COLORADO RIVER RECOVERY PROGRAM
FY 2015 ANNUAL PROJECT REPORT

RECOVERY PROGRAM
PROJECT NUMBER: 160

I. Project Title: **Assessment of Stocked Razorback Sucker Reproduction in the Lower Green and Lower Colorado Rivers**

II. Bureau of Reclamation Agreement Number: R14AP00007

Project/Grant Period: Start Date: 05/01/2014
End date: 09/30/2018
Reporting period end date: 09/30/2015
Is this a final report? Yes____ No__X__

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IV. Abstract: Determining the location, timing, extent, and success of razorback sucker spawning is essential for evaluating the effectiveness of the stocking program, identifying recruitment, and guiding future management. This study was designed to determine spawn timing as well as presence/absence and distribution of larvae and young-of year razorback suckers in the Green River (since 2009) downstream from the town of Green River and in the Colorado River (since 2014) downstream of Moab. The study was prompted by increasing razorback sucker encounters, the presence of multiple age classes, and congregations of ripe razorback suckers (2001-2003 and 2006-2008; Bestgen et al 2012, UDWR unpublished data) during Colorado pikeminnow surveys. Larval razorbacks have been successfully collected since the beginning of the project by either light trapping and/or seining. In 2015, the total number of larvae collected on the Green River was the highest ever recorded (n=11,658). With the increased presence of larval fish, there is a persistent higher abundance and broader distribution of larvae. In the lower Colorado River, larvae have continued to be documented with an increase in larval abundance from 2014.

V. Study Schedule: Initial year 2009, final year ongoing.

VI. 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.

VII. Accomplishment of FY 2015 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1: Lower Green River light trap sample collection: Light trap samples were collected at 16 sites between river miles 119.6 (Saleratus Canyon) and 31 (lower Anderson Bottom) during three sampling events from 4/20/2015-6/5/2015. A total of 81 light trap samples were collected and of those, 62 samples were sent to the Colorado State University Larval Fish Laboratory (CSU LFL) for identification. Out of the 81 light traps set, there were 19 traps did not contain larval fish. A total of 29 m^2 was seined in five seine hauls and all five samples were sent to the CSU LFL for identification. During the study, main channel temperatures ranged from 15.0°C to 19.5°C with a median temperature of 18.5°C. Habitat temperatures ranged from 18.0°C to 25.0°C with a median temperature of 21°C.

The total number of razorback larvae captured in 2015 nearly doubled from the previous year and continued a strong positive trend in both total numbers and catch rates since 2012 (Figures 1-2). In 2015, the total number of captured larvae (n=11,658) was greater than the previous 6 years combined (n=11,082). The average catch rate and number of total larvae captured from 2012-2015 are 25 and 40 times higher, respectively, than the pre-2012 averages. While the 2012 catch rates were attributed to low flows and a lack of available habitat, the continued increase of total larvae and capture rates suggest a continued increase in the reproductive success of stocked razorback sucker.

The mean total length of razorback larvae captured by light traps during 2015 was 11.9±1mm. This is consistent with larval sizes found through previous years (Figure 3). Larvae were found at all sites and of those sites sampled all but one were flooded tributaries. The samples collected contained 85% larvae, similar to 2012 (83%), 2013 (85%), and 2014 (83%) in which the proportion of samples containing larvae ranged

between 83% and 85%.

Spawning and hatch dates for razorback suckers were calculated using formulas developed by Muth et al. (1998) and Bestgen et al. (2002). In general, razorback suckers spawn in the lower Green River from early April-early May when water temperatures are between 10-16°C and when degree days range between 350-1100 (Bestgen et al. 2002). Degree days are the sum of instantaneous water temperatures between 1 January and the earliest date of spawning (Bestgen et al. 2002). Spawning generally begins 28-78 days prior to the highest flow day during spring runoff and nearly always before water temperatures reach 14°C (Bestgen et al. 2002). The majority of spawning in 2015 occurred before water temperatures reached 14°C and when degree days were around 568. Water temperatures during estimated spawning times ranged between 12°C - 15.5°C and began 65 days prior to the highest flow day (5/24/2015) during spring runoff (Figure 4). Spawning was estimated to have spanned approximately eight weeks from 3/20/2015 to 5/13/2015 and was similar to spawning dates for previous years with similar discharge.

Task 2: Lower Green River sample for YOY and age 1+ razorback sucker: Seine samples were collected between river miles 119.5 and 0.8 during two sampling trips (7/21-7/24/2015, 8/20-8/23/2015). A total of 3,616 m² was seined in 65 seine hauls; five samples were unable to be identified in the field and were euthanized, preserved in 100% ethanol, and sent to CSU LFL for identification. During the study, main channel temperatures ranged from 18.0°C to 29.0°C with a median temperature of 23.5°C. Habitat temperatures ranged from 15.0°C to 31.0°C with a median temperature of 23.0°C.

No razorbacks were collected via seining. This could be because razorbacks may be experiencing high mortality rates between larval and juvenile life stages. It could also be attributed to razorbacks not using the habitats sampled, coupled with the absence of available nursery habitat. Additional native species collected during seining efforts in 2015 included: Colorado pikeminnow, flannelmouth sucker, *Gila sp*., and speckled dace (reference VIII. Additional noteworthy observations).

Task 3: Colorado River light trap sample collection: Light trap samples were collected at sites between river miles 66.6 and 21.2 during three sampling events from 5/14/2015-6/14/2015. A total of 68 light trap samples were collected and of those, 65 samples were sent to the CSU LFL for identification. Out of the 68 light traps deployed, three of those samples did not contain larval fish. A total of 219 m² was seined in 42 seine hauls, and 20 samples were sent to the CSU LFL for identification. During the study, main channel temperatures ranged from 13.0°C to 17.5°C with a median temperature of 17.0°C. Habitat temperatures ranged from 14.0°C to 30.0°C with a median temperature of 19.0°C.

The total number of razorback larvae captured in 2015 (n=763) increased slightly from the previous year (n=668) (Figures 8-9); the highest concentrations of larvae have been found in the Moab area (river mile 66.6-52.5). For the second year, we have documented

the highest number of razorback sucker larvae in off-channel habitats near the Matheson Wetlands Preserve. The Preserve is the only floodplain wetland habitat along the Colorado River in the state of Utah.

Razorback sucker larvae collected via light trapping had a mean total length of 12±2 mm. Larvae were found in all locations sampled and the number of razorback larvae captured declined from upstream (river mile 66.6) to downstream (river mile 20). Larvae were collected in 83% of all samples; however they were found in 100% of samples taken during the second and third passes which occurred mid-May to mid-June (Figure 10).

Spawning estimates for razorback in the lower Colorado are generally reflective of water temperature and annual discharge. Estimated spawning began 78 days prior to highest flow day during spring runoff (Figure 5) and when water temperatures were between 11°C -17°C. The majority of spawning occurred before water temperatures reached 14°C, similar to the pattern seen on the Green River, and when degree days were around 471. Spawning was estimated to have spanned approximately nine weeks from 3/27/2015 to 5/26/2015 and was 1-2 weeks later than the spawning on the lower Green River (Figures 6-7).

Task 4: Colorado River sample for YOY and age 1+ razorback sucker: Seine samples were collected between river miles 110.4 and 16.5 during two sampling events (7/13-15/15, 8/5-8/7/15, 8/17-8/18/15). A total of 3,722 m² was seined in 67 seine hauls; 23 samples were sent to CSU LFL for identification. During the study, main channel temperatures ranged from 18.5°C to 23.5°C with a median temperature of 22.0°C. Habitat temperatures ranged from 16.0°C to 30.0°C with a median temperature of 23.0°C.

No razorbacks were collected via seining. Once again, this could be explained by low survival out of the larval stage or that these fish aren't present in these habitats during the time of sampling. These fish may enter the main channel earlier and would require different sampling techniques to capture YOY and juvenile razorbacks. Additional native species collected during seining efforts in 2015 included: bluehead sucker, flannelmouth sucker, *Gila sp*., Colorado pikeminnow, and speckled dace.

Task 5: Preliminary sample identification, data entry, analysis and reporting: All data has been entered. Collected samples have been submitted to the CSU LFL for identification, and results are reported here.

VIII. Additional noteworthy observations:

Green River: Other native fishes captured in the Green River included flannelmouth sucker (n=42) ranging in total length from 17-55 mm, Colorado pikeminnow (n=182) ranging in total length from 12-43 mm, *Gila sp.*(n=5) ranging in total length from 20-84 mm, and speckled dace (n=2) ranging in total length from 21-25 mm. Nonnative fishes captured on the Green River included red shiner, sand shiner, fathead minnow, channel catfish (n=21), common carp (n=46), green sunfish (n=43), smallmouth bass (n=3),

gizzard shad (n=11), black crappie (n=1), black bullhead (n=22), western mosquitofish (n=1), and yellow perch (n=1).

Colorado River: Other native fishes captured in the Colorado River included bluehead sucker (n=47) ranging in total length from 15-56 mm, flannelmouth sucker (n=69) ranging in total length from 17-80 mm, Colorado pikeminnow (n=63) ranging in total length from 16-40 mm, and *Gila sp.* (n=12) ranging in total length from 16-40 mm. Nonnative fishes captured on the Colorado River included red shiner, sand shiner, fathead minnow, channel catfish (n=1), common carp (n=33), black bullhead (n=9), black crappie (n=1), green sunfish (n=1), largemouth bass (n=59), plains killifish (n=9), gizzard shad (n=179), and western mosquitofish (n=24).

IX. 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 (August-September) to determine successful recruitment of YOY and juvenile razorback suckers.
- Consider expanding sampling reach below the confluence of the Green and Colorado Rivers in an effort to capture YOY and juvenile razorback sucker which may move out of zero-velocity habitats by mid to late summer.
- Consider expanding light trap sampling below confluence of the Green and Colorado Rivers to determine extent of larval drift.
- Consider using alternative sampling methods to document recruitment success in areas that are difficult to sample via seine. Alternative methods may include using a trawl to sample cobble bars and higher velocity habitats.

X. Project Status: On track and ongoing.

XI. FY 2015 Budget Status

A.	Funds Provided:	$ 57,116.00
B.	Funds Expended:	$ 57,116.00
C.	Difference:	$ 0
D.	Percent FY 2015 work completed:	100%
E.	Recovery Program funds spent for publication charges:	$ 0

XII. Status of Data Submission: All data will be submitted upon completion of larval identification by CSU.

XIII. Signed: Chelsea Gibson — November 16, 2018
Principal Investigator — Date

XIV. Literature cited:

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

Bestgen, K.R., G.B. Haines, R. Brunson, T. Chart, M. Trammell, R.T. Muth, G. Birchell, K.Christopherson, and J.M. Bundy. 2002. Status of wild razorback sucker in the Green River Basin, Utah and Colorado, determined from basinwide monitoring and other sampling programs. Draft Report of Colorado State University Larval Fish Laboratory to Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado.

Muth, R. T., G. B. Haines, S. M. Meismer, E. J. Wick, T. E. Chart, D. E. Snyder, and J. M. Bundy. 1998. Reproduction and early life history of razorback sucker in the Green River, Utah and Colorado, 1992–1996. Final Report of Colorado State University Larval Fish Laboratory to Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado.

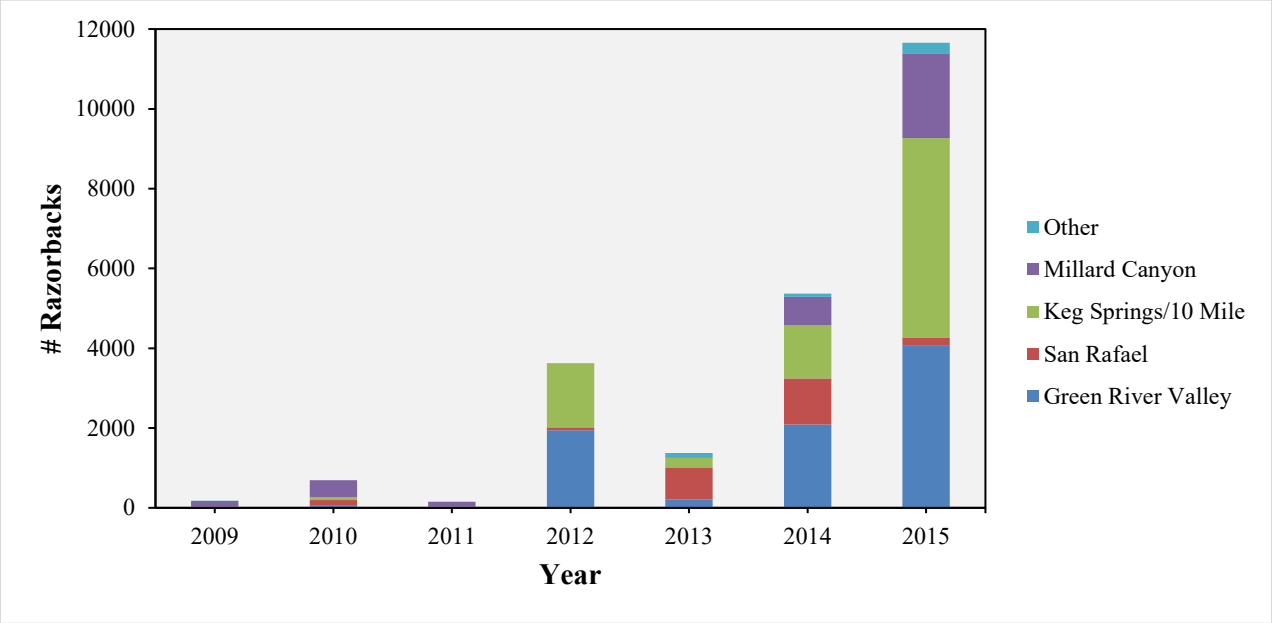

Figure 1. Number of razorback larvae captured via light trapping by year for all sites on lower Green River, 2009-2015.

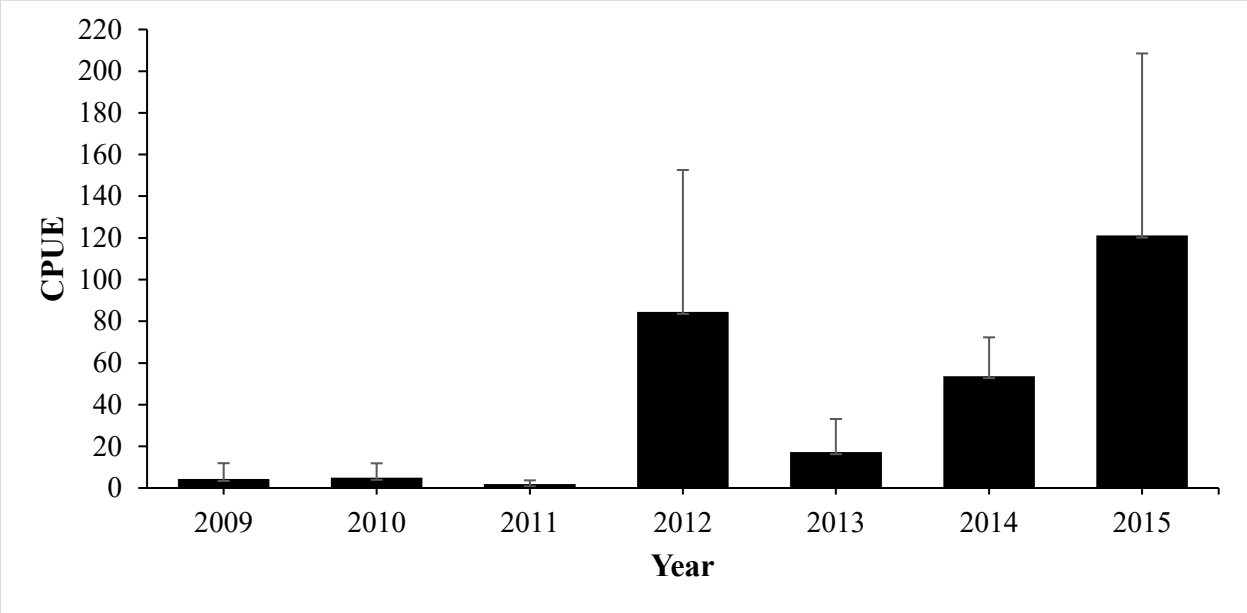

Figure 2. Mean catch-per -unit-effort (# larvae/ trap nights) for light trapping by year for all sites on lower Green River, 2009-2015. Error bars represent standard deviation.

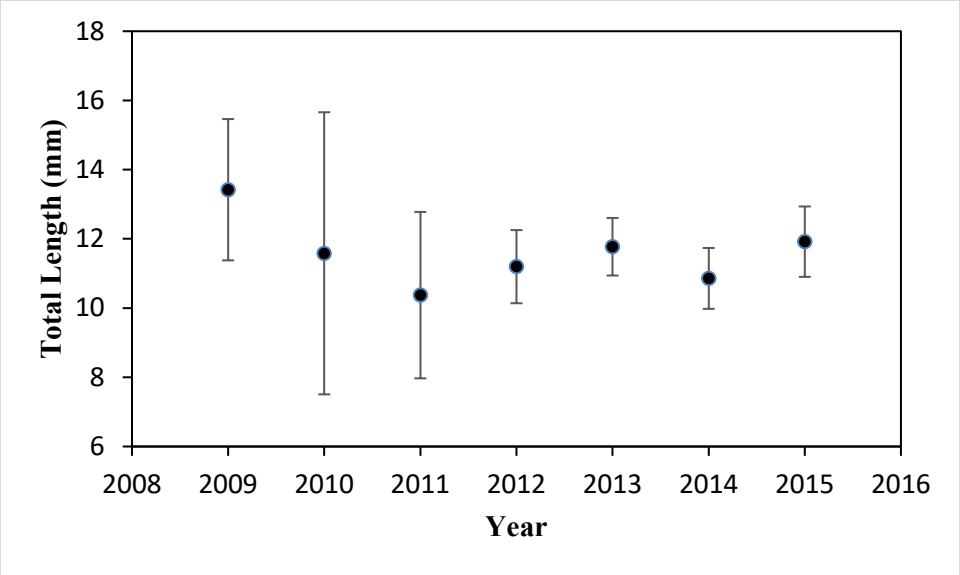

Figure 3. Mean total length (mm) of razorback larvae collected via light trapping by year on lower Green River, 2009-2015. Error bars represent standard deviation.

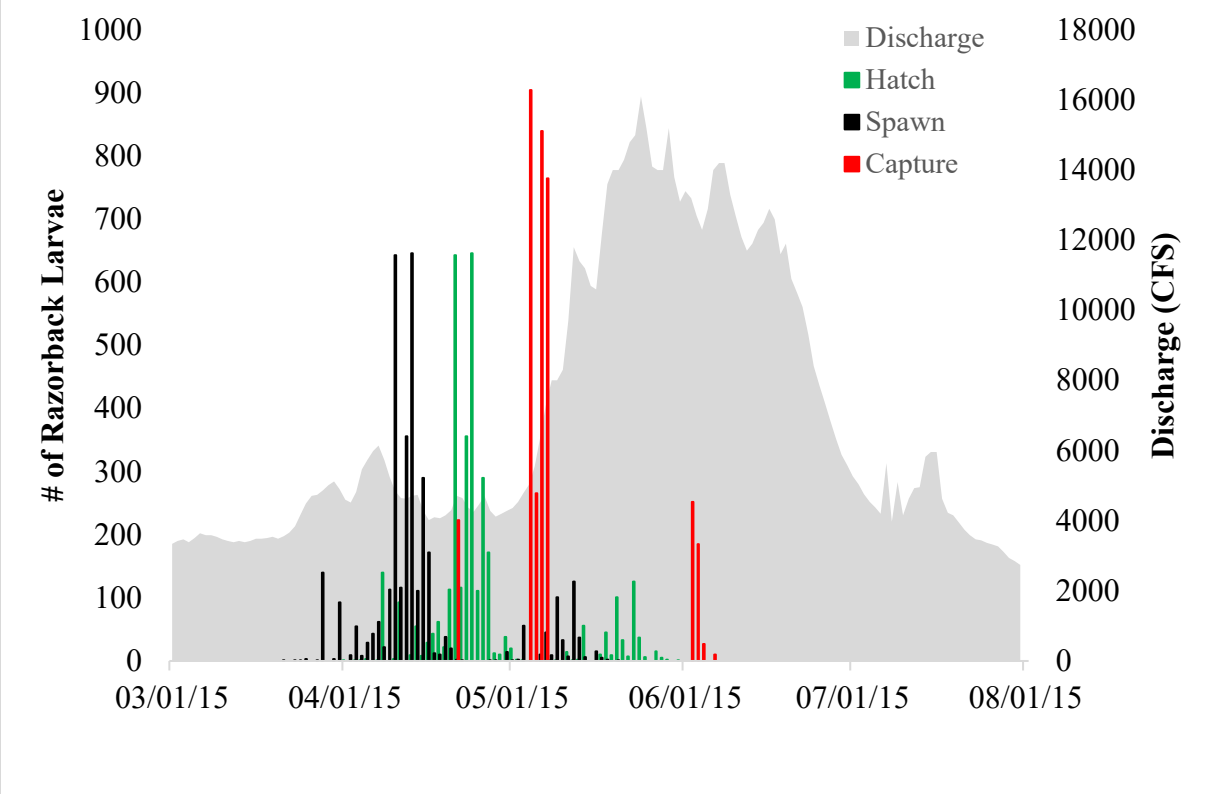

Figure 4. The number of razorback sucker larvae captured in the lower Green River by date, the number of individuals per estimated hatching date, the number of individuals per estimated spawning date and corresponding discharge from the USGS Gauge at Green River, UT.

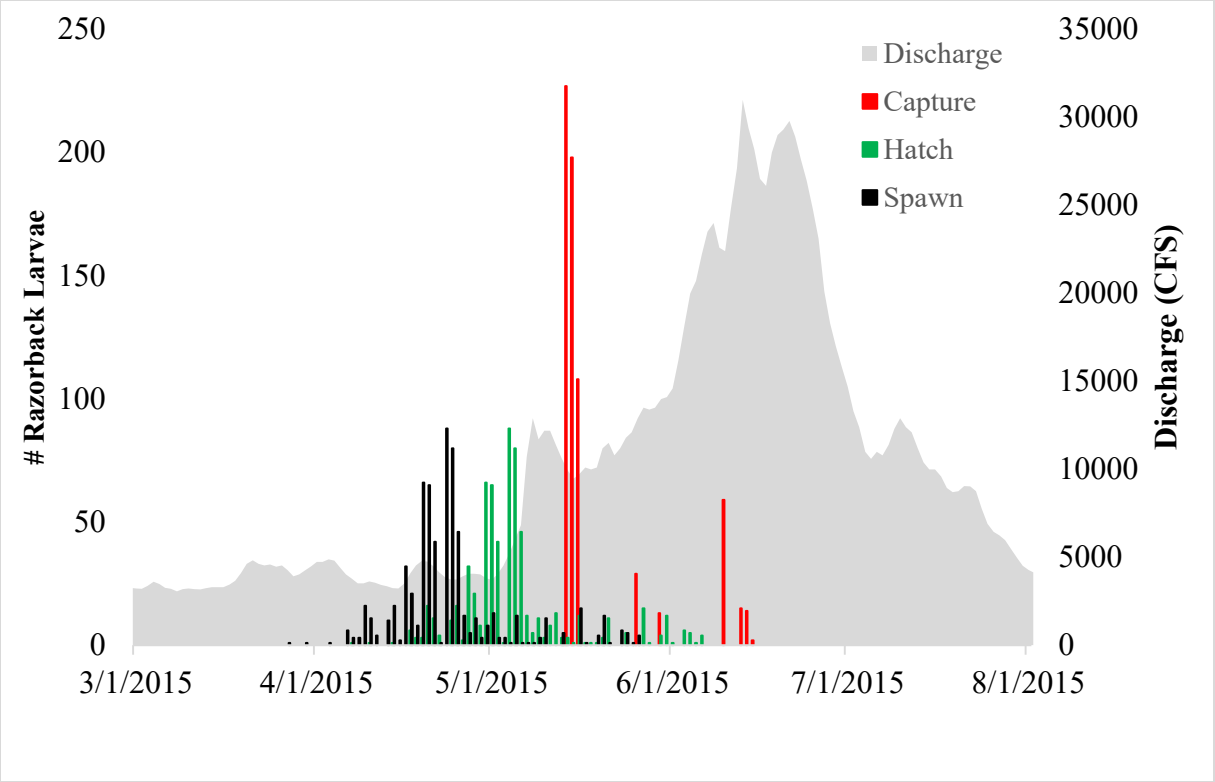

Figure 5. The number of razorback sucker larvae captured in the Colorado River by date, the number of individuals per estimated hatching date, the number of individuals per estimated spawning date and corresponding discharge from the USGS Gauge at Cisco, UT.

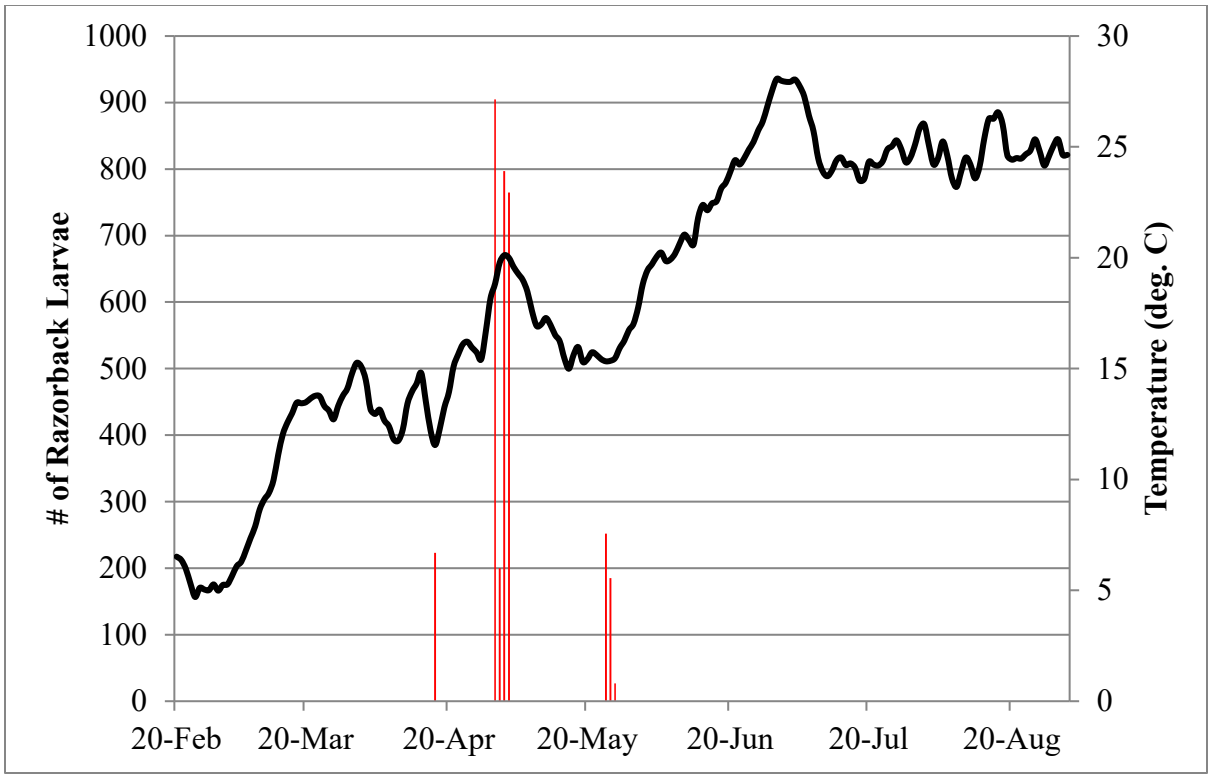

Figure 6. Water temperature and estimated spawning dates on the lower Green River.

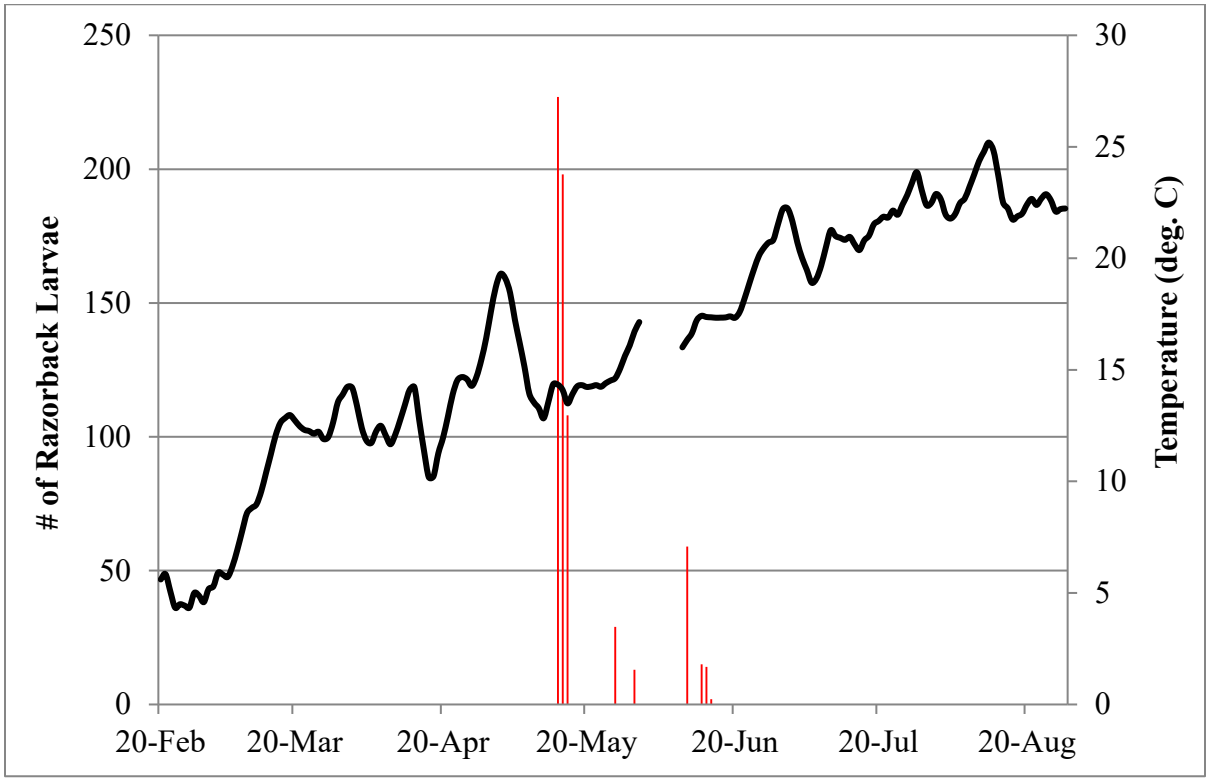

Figure 7. Water temperature and estimated spawning dates on the lower Colorado River.

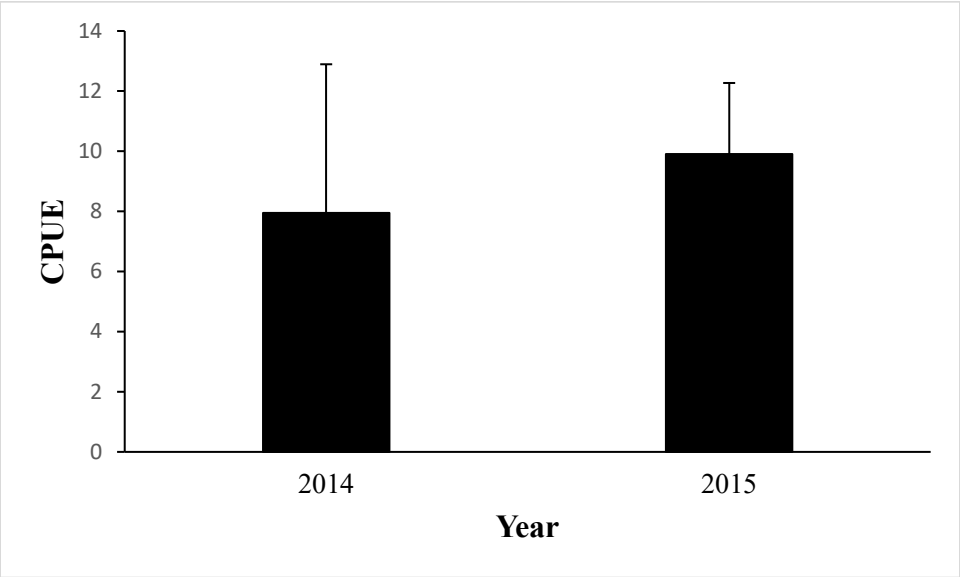

Figure 8. Mean catch-per -unit-effort (# larvae/ trap nights) for light trapping by year for all sites on lower Colorado River, 2014-2015. Error bars represent standard deviation.

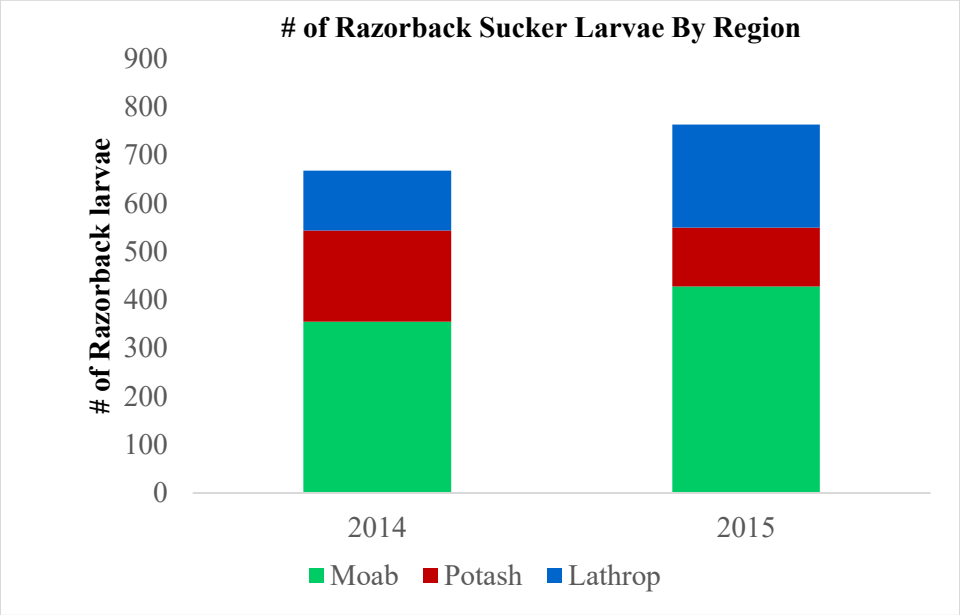

Figure 9. Number of razorback larvae captured via light trapping by year for all sites on lower Colorado River, 2014-2015.

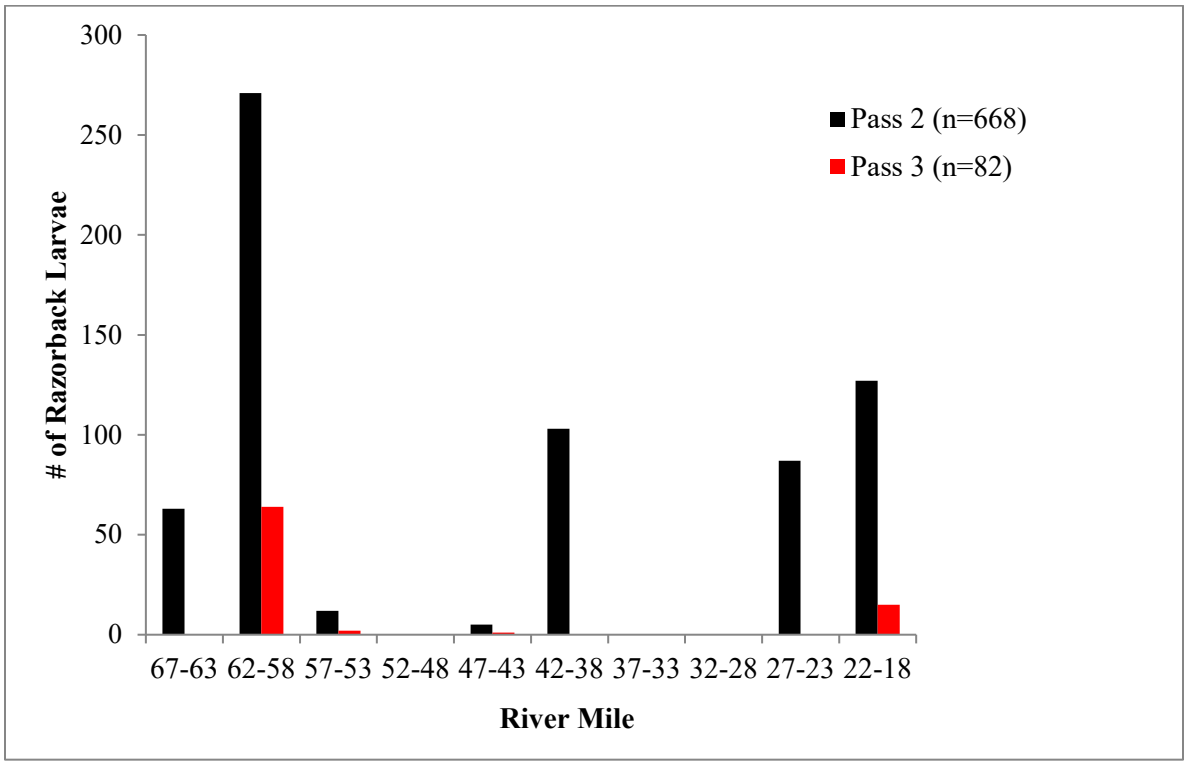

Figure 10. Distribution of razorback larvae collected on the lower Colorado River from river mile 66.6 to the confluence at river mile 0, 2015.