

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2022 ANNUAL REPORT

PROJECT: 22f

Project Title:

Interagency standardized monitoring program assessment of endangered fish reproduction in relation to Flaming Gorge Dam operations in the middle Green and lower Yampa rivers: Yampa and middle Green River assessment of Colorado pikeminnow and razorback sucker larvae

Bureau of Reclamation Agreement Number:

R19AP00058

Project/Grant Period:

Start date: 10/01/2018

End date: 09/30/2023

Reporting period end date: 09/30/2022

Is this the final report? No

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Abstract:

The goal of Flaming Gorge flow and temperature recommendations (Muth et al., 2000, LaGory et al. 2019) that were implemented in 2006 was to improve the status and prospects for recovery of endangered fish populations in the Green River. A major emphasis of those recommendations was to enhance the reproduction and recruitment success of endangered fishes in the middle Green River, in particular razorback sucker and Colorado pikeminnow. This data will be used to assess effects of flow and temperature regimes on reproduction by razorback suckers and Colorado pikeminnow and to correlate abundance of larvae to abundance of juveniles in autumn. Larvae of razorback sucker *Xyrauchen texanus* and Colorado pikeminnow *Ptychocheilus lucius* were captured in the Green River basin in spring and summer 2022. Razorback sucker sampling was conducted with light traps primarily in the Green River between Jensen and Ouray, and Colorado pikeminnow were sampled with drift nets in the lower Yampa River. Sampling was designed to provide a measure of timing of reproduction and a measure of annual reproductive success of each species. Diel variation in abundance of Colorado pikeminnow larvae in the drift was also assessed.

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Study Schedule:

Ongoing in 2022 in a new agreement began on 1 October 2018, similar sampling has been conducted since 1990 for Colorado pikeminnow drift in the Yampa River, CO, except for 1997, and since 1992 for razorback suckers in the middle Green River, Utah. Anticipate continued annual sampling to build this valuable long-term monitoring dataset, which informs real-time flow management at Flaming Gorge Dam.

Relationship to RIPRAP:

Green River Action Plan: Mainstem

I. Provide and protect instream flows--habitat management.

I.A. Green River above Duchesne River.

I.A.3.d. Operate Flaming Gorge Dam to provide winter and spring flows and revised summer/fall flows, if necessary.

I.A.3.d.1. Conduct real-time larval razorback and Colorado pikeminnow sampling to guide Flaming Gorge operations.

I.D. Green River (Flaming Gorge to Colorado River)

I.D.2.d.(1) Conduct annual monitoring of larval razorback suckers and analyze historic monitoring data

I.D.2.f.(1) Conduct annual monitoring of larval Colorado pikeminnow

V. Monitor populations and habitat and conduct research to support recovery actions--research, monitoring, and data management.

V.C.4. Monitor larval Colorado pikeminnow.

V.D.1. Implement razorback sucker monitoring plan.

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

Project Objectives

- 1) Determine timing and duration of spawning by razorback suckers, timing of first presence, and abundance of larvae in the system as measured by capture of larvae in light traps. Additional sampling was also conducted in the Stewart Lake floodplain wetland in early summer and autumn under this project.
- 2) Determine timing and duration of spawning by Colorado pikeminnow and timing of first presence and abundance of larvae in the system as measured by capture of larvae downstream of spawning areas in the lower Yampa River.

Task Description (FY 2022)

- 1) Collect light trap samples for razorback suckers. The U.S. Fish and Wildlife Service (USFWS) office in Vernal, Utah was responsible for this task.
- 2) Collect drift net samples for Colorado pikeminnow. The Larval Fish Laboratory was responsible for this task.
- 3) Identify light trap and drift net samples. Preliminary identifications will be conducted by the responsible sampling entity, with assistance from the LFL, as samples are collected to provide real-

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time data. Final specimen identification and curation will be conducted by the LFL. Preliminary identification of 2022 samples has been completed and are being verified at this time.

- 4) Summarize specimen data collection in an annual report.

Accomplishments by Task

- 1) Collect light trap samples for razorback suckers. Light trap samples were collected during May and June 2022 by the Vernal USFWS. Additional sampling was conducted in the Stewart Lake floodplain wetland and the Stirrup wetland in summer 2022 because the wetland was filled, unlike in 2021.
- 2) Collect drift net samples for Colorado pikeminnow. Drift net samples were collected during June to August 2022 by the Larval Fish Laboratory.
- 3) Identify light trap and drift net samples.

Middle Green River light trap samples, 2020. The sorting and identification of 2020 samples is complete but verification and cataloging was delayed due to personnel limitations. Verification of endangered fishes will be finalized soon. Light trap sampling extended from 4 May to 12 June. First capture of razorback sucker larvae was on 19 May. Similar to 2019, discharge from Flaming Gorge Dam was not increased until 26 May, the day after Memorial Day.

Middle Green River light trap samples, 2021. The preliminary sorting and identification of 2021 samples has been completed. Light trap sampling began on 18 May, the day razorback sucker larvae were first captured, and ended on 10 June. These sample identifications need to be verified and that activity is underway.

Middle Green River light trap samples, 2022. Light trap sampling began on 10 May and ended on 10 June; first razorback sucker larvae were captured 21 May. The preliminary sorting and identification of 2022 samples has been completed. These sample identifications need to be verified and that activity is underway.

Lower Yampa River drift net sampling, 2020. Yampa River drift net samples were collected from 16 June to 16 August (61 days of sampling, $n = 273$ total samples, $n = 567$ specimens). Samples have been identified and verified, and counts completed, but measurements of length have not been completed. The first Colorado pikeminnow captured in 2020 was on 28 June and the last was on 26 July. Numbers of Colorado pikeminnow larvae in samples were moderate and higher than in the last several years (Figure 3). The low abundance of larvae produced in the Yampa River in previous years is worrisome, and may be linked to recent reduced abundance of adult Colorado pikeminnow (see annual report, Project 128).

Summer flows in the Green River were lower in 2020 than in 2019 and within the range of magnitudes that typically promote higher survival of young Colorado pikeminnow for the entire period of larval drift (Bestgen et al. 2020). For example, flows in the middle Green River on 29 June were 8,220 ft³/sec when larvae were first present in 2019; flows in the range of 1,766-5,297 ft³/sec are typical of years when

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young Colorado pikeminnow survival in the middle Green River is relatively high. Unfortunately, sampling conducted in midsummer and during regular ISMP sampling (project 138) revealed little or no detectable Colorado pikeminnow survival in summer 2020.

Lower Yampa River drift net sampling, 2021. Yampa River drift net samples were collected from 8 June to 5 August (59 days of sampling, n = 255 total samples). Preliminary identification of samples has been completed and verification has started. The first Colorado pikeminnow captured in 2021 was on 16 June, which was a few days prior to the onset of the flow spike in the Green River that began on 21 June.

Lower Yampa River drift net sampling, 2022. Yampa River drift net samples were collected from 14 June to 15 August (63 days of sampling, n = 272 total samples). The first Colorado pikeminnow captured in 2022 was on 2 July, which was several days after the onset of the flow spike in the Green River that began on 21 June. Preliminary identification of samples has been completed and verification has started.

Additional noteworthy observations:

Recommendations:

Continue sampling as planned in 2023. Continue to integrate this work into Colorado pikeminnow recruitment patterns noted for juveniles per Bestgen and Hill (2016). We also began an analysis of Colorado pikeminnow larvae drift data in support of a study plan to implement managed base flows in the middle Green River in summer, a report which was completed gratis in autumn 2020 (Bestgen et al. 2020). The first presence of pikeminnow determined from drift net samples was used to evaluate flow and water temperature levels and relate that to subsequent recruitment patterns in autumn, which were estimated from ISMP data (Project 138 results). That analysis led to recommendations for experimental flow conditions to increase Colorado pikeminnow recruitment in the Green River. It would also be worthwhile to assess larval razorback sucker production in relation to reduced adult stocking rates in the Green River in the future.

Project Status:

Ongoing and on-track.

FY 2022 Budget Status

Funds Provided: \$130,889

Funds Expended: \$109,055

Difference: \$21,834

Percent of the FY 2022 work completed, and projected costs to complete: 70% completed, no new funds needed to complete

Recovery Program funds spent for publication charges: 0

Status of Data Submission

NA

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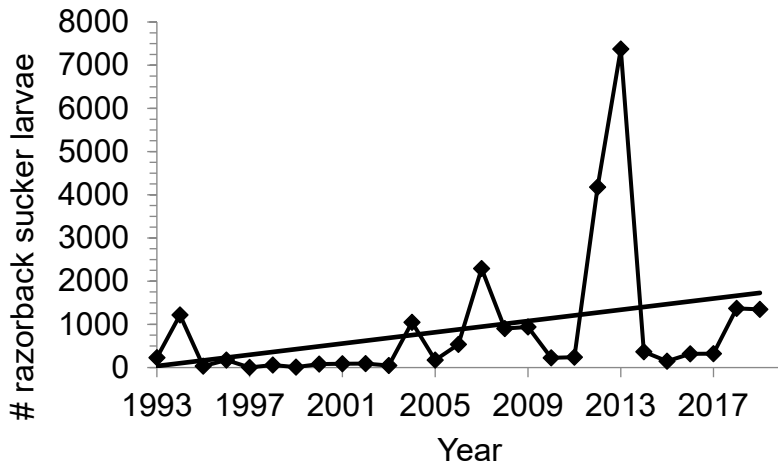
Signed:

Principal Investigator: Kevin R. Bestgen

Date: 22 November 2022

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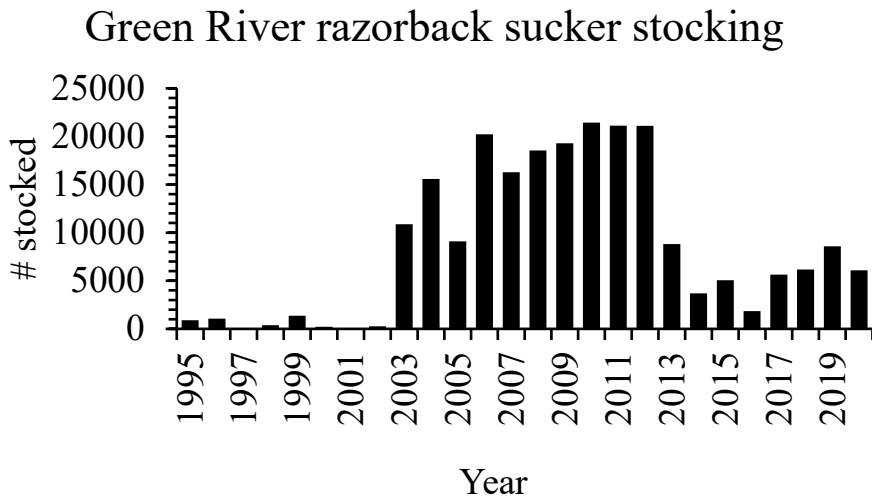
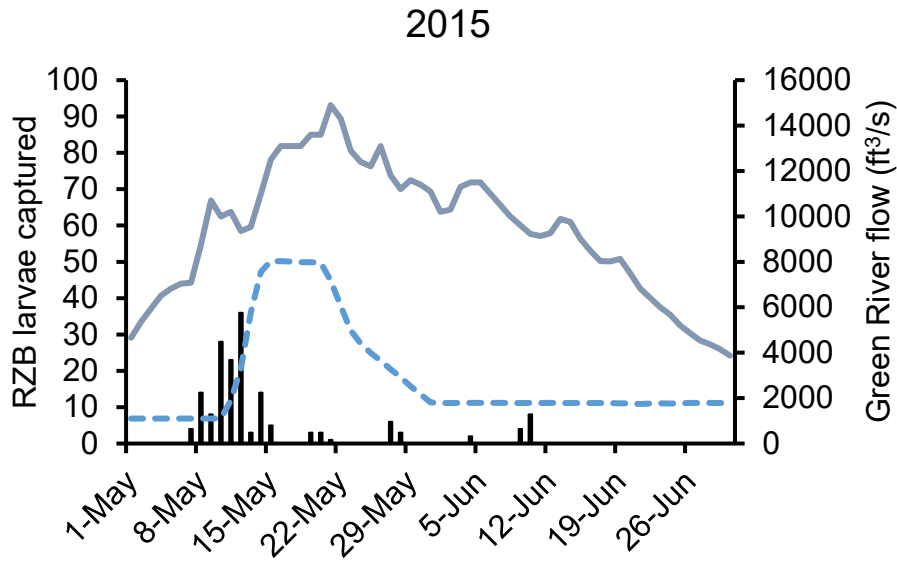


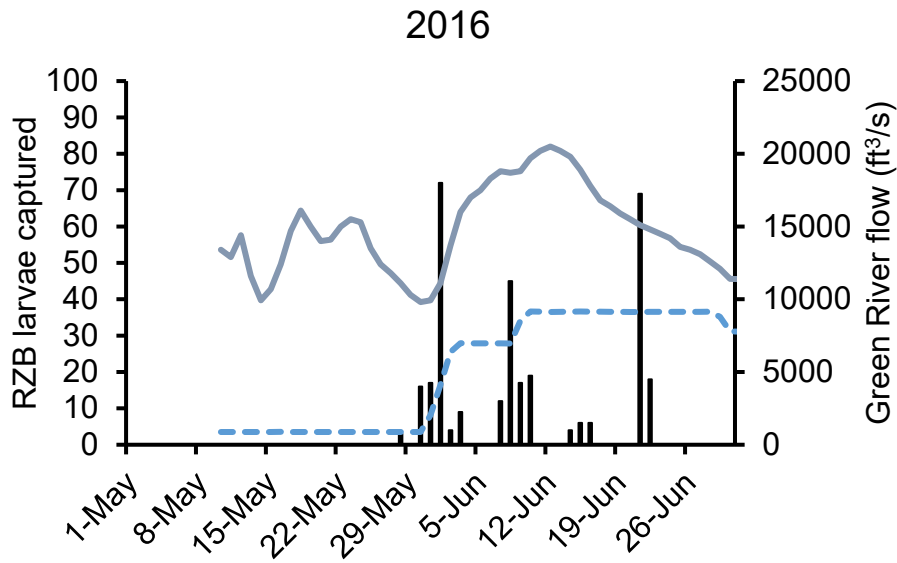
Figure 1. Panel A depicts the increasing number of razorback sucker larvae captured from 1993 to 2019 in the middle Green River, Utah, in light traps (all fish including those of questionable taxonomic identity included; 2020 and 2021 sample identification is not finished so is not included here). Panel B depicts number of razorback suckers stocked each year throughout the Green River (about ½ in each of the middle and lower Green River each year), 1995-2020, with high numbers (about 10,000-20,000) stocked from 2003-2012, and lower numbers (about 2,000-9,000) stocked from 2013-2020.

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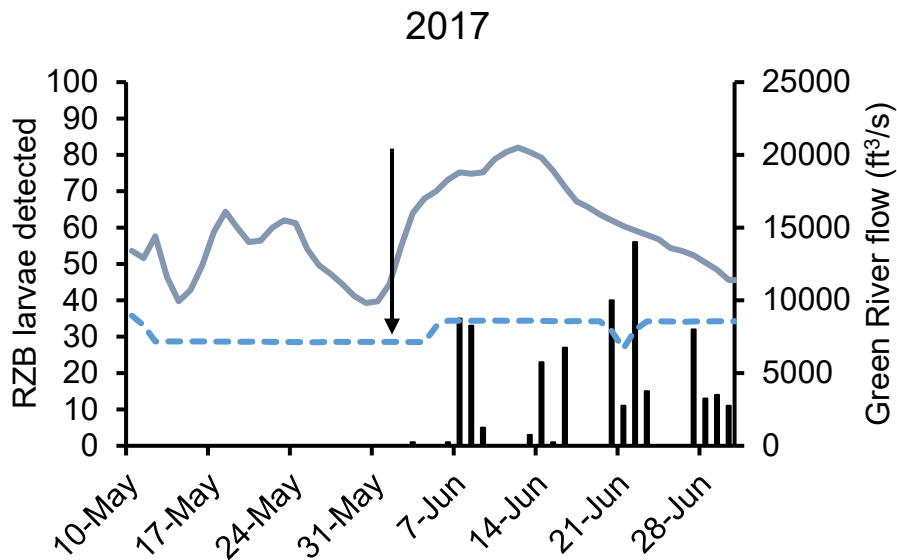
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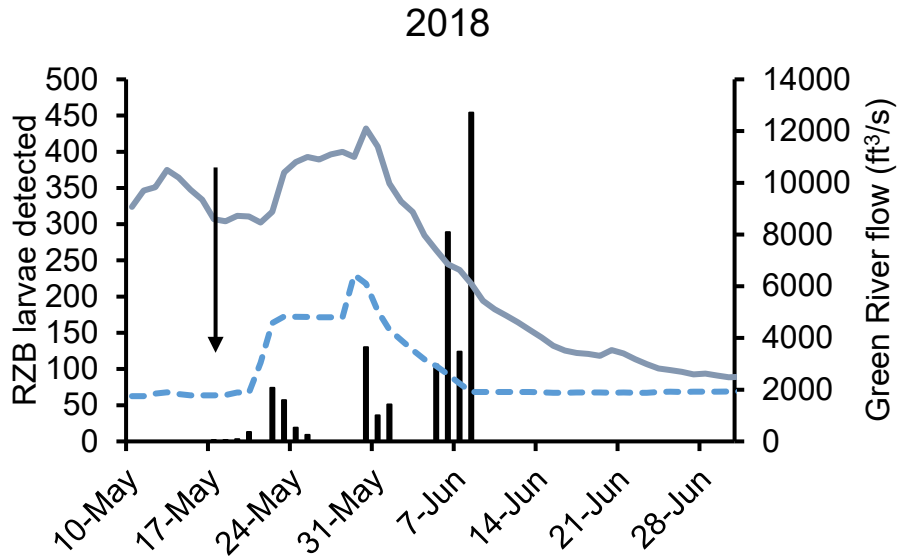


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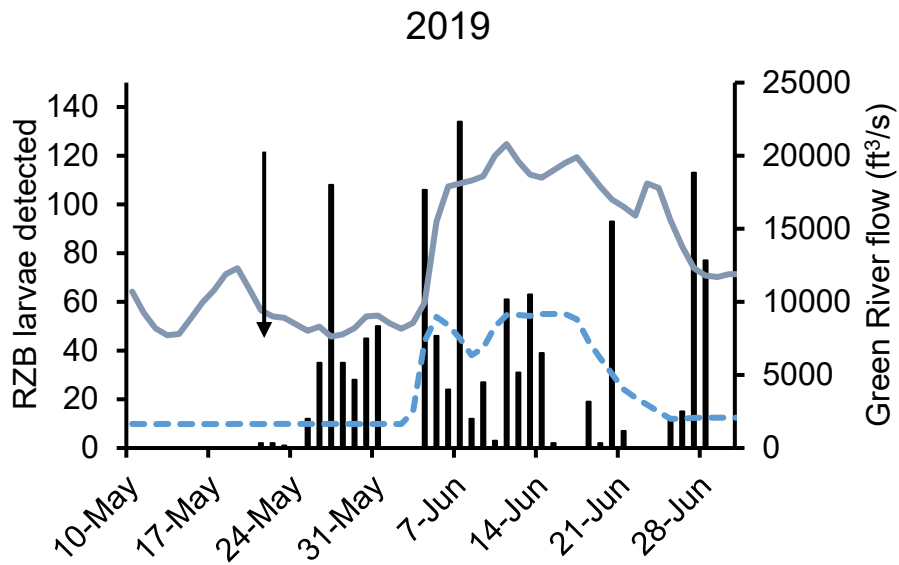


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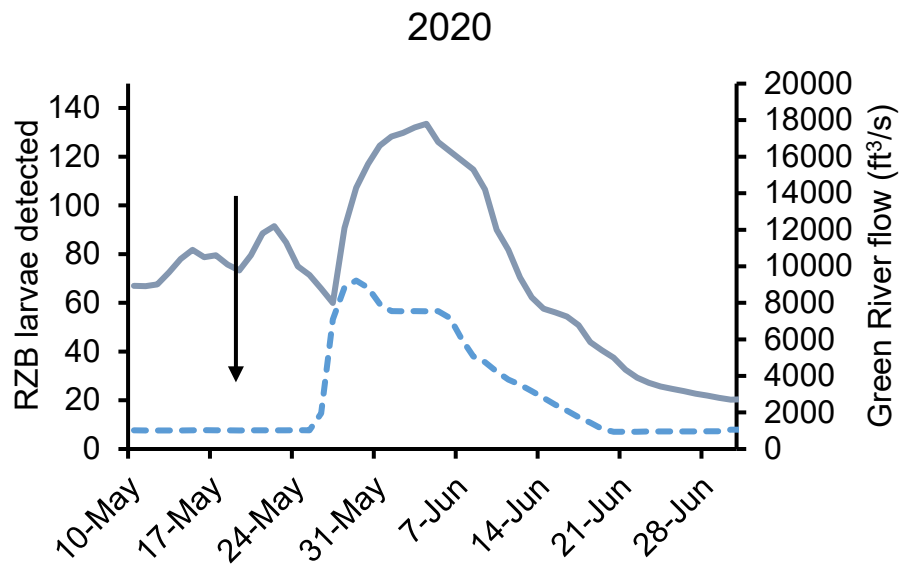


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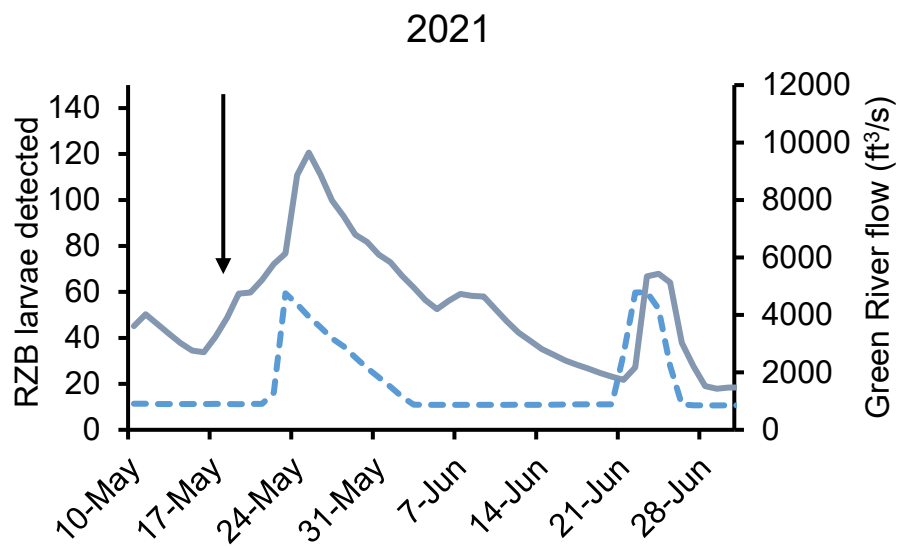


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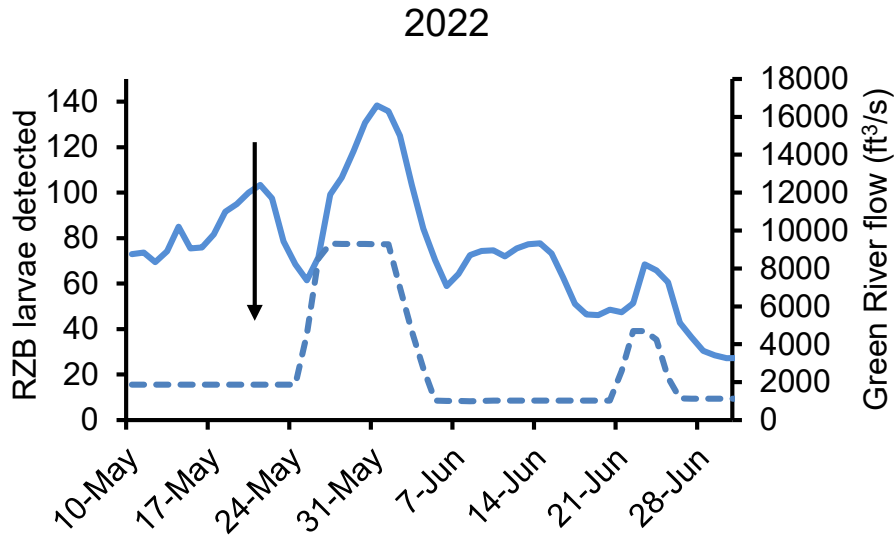


Figure 2. Seasonal distribution of razorback sucker larvae captured in 2015 (panel A), 2016 (panel B), 2017 (panel C), 2018 (panel D), 2019 (panel E), 2020 (panel F, verification ongoing), and 2021 and 2022 (panel G and H, no larvae data, preliminary identifications completed but verification needed) in middle Green River, Utah, light trap samples (all fish including those identified as “razorback sucker?” were included). All samples from all locations were combined for each day. Arrow indicates first presence detected. Gaps in captures after the first capture of razorback sucker larvae likely indicate lack of sampling rather than absence of the species. Green River flows at Jensen, Utah (solid line) are plotted, as are releases from Flaming Gorge Dam (Greendale, Utah gauge, dashed line), with the difference in the two lines being flows mainly from the Yampa River.

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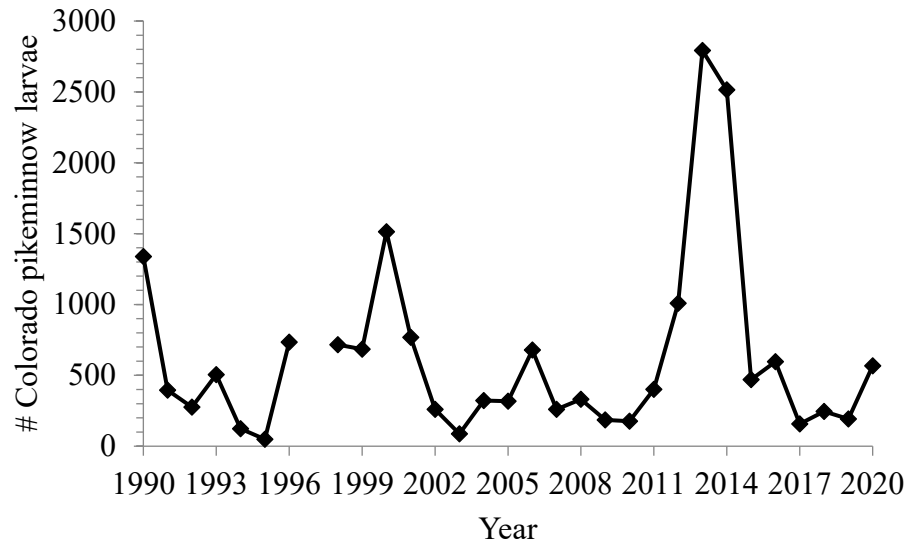
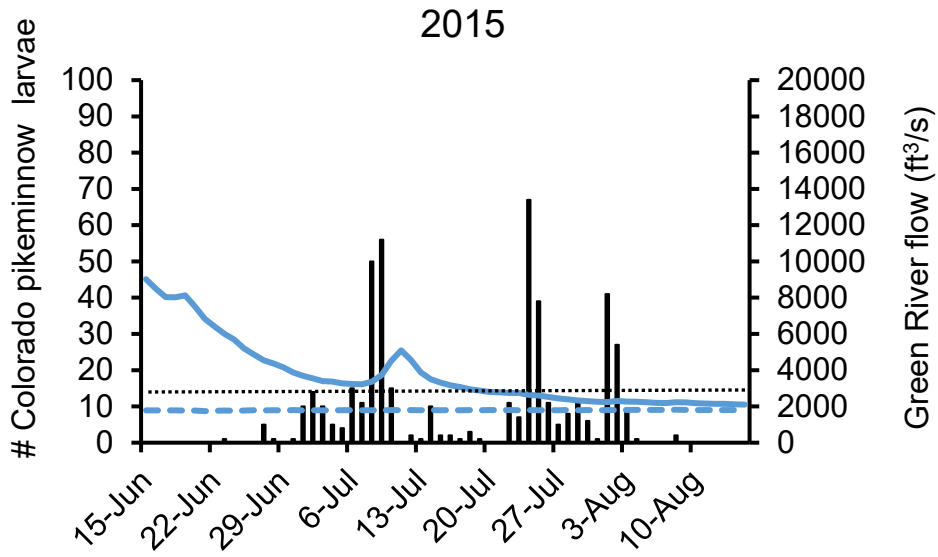


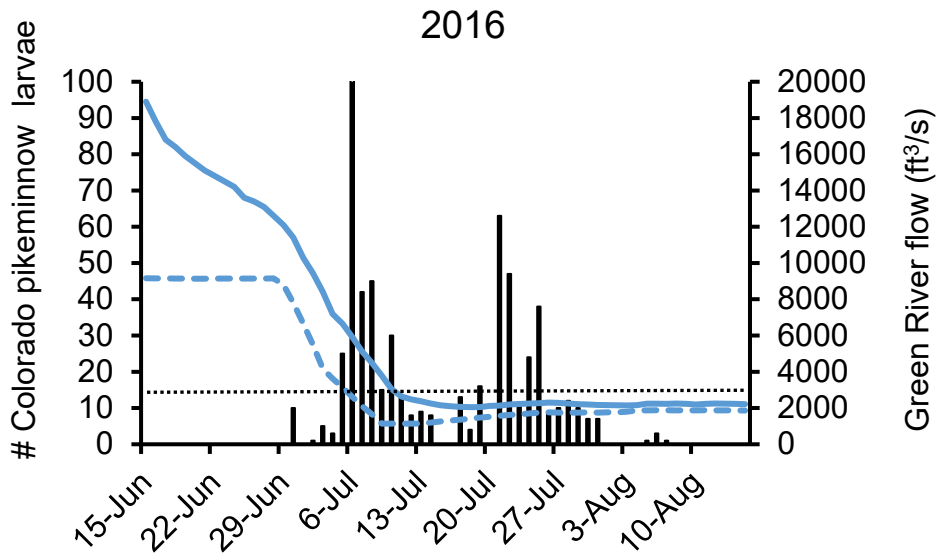
Figure 3. Number of Colorado pikeminnow larvae captured from 1990 to 2020 (no sampling in 1997, includes specimens from all diel samples; 2021 sample identification is not yet complete) in the lower Yampa River, Colorado, during summer in drift nets.

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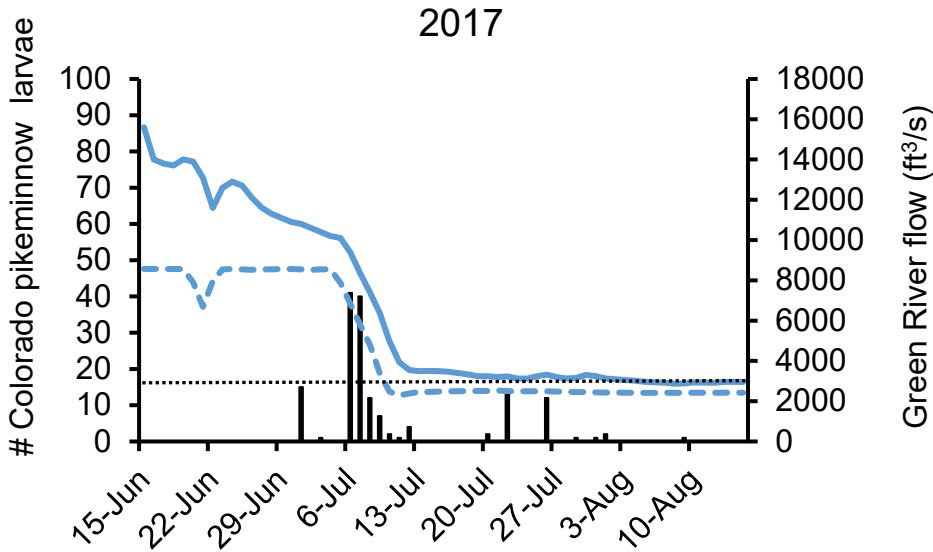


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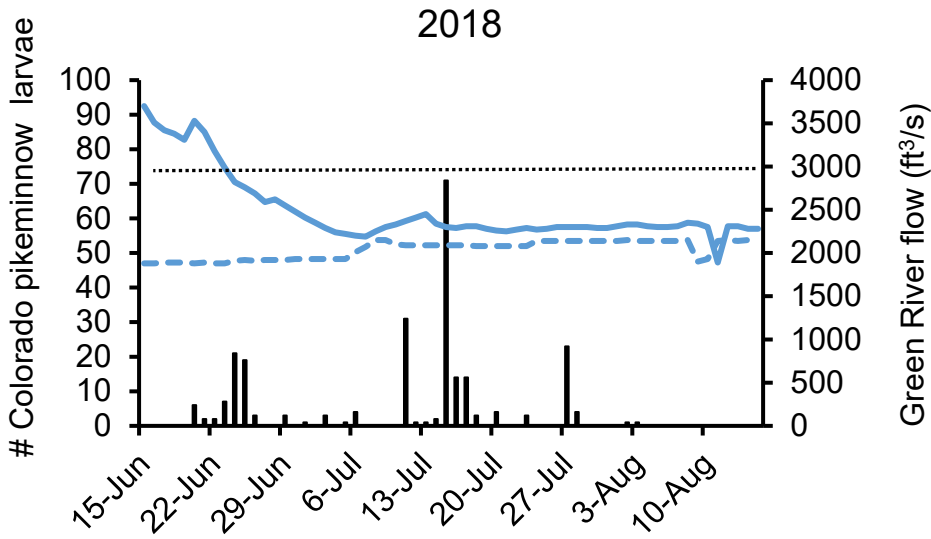


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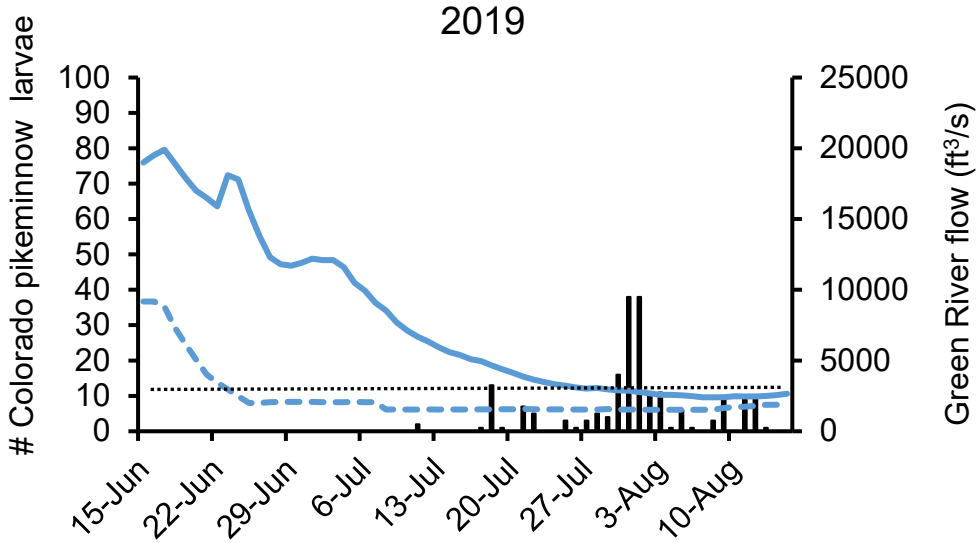


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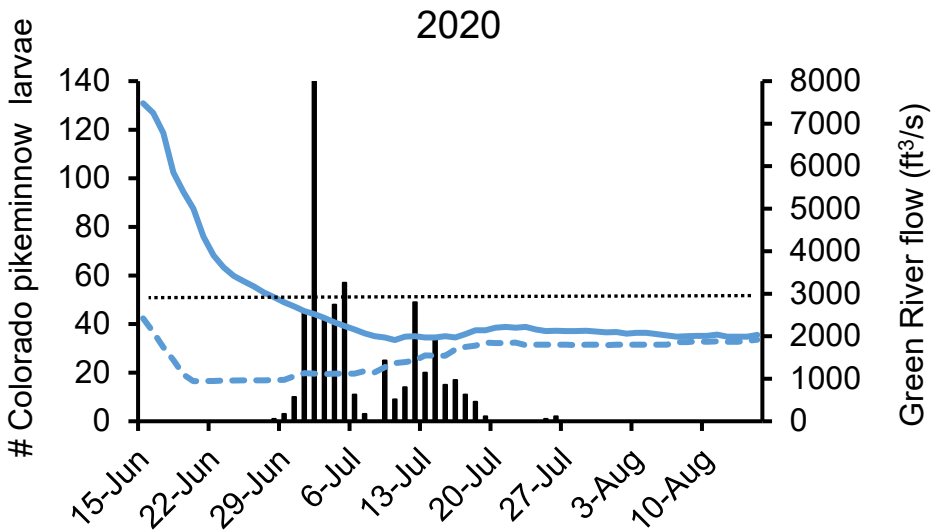


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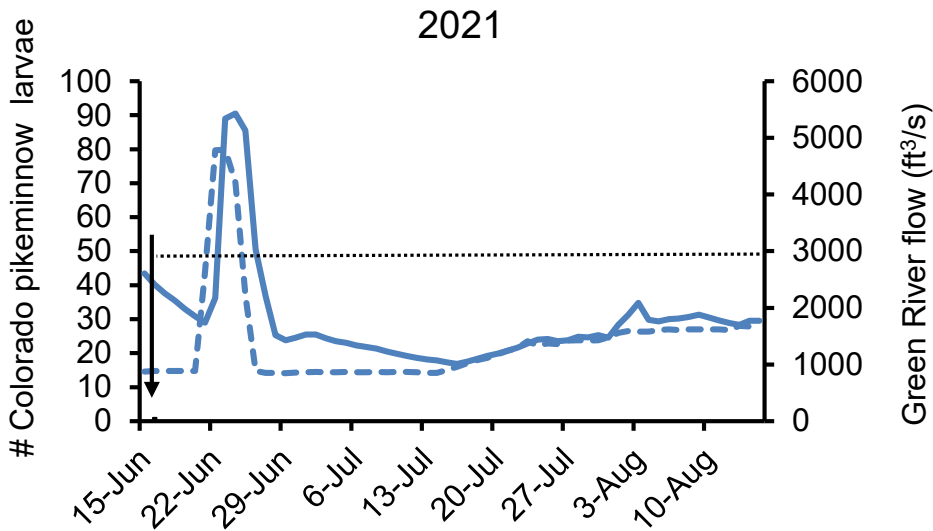


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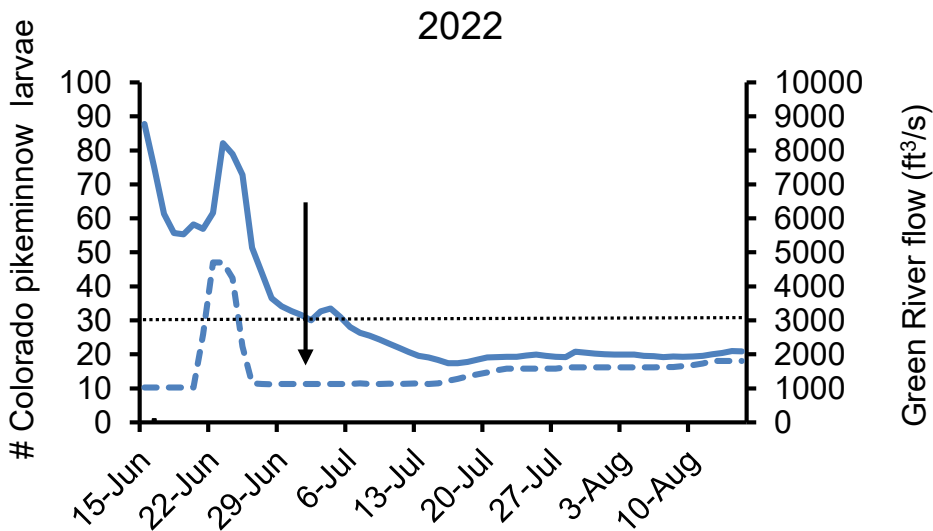


Figure 4. Seasonal distribution of Colorado pikeminnow larvae captured in 2015 (panel A), 2016 (panel B), 2017 (panel C), 2018 (panel D), 2019 (panel E), 2020 (panel F), and 2021 and 2022 (panel G and H, respectively; preliminary sample identification completed, verification needed. First presence date in 2021 was 16 June, and in 2022 was 3 July) drift net samples from the lower Yampa River, Colorado. Sampling for 2015 began on 17 June and ended 16 August. Sampling for 2016 began on 23 June and ended 16 August. Sampling for 2017 began on 21 June and ended 14 August. Sampling for 2018 began on 13 June and ended 12 August. Sampling for 2019 began on 3 July and ended on 21 August (n = 219

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samples). Sampling in 2020 began on 16 June and ended on 16 August (n = 273 samples). Sampling in 2021 began on 8 June and ended on 5 August (n = 255 samples) and in 2022 began on 14 June and ended on 15 August; flow spikes to reduce smallmouth bass reproductive success is evident in the 2021 and 2022 graphs in later June. Several of the largest capture dates were diel sampling occasions (12 samples total each day). Flows of the Green River at Jensen (solid line) and Greendale (dashed line) are also depicted, with the difference in the two flows being the contribution of the Yampa River. Note the difference in scale for flows on the right y-axis. The dotted black line represents the maximum level of the range (1,700-3,000 cfs) of recommended summer base flows thought to benefit survival of young Colorado pikeminnow.

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References

Major products based on data collected in this study include:

Bestgen, K. R., T. E. Chart, D. M. Anderson, and M. T. Jones. 2020. Evaluate effects of summer flow management on survival of age-0 Colorado pikeminnow in the middle Green River, Utah. Final report to the Upper Colorado River Endangered Fish Recovery Program. Denver, Colorado. Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins. Larval Fish Laboratory Contribution 216.

LaGory, K. L., K. R. Bestgen, H. Patno, J. Wilhite, D. Speas, and M. Trammell. 2019. Evaluation and suggested revisions of flow and temperature recommendations for endangered fish in the Green River downstream of Flaming Gorge Dam. Final report to the Upper Colorado River Endangered Fish Recovery Program. Denver Federal Center, Lakewood, Colorado.

Bestgen, K. R., and A. A. Hill. 2016. Reproduction, abundance, and recruitment dynamics of young Colorado pikeminnow in the Green River Basin, Utah and Colorado, 1979-2012. Final report to the Upper Colorado River Endangered Fish Recovery Program, Project FW BW-Synth, Denver, CO. Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins. Larval Fish Laboratory Contribution 183.

Bestgen, K. R. 2015. Aspects of the Yampa River flow regime essential for maintenance of native fishes. Final Report submitted to the National Park Service, Fort Collins, CO, The Nature Conservancy, Boulder, CO, and Western Resource Advocates, Boulder, CO. Department of Fish, Wildlife, and Conservation Biology, Colorado State University, Fort Collins. Larval Fish Laboratory Contribution 181.

Bestgen, K. R., K. A. Zelasko, and G. C. White. 2012. Monitoring reproduction, recruitment, and population status of razorback suckers in the Upper Colorado River Basin. Final Report to the Upper Colorado River Endangered Fish Recovery Program, U. S. Fish and Wildlife Service, Denver. Larval Fish Laboratory Contribution 170.

Bestgen, K. R., G. B. Haines, and A. A. Hill. 2011. Synthesis of flood plain wetland information: Timing of razorback sucker reproduction in the Green River, Utah, related to stream flow, water temperature, and flood plain wetland availability. Final report to the Recovery Implementation Program for Endangered Fishes in the Upper Colorado River Basin. U. S. Fish and Wildlife Service, Denver, CO. Larval Fish Laboratory Contribution 163.

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ANNUAL PERFORMANCE PROGRESS REPORT (PPR)

BUREAU OF RECLAMATION AGREEMENT NUMBER: R19AP00058

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: 22f

Project Title:

Interagency standardized monitoring program assessment of endangered fish reproduction in relation to Flaming Gorge Dam operations in the middle Green and lower Yampa rivers.

Bureau of Reclamation Agreement Number:

R19AP00058

Principal Investigator:

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Project/Grant Period:

Start date: 1 Oct. 2018

End date: 30 Sept. 2023

Reporting period end date: 30 Sept. 2022

Is this the final report? Yes _____ No ___

Performance:

The goal of this project is to document timing and intensity of reproduction by razorback suckers and Colorado pikeminnow in the lower Yampa and middle Green rivers. Samples were collected in the Yampa River about 0.2 to 0.8 km upstream from the Green River (n = 272 total samples collected in 2022, n = 255 samples collected in 2021), the same site that samples were collected from in 1990 to 1996 (Bestgen et al. 1998) and in 1998 to 2021. Sampling in 2022 commenced on 14 June and extended through 15 August. The first Colorado pikeminnow larva was collected on 2 July. We also received light trap samples collected by the U.S. Fish and Wildlife Service in spring 2022. All samples are being identified or verified at this time.

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ANNUAL PERFORMANCE PROGRESS REPORT (PPR)

BUREAU OF RECLAMATION AGREEMENT NUMBER: R20PG00024

UPPER COLORADO RIVER RECOVERY PROGRAM PROJECT NUMBER: 22f

Project Title:

Light trap and drift net sampling for razorback sucker and Colorado pikeminnow larvae

Bureau of Reclamation Agreement Number:

R20PG00024

Project/Grant Period:

Start date: 10/01/2019

End date: 09/30/2024

Reporting period end date: 09/30/2021

Is this the final report? Yes _____ No X

Performance:

U.S. Fish and Wildlife Service Green River Basin FWCO completed our portion of Task 1, collect light trap and seine samples (n = 148) from the Green River and its wetlands. We began light trapping on 10 May and continued sampling through 10 June. All samples and data were delivered to CSU LFL.