

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2022 ANNUAL REPORT

PROJECT: 123a

Project Title:

Nonnative Fish Control in the Green River (project 123a with additions from project 128)

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: 10/1/2019

End date: 9/30/2024

Reporting period end date: 9/30/2022

Is this the final report? Yes ___ No X

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Abstract:

Project 123a 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). Project 128 consisted of Colorado Pikeminnow population monitoring from RM 334.0 to RM 327.5, with bass being removed opportunistically as ancillary captures. We removed 7,961 Smallmouth Bass from the Green River within Dinosaur National Monument. We tagged and released 855 Smallmouth Bass on the first

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123a 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 22,371 bass ≥ 100 mm, or 895 bass/mile. High catch rates in the Echo-Split reach primarily consisted of sub-adult bass in the 100 mm-199 mm range, suggesting that survival probabilities for juvenile bass were high last year or sub-adults are immigrating into the Echo-Split reach from elsewhere. The size distribution in 2022 shifted from 2021 with fewer juvenile (<100 mm) fish.

Utah Division of Wildlife Resources-Moab completed one targeted removal pass in Desolation and Gray Canyons removing 520 Smallmouth Bass. Due to a successive year of high catch rates, a second pass was completed in August by Utah Division of Wildlife Resources-Vernal removing 184 bass. An additional 460 bass were removed in Desolation and Gray Canyons by U.S. Fish and Wildlife Service-Vernal during efforts associated with Project 128 (Colorado Pikeminnow Monitoring). Although the total number of Smallmouth Bass removed was substantially lower in 2022 than 2021, there is still a marked increase in catch rates from years prior. In addition, there was a shift in size structure with adult (200-324 mm) Smallmouth Bass representing 25% more of the total catch than last year. This could be expected as the large cohort of sub adult (100-199 mm) bass detected in 2021 continue to grow and reach maturity but may also be a result of more effort allocated to Gray Canyon in 2021. Removal of Walleye and other nonnative fishes in the lower Green River, as required in this project's scope of work, will be reported in Walleye Control on the Lower Green River (123d; Brockdorff. 2022).

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

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

A combined total of 8,816 bass encounters occurred in the Echo-Split reach during projects 123a and 128 in 2022 (Table 1). Utah Division of Wildlife Resources Vernal (UDWR –V) completed 3 boat electrofishing passes (13.7 hours of electrofishing) during spring Colorado Pikeminnow sampling between April 11 and May 23 and removed 41 bass. These 128 passes covered only a subset of the 123a reach from RM 334 – RM 327.5, with the rest of the reach from RM 327.5 down to Split Mountain (RM 391.6) not electrofished (Table 2).

We encountered 8,775 Smallmouth Bass during project 123a. U.S. Fish and Wildlife Service Vernal (USFWS-V) and UDWR-Moab collaborated to complete one tagging pass (Pass 1) using white Floy

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tags and 11 subsequent removal passes in the Echo-Split reach between July 5, 2022 and September 1, 2022 for a combined total of 305.6 hours of electrofishing (Table 1). We marked and released 855 Smallmouth Bass (2 piscivores ≥ 325 mm, 90 adults ≥ 200 mm, and 763 sub-adults 100-199 mm) during pass 1. Juveniles <100 mm were not marked and were not included in the mark/recapture analysis. The remaining 11 boat electrofishing passes focused only on bass removal and resulted in the capture and removal of 7,920 bass (programmatic definition: 33 piscivores, 942 adults, 5,967 sub-adults, and 978 juveniles <100 mm; Table 3).

Smallmouth Bass catch rates decreased in 2022. The overall boat electrofishing catch rate for projects 128 and 123a combined was 28 bass/hour (Table 1). The boat electrofishing catch rate for all size classes in project 123a was 29 bass/hour (Table 2). This is a decrease of 2 bass/hour from last year. The 123a catch rate for fish ≥ 100 mm (adults and juveniles) was 26 bass/hour, down from 27 bass/hour last year (Fig. 1). No distinct temporal pattern existed for catch rates throughout the 123a season (Figure 2). However, when grouped by sampling period (spring, early summer, late summer), catch rates were lowest in the spring and highest in the late summer (Table 4).

Catch rates varied between size classes by time period (Table 5; Figure 3). Catch rates were highest for sub-adults during the early and late summer periods (Table 5; Figure 3). Catch rates for adults were slightly higher than catch rates for sub-adults in the early spring, but there was more of a difference among size classes during the other time periods (Table 5; Figure 3). Hydrologic conditions and water temperature may have influenced catch rates. Spring 128 sampling occurred during higher discharge and lower temperature conditions than the subsequent 123a electrofishing effort (Table 6; Figures 4 & 5).

The majority of Smallmouth Bass captured in 2022 were sub-adults ranging from 100-199 mm TL (Figure 6). The mode of the size distribution increased slightly from early summer to late summer, but the dominant size class remained sub adults throughout the season (Figure 7). The ridgeline plot in Figure 8 places this within the context of the size structure observed over the last decade. The 2022 length distribution is not as heavily left-skewed with small juvenile fish as years 2020 and 2021 (Figure 8).

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 (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; Smith et al. 2021). This is also 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.

We tagged 855 Smallmouth Bass during pass 1, and we recaptured 221 of these newly tagged bass in all subsequent removal passes. We also recaptured 29 bass that were tagged in previous years (20 with orange tags released in 2021, 3 bass with blue tags released in 2020, 2 with green tags released in 2018, and 4 from previous years with unspecified tag colors).

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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 timing (Table 3). Temporal organization of the removal passes was similar to 2021, with the main difference being that the marking event was completed on the first pass.

Although 221 Smallmouth Bass with white Floy tags were recaptured, we only included 170 recaptures with white tags from passes 2-8 (July 7- August 4). Observations from passes 2-8 were lumped together and treated as a single observation of 170 fish which was used as the second (recapture) sample in the two-sample Lincoln-Peterson model. The remaining 51 recaptures with white tags from passes 9-12 were excluded. The additional 29 recaptures marked in previous years with tag colors other than white were also excluded.

The total population of bass $\geq 100\text{mm}$ in the reach was estimated to be 22,371 fish (95% CI 19,025 , 25,717), or between roughly 760 and 1,030 bass per river mile (Table 7). This year's estimate is significantly lower than last year's all-time high estimate of 40,068 bass (95% CI 30,932, 49,204), but it is still the second highest on record (Fig. 9). Confidence intervals were calculated using an informal variance approximation that was utilized in previous versions of this report from 2007 to 2021 (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; Smith et al. 2021). The confidence intervals on the 2022 abundance estimate do not overlap with previous years, and the coefficient of variation on the 2022 abundance estimate is the lowest on record (7.48%).

Task 3: Smallmouth bass removal- Desolation and Gray canyons

Utah Division of Wildlife Resources-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 132 between June 24th and June 30th, 2022. In consideration of a substantial spike in catch rates beginning last year, combined with this year's high number of Smallmouth Bass, an additional targeted removal pass was completed by UDWR-Vernal between August 21st and August 26th 2022. Prior to these targeted removal passes, USFWS-Vernal completed three electrofishing passes for Project 128 (Colorado Pikeminnow Monitoring). Total numbers of Smallmouth Bass removed, size structure and distribution information in this report will draw from both projects. However, sampling strategies differ between Projects 123a and 128, thus catch rate comparisons presented here refer only to targeted Smallmouth Bass removal.

Through combined effort, 1,164 Smallmouth Bass were removed from Desolation and Gray Canyons in 2022. Two targeted passes were completed by UDWR, removing a combined 704 bass (6.74 bass/hour; Figure 11) with a total effort of 104.5 hours of electrofishing (Table 10). The first pass between June

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24th and June 30th, yielded 520 bass (8.67 bass/hour) and coincided with the Flaming Gorge dam release used to disrupt Smallmouth spawning. This resulted in a large fluctuation in river discharge (USGS Gauge 09315000 in Green River, UT), rising up to 8,000 cfs before dropping down to 4,300 cfs (Figure 10). Water temperatures measured on site ranged between 20.6 and 23 degrees Celsius. The second targeted pass, completed between August 21st and August 26th yielded 184 bass (4.13 bass/hour) with river discharge (USGS Gauge 09315000 in Green River, UT) fluctuating between 1,850 and 2,300 cfs. Water temperatures measured on site ranged between 22.8 and 24.8 degrees Celsius. An additional 460 Smallmouth Bass were removed by USFWS during three Project 128 passes.

Piscivorous adult Smallmouth Bass over 324 mm in total length comprised 7% of the total catch (0.5 bass/hour), adults from 200-324 mm comprised 34.7% (2.33 bass/hour), sub adults from 100-199 mm comprised 58.1% (3.91 bass/hour), and juveniles less than 100 mm comprised 0.2% (0.02 bass/hour). When divided by sub-reach, catch rates for all size classes combined were 7.12 bass/hour in Desolation Canyon (upstream of RM 160) and 5.97 bass/hr in Gray Canyon (downstream of RM 160). A breakdown of catch rates for all size classes within each sub-reach is provided in Figure 12.

Although 2022 targeted Smallmouth Bass catch rates were significantly lower than 2021 (Figure 11), the total number of bass removed (1164 bass) was higher than the combined total of 2015- 2020 including targeted and ancillary efforts (1097 bass). Similar to last year, high catch rates occurred in both Desolation and Gray Canyons (Figure 12), which has not been the case in years prior to 2021 (Smith et al. 2021), when the majority of the catch has come from Desolation Canyon. Additionally, size class structure shifted between 2021 and 2022 (Figure 13) with piscivorous and adult Smallmouth Bass comprising 41.1% of the total catch in 2022 compared with 9.8% in 2021 (Smith et al. 2021). As depicted in Figure 12, catch rates of adult (200-324 mm) bass were higher in Gray Canyon than in Desolation Canyon. This could be related to immigration of adult bass into Gray Canyon from Desolation or other reaches but could also be related to control efforts in years prior. Due to time constraints caused by remarkably high catch rates in 2021, sampling was limited to 9.2 of the 28 river miles of Gray Canyon. Similar to 2014 which yielded 1377 bass, subsequent years of sampling were able to track that cohort grow in total length as well as decrease in numbers in part through UDWR and USFWS removal efforts. With consideration of additional effort allocated to Gray Canyon in 2022 (77.3 hours of electrofishing as opposed to 10.3 hours in 2021), it is possible that high catch rates in Gray Canyon are representative of the same cohort that didn't have the high removal effort as experienced by those fish in Desolation Canyon and are subsequently being captured.

Task 4: Data entry, analysis and reporting

Data was submitted to the database manager on October 18, 2022. This report will serve as the annual progress report including a summary of the 2022 data.

Additional Noteworthy Observations:

Echo-Split Reach

We captured 29 Colorado Pikeminnow. This is a decrease from 54 last year. We captured 11 Razorback Sucker, all of which were recaptures. This is a decrease from 20 last year. We captured 4 Bonytail Chub, all of which were recaptures. We captured 4 Roundtail Chub, all of which were unmarked. We also captured 1 flannelmouth sucker x razorback sucker hybrid (Table 8).

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In addition to Smallmouth Bass, we captured and removed 14 other nonnative fish species (Table 9). The number of Green Sunfish captured this year remained relatively constant at 282 (compared to 266 last year). Seven Northern Pike and five Walleye were captured this year, which is likewise comparable to 2021.

Desolation and Gray Canyons

A summary of native and nonnative fish encounters can be found in Tables 11 and 12, respectively. Seven species of native fish were encountered along with seven species of nonnative fish in addition to Smallmouth Bass that were removed. With the addition of data from Project 128, there was a significant increase in Colorado Pikeminnow encounters this year (24 compared to 10 in 2021) but most notably with Razorback Suckers (570 compared to 25 in 2021).

Recommendations:

Echo-Split Reach

- Continue Smallmouth Bass removal at current levels to address the large cohort of sub-adult Smallmouth Bass encountered in 2022.
- 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.
- With successive years of high catch, consideration should be taken to allocate effort for additional passes of targeted Smallmouth bass removal in Desolation and Gray Canyons. Additional removal effort associated with other projects (128) is advantageous, however the lower CPUE is indicative of the importance of targeted fishing.

Project Status:

Ongoing

FY 2022 Budget Status

Funds Provided: \$201,541

Funds Expended: \$201,541

Difference: \$0

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

Recovery Program funds spent for publication charges: \$0

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Status of Data Submission

Compiled data will be submitted to the database manager in December 2022.

Science/Technical Reviewer:

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Signed:

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Table 1. Overall effort summary for Dinosaur National Monument. Standardized table by Chris Michaud.

Sampling Date Range	Sampling River Mile Range	Total Sampling Days	Total Effort (hr)	Number of Target Species Encountered	CPUE of Target Species
Apr 11 - Sep 01	345.6 - 319.6	38	319.3	8,816	27.61

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Table 2. Effort summary by project for Dinosaur National Monument in 2022. Standardized table by Chris Michaud.

Study Code	Sampling Date Range	Sampling River Mile Range	Total Sampling Days	Total Effort (hr)	Number of Target Species Encountered	CPUE of Target Species
128	Apr 11 - May 23	334 - 327.5	3	13.7	41	2.99
123a	Jul 05 - Sep 01	345.6 - 319.6	35	305.6	8,775	28.71

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Table 3. Total bass removed during boat electrofishing passes in 123a by pass and size group, 2022. USFWS marked and released 869 bass on Pass 1. These are noted with an asterisk (*) and are not included in the totals. Non-standardized table by Katherine Lawry.

Pass	Agency	Date	Juvenile (<100mm)	Sub-Adult (100-199mm)	Adult (200-324mm)	Piscivore (325mm +)	Total
<i>1*</i>	<i>FWS</i>	<i>July 5 - July 7</i>	<i>*0</i>	<i>*763</i>	<i>*90</i>	<i>*2</i>	<i>*855</i>
1	FWS	July 5 - July 7	231	16	5	0	252
2	UDWR	July 7 - July 10	139	327	40	4	510
3	UDWR	July 11- July 13	160	463	75	1	699
4	FWS	July 13- July 15	140	857	85	5	1087
5	UDWR	July 21 - July 24	70	754	71	6	901
6	UDWR	July 25 - July 27	23	473	31	0	527
7	FWS	July 27 – July 29	20	532	64	2	618
8	FWS	Aug 2 - Aug 4	10	606	71	1	688
9	FWS	Aug 9 - Aug 11	8	589	99	2	698
10	FWS	Aug 16 - Aug 18	48	642	141	4	835
11	FWS	Aug 23 - Aug 25	33	440	143	2	618
12	FWS	Aug 30 - Sep 1	96	268	117	7	488
Total Captured			978	6730	1032	35	8775
Total Removed			978	5967	942	33	7920

** indicates fish tagged and released alive during Pass 1. (included in captured total, but not in removal total)*

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Table 4. Sampling summary by period. Standardized table by Chris Michaud.

Season	Sampling Date Range	Sampling River Mile Range	Total Sampling Days	Total Effort (hr)	Number of Target Species Encountered	CPUE of Target Species
Spring	Apr 11 - May 23	334 - 327.5	3	13.7	41	2.99
Early Summer	Jul 05 - Jul 29	345.6 - 319.6	20	191.8	5,458	28.46
Late Summer/Fall	Aug 02 - Sep 01	344.5 - 319.6	15	105.4	3,324	31.54

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Table 5. Smallmouth Bass encounters and CPUE by size-class and season. Standardized table by Chris Michaud.

Season	Juveniles	Sub- adults	Adults	Juveniles/hour	Sub- adults/hour	Adults/hour
Spring	0	17	24	0.00	1.24	1.76
Late Summer/Fall	193	2,545	586	1.83	24.13	5.56
Early Summer	778	4,199	481	4.06	21.90	2.51

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Table 6. Hydrologic summary. Standardized table by Chris Michaud.

Station Name	Maximum Discharge	Minimum Discharge	Mean Discharge	Date at Maximum Discharge	Date at Minimum Discharge	Maximum Temperature	Mean Temperature	Date at Maximum Temperature
Green River At Green River, Ut	17,400	1,180	3,867	June 03, 2022	February 28, 2022	29.5	14	July 22, 2022
Green River Near Jensen, Ut	17,000	831	3,260	May 31, 2022	January 04, 2022	26.1	12	July 19, 2022

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Table 7. Abundance estimates for Smallmouth Bass, 2022. Results of 2-sample Lincoln Petersen estimate with Chapman's Correction (consistent with previous versions of this annual report). Non-standardized table by Katherine Lawry.

Size Class	Method	Abundance Estimate	95% CI	SE	Fish/Mile
All bass \geq 100mm	Lincoln - Petersen	22,371	19,025- 25,717	1672	895

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Table 8. Targeted and ancillary captures of native species in the Dinosaur National Monument

Common Name	Number of Fish	Median Length	Length Range
Colorado Pikeminnow	29	606.0	455 - 845
Razorback Sucker	11	473.0	452 - 500
Bonytail	4	270.0	238 - 299
Roundtail Chub	4	190.5	150 - 207
Flannelmouth Sucker x Razorback Sucker	1	566.0	566 - 566

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Table 9. Targeted and ancillary captures of nonnative species in Dinosaur National Monument.
Standardized table by Chris Michaud.

Common Name	Number of Fish	Median Length	Length Range
Smallmouth Bass	8,816	150.0	23 - 419
White Sucker	2,166	137.0	65 - 562
Green Sunfish	282	97.0	38 - 245
Brown Trout	111	172.0	61 - 446
Flannelmouth Sucker x White Sucker	35	143.0	96 - 472
Rainbow Trout	13	231.0	90 - 397
Channel Catfish	8	516.5	297 - 651
Northern Pike	7	659.0	496 - 782
Bluehead Sucker x White Sucker	7	223.0	79 - 335
Black Crappie	6	133.5	116 - 146
Walleye	5	515.0	471 - 719
Black Bullhead	4	164.5	154 - 240
Creek Chub	4	91.5	77 - 93
White Crappie	2	113.0	105 - 121
Mountain Sucker	1	99.0	99 - 99

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Table 10. Effort summary by project for Desolation and Gray Canyons, 2022. Compiled Standardized table by Chris Michaud.

Study Code	Sampling Date Range	Sampling River Mile Range	Total Sampling Days	Total Effort (hr)	Number of Target Species Encountered	CPUE of Target Species
128a	Apr 20 - May 22	206.9 - 128.1	17	137.5	460	3.35
123b	Aug 21 - Aug 26	206.8 - 135.7	6	44.5	184	4.13
123a	Jun 24 - Jun 30	207 - 132	7	60.0	520	8.67
Combined	Apr 20 – Aug 26	207 – 128.1	30	242	1164	6.74*

**CPUE considers only targeted effort*

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Table 11. Targeted and ancillary captures of native species in Desolation and Gray Canyons, 2022.
Standardized table by Chris Michaud.

Common Name	Number of Fish	Median Length	Length Range
Razorback Sucker	570	438.0	326 - 562
Colorado Pikeminnow	24	541.0	195 - 775
Humpback Chub	12	280.5	235 - 328
Bonytail	7	253.0	209 - 327
Bluehead Sucker	5	370.5	321 - 390
Flannelmouth Sucker x Razorback Sucker	3	497.0	461 - 499
Flannelmouth Sucker	2	480.5	478 - 483

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Table 12. Targeted and ancillary captures of nonnative species in Desolation and Gray Canyon, 2022. Standardized table by Chris Michaud.

Common Name	Number of Fish	Median Length	Length Range
Smallmouth Bass	1,164	177.0	72 - 442
Green Sunfish	57	90.0	60 - 176
Black Crappie	23	110.0	85 - 300
Walleye	18	482.5	190 - 710
White Sucker	17	261.0	235 - 347
Channel Catfish	10	519.5	473 - 700
Black Bullhead	8	192.5	120 - 240
Yellow Bullhead	3	168.0	162 - 230

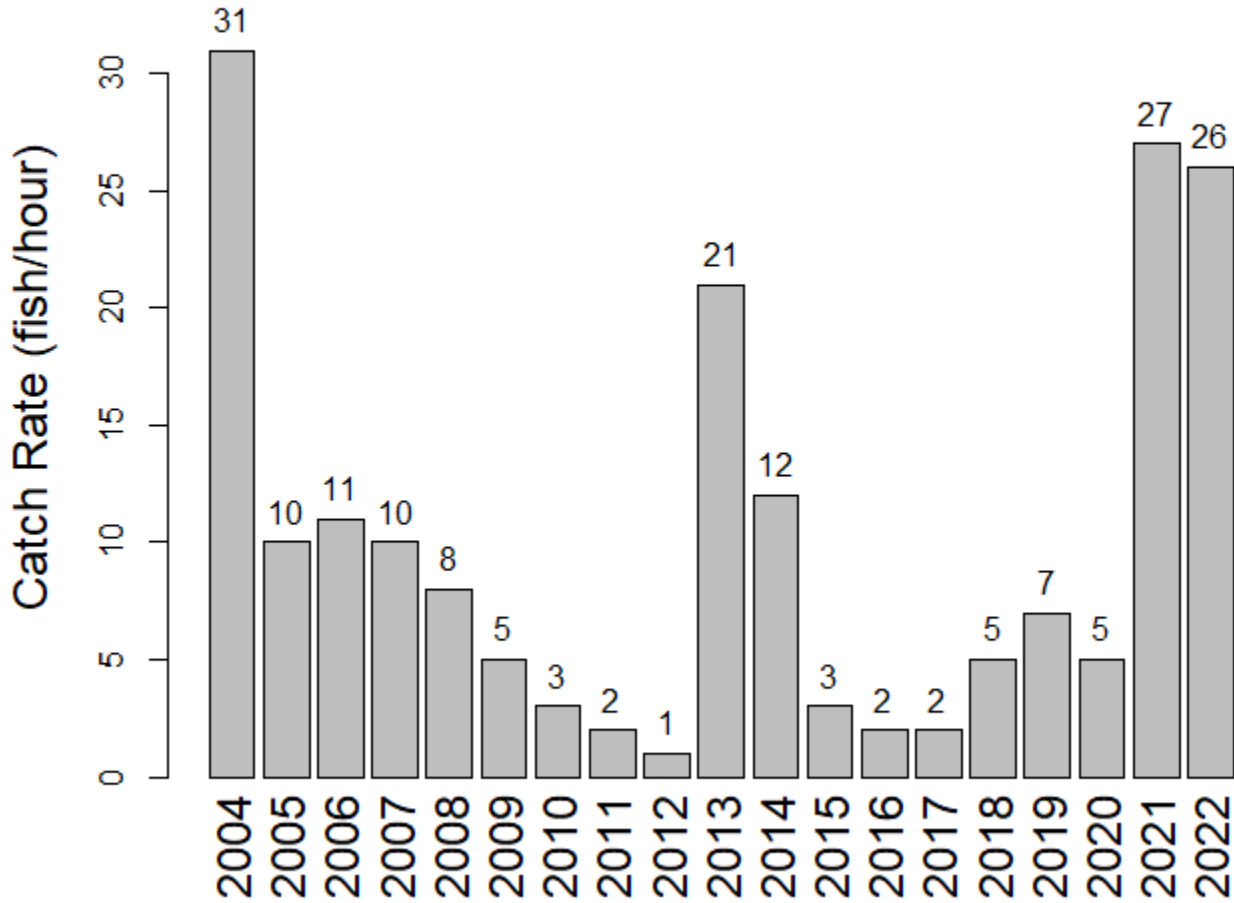


Figure 1. Catch rates for all bass >100mm in the Echo-Split reach encountered via project 123a, 2004-2022. Non-standardized figure by Katherine Lawry. This figure contains data from project 123a only; this does not include data from project 128.

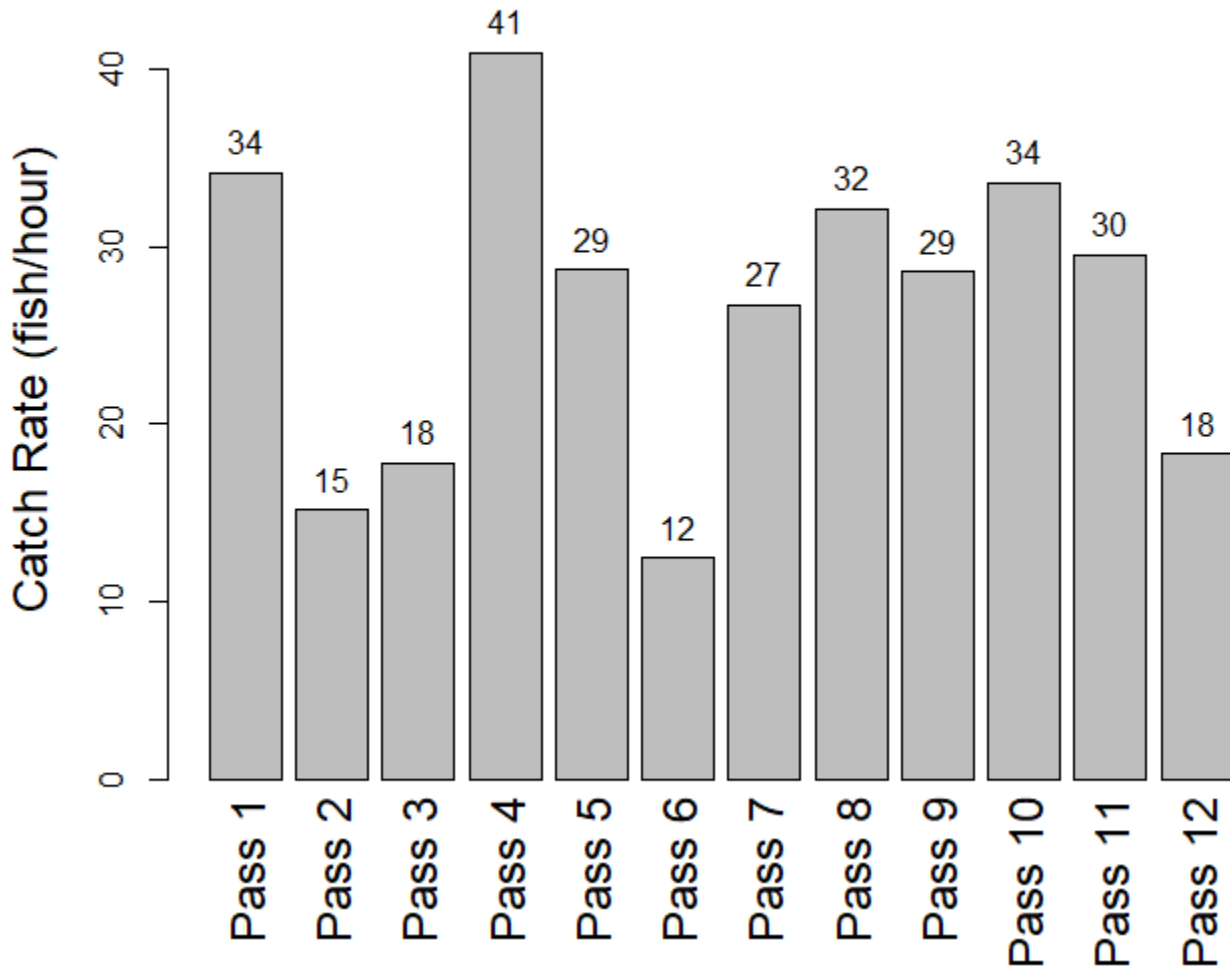


Figure 2. Catch rates by 123a pass for all bass ≥ 100 mm, Echo-Split reach 2022. This figure contains data from project 123a (project 128 is not included). Non-standardized figure produced by Katherine Lawry.

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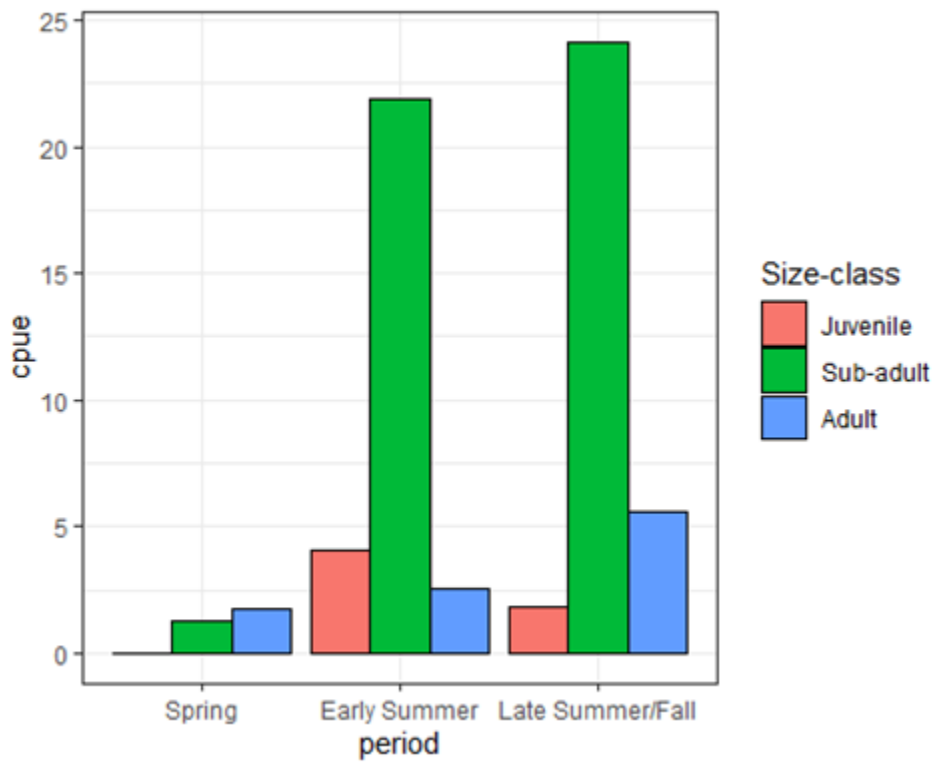


Figure 3. Catch rates by season and size class. This figure contains data from projects 123a and 128. Standardized figure produced by Chris Michaud.

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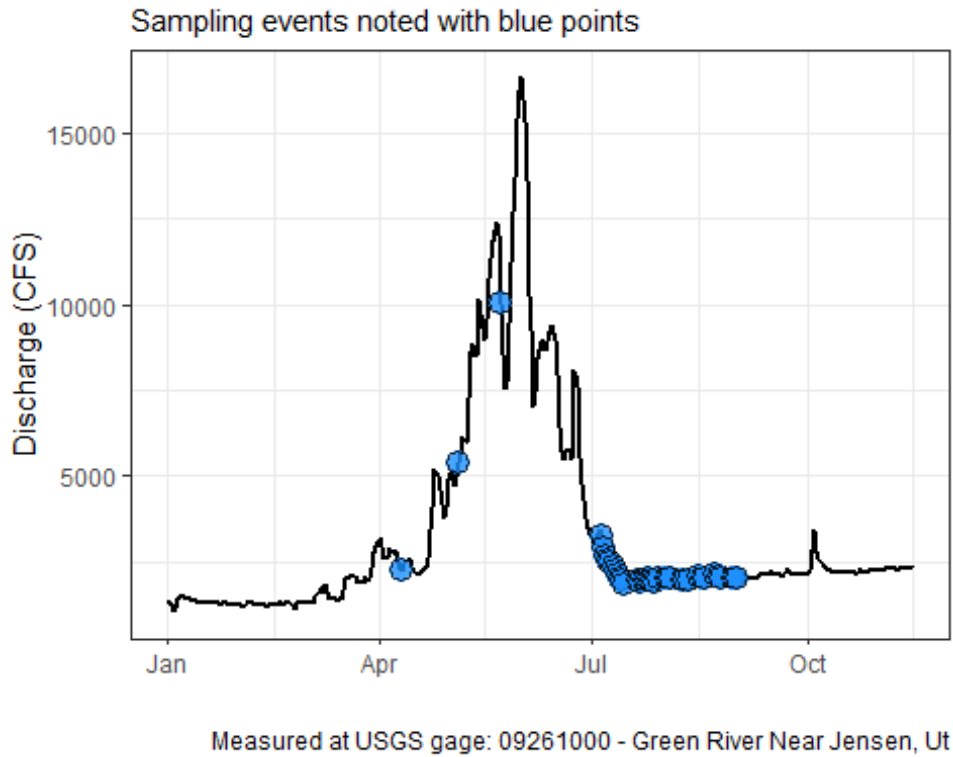
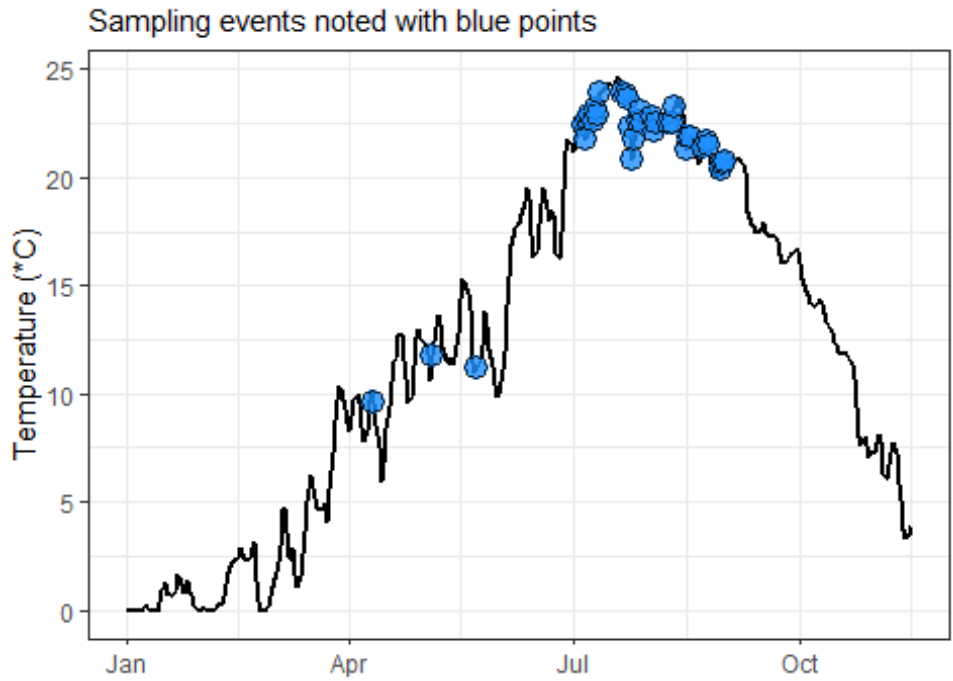


Figure 4. Electrofishing events and discharge. Standardized figure by Chris Michaud.

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Measured at USGS gage: 09261000 - Green River Near Jensen, Ut

Figure 5. Electrofishing events and temperature. Standardized figure by Chris Michaud.

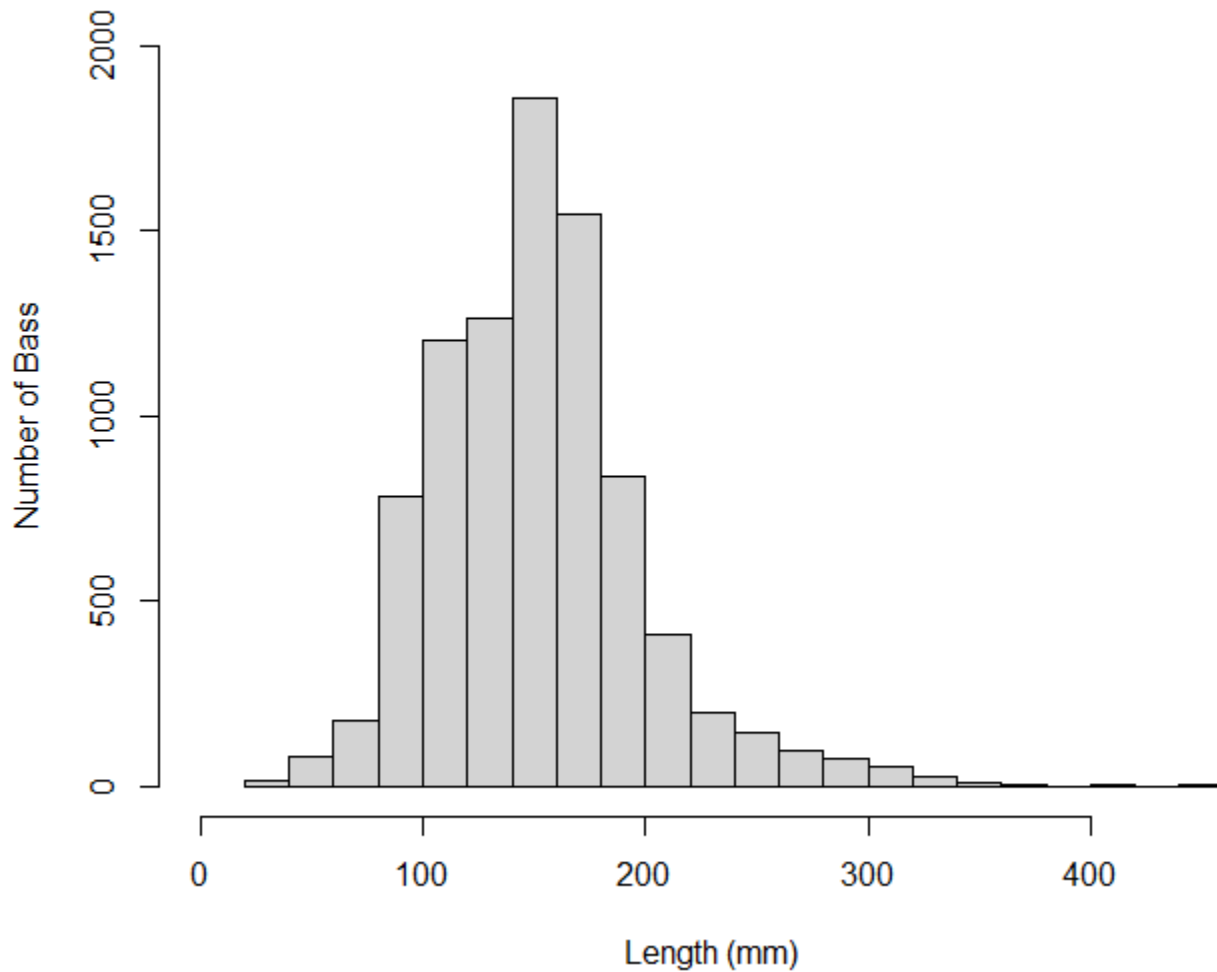


Figure 6. Length-frequency histogram for all Smallmouth Bass captured by boat electrofishing during project 123a in the Echo-Split reach 2022. This figure contains bass from project 123a only; project 128 is not included. Non-standardized figure by Katherine Lawry.

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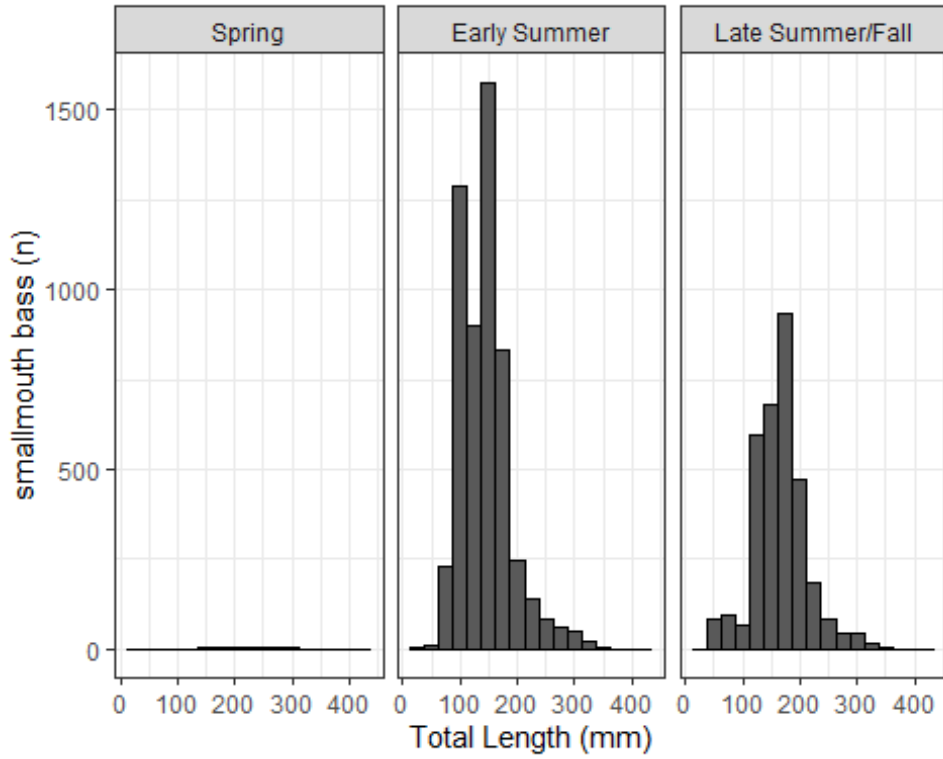


Figure 7. Length frequency by time-period. This figure contains combined data from projects 128 and 123a. Standardized figure by Chris Michaud.

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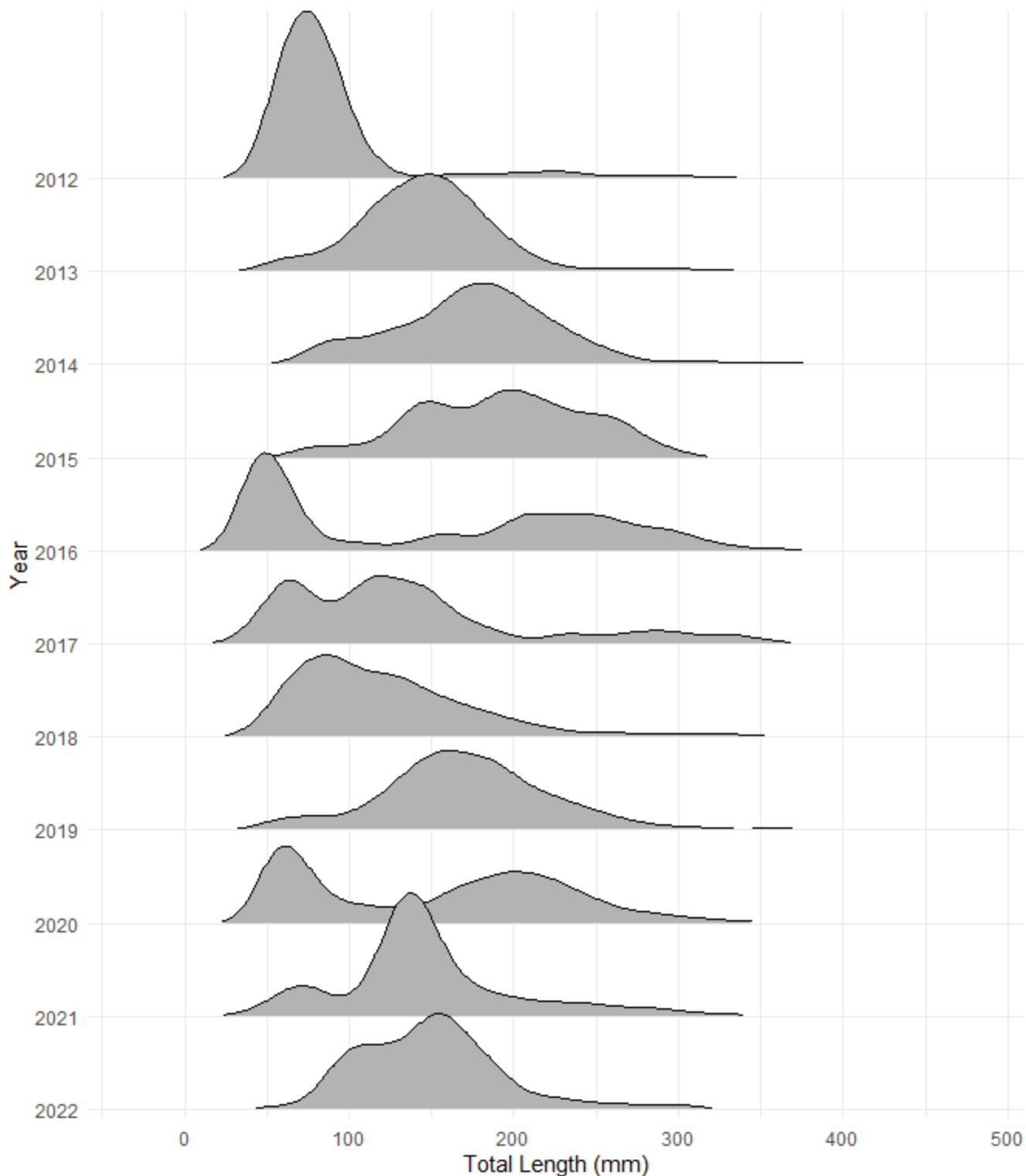


Figure 8. A decade of length distributions of Smallmouth Bass captured by boat electrofishing in the Echo-Split reach during project 123a by USFWS-Vernal (years 2012 – 2022). Each curve is smoothed histogram, with the Y axis for each year expressed as a kernel density. This figure does not include bass captured by UDWR-Moab, as historical data were not readily available from the agency. Non-standard figure by Katherine Lawry.

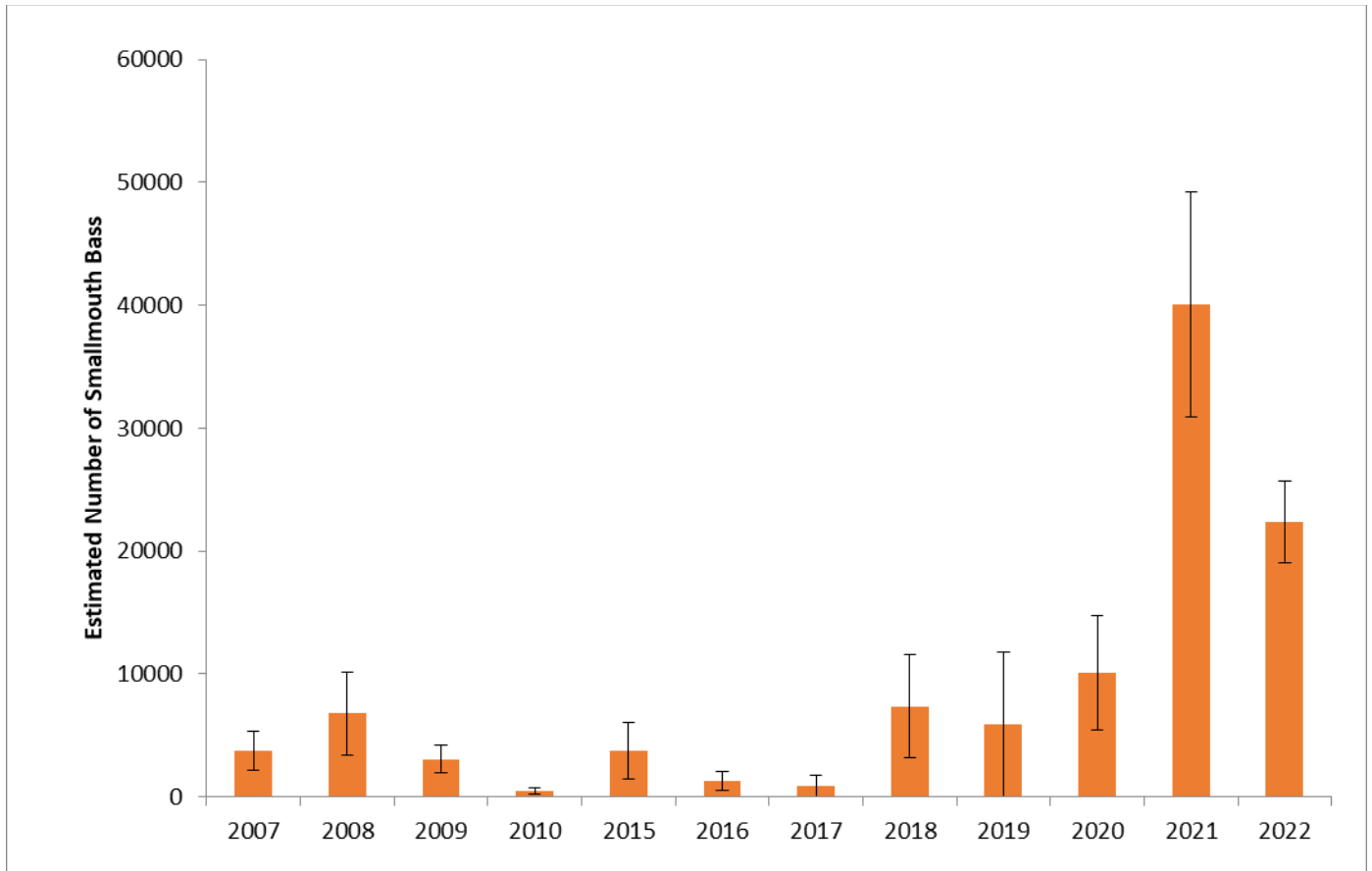


Figure 9. Abundance estimates with 95% confidence intervals for Smallmouth Bass in the Echo-Split reach, 2007-2010 and 2015-2022. For ease of comparison with previous years, abundance estimation methods and confidence interval approximations for 2022 mirror those that were used in previous versions of this report. This figure contains data from project 123a only; project 128 is not included. Non-standardized figure by Katherine Lawry.

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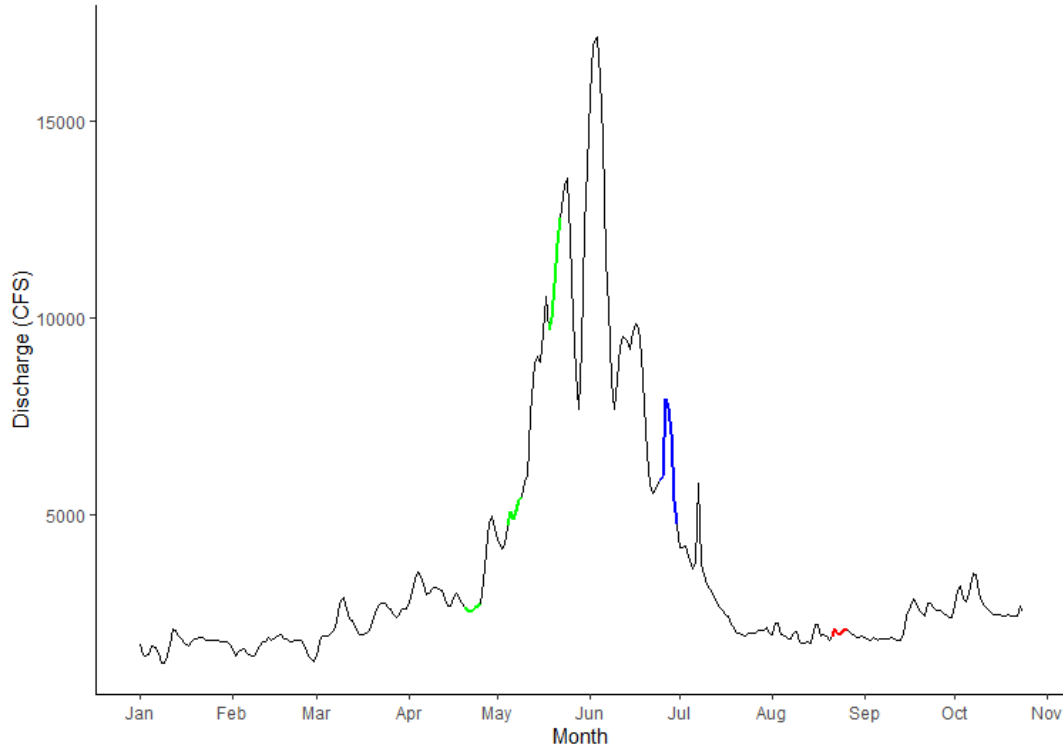


Figure 10. Sampling events and discharge on the Green River (USGS Gauge 09315000 in Green River, UT) through the 2022 field season. Green lines represent Project 128 sampling, blue represents Project 123a, and red represents Project 123b.

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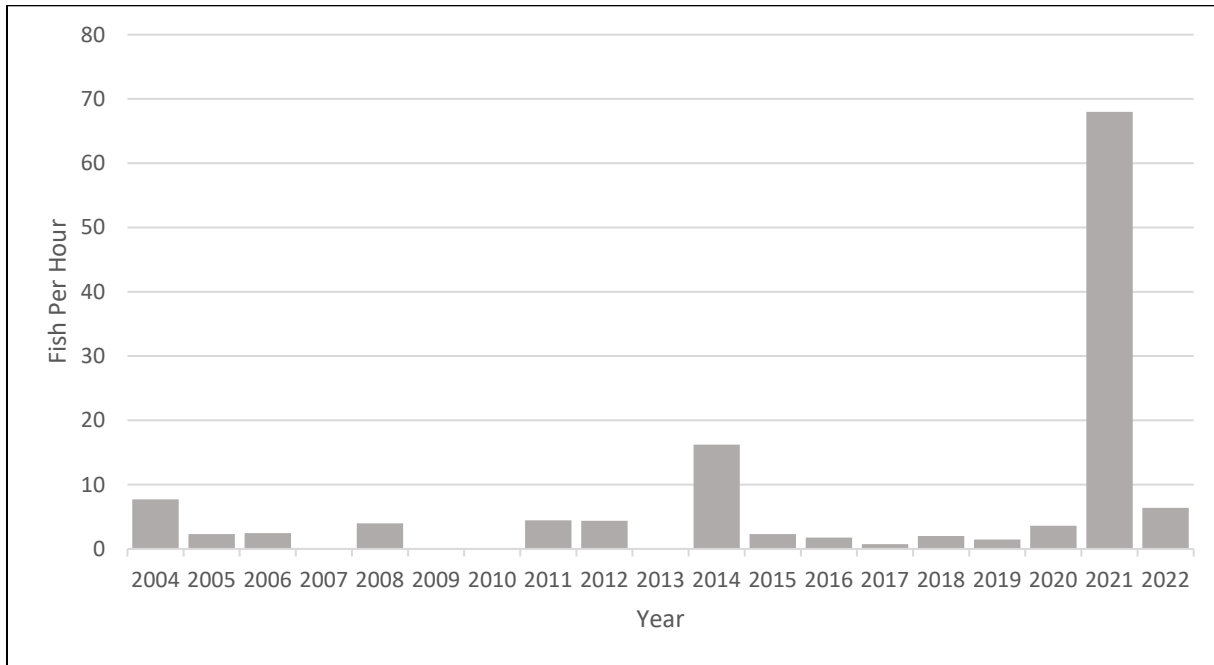


Figure 11. Catch per unit effort (fish per hour) from targeted Smallmouth Bass removal in Desolation and Gray canyons, 2004 – 2022.

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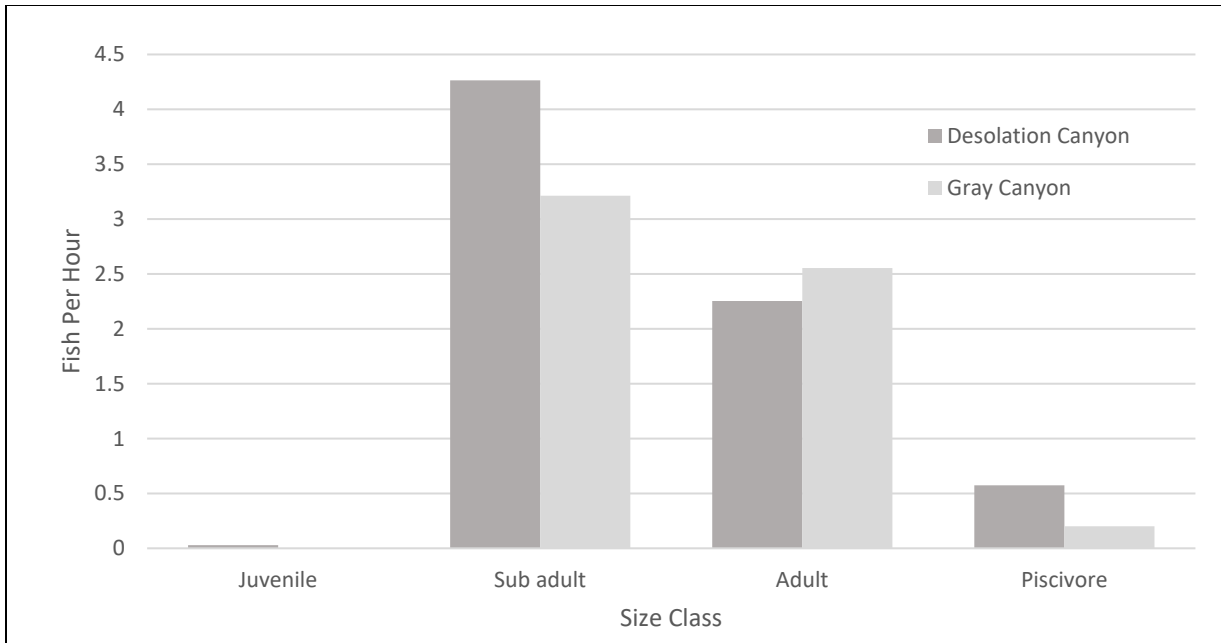


Figure 12. Catch per unit effort (fish per hour) from targeted Smallmouth Bass removal in Desolation and Gray canyons by sub-reach and size class (Desolation Canyon = RMI 207 – RMI 160; Gray Canyon = RMI 160 – RMI 132)

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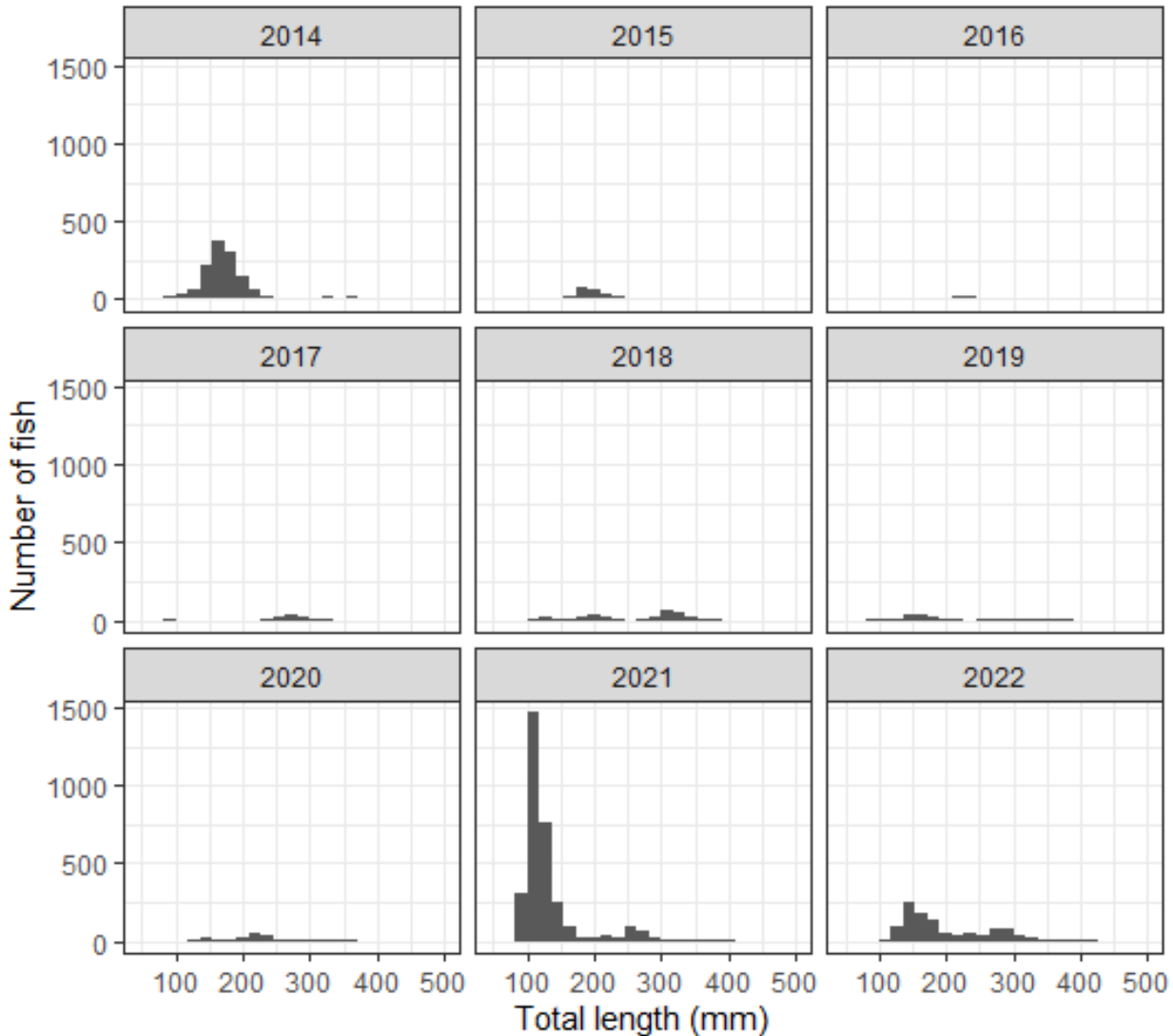


Figure 13. Smallmouth Bass length-frequency distribution in Desolation and Gray Canyons, 2014 – 2022. 2022 includes captures from 2 targeted removal passes by UDWR and ancillary captures from three USFWS Project 128 passes. 2021, 2020 and 2016 include captures from one UDWR-Moab targeted removal pass. 2019, 2015, and 2014 include captures from two UDWR-Moab targeted removal passes. 2018 and 2017 include captures from one UDWR-Moab targeted removal pass and the ancillary captures from three USFWS Project 128 passes.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

ANNUAL PERFORMANCE PROGRESS REPORT (PPR)

BUREAU OF RECLAMATION AGREEMENT NUMBER: R19AP00059

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: 123a

Project Title: Nonnative fish control in the Green River

Principal Investigator: *Sam Brockdorff*
1165 S Hwy 191 Suite 4
Moab, UT 84532
spbrockdorff@utah.gov
435-259-3783

Project/Grant Period: Start date: 10/01/2019
End date: 09/30/2024
Reporting period end date: 9/30/2022
Is this the final report? Yes No X

Performance:

Task 2 was completed: *Four passes were successfully completed (7/7 – 7/10/22, 7/10 – 7/13/22, 7/21 – 7/24/22, 7/24 – 7/27/22) on the Green River from Echo Park (RM 344.5) to Split Mountain (RM 319.5). A total of 2637 Smallmouth Bass were captured and removed. Additionally, 3 Black Bullhead, 3 Black Crappie, 95 Brown Trout, 3 Channel Catfish (> 450 mm), 3 Creek Chub, 120 Green Sunfish, 1 Northern Pike, 11 Rainbow Trout, 2 Walleye, and 1130 White Sucker and White Sucker hybrids were captured and removed. Four Colorado Pikeminnow, and four Roundtail Chub 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 2022 (Task 4 was completed).*

Task 3 was completed: *One targeted removal pass was completed (6/24- 6/30/22) in Desolation and Gray Canyons on the Green River from Tabyago riffle (RM 207) to RM 132. A total of 520 Smallmouth Bass were captured and removed. Additionally, 6 Black Bullhead, 10 Black Crappie, 2 Channel Catfish (over 450 mm), 30 Green Sunfish, four Walleye, 4 White Suckers, and 3 Yellow Bullhead were removed. Four Colorado Pikeminnow, 4 Bonytail, 3 Humpback Chub, and 33 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 2022 (Task 4 was completed).*