

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2023 ANNUAL REPORT

PROJECT: 160

Project Title

Assessment of Stocked Razorback Sucker Reproduction in the Lower Green and Lower Colorado Rivers

Bureau of Reclamation Agreement Number:

R19AP00059

Project/Grant Period:

Start date: 10/01/2018

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Reporting period end date: 09/30/2023

Is this the final report? Yes ___ No X

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Abstract:

Determining the location, timing, extent, and success of razorback sucker (*Xyrauchen texanus*) spawning is essential for evaluating the effectiveness of the stocking program, identifying recruitment, and guiding future management. This study was designed to determine the spawn timing as well as presence/absence and distribution of larval, young-of-year (YOY), and age-1+ razorback suckers in the Green River downstream from the town of Green River and in the Colorado River downstream of Cisco. The study was prompted by increasing razorback sucker encounters, the presence of multiple age classes, and congregations of ripe razorback suckers during Colorado pikeminnow (*Ptychocheilus lucius*) surveys (2001 – 2003 and 2006 – 2008; Bestgen et al 2012, UDWR unpublished data). In 2023, larval fish samples were collected during light trapping efforts on both the lower Green and Colorado Rivers. High water levels on both rivers throughout our sampling allowed for most historic priority sites to be sampled. Via light trapping, larval fish were captured in both reaches and a total of 30 samples were sent to the Colorado State University Larval Fish Lab (CSU LFL) for identification; this report will be revised upon the completion of lab identification. In August and September, two passes of seining for juvenile razorback were conducted in both reaches; on the first pass on the Green River, two razorback suckers were captured. During seining efforts in both August and September on both reaches, a total of 66.5% of all fish caught were identifiable native fish, with 39.9 % of that total being YOY pikeminnow and 0.08% being razorback sucker. Non-native species accounted for 33.5% of all fish caught.

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Study Schedule:

Initial year 2009 – Ongoing

Relationship to RIPRAP:

GENERAL RECOVERY PROGRAM SUPPORT ACTION PLAN

- V. Monitor populations and habitat and conduct research to support recovery actions (research, monitoring, and data management).
- V.A. Measure and document population and habitat parameters to determine status and biological response to recovery actions.
- V.B.2. Conduct appropriate studies to provide needed life history information.

GREEN RIVER ACTION PLAN: MAINSTEM

- V. Monitor populations and habitat and conduct research to support recovery actions (research, monitoring, and data management).
- V.A. Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.

COLORADO RIVER ACTION PLAN: MAINSTEM

- V. Monitor populations and habitat and conduct research to support recovery actions (research, monitoring, and data management).
- V.A. Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.

Accomplishment of FY 2023 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1: Lower Green River light trap sample collection:

Larval light trap samples were collected at 10 unique sites, all of which were previous priority tributaries, between river miles (RM) 33.8 (Millard Canyon) and 119.5 (Browns Wash) during three sampling events that took place between 4/27/2023 – 6/9/2023 (Figure 1). A total of 57 light trap samples were collected. Thirty-three of the traps contained no larval fish. The 24 samples that contained larval fish were sent to Colorado State University Larval Fish Laboratory (CSU LFL) for identification. During sampling, main channel water temperatures ranged from 15.0 °C to 18.0 °C with an average temperature of 17.2 °C. Habitat water temperatures ranged from 16.0 °C to 25.0 °C with an average temperature of 20.5 °C.

Larval sampling on the Green River this year was completed in conjunction with adult pikeminnow sampling efforts (Project #128). Most historic priority habitats were inundated and available for sampling. During the first pass, three flooded tributaries were sampled. On the second and third pass, eight flooded tributaries were sampled during each pass. Razorback sucker larvae have consistently been detected in flooded tributary habitats throughout this study, so we expect to accurately determine presence or absence of razorback larvae by sampling in these locations, pending lab identification.

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Task 2: Lower Green River sampling for YOY and age 1+ razorback sucker:

Seine samples were collected between river mile 1.8 (near the confluence with the Colorado River) and 119.6 (near Saleratus Wash) during two sampling passes. The first pass was conducted 8/1/2023 – 8/3/2023. The second pass was conducted 8/29/2023 – 8/31/2023.

During both sampling passes on the Lower Green River, an estimated total of 9,140 m² was seined in 111 seine hauls within 67 habitats. These habitats included backwaters, which constituted 56% of all habitats sampled, isolated pools (5%), side channels (6%), embayments (25%), flooded tributaries (8%). The estimated area of individual habitats ranged from 50 m² to 4,000 m² with an average habitat area of 1735 m² ± 906 m² (mean ± standard deviation). Fifteen percent of the habitats sampled had a maximum depth of one meter or greater.

During sampling, main channel water temperatures ranged from 21.0 °C to 30.0 °C with an average temperature of 25.4 °C. Main channel Secchi disk measurements ranged from 35 mm to 440 mm with an average Secchi of 158 mm. Habitat water temperatures ranged from 21.0 °C to 30.0 °C with an average temperature of 26.6 °C. Habitat Secchi disk measurements ranged from 35 mm to 370 mm with an average Secchi of 151 mm.

During seine sampling on the lower Green River, there were two YOY razorback suckers identified (lengths 57 mm and 78 mm). Both individuals were released alive back into the habitat after being measured. These samples were all collected during the first pass of sampling from 8/1/2023 to 8/3/2023 at river mile 4.4. Razorback sucker accounted for 0.11% of all fish captured on the Green during these 2023 passes. There were no juvenile (age-1+) razorback suckers captured during seining.

There was an increase in the number of YOY pikeminnow captured during seining on the lower Green River this year. Colorado pikeminnow were 47.2% of all fish caught on the Green during both 2023 passes and 78.4% of all native fish caught (Table 1). Few Colorado pikeminnow were measured during seining to limit stress on the fish and to be able to quickly return them to the habitat; instead, when more than 10 pikeminnow were present in the sample, they were tallied as a count. Other native fish were measured for total length only, to limit stress on fish related to high water and air temperatures. The average total length of measured Colorado pikeminnow was 37 mm (n=40) with a length range of 17mm to 115 mm. Other native fish encountered include flannelmouth sucker, bluehead sucker, and speckled dace (Table 1).

Three juvenile chub were caught near Anderson Bottom. Two of these chub were caught together in the same backwater at river mile 25.0; total lengths were 51 mm and 68 mm. and the third was caught at river mile 30.9 with a total length of 63 mm. Additionally, numerous YOY chub were captured during 2023 seining efforts on the Colorado River (Task 4; Table 1) which were smaller (averaging 36 mm total length).

Non-native species captured during 2023 seining efforts on the lower Green River can be found in Table 2. Other non-native fish captured (not reported in Table 2) include: Red Shiner (*Cyprinella lutrensis*), Sand Shiner (*Notropis stramineus*), and Fathead Minnow (*Pimephales promelas*).

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Task 3: Lower Colorado River light trap sample collection:

Larval light trap samples were collected at two unique sites between river mile 21.5 (Lathrop) and 63.9 (Courthouse Wash) during three sampling events that took place 4/27/2023 – 6/9/2023 (Figure 2). Most historic priority habitats were inundated and available for sampling; however, due to high spring run-off sparking safety concerns, one historic sampling site (Lathrop) was not sampled in mid-May. A total of 15 light traps were set. Nine of the traps contained no larval fish. The six samples containing larval fish were preserved and sent to CSU LFL for identification. During sampling, main channel water temperatures ranged from 12.5 °C to 17.5 °C with an average temperature of 14.9 °C. Habitat water temperatures ranged from 13.5 °C to 20.0 °C with an average temperature of 17.5 °C.

In 2023, all sampling occurred within sites that have been sampled in previous years, all of which were flooded tributaries. Sampling effort was limited in comparison to prior years by dynamic high flows as well as time and crew constraints due to our sampling coinciding with the effort intensive Colorado pikeminnow population estimate.

Task 4: Lower Colorado River sampling for YOY and age 1+ razorback sucker:

Seine samples were collected between river miles 0.5 and 110.2 (near the Cisco boat ramp) during two sampling passes. The first pass was conducted 8/3/2023 – 8/4/2023. The second pass was conducted 8/31/2023 – 9/1/2023.

During both sampling passes, an estimated total of 2,526 m² was seined in 36 seine hauls within 30 habitats. These habitats included backwaters, which constituted 50% of all habitats sampled, flooded tributaries (3.3%), embayments (23.3%), side channels (10%), isolated pools (6.7%), and shoreline (6.7%). The estimated area of individual habitats ranged from 30 m² to 5,325 m² with an average habitat area of 1,178 m² ± 1330 m². Ten percent of the habitats sampled had a maximum depth of one meter or greater.

During sampling, main channel water temperatures ranged from 20.0 °C to 32.0 °C with an average temperature of 25.4 °C. Main channel Secchi disk measurements ranged from 30 mm to 380 mm with an average Secchi of 96.8 mm. Habitat water temperatures ranged from 18.0 °C to 35.0 °C with an average temperature of 25.3 °C. Habitat Secchi disk measurements ranged from 45 mm to 330 mm with an average Secchi of 103.67 mm.

There were no juvenile (age-1+) razorback suckers captured during seining.

Similar to seining results from the lower Green River, we sampled a higher number of identifiable native fishes compared to sampling in 2022 (Table 1). Colorado pikeminnow were 4.4% of all fish caught on the Colorado during both 2023 passes and 5.9% of all native fish caught. Razorback sucker accounted for 0% as none were caught. A small subset of Colorado pikeminnow were measured which had an average length of 27 mm (n=184). Unknown chub species accounted for 34% of all fish caught on the 2023 Colorado passes and 46% of all native fish caught. Other native fish encountered include flannelmouth sucker, bluehead sucker, and speckled dace (Table 1).

Non-native species captured during 2023 seining efforts on the Colorado River can be found in Table 2. Other non-native fish captured (not reported in Table 2) include: Red Shiner, Sand Shiner, and Fathead Minnow.

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Task 5: Preliminary sample identification, data entry, analysis and reporting:

All data has been entered. Collected samples have been submitted to CSU LFL for identification. This annual report will be updated and resubmitted upon completion of fish identification.

Shortcomings:

This project was initially designed as a pilot study to determine the presence/absence of early life stages of endangered razorback sucker. The sampling methods of this project are relatively basic with few restrictions which allows for exploration and experimentation. These methods have been used successfully to detect reproduction by the presence of larval razorback suckers, as well as determine relative spawn and hatch dates of captured larvae through back calculations based on larval growth rates. This project has also tried to determine relative recruitment (i.e., presence/absence of YOY/Age 1+) of razorback suckers but has had little success due to low numbers of captures each year. This has limited the ability to make any inferences about what recruitment may be occurring each year as well as over time. Likewise, the sampling protocols and subsequent data collected may be too vague/insufficient to address any future project directions, needs, and questions. Questions such as what is happening to razorback sucker larvae as they transition from the larval to juvenile stages? How are the razorback sucker larvae/juvenile utilizing the habitat spatially or temporally? What kind of habitat factors may be impacting recruitment and how is the habitat changing as the season progresses? In order to get at many of these questions we may need to consider a more in-depth sampling protocol, methods, and analysis. This may include more sampling passes in order to gain insight into temporal shifts occurring during the transition from larvae to juvenile. It may also include more in-depth habitat analysis as well as the use of remote sensors to assess changes in water quality during this crucial time.

Additional noteworthy observations:

Effect of a high water year on sampling effort: Heavy precipitation in the 2022-2023 winter resulted in an above-average snowpack and therefore high flows on the Colorado and Green Rivers. Higher than average spring flows and cooler water temperatures may have delayed spawning which may explain the lack of larval fish detections on the first light trapping pass. In addition, high flows limited the ability for the crew to safely and effectively sample some sites (e.g., Lathrop in mid-May).

Recommendations:

- Continue sampling via light trapping for larval razorback sucker in both the Colorado and Green Rivers (May-June) to determine the annual success and timing of reproduction.
- Continue seining in both the Colorado and Green Rivers (July-September) to document recruitment of YOY and juvenile razorback suckers.
- Augment study design to further assess annual reproduction and recruitment of razorback sucker, including:
 - Decide what questions about razorback sucker reproduction and recruitment in the lower Green and Colorado rivers would aid recovery and determine the level of sampling required to answer them.
 - Try alternative sampling methods to document recruitment success in areas that are difficult to sample via seine. Alternative methods may include backpack electrofishing.
 - Analyze all data from previous years to assess any temporal trends or patterns, as well

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as identify any areas of increased reproduction and recruitment. Doing such an analysis may be beneficial when considering the future direction of this project.

- Conduct further research to help determine what flow and habitat conditions contribute to high YOY razorback captures in our study area. This may then aid in developing a hypothesis for what conditions support the survival of razorback sucker from larval to early juvenile stages.
- Replace all light traps with LED-lit traps to improve capture efficiency, per Adams et al. (2023).

Project Status:

On track and ongoing

FY 2023 Budget Status

Funds Provided: \$53,534

Funds Expended: \$53,534

Difference: \$0

Percent of the FY 2023 work completed, and projected costs to complete: 100%

Recovery Program funds spent for publication charges: \$0

Status of Data Submission

All data will be submitted upon completion of fish identification by CSU LFL.

Signed:

Blake Hansen

Principal Investigator

October 26th, 2023

Literature Cited:

Adams, C.M., Jones, T.M., Hatch, R., Bestgen, K.R. 2023. Laboratory and field evaluation of a new light-emitting-diode-lit quatrefoil light trap for sampling fish early life stages. *North American Journal of Fisheries Management*, V. 43.

Bestgen, K.R., Zelasko, K.A., and G.C. White. 2012. Monitoring reproduction, recruitment, and population status of razorback sucker in the upper Colorado River basin. Final report of Colorado State University Larval Fish Laboratory to Upper Colorado River Endangered Fish Recovery Program, Denver, CO.

Howard, J. 2013. Lower Green River Razorback Sucker Larval and Young-of-Year Monitoring Pilot Study, Annual Report. Upper Colorado River Endangered Fish Recovery Program Project 160.

Snyder, D.E., Muth, R.T., and C.L. Bjork. 2004. Catostomid Fish Larvae and Early Juveniles of the Upper Colorado River Basin – Morphological Descriptions, Comparisons, and Computer-Interactive Key. Colorado Division of Wildlife Technical Publication No. 42.

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Table 1. Counts of identifiable native fish captured via seining on the lower Green and Colorado Rivers (n represents the number of seine hauls). This table does not include any fish that were preserved for identification by CSU LFL. Species abbreviations are as follows: RZ = razorback sucker; CPM = Colorado pikeminnow; CH = unknown chub; FM = flannelmouth sucker; BH = bluehead sucker; SD = speckled dace.

Reach	RZ	CPM	CH	FM	BH	SD
Green River (RM 0-119.6) n=111	2	844	3	106	91	28
Colorado River (RM 3.5-110.1) n=36	0	73	567	237	343	4
Total	2	917	570	343	434	32

Table 2. Counts of non-native fish captured via seining on the lower Green and Colorado Rivers (n represents the number of seine hauls). This table does not include any fish that were preserved for identification by CSU LFL. Species abbreviations are as follows: CP = common carp; GS = green sunfish GZ = gizzard shad; GA= western mosquitofish; SM = smallmouth bass; LG = largemouth bass; BB = black bullhead; BG = bluegill sunfish; BC = black crappie; CC = channel catfish; WS = white sucker; WC = white crappie; YB = yellow bullhead.

Reach	CP	GS	GZ	GA	SM	LG	BB	BG	BC	CC	WS	YB	WC
Green River (RM 0-19.6) n=111	172	22	319	19	11	1	20	0	1	146	20	3	2
Colorado River (RM 3.5-110.1) n=36	75	15	122	30	1	47	108	7	3	65	26	0	0
Total	247	37	441	49	12	48	128	7	4	211	46	3	2

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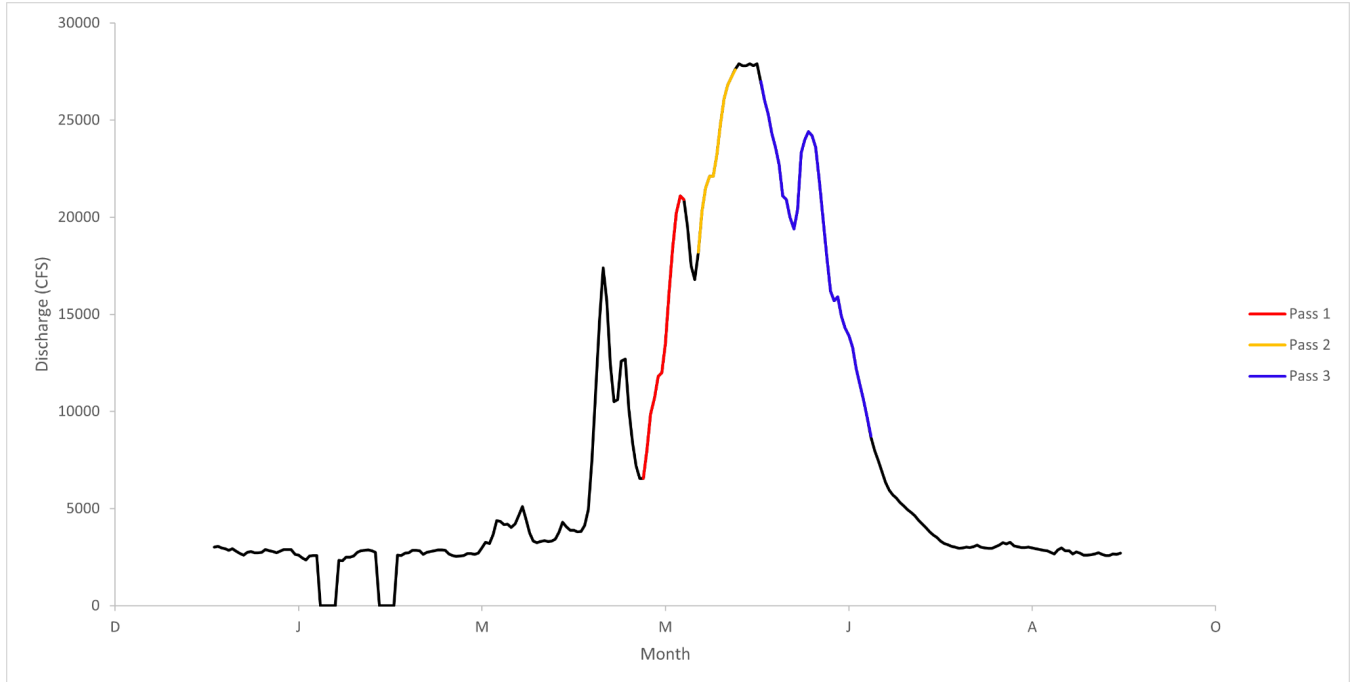


Figure 1. Discharge recorded in 2023 for the Green River at USGS gage #09315000, Green River, UT. The areas of the line highlighted by color show the discharge during light trap sampling on the lower Green River in 2023. The red line corresponds to sampling during pass one (April 28th through May 9th), the yellow line corresponds to sampling during pass two (May 13th through May 23rd), and the blue line corresponds to sampling during pass three (May 30th through June 29th).

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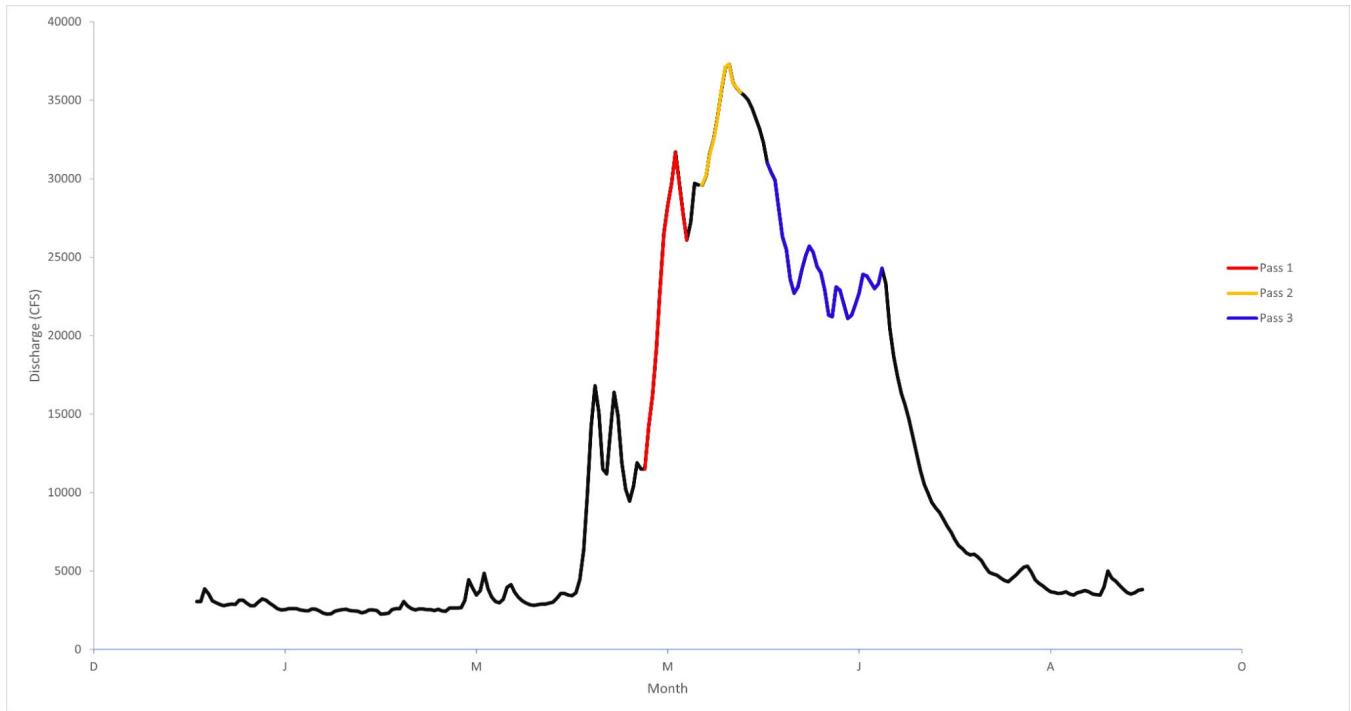


Figure 2. Discharge recorded in 2023 for the Colorado River at USGS gage #09185600, Potash, UT. The areas of the line highlighted by color show the discharge during light trap sampling on the lower Colorado River in 2023. The red line corresponds to sampling during pass one (April 28th through May 9th), the yellow line corresponds to sampling during pass two (May 13th through May 23rd), and the blue line corresponds to sampling during pass three (May 30th through June 29th).