

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2021 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: 09/30/2021

Is this the final report? No

Principal Investigator:

Kevin R. Bestgen

Larval Fish Laboratory (LFL)

Department of Fish, Wildlife, and Conservation Biology

Colorado State University

Fort Collins, CO 80523

(970) 491-1848/5295; FAX 491-5091

E-mail kbestgen@colostate.edu

Christian Smith

USFWS

Green River Basin FWCO

1380 S. 2350 W.

Vernal, Utah 84078

Phone: (435) 789-0354

Abstract:

The goal of Flaming Gorge flow and temperature recommendations (Muth et al., 2000, LaGory et al. in draft) 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 2021. 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.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Study Schedule :

Ongoing in 2021 in a new agreement began on 1 October 2018, similar sampling has been conducted since 1990 for Colorado pikeminnow except for 1997, and since 1992 for razorback suckers. Anticipate continued annual sampling to build this valuable long-term monitoring dataset, which informs 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 2021 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 2021)

- 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-time data. Final specimen identification and curation will be conducted by the LFL.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

- 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 2021 by the Vernal USFWS. Additional sampling was not conducted in the Stewart Lake floodplain wetland in summer 2021 because the wetland was not filled.
- 2) Collect drift net samples for Colorado pikeminnow. Drift net samples were collected during June to August 2021 by the Larval Fish Laboratory.
- 3) Identify light trap and drift net samples.

Middle Green River light trap samples, 2019. The sorting and identification of 2019 samples (n = 409 total samples) was not yet complete when the FY 2019 report was due so we detail those results here. Light trap sampling extended from 13 May to 28 June. First capture of razorback sucker larvae was on 21 May at the Stewart Lake outlet channel, and last capture was on 28 June at Baeser Wash; 1,347 razorback sucker larvae were captured (Figure 1). The number of razorback sucker larvae captured in 2018 and 2019 is a substantial increase over their abundance in 2014-2017. Differences in numbers of larvae captured occurred even when the number of razorback suckers stocked stayed relatively low and constant since 2014.

Increased flow releases from Flaming Gorge Dam are timed when razorback sucker larvae first emerge from spawning gravels in the Green River (Figure 2). Higher flows allow larvae to access low-velocity, warm, and food-rich floodplain wetlands in the middle Green River, Utah, in spring when the mainstem river is high-velocity, cold, and food-poor. In 2019, flow releases were delayed for a relatively long period compared to other years—first presence of larvae was observed on 21 May but flow increases did not occur until 3 June. This was because upstream Yampa River flows had declined to levels that even when combined with Flaming Gorge releases would not have connected floodplain wetlands with the Green River. Because of the relatively long reproductive period of razorback suckers, substantial numbers of larvae were still emerging from spawning gravels when flows did increase on 3 June. Larvae were captured in light traps until the end of the sampling period and were relatively abundant late in the year as Green River flows were declining. High abundance of larvae when flows were increasing and high in spring 2019 may be responsible for relatively high survival of razorback suckers in wetlands (see Recovery Program annual report, project 165; https://coloradoriverrecovery.org/documents-publications/work-plan-documents/arpts/2019/hab/FR-165_FY19AR-Final.pdf). For example, several hundred juveniles were captured in the Stewart Lake outlet during draining and likely as many or more were observed escaping to the river during draining but were not handled.

Middle Green River light trap samples, 2020. The sorting and identification of 2020 samples is nearly complete but was delayed due to personnel limitations. Verification of endangered fishes will begin once initial identification is complete. 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.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Middle Green River light trap samples, 2021. The sorting and identification of 2021 samples has not begun as these were recently received and we are focused on finalizing 2020 samples. Light trap sampling began on 18 May, the day razorback sucker larvae were first captured, and ended on 10 June.

Lower Yampa River drift net sampling, 2019. Samples were collected in the Yampa River about 0.2 to 0.8 km upstream from the Green River (n = 213 total samples collected in 2019), the same site where samples were collected in 1990 to 1996 (Bestgen et al. 1998) and in 1998 to 2018. Sampling commenced on 3 July, a relatively late start due to high flows, and extended through 21 August. The first Colorado pikeminnow larva was collected on 11 July, a relatively late date of first capture but not unexpected given the high water level into late June and associated lower water temperatures early in summer in the Yampa River. Flows and water temperatures in 2019 were also high and cool in early summer in the adjacent Green River due to later than normal releases. The number of Colorado pikeminnow larvae collected in 2019 was comparable to other recent years (Figure 3) and relatively low.

Flow levels in the Yampa and Green rivers were relatively high and cold for about the first half of the larval drift period for Colorado pikeminnow, and well above the level thought to promote relatively high summer survival in backwaters of the Green River (Bestgen et al. 2020). For example, flows in the middle Green River on 11 July were 6,680 ft³/sec when larvae were first present in 2019 (Figure 4); flows in the range of 1,766-5,297 ft³/sec are typical of years when young Colorado pikeminnow survival in the middle Green River is relatively high.

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 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.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

Additional noteworthy observations:

Recommendations:

Continue sampling as planned in 2022. 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 2021 Budget Status

Funds Provided: \$130,889

Funds Expended: \$111,000

Difference: \$19,889

Percent of the FY 2021 work completed, and projected costs to complete: 80% completed, no new funds needed to complete

Recovery Program funds spent for publication charges: 0

Status of Data Submission

NA

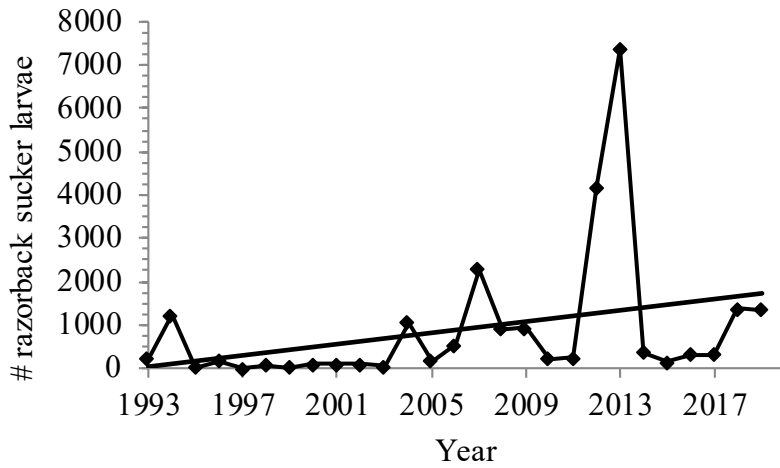
Signed:

Principal Investigator: Kevin R. Bestgen

Date: 11 November 2021

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

A.



B.

Green River razorback sucker stocking

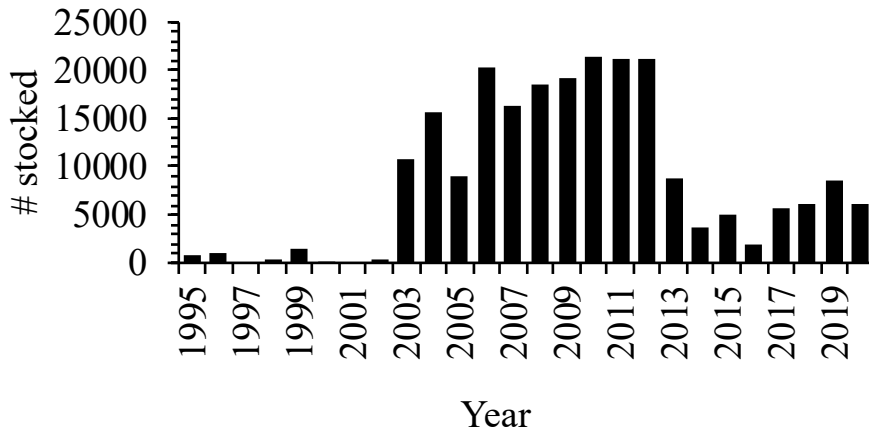
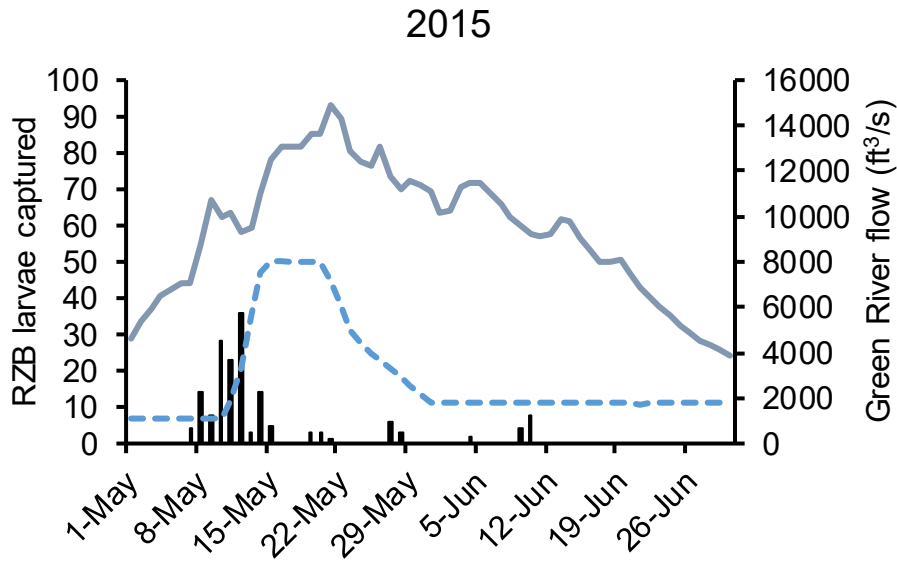


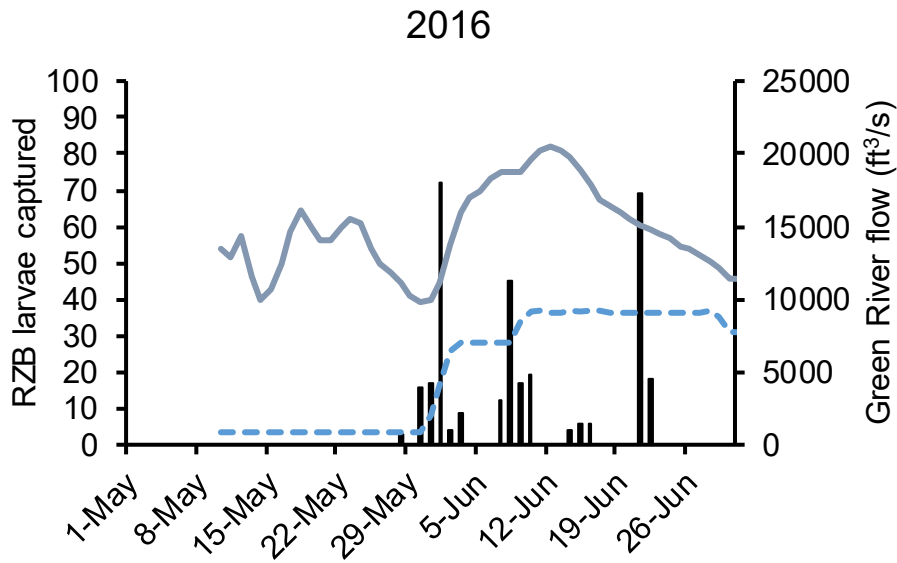
Figure 1. Panel A depicts the increasing number of razorback sucker larvae captured from 1993 to 2019 in the middle Green River, Utah, in light traps (all fish including those of questionable taxonomic identity included; 2020 and 2021 sample identification is not finished so is not included here). Panel 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.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

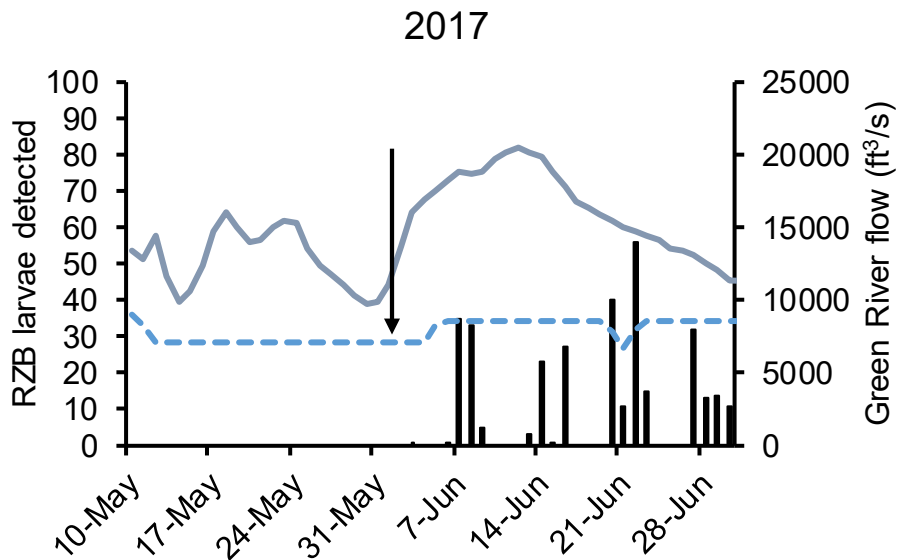
A.



B.

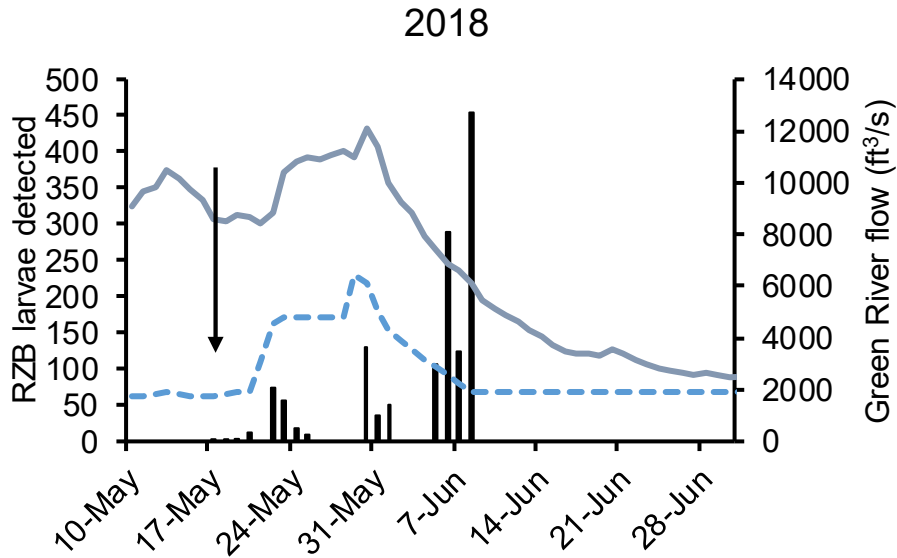


C.

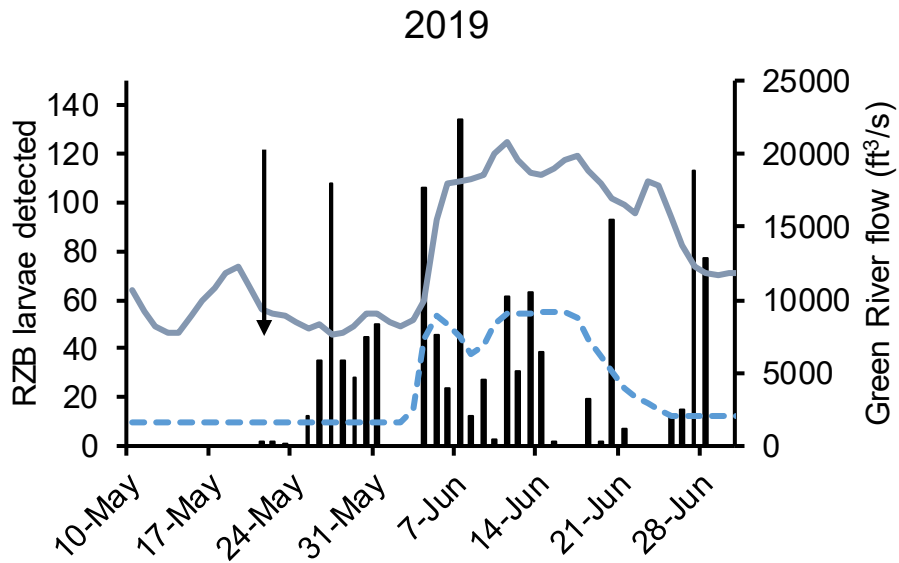


UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

D.

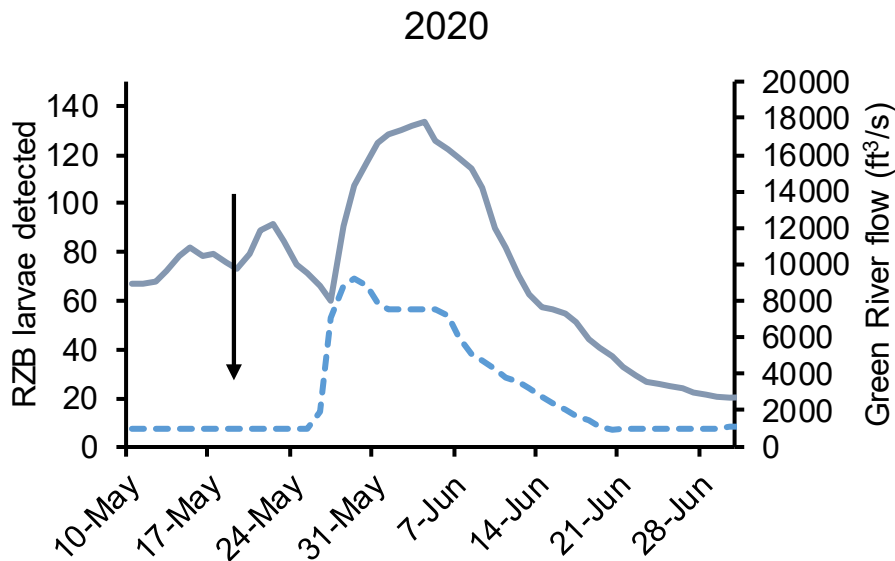


E.



UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

F.



G.

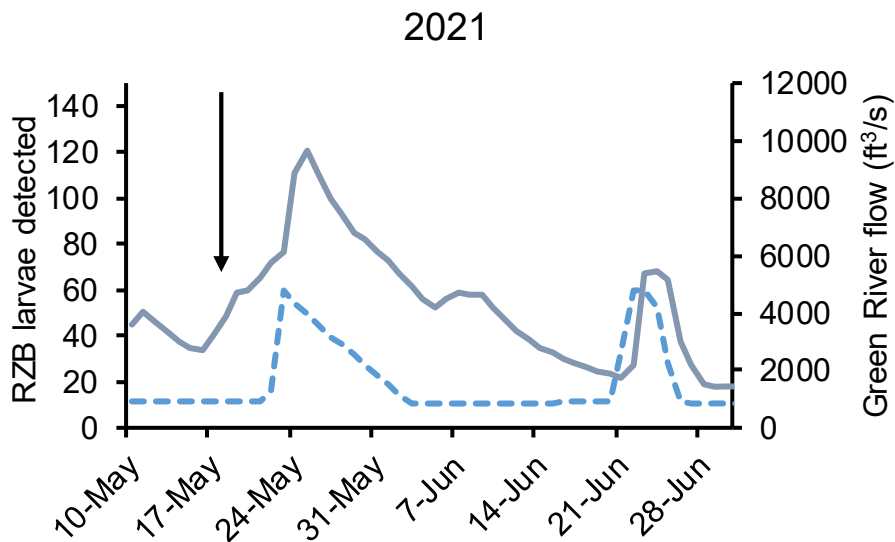


Figure 2. Seasonal distribution of razorback sucker larvae captured in 2015 (panel A), 2016 (panel B), 2017 (panel C), 2018 (panel D), 2019 (panel E), 2020 (panel F, no larvae data, identifications ongoing), and 2021 (panel G, no larvae data, identifications not yet started) in middle Green River, Utah, 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 may 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 mainly flows of the Yampa River.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

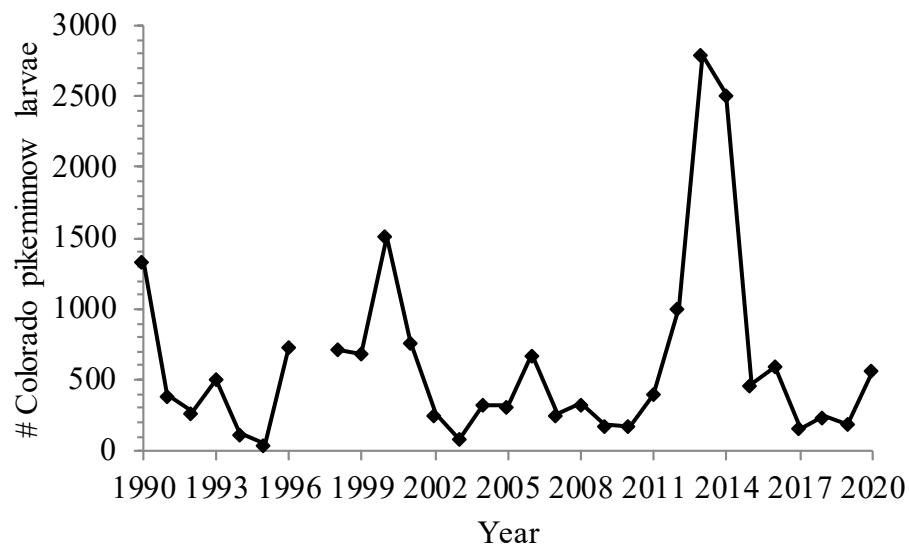
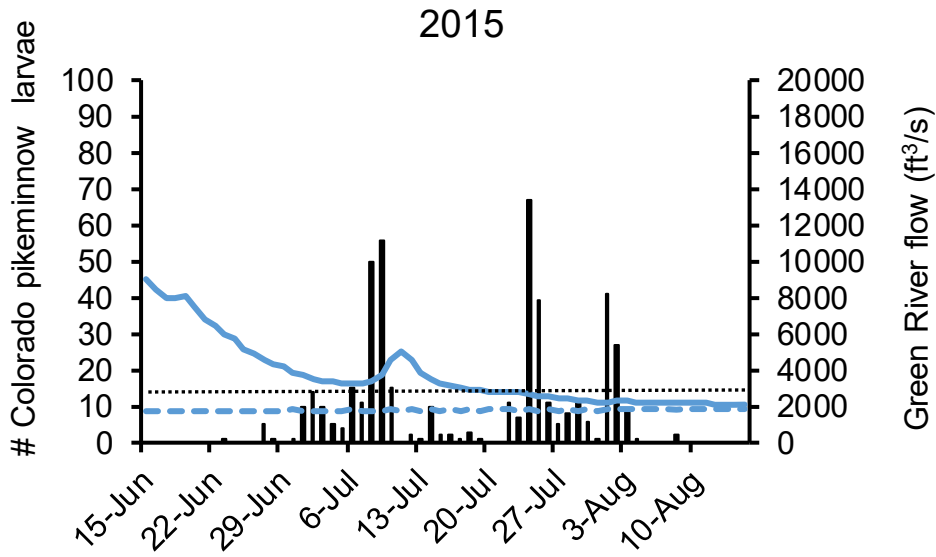


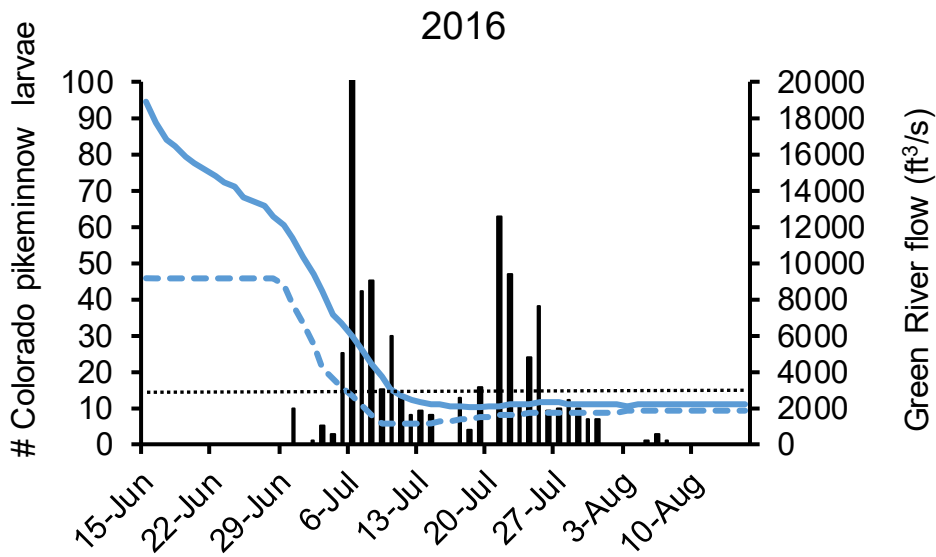
Figure 3. Number of Colorado pikeminnow larvae captured from 1990 to 2020 (no sampling in 1997, includes specimens from all diel samples; 2021 sample identification is not yet complete) in the lower Yampa River, Colorado, during summer in drift nets.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

A.

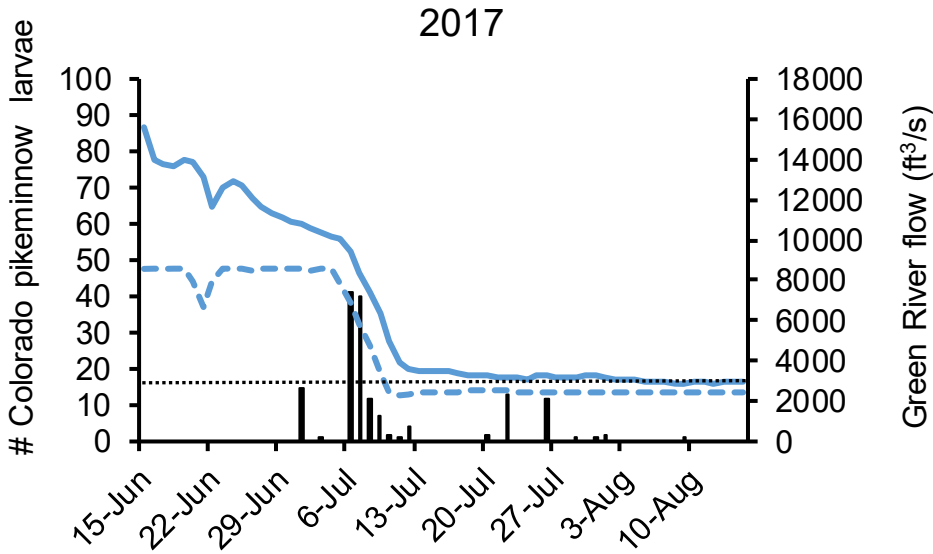


B.

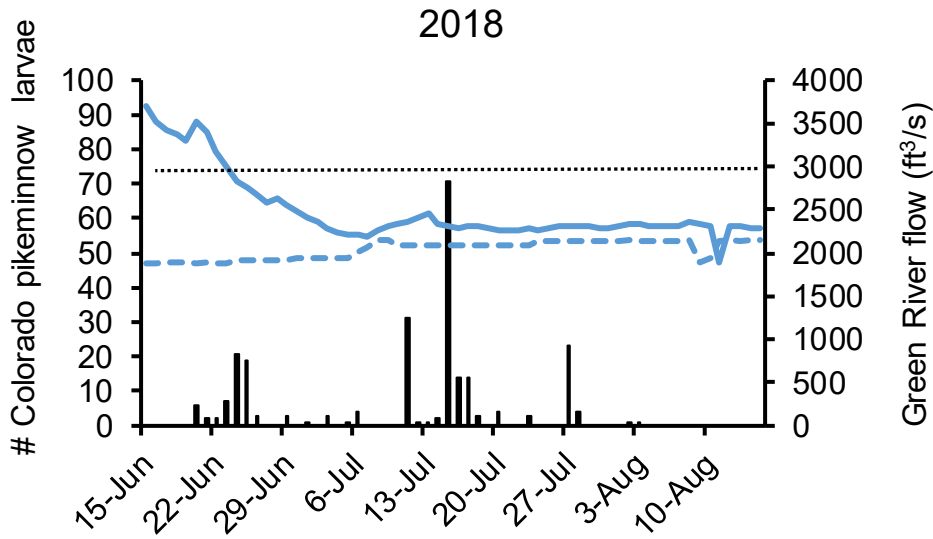


UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

C.

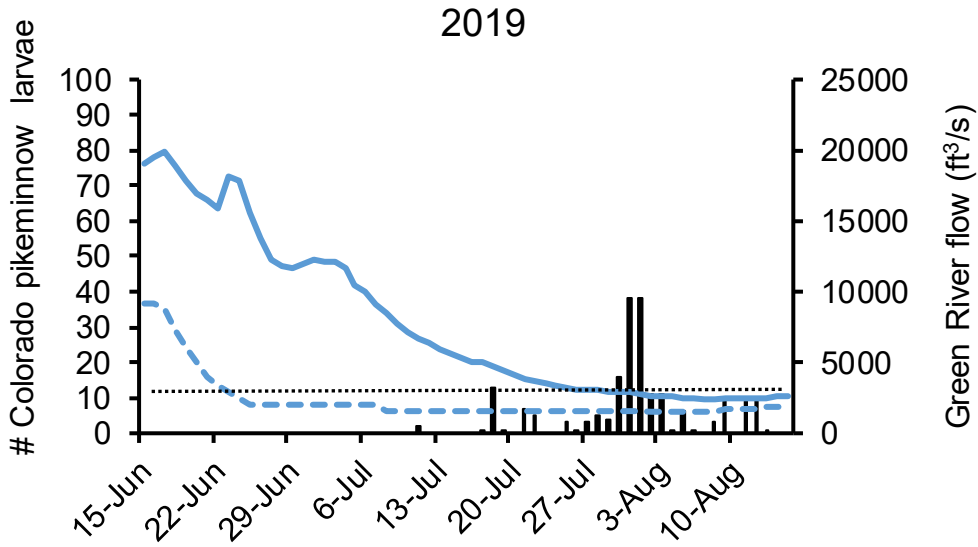


D.

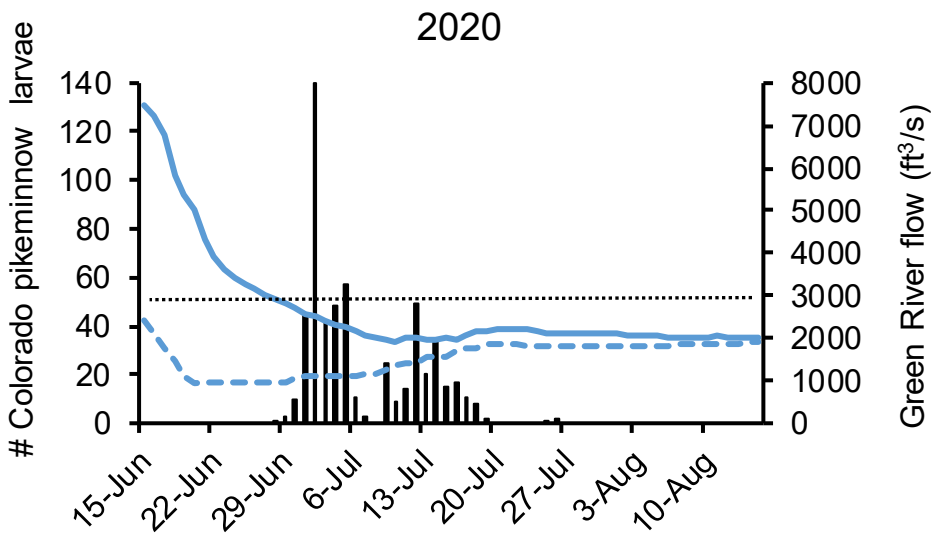


UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

E.



F.



UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

G.

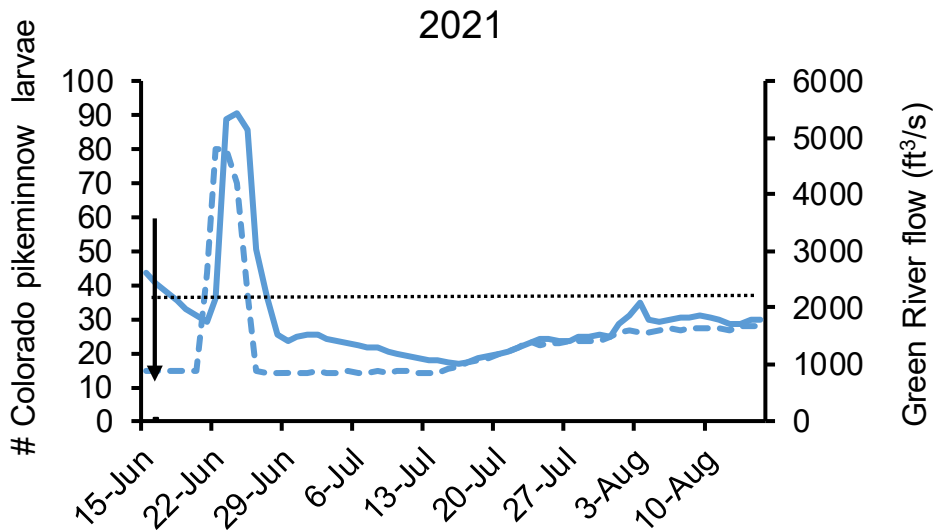


Figure 4. Seasonal distribution of Colorado pikeminnow larvae captured in 2015 (panel A), 2016 (panel B), 2017 (panel C), 2018 (panel D), 2019 (panel E), 2020 (panel F), and 2021 (panel G, no samples verified yet except for first presence date, 16 June) drift net samples from the lower Yampa River, Colorado. 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 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); the flow spike to reduce smallmouth bass reproductive success is evident in the graph 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.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

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.

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.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

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:

Kevin R. Bestgen
Larval Fish Laboratory (LFL)
Department of Fish, Wildlife, and Conservation Biology
Colorado State University
Fort Collins, CO 80523
(970) 491-1848/5295; FAX 970 491-5091
E-mail kbestgen@colostate.edu

Project/Grant Period:

Start date: 1 Oct. 2018

End date: 30 Sept. 2023

Reporting period end date: 30 Sept. 2021

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 = 273 total samples collected in 2020, 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 2021 commenced on 8 June and extended through 5 August. The first Colorado pikeminnow larva was collected on 16 June. We also received light trap samples collected by the U.S. Fish and Wildlife Service in spring 2021. All samples are being identified or verified at this time.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

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 from the Green River and its wetlands. We began light trapping on 18 May and continued sampling through 10 June. The initiation of sampling was later in 2021 than in most years due to delayed runoff in the Yampa and Green Rivers. All samples and data were delivered to CSU LFL on 26 July.