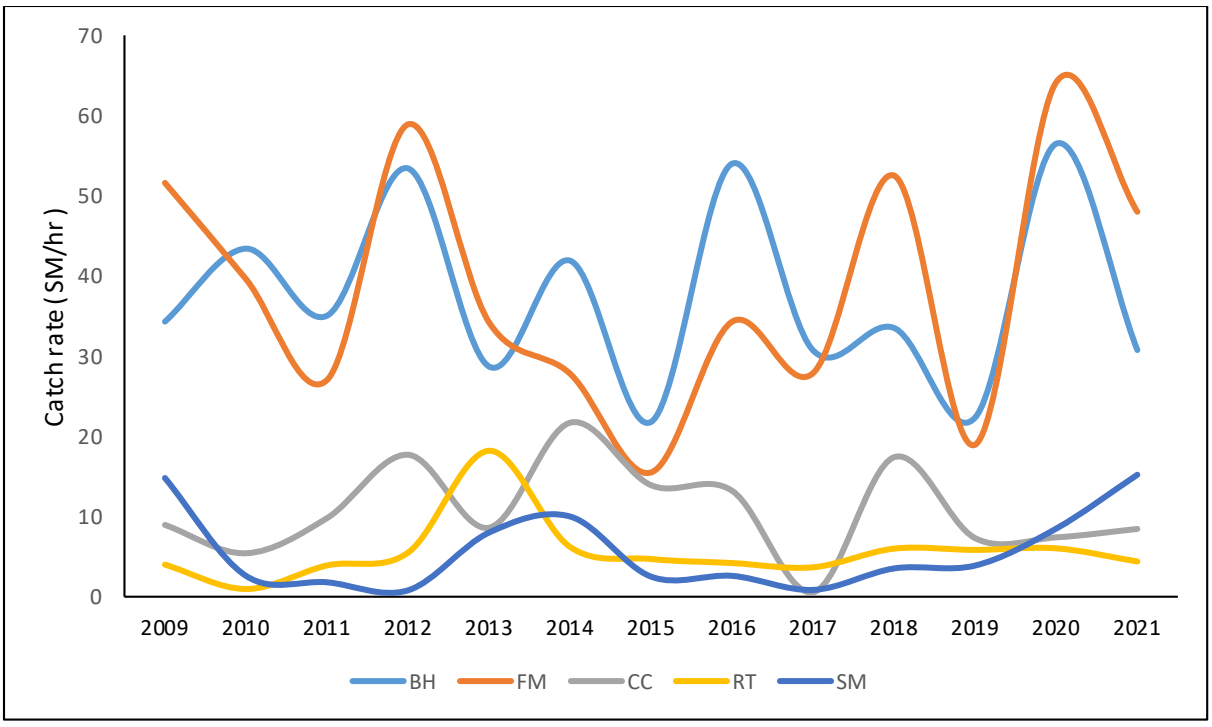


Figure 8. Percent electrofishing catch of five most common species encountered in annual fish community monitoring reaches in Yampa Canyon, 2009-2021. Species codes are BH (Bluehead Sucker), FM (Flannelmouth Sucker), CC (Channel Catfish), RT (Roundtail Chub), and SM (Smallmouth Bass).