

- I. Project Title: Middle Green River floodplain sampling
- II. Bureau of Reclamation Agreement Number: R15PG00083  
Project/Grant Period: Start date: 10/01/2014  
End date: 09/30/2019  
Reporting period end date: 09/30/2017  
Is this the final report? Yes  No
- III. Principal Investigators:  
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- IV. Abstract:  
We sampled floodplain wetlands during high water connection this spring using light traps to identify sites where razorback sucker larvae were being entrained. Sites that were flooded included Escalante Ranch, Stewart Lake, Bonanza Bridge, Stirrup, Above Brennan, Johnson Bottom, Leota Bottom, Wyasket Lake, Sheppard Bottom, and Old Charley. Preliminary results indicate razorback sucker larvae were collected from Stewart Lake (see FR-165 report), Stirrup, and Johnson Bottom. We also sampled select floodplains during the summer and autumn to track fish survival and recruitment, with particular emphasis on sites that are being considered for future restoration or sites that have been modified for fish habitat management. This report also summarizes management activities and results at the Johnson Bottom wetland.
- V. Study Schedule: 2012-ongoing
- VI. Relationship to RIPRAP:  
Green River Action Plan: Mainstem  
I.A.3.d.1. Conduct real-time larval razorback and Colorado pikeminnow sampling to guide Flaming Gorge operations.  
I.D.1.b.(4)(a) Implement LTSP  
V.D.1. Implement razorback sucker monitoring plan
- VII. Accomplishment of FY 2017 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

### **Larval Trigger and Spring Peak Flow Hydrology**

U.S. Fish and Wildlife Service monitors larval razorback sucker (RZB) drift through the use of light traps, starting each spring in May or as water temperatures indicate spawning is imminent. The first detection of RZB larvae was on June 3<sup>rd</sup> during sampling at the Stewart Lake outlet by Utah Division of Wildlife Resources. We detected the first RZB larvae on June 6 at Cliff Creek, when mean daily flow at Jensen, UT was 16,600 cfs and mean water temperature was 15.8°C. Bureau of Reclamation (BR) managed flows in 2017 primarily with regards to dam safety and managing reservoir capacity

due to well above average snowpack in the upper Green River basin (wet hydrologic category; 231% of 30-year average<sup>1</sup>). As a result, in mid-February BR increased flows from 1,800 cfs<sup>2</sup> mean daily discharge to powerplant capacity (~4,600 cfs) by March 9. Flows were again increased on March 27 to reach full bypass (8,600 cfs) by March 31. BR maintained bypass flows through May 10 when flows were decreased to 6,600 cfs. Flows were again increased to 8,600 cfs on June 5 in anticipation of RZB larval presence, and BR maintained bypass flows through July 4. During this time, the Green River at Jensen peaked at 18,300 cfs on June 9, although flows fluctuated around 18,000 cfs from June 6-13. Because of the elevated releases from Flaming Gorge prior to larval presence, flows at Jensen exceeded 17,000 cfs on May 12 and 16. These earlier pulses began filling some wetlands before the detection of RZB larvae. Details of spring larval sampling can be found in the annual report for project 22f, but much of the larval identification and final data are still pending laboratory verification, which is currently in process.

Once floodplain wetlands were connected to the river and contained enough water to sample, we deployed light traps to confirm larval RZB had been entrained from the main channel. Light traps were deployed in wetlands at Stirrup, Above Brennan, Sheppard Bottom, and Johnson Bottom. We focused on these sites because of their potential for future wetland restoration (Stirrup and Above Brennan) or because they had been recently renovated to improve their management as fish habitats (Sheppard and Johnson). Utah Division of Wildlife Resources set light traps in Stewart Lake. We observed flooding at Wyasket Lake and Old Charley wetland, but were not able to sample those sites because of access issues. Razorback sucker larvae were collected from Stirrup and Johnson Bottom in mid-June. The larval RZB from Johnson was 12 mm when it was captured June 16, and daily otolith increments indicated this was a wild spawned fish (K. Bestgen, pers. comm.).

## **Johnson Bottom Wetland Management and Sampling Results**

### *Water Management*

Due to high forecasted flows, we did not attempt to block fish access from the river through the large, downstream breach, nor did we manage water through the much smaller control structure. As a result, Johnson Bottom was connected to the Green River periodically from mid-April through May. With a longer period of connection and later than average flooding, we did not supplement water during the summer. Water levels remained high despite this, and were still three feet by late September.

### *Fish Sampling*

Based on spawning and recruitment of young fish observed in 2016, Ouray National Fish Hatchery stocked 2,055 bonytail into the wetland on May 10. These fish averaged 228 mm in length (range 105-300 mm). We also used the early filling to conduct experiments on RZB larval entrainment through the wetland's inlet fish screen as well as larval detection probability using light traps (LFL study). Since our stocking of larvae was well before wild larvae were expected to arrive, we felt that different sources might be discernable through size differences. In addition, the early wetland connection made it more likely that nonnative fishes would invade the wetland and reduce survival of wild larvae. Finally, some of the hatchery larvae used were marked with oxytetracycline for discerning their source and stocking location.

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<sup>1</sup> May 1, 2017 final forecast, reported in Flaming Gorge Technical Working Group hydrology summary, BR, 5/9/2017

<sup>2</sup> Flow measured by Bureau of Reclamation through the dam outlet and bypass. This value differs from the USGS gage at Greendale, UT.

We sampled the wetland July 12 with seines and July 26-27 using baited hoop nets and seines. We also electrofished in the wetland on July 27. We were able to catch one age-0 RZB (TL = 44 mm) during the July 12 seining. The hoop netting resulted in a catch of 102 (80%) common carp (CP), 21 (17%) black bullhead, and one each of black crappie, fathead minnow, green sunfish, and white sucker. Fish captured consisted primarily of age-0 sizes, with the exception of the black bullhead (TL = 298 mm) and the white sucker (TL = 149 mm). Seining was difficult due to the dense stands of cattails along the wetland margin, as well as submerged vegetation within the water column. In locations where seining was feasible, we caught common carp, fathead minnow, green sunfish, black crappie, and brook stickleback. Electrofishing resulted in a similar species composition, but we did capture one age-0 razorback sucker (TL = 52 mm) during this sampling.

We deployed seven submersible PIT tag antennas in the wetland on July 26 and left them to collect data until August 7. Over that time, the antennas detected 242 unique tags from fish in the wetland. These included 213 bonytail stocked into the wetland on May 10, nine bonytail stocked into the Johnson Bottom inlet canal in March 2017 before the wetland connected to the river, four bonytail stocked to the Green River in the fall of 2016, and four razorback sucker stocked to the Green River in the years 2013, 2014, and 2015 (n = 2).

We resumed fish sampling once we opened the water control structure to drain the wetland on September 19 and continued periodically sampling until closing the gates on October 26. This sampling involved pulling seines in the fish kettle, which is isolated between two water control gates. The downstream gate (during wetland draining) is screened with 6mm x 75mm slots to hold fish in the kettle. Over the roughly one month of sampling during draining, we were able to catch 134 bonytail and 45 razorback sucker, which were then transferred to the Green River at the mouth of the wetland canal outlet. All of the bonytail were adults that had tags indicating they were stocked from Ouray NFH, although eight of them were stocked outside the wetland in March 2017. Another three of the bonytail were stocked to the Green River in the fall of 2016, and had to enter the wetland through the breach during flooding in the spring of 2017. We also detected 69 of the bonytail during the PIT tag antenna sampling, meaning nearly half the fish exiting the wetland were not detected with this technique. For bonytail stocked into the wetland in May, we observed an average growth of 92 mm in length. Weight data were not available for every individual stocked, but average weight was available for groups of stocked fish. We used average batch weight to calculate mean weight gain in these fish, which was 105 grams. These data are consistent with weight gain data that were available for individuals. The RZBs were all age-0 fish, but since larval RZB were stocked to the wetland in May, it was not possible to determine if they were of hatchery or wild origin. We did preserve two of these fish for otolith examination which could determine the hatch dates or reveal the oxytetracycline mark from the hatchery release. The RZBs had a mean length of 125 mm (range 84-160 mm), and we PIT tagged RZBs larger than about 130 mm.

The majority of fish captured at Johnson Bottom in autumn were nonnative species consisting of fathead minnow, common carp, black bullhead, black crappie, red shiner, green sunfish, yellow perch, white sucker, channel catfish, brook stickleback, and walleye. We preserved entire seine hauls periodically during sampling for a more exact estimate of species composition, but these samples have not been identified yet. This is the first time yellow perch and walleye have been observed in Johnson Bottom, and the individuals of both species were relatively small and similarly sized. There were only two walleye captured, measuring 230 and 254 mm. Both species are present in Red Fleet Reservoir as a result of stocking triploid walleye and fertile yellow perch after a rotenone treatment, and their presence in the wetland suggests escapement through the outlet works at this reservoir. The sizes of fish captured in Johnson Bottom are comparable to those seen in Red Fleet (N. Boren,

UDWR, pers. comm.).

Johnson Bottom connected to the Green River earlier in 2017 compared to previous years because of prolonged periods of bypass flows from Flaming Gorge most of the spring. These higher flows allowed for an extended period of connection to the river, which in turn facilitated the introduction and establishment of several nonnative fish species in the wetland prior to larval RZB emergence. Although age-0 RZB sucker did survive until autumn, it is unclear if these fish were the product of larval stocking before the wetland was fully breached and allowed access to nonnative species. Over the last several years of floodplain sampling, survival of larval RZB is below detectable levels when nonnative fish species are allowed to colonize wetland habitats in advance or when pre-existing populations are present. This underscores the need to prevent nonnative fish establishment before larval RZB are entrained into a habitat. Despite a screen on the Johnson Bottom inlet gate, the presence of the large, unscreened breach on the downstream end of the wetland has complicated our ability to control nonnative fish. River flows in the last two years have deposited a sand berm across most of the breach, and we believe it may now be possible to more effectively screen this access. It is our intent to attempt a screening solution in 2018 if flows allow.

### **Sampling Results for Other Wetlands**

#### *Leota Bottom*

We sampled Leota Bottom unit 7 on August 9-10 using baited hoop nets. The fish community consisted of 79% black bullhead, 19% carp, 2% green sunfish, and <1% black crappie. Both Wahweap and Ouray stocked bonytail into the lower Leota complex in spring (n = 3,457), but our sampling was unable to collect these fish. We did, however, detect 134 bonytail with submersible antennas after deploying seven antennas during August 10-21. For these detections, 71 of the tags were from bonytail stocked in 2016 and 63 were from bonytail stocked in 2017. Various units of the Leota complex were stocked in both years, and those units were connected by water over this time period. We also sampled Leota 7 with baited hoop nets on August 9-10, and this sampling resulted in a fish community composition of 79% black bullhead, 19% common carp, 2% green sunfish, and <1% black crappie.

#### *Above Brennan*

We first sampled this site July 25-26 using baited hoop nets, electrofishing, and seines. From this sampling, we captured four adult RZB. One RZB was stocked in 2003 at Split Mountain boat ramp, and then recaptured in May 2008 near Razorback Bar. The other fish were stocked in 2011, 2014, and 2015 near Ouray NWR. We released these native fish back to the wetland. The remainder of fish caught were nonnative species: 80% black bullhead, 18% green sunfish, <1% white sucker, and <1% black crappie.

We sampled Above Brennan again Oct. 4-5 using only fyke nets. This produced only one untagged adult RZB (TL = 494 mm), which we released in the Green River. Besides this native fish, the rest of the sampling collected approximately 70% black bullhead, 18% crappie, 9% green sunfish, and 2% fathead minnow. We also observed incidental captures (<1%) of common carp (including adults), white sucker, channel catfish, and one Iowa darter.

#### *Stirrup*

Wahweap State Fish Hatchery (UDWR) stocked over 4,000 bonytail to the wetland on April 3. We first sampled Stirrup July 24-25 using baited hoop nets, electrofishing, and seines. This sampling event yielded ten bonytail, primarily from boat electrofishing (n = 8). Two of the fish were not

tagged, and of the eight tagged fish with stocking records, six had lost weight after 113 days in the wetland. For all eight fish with stocking records, growth in length averaged only 6 mm (range 0-18 mm). We also caught nonnative fish species in the wetland during the July sampling, which resulted in a species composition of 79% green sunfish, 20% black bulhead, and 1% common carp.

We returned to the Stirrup wetland on August 31 and deployed PIT tag antennas for eighteen days. The antennas detected 214 unique tags during this time, all of which belonged to bonytail stocked or tagged in the wetland in 2017. Our final sampling occurred on October 4-5, when we set fyke nets with assistance from UDWR Vernal. This sampling produced one bonytail and one razorback. The RZB was untagged and measured 348 mm. The bonytail had been stocked in April, and grew 15 mm and lost 15 grams after six months at large. We released both fish to the Green River. The fall sampling also produced several nonnative fish species: 66% green sunfish, 22% fathead minnow, 11% black bullhead, and less than 1% each of carp and red shiner.

#### *Sheppard Bottom*

Sheppard Bottom was renovated in spring of 2017 to improve its connection to the Green River during spring run-off, and during this construction a fish screen was installed between S2 (unit connected to the river via breach) and S3 (interior unit filled through water control structure from S2). We were unable to detect RZB larvae using light traps as the wetland was filling through the breach. We returned with seines and sampled the flooded road crossing between units S2/S5 on July 11 and captured 13 age-0 RZB ranging 21-29 mm in length. Seining in the interior unit 3 where water had been screened did not produce fish.

We returned to Sheppard with baited hoop nets and sampled all three units (S2/S3/S5) July 27-28. All of these nets only captured common carp. Fyke net sampling later in the fall (October 25) yielded a species composition of 62% common carp, 17% fathead minnow, 13% black bullhead, 6% green sunfish, 2% red shiner, and <1% black crappie. Dissolved oxygen loggers in all three wetland units recorded DO levels at or near zero for most of the mid-summer. These units had not been flooded in several years, and we hypothesize that the decomposition of newly flooded vegetation produced high biological oxygen demand.

#### *Escalante Ranch*

We sampled the Escalante Ranch wetland with baited hoop nets August 8-9. This sampling resulted in a fish community comprised of 82% black bullhead, 17% green sunfish, 1% common carp, and <1% each of fathead minnow and white sucker. Wahweap fish hatchery stocked bonytail at Escalante in the spring, but we were not able to capture any of these fish.

VIII. Additional noteworthy observations:

IX. Recommendations:

- We recommend continuing light trapping to evaluate the entrainment of RZB, as well as other native species, under the Larval Trigger Study Plan. This work provides information on presence of larval RZB in monitored floodplain habitats, which has not historically been part of the long term light trapping study under Project 22f. This information also informs which site we might sample later in summer.
- Continue to manage Johnson Bottom for larval RZB entrainment and growth. Sample fish through use of seines during summer to track growth and survival.
- Consider managing some floodplain sites specifically for bonytail given favorable

hydrology, or river conditions that may not benefit floodplain use by larval RZB. Submersible antennas detected bonytail in several floodplains, including tags from fish stocked the previous year.

- Investigate methods to improve bonytail captures in the habitats.
- Investigate techniques to control or eliminate nonnative fish populations that might overwinter in wetlands in order to reduce their numbers before river connection, including genetic or chemical methods. The species composition in the wetlands sampled is similar, and comprised of fish species not commonly observed in the main channel. Wetlands can serve as preferred habitat where these species will reproduce and persist in the basin. They can also become a source to reintroduce these species back into main channel habitats where they might otherwise not occur.

X. Project Status: on track and ongoing

XI. FY 2017 Budget Status

- A. Funds Provided: \$36,597
- B. Funds Expended: \$36,597
- C. Difference: -0-
- D. Percent of the FY 2017 work completed: 100%
- E. Recovery Program funds spent for publication charges: -0-

XII. Status of Data Submission: Data will be submitted to the database manager by December 2017.

XIII. Signed: M. Tiddon Jones  
Principal Investigator

6 December 2017  
Date

Table 1. Summary of 2017 fish sampling and results. \*Most BT detected were stocked in 2016.

	BT stocked	RZB larvae?	RZB juvenile?	BT detected	BT captured
Above Brennan	No	No	No	N/A	N/A
Escalante Ranch	4,379	N/A	No	N/A	0
Johnson Bottom	2,959	Yes	Yes	226	134
Leota	3,457	N/A	No	134*	0
Sheppard Bottom	No	No	Yes	N/A	N/A
Stirrup	4,298	Yes	No	214	11