

- I. Project Title: Middle Green River floodplain sampling
- II. Bureau of Reclamation Agreement Number: R15PG00083
Project/Grant Period: Start date: 10/01/2014
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Is this the final report? Yes ___ No X
- 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 sampled included Stewart Lake, Johnson Bottom, Leota Bottom, Sheppard Bottom, and Old Charley. Preliminary results indicate razorback sucker larvae were collected from Stewart Lake (see FR-165 report), Stirrup, Above Brennan, Johnson Bottom, and Old Charley Wash. 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 and Old Charley wetlands.
- V. Study Schedule: 2012-ongoing
- VI. Relationship to RIPRAP:
Green River Action Plan: Mainstem
I.D.2.b.(4)(a) Implement LTSP
II.A.5. Manage and/or modify priority floodplain sites for nursery habitat for endangered fish
II.A.5.b. Johnson Bottom
II.A.5.c. Old Charley Wash
II.A.5.d. Sheppard Bottom
II.A.5.e. Other sites
- VII. Accomplishment of FY 2019 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 May 21 at Cliff Creek, when mean daily flow at Jensen, UT was 9,420 cfs and mean water temperature was 11.2°C. The Bureau of Reclamation (BR) increased

Flaming Gorge Dam releases to 8,600 cfs on June 4 in response to increasing RZB larval captures in light traps and maintained varying magnitudes of bypass flows through July 20. During this time, the Green River at Jensen peaked at 21,000 cfs on June 11, although flows stayed above 18,000 cfs from June 10-19. These elevated and extended high flows filled all key wetlands identified in the Larval Trigger Study Plan except for Baser Bend, all of which were dry or reset prior to 2019 runoff. 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. Green River Basin FWCO sampled with light traps or seined at Above Brennan, Stirrup, Leota Bottom, Johnson Bottom, Sheppard Bottom, and Old Charley. Utah Division of Wildlife Resources set light traps in Stewart Lake. Razorback sucker larvae were confirmed in all wetlands sampled except Leota Bottom and Sheppard Bottom.

Johnson Bottom Wetland Management and Sampling Results

Water Management

Due to high flows, we did not block fish access from the river through the large, downstream breach despite installing a substantial screen, which failed between June 6 and June 7. Up to this point, we managed water through the screened canal control structure starting on June 4. We did not need to supplement water during the summer thanks to the extended high flows in the Green River in early June and water levels were still above three feet in early October. Wetland draining began on October 1 and continues to date (December 12).

Fish Sampling

Sampling was conducted with 10 fyke nets August 19-21 to determine whether razorback sucker were entrained during peak flows and survived in Johnson Bottom. As with Old Charley, Leota Bottom, and Sheppard Bottom, summer sampling was limited to three days due to concerns for fish health and survival given prior experience with high juvenile mortality while handling fish when air temperature is near or above 100° F. In total, six razorback sucker (range= 50-81 mm TL) and one hatchery-reared adult bonytail were captured during this sampling event.

We resumed fish sampling once we opened the water control structure to drain the wetland on October 1 and continued sampling periodically until November 6. This sampling involved pulling seines in the fish kettle, which is isolated between two water control gates, and within the canal on the wetland side of the kettle. The downstream gate (during wetland draining) is screened with 6mm x 75mm slots to hold fish in the kettle. Over the five weeks of sampling during draining, we were able to catch four razorback sucker, which were then transferred to the Green River at the mouth of the wetland canal outlet. The RZBs were all age-0 fish and since larval RZB were not stocked to the wetland in 2019, all fish were of wild origin. These RZBs had a mean total length (TL) of 114 mm (range= 72-136 mm), and we PIT-tagged two RZBs that were larger than 100 mm TL.

The majority of fish captured at Johnson Bottom in autumn were nonnative species consisting of common carp, red shiner, green sunfish, fathead minnow, white sucker, black bullhead, and sand shiner. Other nonnative species that have been captured in this wetland in past years such as channel

catfish, black crappie, yellow perch, and walleye were not caught in 2019. In general, seine hauls at Johnson Bottom in 2019 were paltry compared to previous years, which does not appear to be the result of depleted dissolved oxygen within this wetland. In fact, dissolved oxygen remained higher in Johnson Bottom than Old Charley (Figure 1) during fall draining despite the former wetland yielding many more razorback suckers.

Over the last several years of floodplain sampling, survival of larval RZB has been below desired levels. Nonnative fish species often 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. The low water hydrology of 2018 dried this wetland and provided a clean slate that allowed such a scenario. As previously mentioned, the water control structure at this wetland was opened on June 4, which was after RZB larvae had been detected within this reach of river. However, despite the screen on the Johnson Bottom inlet gate, the presence of the large, unscreened breach on the downstream end of the wetland eliminated our ability to control nonnative fish. River flows in recent years had deposited a sand berm across most of the breach and crews constructed a temporary screen prior to 2019 peak flows that appeared much more substantial than our previous attempts at nonnative exclusion at this site. Unfortunately this screen failed within a few days of opening the gate, but the need for a permanent solution (i.e. filling the breach) has been identified and discussion with Ouray National Wildlife Refuge (ONWR) to do so has begun.

Old Charley Wash Wetland Management and Sampling Results

Water Management

This was the first year Old Charley Wash (aka Woods Bottom) has been managed as razorback sucker nursery habitat. Green River Basin FWCO, with the assistance of Ouray National Fish Hatchery (ONFH) staff and ONWR heavy equipment, cleaned the fish kettle and wetland (inside) drainage canal prior to filling. Wetland filling was initiated on June 5 after RZB larvae had been captured in light traps in the outside drainage canal. Similar to Johnson Bottom, by June 7 high flows created multiple unscreened breaches that allowed the entry of larger nonnative fishes into the wetland. Supplemental water was not added later in summer because of the elevated and extended runoff period this year. Wetland draining began on October 1 and was deemed complete by November 1.

Fish Sampling

During the filling period many adult RZBs, that were presumably attempting to enter the wetland, were observed in the river side of the water control structure and screen at Old Charley Wash. Given these observations and the multiple unscreened breaches into Old Charley during high flows, crews attempted to determine whether adult RZB were present in the wetland via boat electrofishing on June 26. During this effort crews captured five adult RZB that carried hatchery tags. These fish were released in the Green River near the outlet canal mouth.

Mid-summer sampling was conducted with 10 fyke nets August 14-16 to determine whether larval razorback sucker were entrained during peak flows and survived in Old Charley. In total, sixteen young-of-year RZB (range= 56-97 mm TL) and two hatchery-reared adult RZB were captured during this sampling event.

Fish sampling was resumed on October 2 after draining began, continued daily except for weekends

until October 29, and primarily entailed seine hauls in the fish kettle and inside canal. Fyke nets were set in the inside canal for five days in mid-October to increase the number of RZB captures, but 18 RZB mortalities occurred on the fifth day so this gear was abandoned. In total, 172 RZB (range = 53-156 mm TL; Figure 2) were captured during the draining period. Of these, 154 were released into the Green River near the outlet canal mouth, of which 69 were PIT-tagged (>100 mm TL). In addition to RZB, five hatchery-reared and tagged bonytail were captured in Old Charley during the draining period.

As with Johnson Bottom in 2019, nonnative fishes comprised the majority of captures at Old Charley. Nonnative species caught and removed include common carp, black bullhead, white sucker, fathead minnow, black crappie, red shiner, green sunfish, and channel catfish. Despite lower dissolved oxygen during the draining period when compared to Johnson Bottom (Figure 1), as with razorback sucker, many more nonnatives were caught at Old Charley in 2019.

PIT tag Antenna Detections

Submersible PIT-tag antennas were deployed at Old Charley on October 1 and retrieved on October 29. Two antennas were placed in the outlet canal to determine if tagged fish released in the Green River were returning into the canal and one antenna was set inside the wetland near the kettle. A total of ten traceable unique tags were detected, all by the antenna inside the wetland. These tags were associated with three RZB and 6 bonytail; all were hatchery-reared and tagged fish. Only one of these fish was captured during draining, a bonytail stocked by ONFH in the Green River near Leota Bottom in June 2019. It is possible that these fish were removed from the wetland by raccoons, cormorants, pelicans, or other predators after they became concentrated in the drainage canal.

Sampling Results for Other Wetlands

Leota Bottom

Light trap sampling was conducted in Leota Bottom from June 20 to June 28. Larval RZB were not captured by GRB FWCO staff during this sampling period. Leota Bottom unit 7 was sampled on August 21-23 with 10 fyke nets to determine if RZB were entrained in this wetland during runoff and had survived. Endangered fish captures confirmed both and included ten RZB (range = 62-136 mm TL) and one adult bonytail.

Above Brennan

Larval RZB were captured with a seine at the Above Brennan wetland on June 18. Additional sampling was conducted from September 11-3 with 10 fyke nets. Juvenile RZB were not captured during this sampling event. However, four adult RZB containing hatchery tags were caught. These fish had been stocked in the middle Green River by ONFH between 2012 and 2018 and would have entered this wetland during 2019 runoff since it was dry in 2018. Although juvenile RZB were not captured in Above Brennan in 2019, Green River Basin FWCO will attempt to do so in spring 2020.

Stirrup

Three light traps were set at the Stirrup wetland on June 17 and larval RZB were captured with a larval seine on June 18. Additional sampling was conducted with 10 fyke nets from September 16-18 to confirm whether young-of-year RZB had survived through summer. A total of twelve RZB (range = 66-130 mm TL) were caught during this event and returned to the wetland. Green River Basin FWCO plans to sample the Stirrup in spring 2020 with the intent of determining whether these fish successfully overwintered or not.

Sheppard Bottom

Sheppard Bottom was renovated in spring of 2017 to improve its connection to the Green River during spring runoff, 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). Ten fyke nets were used to sample Sheppard Bottom from August 12-14 which confirmed that larval RZB were entrained to this wetland in 2019 despite not catching them with light traps or larval seines in June. A total of sixteen RZB (range = 75-106 mm TL) were captured during this sampling event, which represents the first occasion RZB have been captured in this recently renovated wetland. As with the RZB's caught in the Stirrup wetland, these fish were returned to Sheppard Bottom. Ouray National Wildlife Refuge supplemented water in Sheppard Bottom with Pelican Lake water in October to promote RZB overwinter survival. Green River Basin FWCO will sample this wetland in spring 2020 with the intent of confirming this cohort's presence.

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 discussions with Ouray National Wildlife Refuge concerning improvements at Johnson Bottom and Old Charley Wash. More specifically, filling breaches that allow nonnative fish to enter these wetlands in moderate to moderately high runoff years should be given serious consideration.
- If RZB successfully overwinter at Sheppard Bottom and the Stirrup, consideration should be given to translocating juvenile RZB and BT caught at Old Charley and Johnson Bottom to these wetlands. Although relatively few endangered fish have been stocked into the Green River during this project, encounters with wetland-tagged fish, including those from Stewart Lake, are few. Providing these juvenile endangered fish another wetland growing season could increase post-tagging encounters and survival.
- 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 2019 Budget Status

- A. Funds Provided: \$49,723
- B. Funds Expended: \$49,723
- C. Difference: -0-

- D. Percent of the FY 2019 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 2019.

XIII. Signed: 5 December 2019
Principal Investigator Date

Table 1. Summary of 2019 fish sampling and total captures.

Wetland	RZB larvae?	RZB juvenile (n)	RZB adult (n)	BT adult (n)
Above Brennan	Yes	0	4	0
Johnson Bottom	Yes	10	0	1
Leota Bottom	No	10	0	1
Old Charley	Yes	188	7	9
Sheppard Bottom	No	16	0	0
Stirrup	Yes	12	0	0
Total		236	11	11

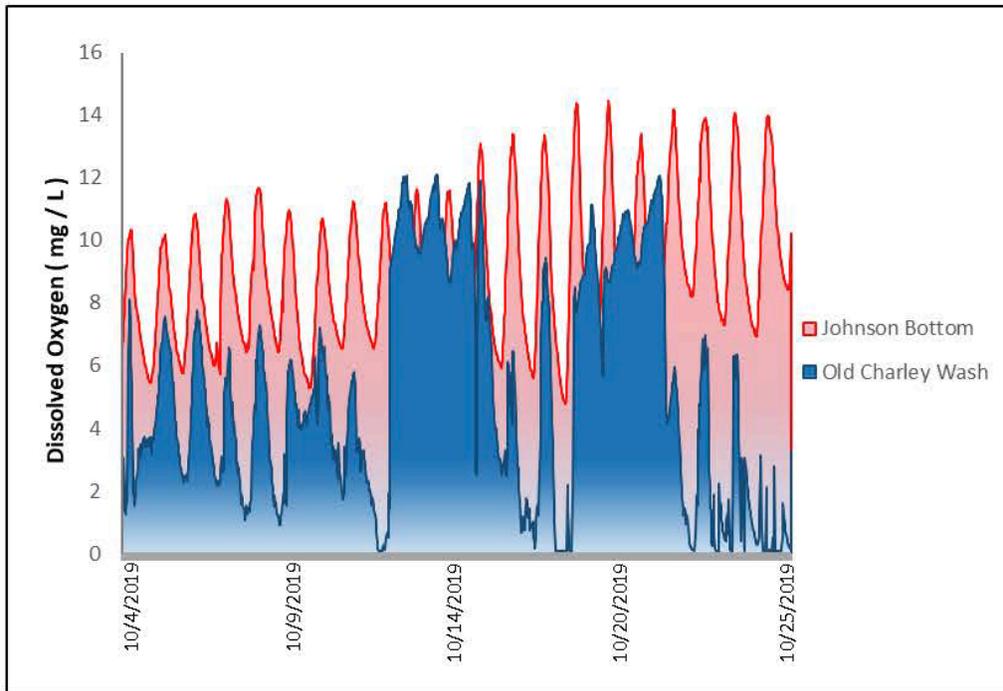


Figure 1. Dissolved oxygen concentration (mg/L) at Johnson Bottom and Old Charley-Wash wetlands during the 2019 draining period.

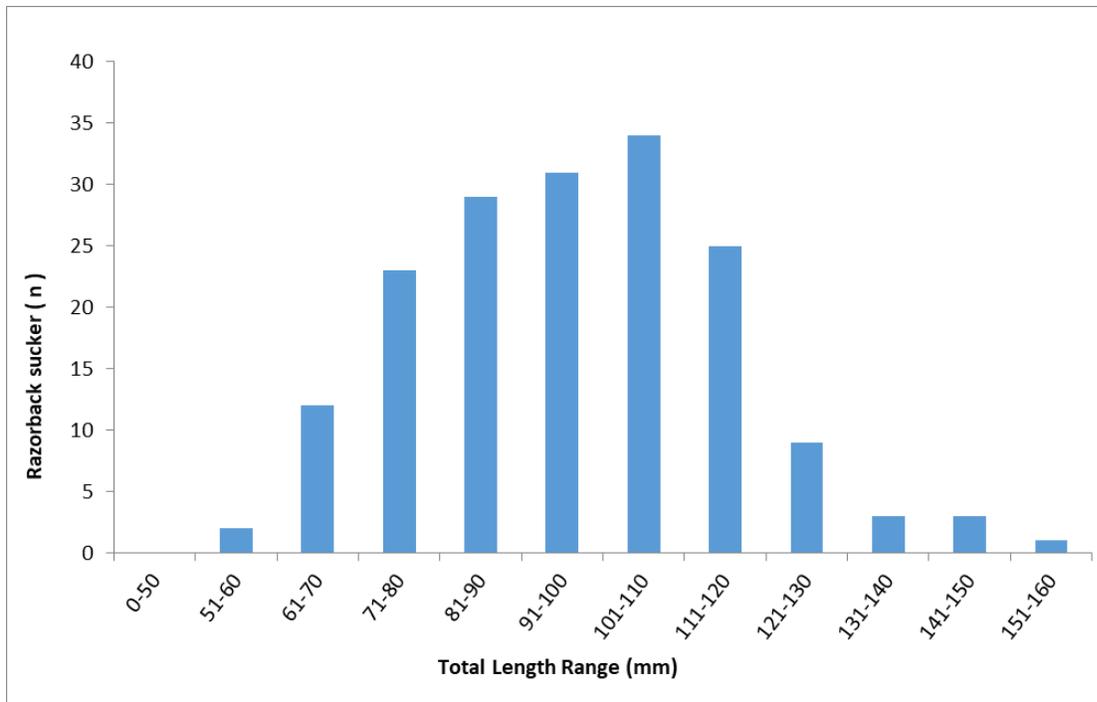


Figure 2. Size distribution of razorback sucker caught in Old Charley Wash wetland in October 2019.