

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2021 ANNUAL REPORT

PROJECT: 123a

**Project Title:**

Nonnative fish control in the Green River

**Bureau of Reclamation Agreement Number:**

USFWS: R20PG00024

UDWR: R19AP00059

**Project/Grant Periods:**

USFWS

Start date: 10/1/2019

End date: 9/30/2024

UDWR

Start date: 10/1/2018

End date: 9/30/2023

Reporting period end date: 9/30/2021

Is this the final report? Yes \_\_\_ No X

**Principal Investigators:**

Christian Smith, Biologist

Katherine Lawry, Fish Biologist

U.S. Fish and Wildlife Service

Utah FAC Complex

Green River Basin Fish and Wildlife Conservation Office

1380 S 2350 W,

Vernal, UT 84078

Phone: (435) 789-0351

Email: [christian t smith@fws.gov](mailto:christian_t_smith@fws.gov), [katherine lawry@fws.gov](mailto:katherine_lawry@fws.gov)

John Caldwell, Fish Biologist

Utah Division of Wildlife Resources

Moab Field Station

1165 S Hwy 191, Ste. 4

Moab, UT 84532

Phone: (435) 259-3781

Email: [johncaldwell@utah.gov](mailto:johncaldwell@utah.gov)

**Abstract:**

This project consisted of two components: **a)** remove Smallmouth Bass from the Green River in Dinosaur National Monument between Echo Park and Split Mountain. (RM 344.5-319.5) and **b)** remove Smallmouth Bass from the Green River in Desolation/Gray Canyons (RM 215.3-129.8). All components were completed. The United States Fish and Wildlife Service (USFWS) and the Utah Division of Wildlife Resources (UDWR) completed a combined total of 13 boat electrofishing passes in the Echo-

## UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Split reach, resulting in the removal of 9,544 Smallmouth Bass. USFWS also tagged and released 487 Smallmouth Bass on the third pass to estimate abundance in the Echo-Split reach. A two-sample Lincoln-Petersen model identical to that used in previous years for this report produced a point estimate of 40,068 bass  $\geq 100$  mm, or 1,603 bass/mile. High catch rates in the Echo-Split reach primarily consisted of juvenile fish in the 100mm-199mm range, suggesting that spawning success rates and/or survival probabilities were high last year or juvenile fish are immigrating into the Echo-Split reach from elsewhere. Highly turbid water conditions caused by rain events in late July may also have contributed to high catch rates. UDWR-Moab completed one targeted removal pass in Desolation and Gray Canyons removing 3,262 Smallmouth Bass. Catch rates were much higher than any previous targeted removal in this area. The high catch rates caused fish sampling to proceed slower than anticipated, so the entire reach was not electrofished. The high catch rates primarily consisted of juvenile fish suggesting that Smallmouth Bass successfully spawned throughout the reach or juvenile fish are immigrating into the Desolation-Gray reach from other locations.

### **Study Schedule:** 2004-Ongoing

### **Relationship to RIPRAP:**

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 endangered fishes to identify required levels of control. Each control activity will be evaluated for effectiveness, and then continued as needed.

III.A.4.b.(3) Smallmouth Bass removal in middle and lower Green River.

### **Accomplishment of FY 2021 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:**

#### Tasks 1 & 2: Smallmouth Bass removal-Echo Park to Split Mtn.

A total of 10,031 bass were captured in the Echo-Split reach in 2021. The USFWS and UDWR collaborated to complete one marking pass (pass 3) and 12 removal passes in the Echo-Split reach between June 2, 2021 and September 10, 2021 (Table 1). USFWS marked and released 487 bass (2 piscivores  $\geq 325$  mm, 135 adults  $\geq 200$  mm and 350 juveniles 100-199 mm) during pass 3. The remaining boat electrofishing passes focused only on bass removal and resulted in the capture and removal of 9,544 bass (59 piscivores, 1,288 adults, 6,894 juveniles, and 1,303  $< 100$ mm).

Smallmouth Bass catch rates increased in 2021. The overall boat electrofishing catch rate for all size classes was 31 bass/hour. The highest overall catch rate that had been reported prior to this year was 21 bass/hour in 2013 (Jones and Howard 2013). The boat electrofishing catch rate for fish  $\geq 100$  mm (adults and juveniles) was 27 bass/hour, which is highest on record since 2004 (Fig. 1). No distinct temporal pattern existed for catch rates throughout the season (Figure 2). Catch rates varied between size classes; the catch rate for fish  $< 100$ mm was 4 fish/hour, juveniles 22 fish/hour, and adults 5 fish/hour. Catch rates for juvenile fish exceeded catch rates for all other size classes in Whirlpool Canyon, Island and Rainbow Parks, and Split Mountain Canyon (Figure 5).

## UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

The majority of Smallmouth Bass captured this year were juveniles ranging from 100-199mm TL (Figure 3). To place this in a broader temporal context, Figure 4 shows the size structure of SMB over the last ten years. The large proportion of juvenile bass present in the system in 2021 may be due to a high survival rate for the cohort that comprised the <100mm size group in 2020. This large cohort is likely the product of successful spawning in 2019 and/or 2020.

We conducted a population estimate using a closed-population two-sample Lincoln-Petersen capture-recapture model with Chapman's correction (Chapman 1951). Although other estimation methods are available, we sought to replicate the analysis used in previous annual reports for ease of comparison through time. The estimation methods used in 2021 exactly mirror the methods that were used in the Project 123a report between 2007 and 2020 (Badame et al. 2007; Badame and Jones 2008; Badame and Jones 2009; Breidinger et al. 2010; Badame et al. 2011; Jones and Howard 2012; Jones and Howard 2013; Jones et al. 2014; Jones et al. 2015; Jones et al. 2016; Jones and Caldwell 2017; Jones and Caldwell 2018; Smith et al. 2019; Smith et al. 2020). This is true for the choice of the model used to generate the abundance estimate, the variance approximation used to calculate confidence intervals for that estimate, and the decision to include only a subset of all observed recaptures in the abundance estimation procedure.

USFWS marked and released 487 bass (137 adults  $\geq 200$  mm and 350 juveniles 100-199 mm) during pass 3 (July 19 - July 21) using orange Floy tags. We recaptured 84 of these newly marked fish in all subsequent removal passes. We also recaptured 25 fish that were tagged in previous years (18 fish with blue tags released in 2020, a fish with a green tag released in 2018, and 6 fish from previous years with unspecified tag colors).

Abundance estimates used in prior annual reports for Project 123a excluded all recaptured individuals observed during electrofishing passes that occurred more than one month after the initial marking pass. Previous authors reasoned that additional elapsed time between the marking event and the observation of recaptures would contribute to violations of the assumption of demographic closure implicit in the Petersen method. We followed this convention. However, we increased the number of removal passes completed within the one-month recapture timeframe and decreased the elapsed time between the marking passes and the removal passes. We implemented 7 removal passes within the month following the initial marking pass. The first removal pass began less than 1 day after the end of the marking pass, and subsequent removal passes followed the same nearly seamless timing (Table 1). This differs from last year, when only 4 removal passes were completed within the month following the marking pass and 12 days elapsed between the end of the marking pass and the beginning of the first recapture pass.

Although 84 Smallmouth Bass with orange tags were recaptured, we only included 74 recaptures with orange tags from passes 4-10 (July 21- August 19). Observations from passes 4-10 were lumped together and treated as a single observation of 74 fish which was used as the second (recapture) sample in the two-sample Lincoln-Peterson model. The remaining 10 recaptures with orange tags from passes 11-13 were excluded. The additional 25 recaptures marked in previous years with tag colors other than orange were also excluded.

The total population of bass  $\geq 100$ mm in the reach was estimated to be 40,068 fish (95% CI 30,932 , 49,204), or between roughly 1,200 and 1,900 fish per river mile. This estimate is significantly higher

## UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

than all previous estimates on record (Fig. 6). Confidence intervals were calculated using an informal variance approximation that was utilized in previous versions of this report from 2007 to 2020.

### Task 3: Smallmouth Bass removal- Desolation and Gray canyons

UDWR-Moab completed one targeted Smallmouth Bass removal electrofishing pass in Desolation and Gray canyons beginning at Tabyago Riffle (RM 207.0 ) and ending at RM 138.2 between June 23 and June 29, 2020. Because of high catch rates causing the trip to proceed at a slower rate than anticipated, 26.8 river miles (RM 198 – 193.5, 163.5 – 156.5, 151.1 – 142.0, 138.2 – 132.0) were not sampled. Overall, 3,262 bass were removed (68 fish/hour; Figure 6) for an average of 68 bass per sampled river mile with a total effort of 48.2 hours of electrofishing. River discharge increased during the pass from 2,150 to 4,850 cubic feet/second (USGS Gauge 09315000 in Green River, UT). Water temperatures measured on-site ranged from 21.1 – 24.4 degrees Celsius. Secchi disk depths ranged from 360 mm on 23 June 2021 to 70 – 155 from June 25 – June 29 (a precipitation event on June 24 decreased Secchi depths for the remainder of the trip).

Piscivorous adult bass over 324 mm in total length comprised 1% of the total catch (1 fish/hour), adults from 200-324 mm comprised 9% (6 fish/hour), juveniles from 100-199 mm comprised 81% (54 fish/hour), and juveniles less than 100 mm comprised 10% (6 fish/hour). When divided by sub-reach, catch rates for all size classes combined were 71 bass/ hr in Desolation Canyon (upstream of RMI 160) and 54 bass/ hr in Gray Canyon (downstream of RMI 160). In Desolation Canyon, catch rates by size class were 1 fish/hour (>324mm), 7 fish/hour (200-324 mm), 58 fish/hour (100-199 mm), and 6 fish/hour (<100mm). In Gray Canyon, catch rates by size class were 1 fish/hour (>324mm), 3 fish/hour (200-324 mm), 43 fish/hour (100-199 mm) and 8 fish/hour (<100 mm). Note that due to time constraints and high catch rates sampling was limited to 9.2 of the 28 river miles in Gray Canyon whereas 39 of the 47 river miles were sampled in Desolation Canyon.

Targeted Smallmouth Bass removal catch rates in 2021 were much higher than any previous year when sampling occurred (Smith et al. 2020). Adult catch rates from 2021 were higher than all size classes combined from 2015-2020, indicated that either adult fish are moving into the reach or sampling conditions were poor in previous years. Additionally, high catch rates occurred in both Desolation and Gray canyons (Figure 7), which differs from previous years (Smith et al. 2020) when the majority of the catch has come from Desolation Canyon upstream of RMI 160. As illustrated in Figure 8, catch rates were heavily influenced by the high numbers of juveniles. Smallmouth Bass may have successfully spawned during the low discharge conditions that occurred in 2020 or large numbers of juveniles are entering the reach from other reaches. No bass were observed actively spawning during sampling but seven adult Smallmouth Bass were found to be females containing eggs.

### Tasks 4 and 5: Walleye removal-Lower Green and Lower Colorado rivers

These tasks will be reported on in Evaluation of Walleye Removal in the Upper Colorado River Basin Annual Report (123d; Michaud et. al. 2021 in prep).

### Task 6: Data entry, analysis and reporting

Data was submitted to the database manager on November 8, 2021. This report will serve as the annual progress report including a summary of the 2021 data.

## UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

### **Additional Noteworthy Observations:**

#### ***Echo-Split Reach***

Despite the large increase in total catch, catch rates, and population estimates for Smallmouth Bass, other nonnative fish captures were relatively consistent with those of 2020. We collected 9 additional nonnative fish species, including Brown Trout, Creek Chub, Green Sunfish, Northern Pike, Rainbow Trout, Walleye, White Sucker, and White Sucker hybrids (Table 3). The number of Green Sunfish captured this year decreased from 367 in 2020 to 266 this year. Thirteen Northern Pike and four Walleye were captured this year, which is a slight increase from 2020.

We captured 54 Colorado Pikeminnow, 15 of which were unmarked. Prior to this year, the highest number of Colorado Pikeminnow captured in the Echo-Split reach was 43, as reported by Breidinger et al. in 2010. We also captured 20 Razorback Sucker (all recaptures), 11 Bonytail Chub (all recaptures) and 3 Roundtail Chub (Table 3).

#### ***Desolation and Gray Canyons***

We collected 8 additional nonnative fish species, including Black Bullhead, Black Crappie, Channel Catfish, Green Sunfish, Northern Pike, Rainbow Trout, Walleye, and White Sucker (Table 4). We also captured 10 Colorado Pikeminnow, 1 Humpback Chub, and 25 Razorback Sucker (Table 4).

### **Recommendations:**

#### ***Echo-Split Reach***

- Continue Smallmouth Bass removal at current levels to address the large cohort of juvenile Smallmouth Bass encountered in 2021.
- Continue marking Smallmouth Bass, and implementing back-to-back removal passes immediately following the initial 3-day marking pass.

#### ***Desolation and Gray Canyons***

- Continue annual targeted removal of Smallmouth Bass and other predatory fishes by UDWR-Moab. Monitoring the distribution of Smallmouth Bass in Desolation and Gray canyons is important because of the critical endangered fish nursery and spawning habitat downstream in the Lower Green River.

### **Project Status:**

Ongoing

#### **FY 2021 Budget Status**

Funds Provided: \$201,541

Funds Expended: \$201,541

Difference: \$0

Percent of the FY 2021 work completed, and projected costs to complete: 100%

Recovery Program funds spent for publication charges: \$0

## UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

### **Status of Data Submission**

Compiled data will be submitted to the database manager in December 2021.

### **Signed:**

Christian Smith  
Principal Investigator  
11/5/2021

Katherine Lawry  
Principal Investigator  
11/16/2021

John Caldwell  
Principal Investigator  
10/25/2020

## UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

### References

- Badame, P., K. Breidinger, M.T. Jones, A. Webber. 2011. Smallmouth Bass Control in the Green River. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.
- Badame, P., M. Fuller, S. Finney. 2007. Smallmouth Bass Control in the Green River. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.
- Badame, P., K., M.T. Jones. 2008. Smallmouth Bass Control in the Green River. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.
- Badame, P., K., M.T. Jones. 2009. Smallmouth Bass Control in the Green River. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.
- Breidinger, K., P. Badame, M.T. Jones, B. Haines. 2010. Smallmouth Bass Control in the Green River. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.
- Breton, A.R., D.L. Winkelman, J.A. Hawkins, and K.R. Bestgen, 2014. Population trends of Smallmouth Bass in the upper Colorado River basin with an evaluation of removal effects. Final report to the Upper Colorado River Endangered Fish Recovery Program, Denver, CO. Larval Fish Laboratory Contribution 169.
- Chapman, D. G. 1951. Some properties of the hypergeometric distribution with applications to zoological censuses. University of California Publications on Statistics 1:131–160.
- Hawkins, J.A. 2010. Evaluation of Smallmouth Bass and northern pike management in the middle Yampa River. Project 125. 2010 Annual Report to the Colorado River Endangered Fish Recovery Program, U.S. Fish and Wildlife Service, Denver, CO.
- Jones, M.T. and J. Howard. 2012. Smallmouth Bass control in the Green River. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.
- Jones, M.T. and J. Howard. 2013. Nonnative Fish Control in the Echo Park to Split Mountain Reach of the Green River, Utah. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.
- Jones, M.T., J. Howard, C. Michaud, Z. Ahrens. 2014. Nonnative fish control in the Green River. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.

## UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Jones, M.T., B. Haines, C. Smith, J. Howard, C. Michaud. 2015. Nonnative fish control in the Green River. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.

Jones, M.T., C. Smith, Z. Ahrens, J. Howard, K. Creighton. 2016. Nonnative fish control in the Green River. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.

Jones, M.T. and J. Caldwell. 2017. Nonnative fish control in the Green River. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.

Jones, M.T. and J. Caldwell. 2018. Nonnative fish control in the Green River. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.

Jones, M.T. and C. Smith. 2018. Smallmouth Bass control in the Lower Yampa River. Project 110 Annual Report to the Upper Colorado River Endangered Fish Recovery Program, U.S. Fish and Wildlife Service, Denver, CO.

Seber, G.A.F. 1982. The estimation of animal abundance and related parameters, 2<sup>nd</sup> ed. Chapman, London and Macmillan, New York.

Smith, C. 2019. Smallmouth Bass control in the Lower Yampa River. Project 110 Annual Report to the Upper Colorado River Endangered Fish Recovery Program, U.S. Fish and Wildlife Service, Denver, CO.

Smith, C., J. Caldwell, and M. Partlow. 2019. Nonnative fish control in the Green River. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.

Smith, C., K. Lawry, and J. Caldwell 2020. Nonnative fish control in the Green River. Project 123a annual report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver, CO.



UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

**Table 1. Total bass removed during boat electrofishing passes in Echo-Split reach by pass and size group, 2021.** USFWS marked and released 487 bass on Pass 3. These are noted with an asterisk (\*) and are not included in the totals.

Pass	Agency	Date	<100mm	Juvenile (100-199mm)	Adult (200-324mm)	Piscivore (325mm +)	Total
1	FWS	June 2 - June 4	137	104	85	3	329
2	UDWR	July 7 - July 10	39	205	53	0	297
3*	FWS	July 19 - July 21	25 *0	39 *350	4 *135	0 *2	68 *487
4	UDWR	July 21- July 24	47	397	73	1	518
5	UDWR	July 24 - July 27	41	811	90	2	944
6	FWS	July 27 - July 29	200	1363	240	6	1809
7	FWS	Aug 2 - Aug 4	52	579	139	6	776
8	UDWR	Aug 4 - Aug 7	32	665	136	5	838
9	FWS	Aug 10 - Aug 12	130	827	122	10	1089
10	FWS	Aug 17 - Aug 19	149	586	88	11	834
11	FWS	Aug 24 - Aug 26	141	597	87	7	832
12	FWS	Aug 31 - Sep 2	88	291	69	3	451
13	FWS	Sep 8 - Sep 10	222	430	102	5	759
<b>Total Removed</b>			<b>1303</b>	<b>6894</b>	<b>1288</b>	<b>59</b>	<b>9544</b>
<i>* indicates fish tagged and released alive during Pass 3.</i>							

**Table 2. Abundance estimates for Smallmouth Bass, 2021.** Results of 2-sample Lincoln Petersen estimate with Chapman's Correction (consistent with previous versions of this annual report).

Size Class	Method	Abundance Estimate	95% CI	SE	Fish/Mile
All bass $\geq$ 100mm	Lincoln - Petersen	40,068	30,932- 49,204	4568	1602

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

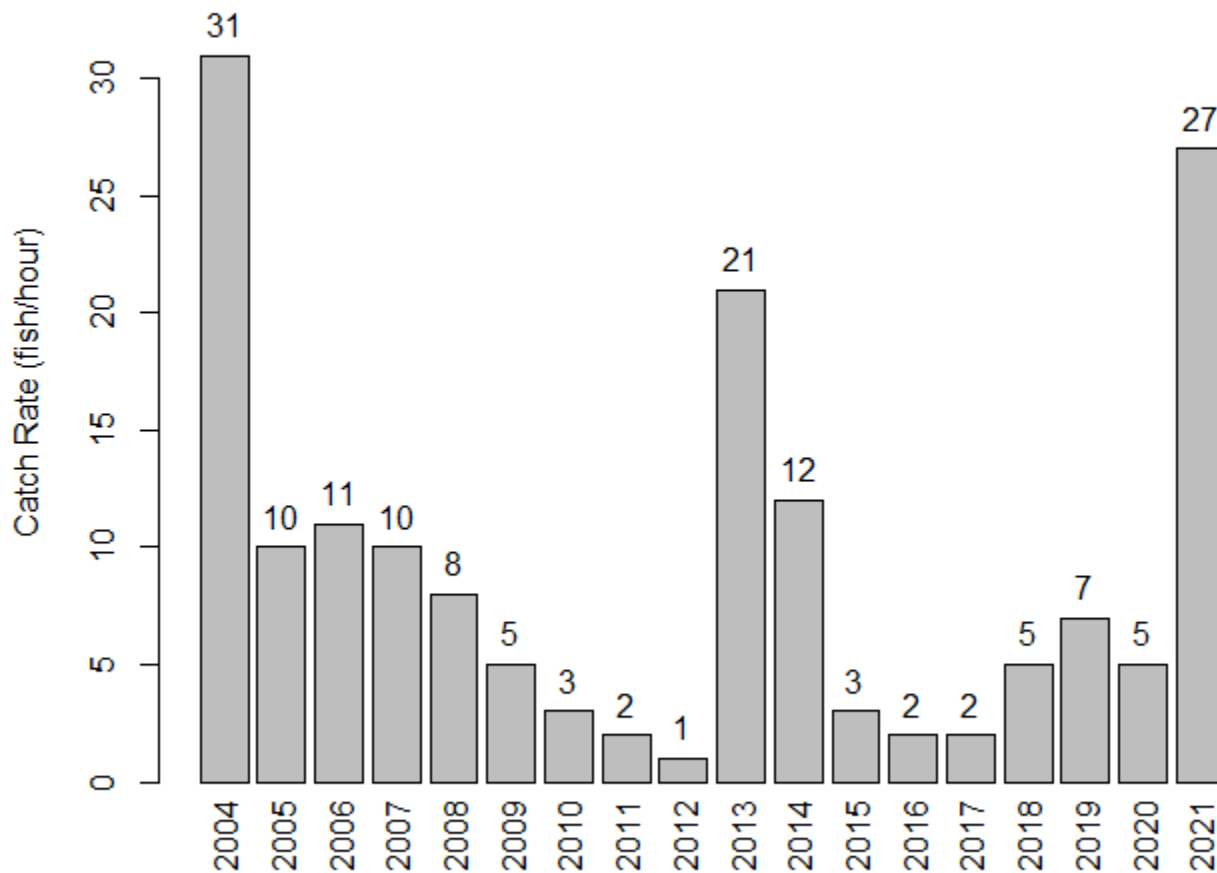
**Table 3. Ancillary fish captures in the Echo–Split reach, 2021.**

Common Name	Scientific Name	Number Captured
Brown Trout	<i>Salmo trutta</i>	68
Channel Catfish	<i>Ictalurs punctatus</i>	11
Green Sunfish	<i>Lepomis cyanellus</i>	266
Northern Pike	<i>Esox lucius</i>	13
Rainbow Trout	<i>Oncorhynchus mykiss</i>	18
Walleye	<i>Sander vitreus</i>	4
White Sucker	<i>Catostomus commersoni</i>	1421
White Sucker / Bluehead Sucker hybrid	<i>C. commersoni</i> / <i>C. discobolus</i>	4
White Sucker / Flannelmouth Sucker hybrid	<i>C. commersoni</i> / <i>C. latipinnis</i>	17
Bonytail Chub	<i>Gila elegans</i>	11
Colorado Pikeminnow	<i>Ptychocheilus lucius</i>	54
Razorback Sucker	<i>Xyrauchen texanus</i>	20
Roundtail Chub	<i>Gila robusta</i>	3

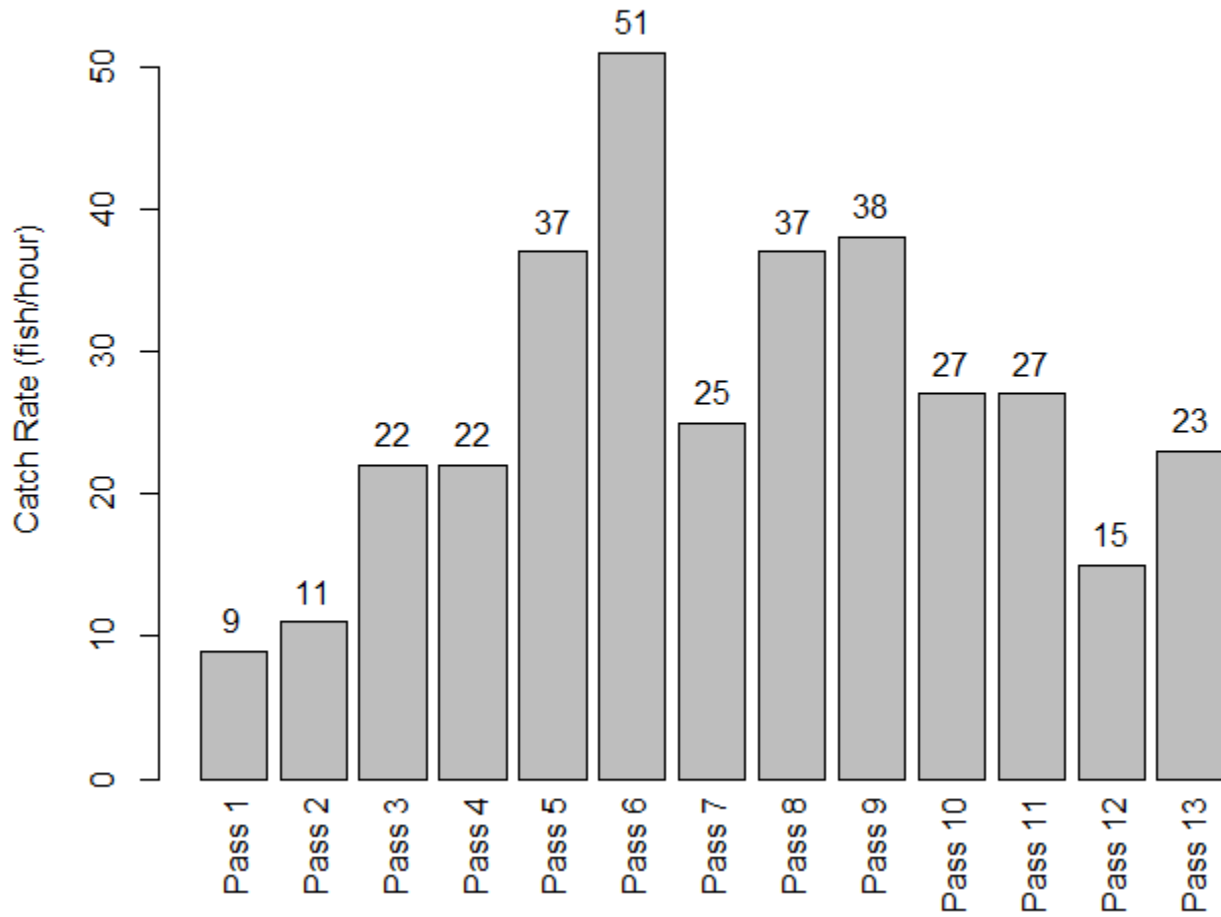
**Table 4. Ancillary fish captures in Desolation and Gray Canyons, 2021.**

Common Name	Scientific Name	Number Captured
Black Bullhead	<i>Ameiurus melas</i>	1
Black Crappie	<i>Pomoxis nigromaculatus</i>	1
Channel Catfish	<i>Ictalurs punctatus</i>	2 (> 450mm)
Green Sunfish	<i>Lepomis cyanellus</i>	82
Northern Pike	<i>Esox lucius</i>	1
Rainbow Trout	<i>Oncorhynchus mykiss</i>	1
Walleye	<i>Sander vitreus</i>	4
White Sucker	<i>Catostomus commersoni</i>	39
Colorado Pikeminnow	<i>Ptychocheilus lucius</i>	10
Humpback Chub	<i>Gila cypha</i>	1
Razorback Sucker	<i>Xyrauchen texanus</i>	25

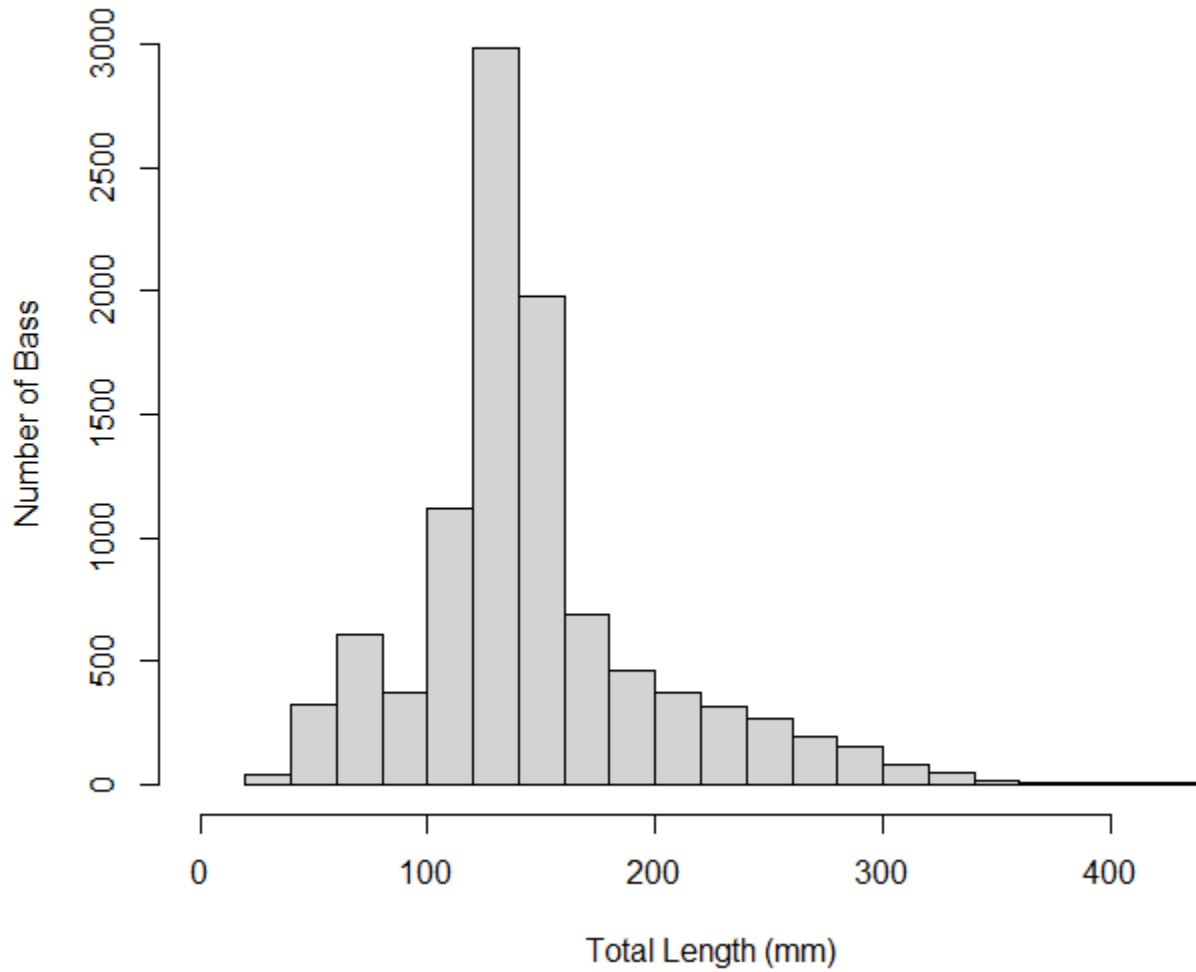
UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM



**Figure 1.** Catch rates for all bass >100mm in the Echo-Split reach, 2004-2021.

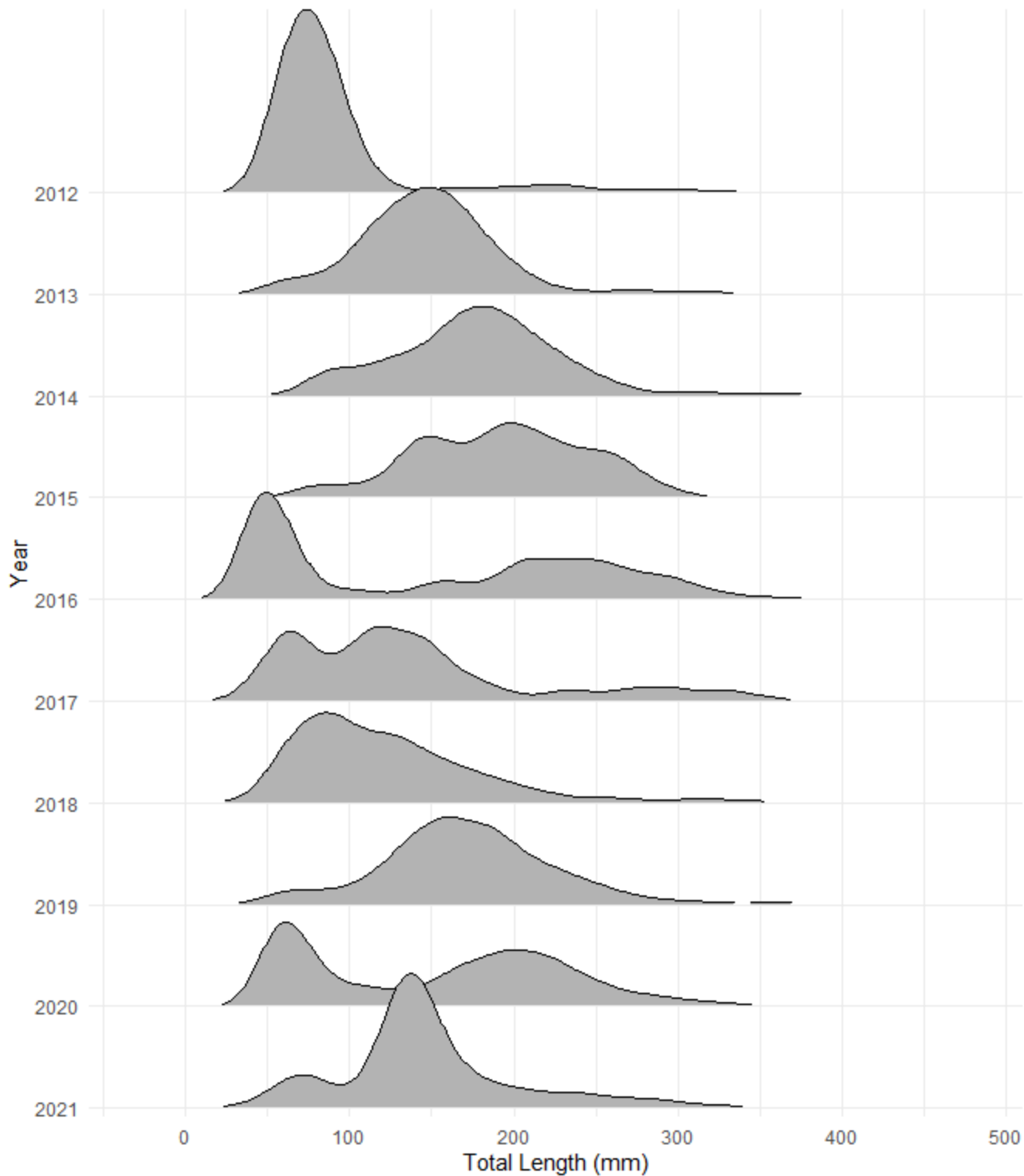


**Figure 2.** Catch rates by pass for all bass  $\geq 100\text{mm}$ , Echo-Split reach 2021.



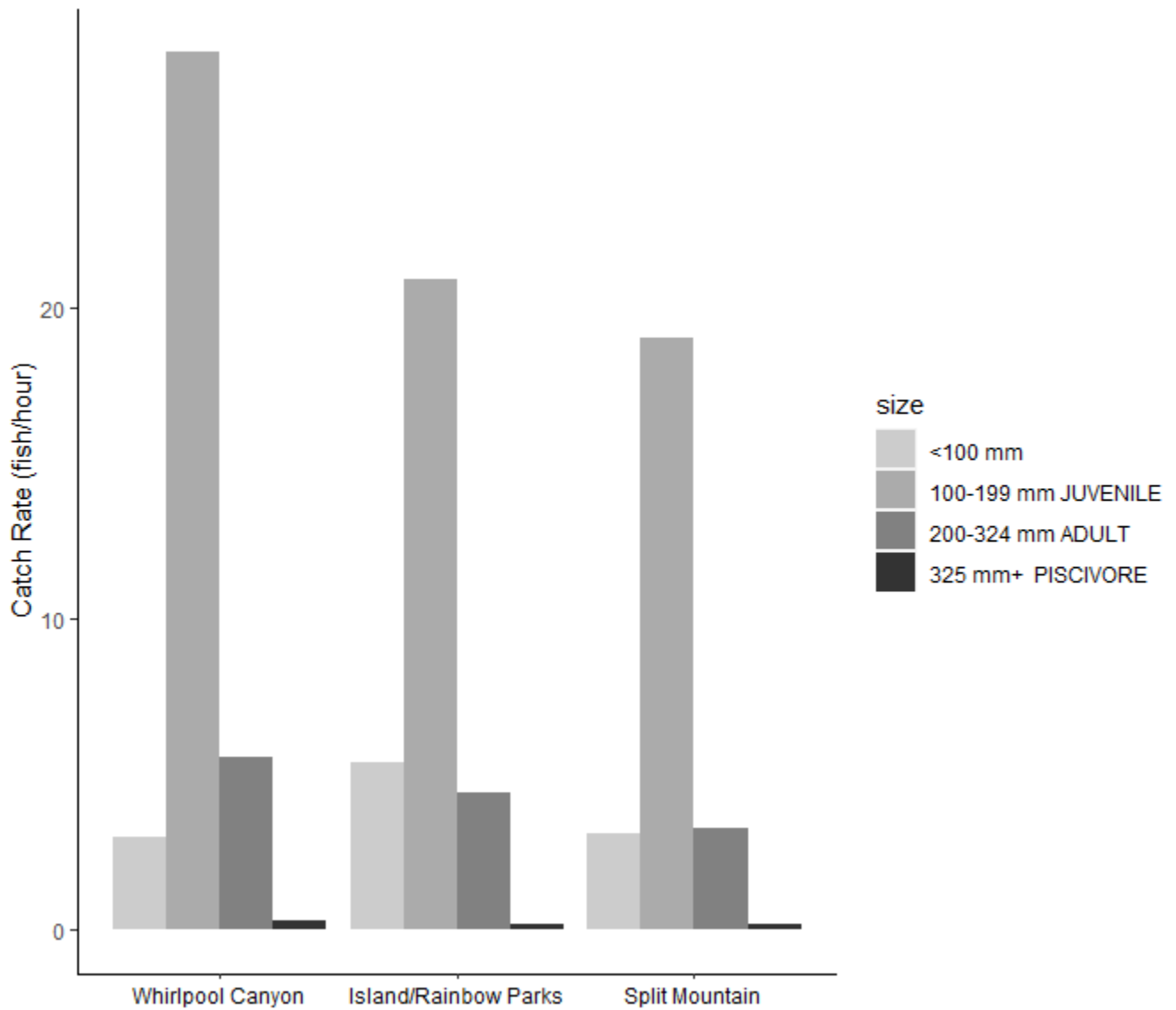
**Figure 3.** Length-frequency histogram for all Smallmouth Bass captured by boat electrofishing in the Echo-Split reach 2021.

# UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM



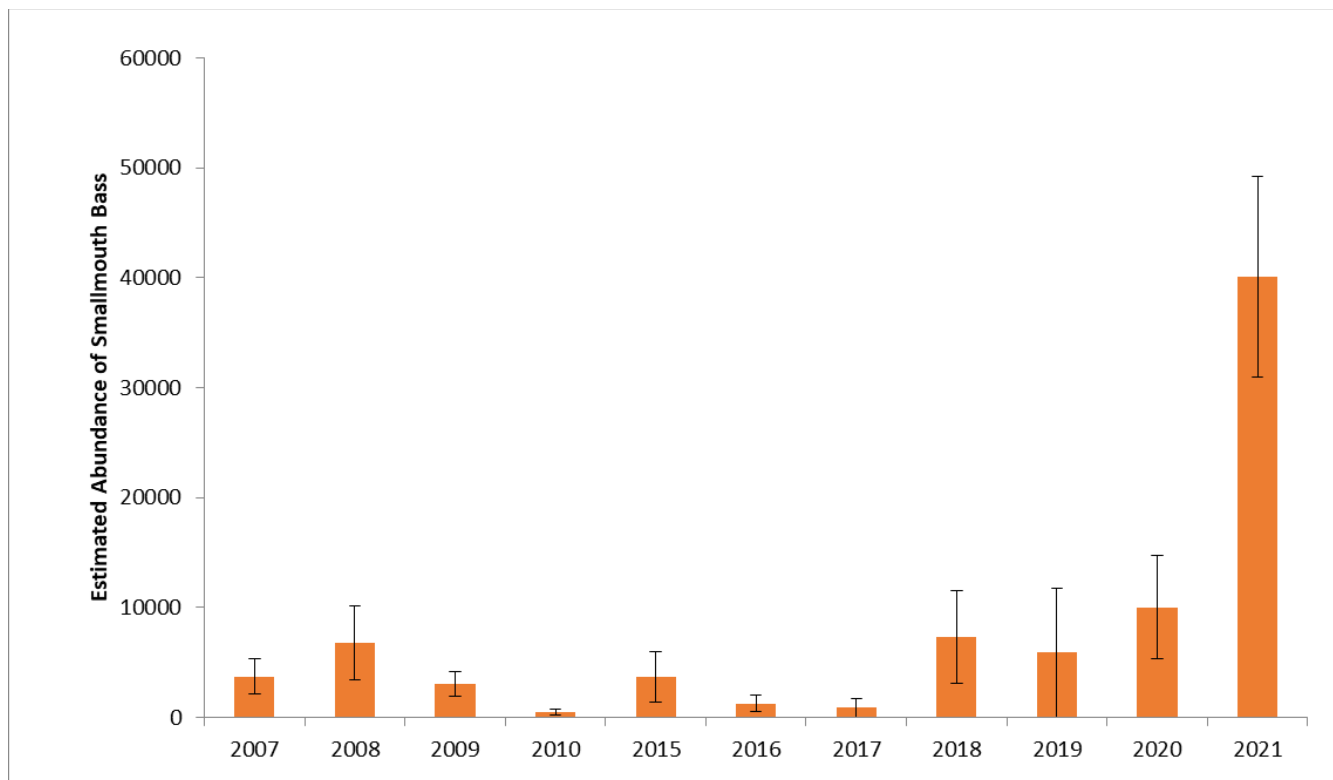
**Figure 4.** Relative length-frequency of Smallmouth Bass captured by boat electrofishing in the Echo-Split reach by USFWS-Vernal from years 2012 - 2021. This figure does not include bass captured by UDWR-Moab, as historical data were not readily available from the agency.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM



**Figure 5.** Catch rates by size class and river section for the Echo-Split reach, 2021.

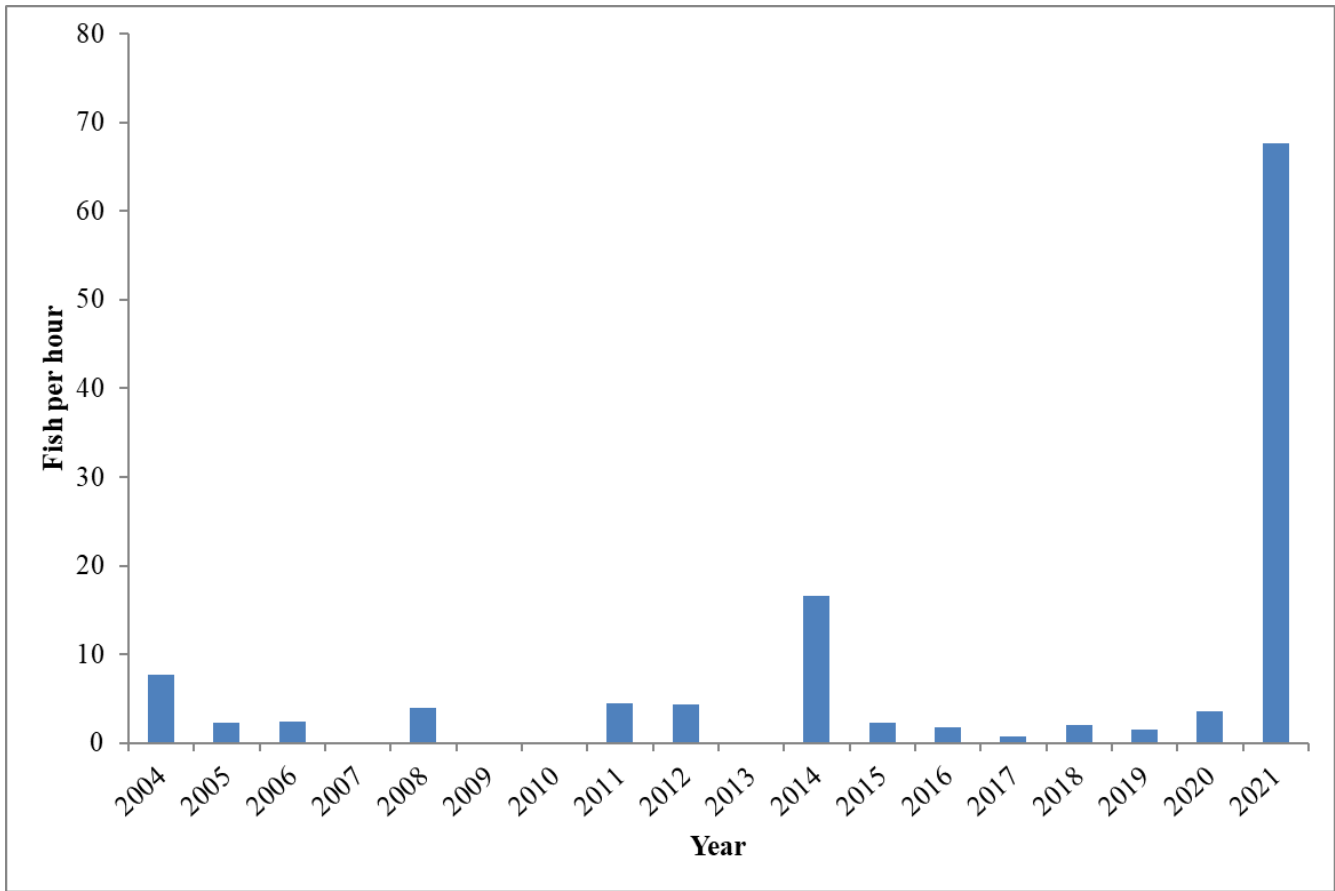
# UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM



**Figure 6.** Abundance estimates with 95% confidence intervals for Smallmouth Bass in the Echo-Split reach, 2007-2010 and 2015-2021. For ease of comparison with previous years, abundance estimation methods and confidence interval approximations for 2021 mirror those that were used in previous versions of this report.

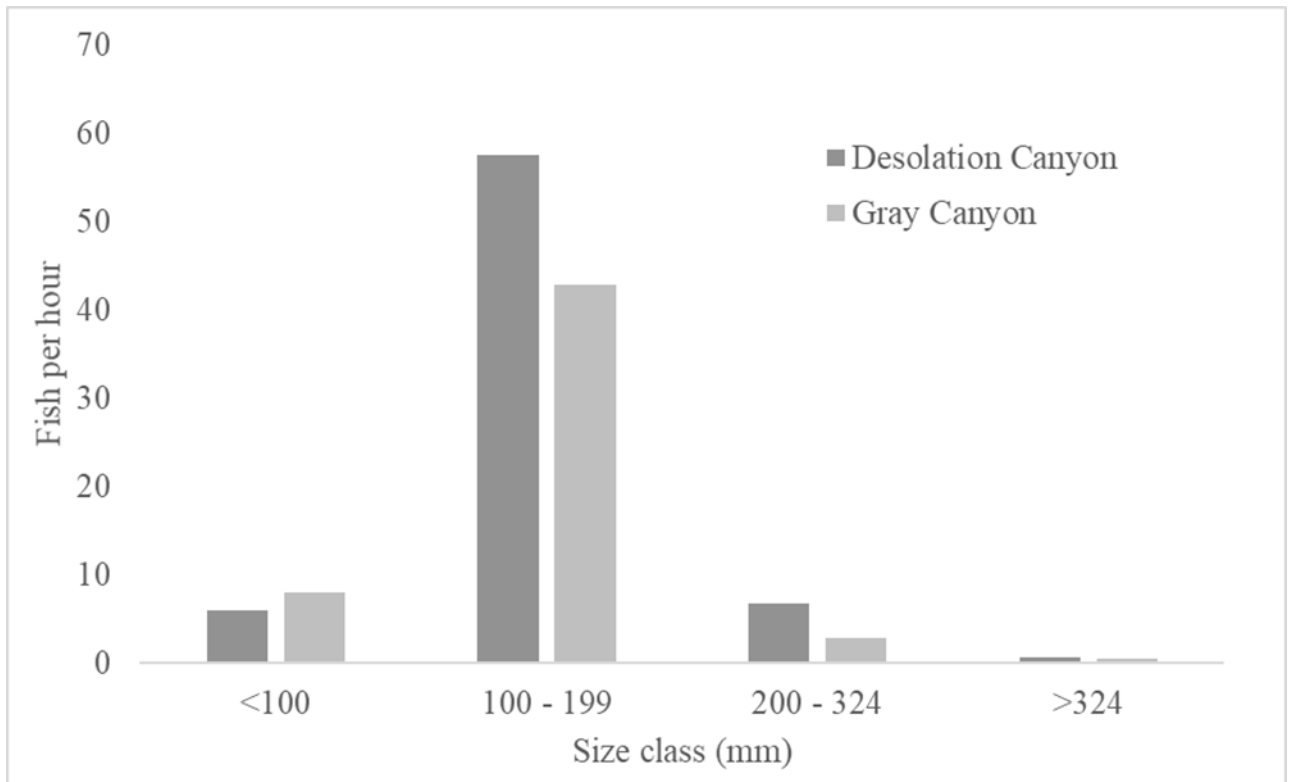


# UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

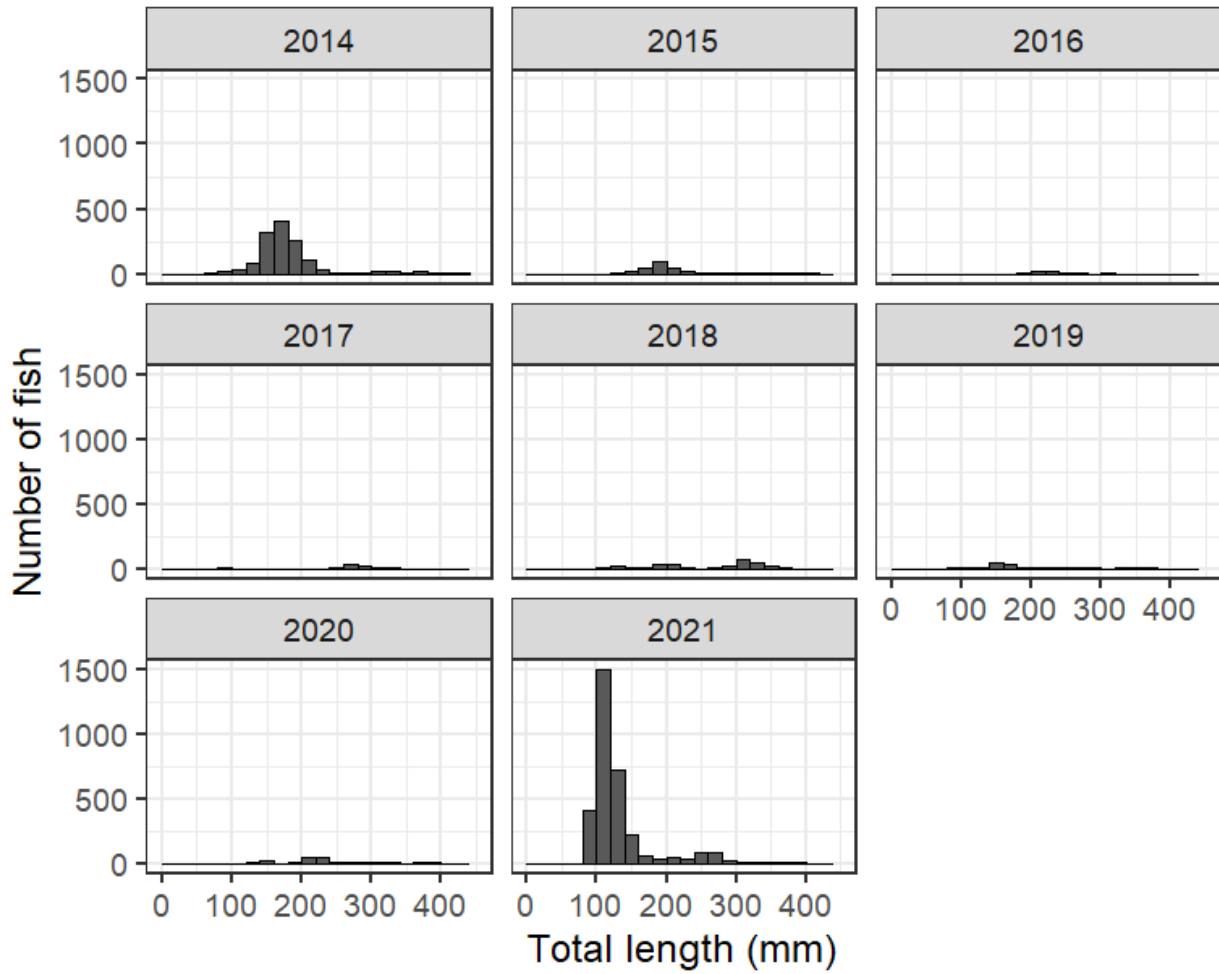


**Figure 7.** Catch per unit effort (fish per hour) from targeted Smallmouth Bass removal in Desolation and Gray canyons, 2004 – 2021.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM



UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM



UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

**ANNUAL PERFORMANCE PROGRESS REPORT (PPR)**

BUREAU OF RECLAMATION AGREEMENT NUMBER: R14AP00007

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: 123a

Project Title: Nonnative fish control in the Green River

Principal Investigator: *John Caldwell*  
*1165 S Hwy 191 Suite 4*  
*Moab, UT 84532*  
[johncaldwell@utah.gov](mailto:johncaldwell@utah.gov)  
*435-259-3781*

Project/Grant Period: Start date: 10/01/2019  
End date: 09/30/2024  
Reporting period end date: 9/30/2021  
Is this the final report? Yes \_\_\_\_\_ No \_\_\_\_\_

Performance:

**Task 2 was completed:** *Four passes were successfully completed (7/7 – 7/10/21, 7/21 – 7/24/21, 7/24 – 7/27/21, 8/4 – 8/7/21) on the Green River from Echo Park (RM 344.5) to Split Mountain (RM 319.5). A total of 2599 Smallmouth Bass were captured and removed. Additionally, 68 brown trout, two channel catfish (> 450 mm), 75 green sunfish, two northern pike, 18 rainbow trout, one walleye, and 570 white sucker and white sucker hybrids were captured and removed. These data were analyzed and reported within the annual report for project #123a by November 2021 (Task 4 was completed). Effort from two passes was reallocated to Smallmouth Bass control on the Colorado River downstream from Westwater.*

**Task 3 was completed:** *One removal passes was successfully completed (6/23 – 6/29/2021) in Desolation and Gray Canyons on the Green River from Sand Wash boat ramp (RM 215.3) to RMI 138.2). A total of 3262 Smallmouth Bass were captured and removed. Additionally, one black bullhead, one black crappie, two channel catfish (over 450 mm), 82 green sunfish, one northern pike, one rainbow trout, and 32 white suckers were removed. Ten Colorado pikeminnow, one humpback chub, and 25 razorback sucker were also encountered. Endangered species were enumerated, measured, tagged (if not already) and returned to the river. These data were analyzed and reported within the annual report for Project #123a by November 2021 (Task 4 was completed).*