Project Title
Matheson Preserve Larval Razorback Sucker Entrainment

Bureau of Reclamation Agreement Number:
R14AP00059

Project/Grant Period:
Start date: 10/01/2018
End date: 09/30/2024
Reporting period end date: 09/30/2023
Is this the final report? No

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Abstract:
This project aims to provide rearing habitat for wild razorback sucker (*Xyrauchen texanus*) via managed wetland flooding. Success is evaluated by enumerating and transferring young of year (YOY) razorback sucker to the Colorado River. Although infrastructure issues exist with the water control structure preventing complete water retention, the installation of the supplemental water pipeline completed in 2021 combined with significant river discharge this year allowed for sufficient water quality and quantity throughout the rearing season. Multiple breaches occurred along the southern periphery of the wetland due to high spring flows, allowing access to large bodied nonnative fish, however, the transfer of 53 YOY razorback sucker to the Colorado River this October proved to be the most successful year for the Matheson Wetlands to date.

Study Schedule:
2019-Ongoing

Relationship to RIPRAP:
COLORADO RIVER ACTION PLAN: MAINSTEM

II.A.	Restore and manage flooded bottomland habitat
II.A.7.	Matheson
II.A.7.d.	Operate and maintain

Accomplishment of FY 2023 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1: Inlet sampling for larval razorback sucker arrival

Larval fish samples were collected from the wetland inlet channel between May 2nd and June 13th using quadrafoil light traps. Sampling consisted of three light traps spaced evenly along the length of the inlet channel (between the Colorado River and the water control structure). A total of 17 light trap samples were collected from the inlet, 3 of which contained larval fishes which were preserved for identification by Colorado State University Larval Fish Lab (CSU LFL). Composition of larval samples will be reported after identification data are made available.

Preliminary identification of larval suckers was conducted at UDWR Moab to determine presence or absence of razorback sucker larvae in the inlet channel. These preliminary identifications indicated possible presence of razorback sucker larvae in the inlet channel as early as May 23rd.

Task 2: Operations, wetland fish sampling, and water quality monitoring.

Wetland Filling

The objective of this task is to hold Colorado River flood water out of the wetland until larval razorback sucker presence is determined in the inlet channel, then open the gate and flood the wetland with river water containing larvae. Early in 2021 the wetland gate was determined to be incapable of achieving bi-directional control of water, contrary to project design goals. Wetland inundation occurs with the doors fully sealed, hampering our ability to build significant hydraulic pressure to drive inundation and entrainment.

A modified strategy was employed this season for entrainment of water and larvae. Rather than relying on sufficient hydraulic pressure to drive a "pulse" into the wetland, the gate was opened on March 27th (Figure 1) in anticipation of rising water to allow for a more natural influx. This was completed in conjunction with lowering the fish screen to prevent access to large bodied fish and shutting off supplemental water to allow for maximum inundation from the river. Discharge on the Colorado River peaked on May 19th at approximately 41,000 cfs (USGS gage 09180500) at which point multiple breaches were observed on the south end of the preserve allowing free access of large bodied nonnative fish to the central pond. The gate was closed on June 14th while river discharge was still above 20,000 cfs, corresponding to 3.4 meters of water depth at the control structure.

Post-entrainment water quality monitoring

Dissolved oxygen concentrations and temperatures in the wetland were measured periodically via a handheld reader throughout the rearing season. These parameters were monitored on a weekly basis at multiple pre-determined stations throughout the wetland to track water quality in real-time and avoid potential fish mortality events. Pond elevation at the gate was also recorded during visits. As river levels dropped midsummer and sufficient head pressure was built within the wetland it became apparent a new issue allowed entrained water to flow back to the river. Gaps built into the frame to allow for full mobility of the doors appear to have lost their sealant combined with beaver damage to the main door gasket allowed for slow, consistent release of

water all season long. Although this issue will need to be addressed, the combination of supplemental spring water and high river discharge kept water levels above 1.1 meters at the control structure through the season with an average depth of 1.7 meters season long. Water temperatures measured within the wetland rose to a high of 29.1° C on July 13th before reaching a low of 1° C on October 30th. Dissolved oxygen concentration measured on-site remained acceptable (minimum = 4.5 mg/L) season long, and no evidence of large-scale fish mortality was observed.

Wetland draining and fish collection

Similar to the previous two years, the timing of wetland draining was not determined by degrading water quality. Rather, wetland draining was conducted between October 24th and October 30th in order to accomplish project objectives with minimal impact on the fall waterfowl hunting season.

Initial fish collection was completed by deploying a fyke net across the river side of the water control structure. River side placement was necessitated this year as the pond maintained water levels of 1.1 meters up until draining and proved too deep for effective use of a fyke net. Additionally, external placement allowed for use of the debris screens to prevent the first waves of debris from entering the net. The net was checked every two hours, constituting six distinct samples, until low water levels disallowed continued use of the fyke net midday of October 26th. Further sampling was completed by constructing a block net across the river side of the structure and utilizing a combination of backpack electrofishing and seining within the control structure. The gate was closed every evening and covered with a block net to prevent fish escapement overnight. Modifications made to the linear pond by beavers combined with shifting and slumping of sediments in the central pond have resulted in a grade slightly lower than that of the control structure preventing complete, natural dewatering. During later stages, the remaining standing water in the central pond was sampled via two thorough passes with a backpack electrofisher. All native fish detection throughout the draining process occurred near the control structure, with no native fish captured in the central or linear ponds.

During fish collection, native fish were immediately sorted from the numerous nonnative fish and processed promptly. Processing included measuring total length (mm), weight (g), scanning for a PIT tag, and implanting one if necessary. Native fish were then held in an aerated live well before release into the Colorado River. Nonnative fish from each sample were weighed en masse, and then a random subsample from each was measured to gain insight into size structure. All nonnative fish collected were euthanized.

Composition of fish community

A total of 53 razorback sucker were collected in the Matheson Wetlands in 2023. Fifty-one of these fish were PIT tagged and transferred to the Colorado River while two additional razorback were found as mortalities during the draining process. One of the released fish expressed physical traits characteristic of possible flannelmouth sucker hybridization. Total lengths of razorback sucker ranged between 98 and 171 mm with a mean length of 141 mm (Figure 2). Fin clip tissue samples were collected from all razorback sucker and preserved in 95% ethanol solution for possible future genetic investigation. Additional native fish encounters include two YOY *Gila* spp. and one speckled dace (*Rhinichthys osculus)*.

Approximately 80 kg of nonnative fish biomass was removed from the wetland during draining. Similar to previous years, green sunfish (*Lepomis cyanellus*) was the most abundant species enumerated in subsamples. While many adult common carp (*Cyprinus carpio*) were observed within the wetland post- breach, none were recovered during draining. Two adult largemouth bass (265 and 272 mm) were captured within the central pond that could not have accessed through the fish screen. Percent frequency of nonnative fish collected during wetland draining may be found in Table 1.

An effort to remove nonnative fish from the wetland was conducted on March 27th. This consisted of two backpack electrofishers working in conjunction with two seine teams. Crews worked the perimeter of the central pond before then pushing down towards the control structure. Hundreds of green sunfish were encountered between 17 and 141 mm suggesting their ability to overwinter and possibly reproduce or recruit within the wetland. Due to their highly predatory nature, green sunfish pose a particularly high threat to entrained razorback sucker larvae and work to completely reset the fish population within wetland every year will contribute to further success.

Task 3: Data entry, analysis and reporting

- Larval fish collections and accompanying data were transferred to CSU LFL in FY 2023.

- Additional FY 2023 field data will be formatted for the STReaMS database and transferred to the Database Manager by January 12th 2024.

Additional noteworthy observations:

- Larval razorback sucker detections in the inlet channel were lower than years past however many YOY razorback sucker were encountered. This could be related to high spring runoff creating more habitat and decreasing efficacy of light trapping. It could also be related to the modified fill strategy of leaving the gate open for a longer period of time. This would allow for free access of larval fish without a possible staging effect detected in previous years' light trapping. The multiple breaches on the south end could have also contributed to the entrained razorback population this year.

- High water this spring resulted in multiple breaches of the wetland, allowing for uncontrolled access of adult fish to the wetland through both surface flow and conduit piping.

- By block netting the river side of the control structure and closing the gate, we were able to determine fish up to 120 mm are able to swim through the hinge component of the gate, allowing immigration and emigration season long.

- Currently, the grade of the pond is lower than that of the control structure, preventing complete natural dewatering.

- Early stages of draining have very little fish activity, quickly changing when the depth of the linear pond dropped below approximately 300 mm.

- Three otters occupied the wetlands through the rearing season and had a noticeable effect on the bullfrog population. This may have been a component of why so few large bodied nonnatives were observed during draining.

Recommendations:

- Many factors contribute to the challenges of completely removing all nonnative fish from the Matheson Wetlands every year. Uncontrollable sub-surface spring water provides sufficient habitat for nonnatives to overwinter in the central pond and the area surrounding the control structure. Nonnative fish in the north pond also have access through the unscreened supplemental water pipeline. Future mechanical or chemical effort may be necessary if complete dewatering is not attainable. This work must be completed annually as larval intrusion during entrainment is nonexclusive and may best be completed with a spring and fall component.

- Bidirectional water retention must be achieved. This is now confounded by beaver damage to the main seal. We were able to confirm the ability of fish to pass through the hinge component of the gate structure this year and preventative measures must be put in place to prevent season long access by nonnative fishes. Additional consideration should be made to prevent passage of large bodied nonnatives from the Mill Creek and Colorado River floodplains into the south pond of the Matheson Wetlands. A combination of berm development and fish screening could prevent these breaches in future high water years.

- A pipeline from the Colorado River could increase rearing habitat quantity and quality season long, as well as provide another access point for larval razorback sucker intrusion. Consideration should be taken for the long term integrity of the retaining areas due to increased sediment load and proper measures must be put in place to exclude large bodied nonnatives.

- Both the central pond and linear pond have experienced shifts in grade since completion. These changes prevent complete dewatering of the retained areas and currently contribute to the nonnative situation. Smoothing and regrading of both components would increase the success of the wetlands for razorback rearing. The ability to remove water from the central pond through a pump or siphon may be beneficial as well.

- Proper draining is complex and the process changes every year. Due to previously mentioned issues this year, draining occurred quite slowly, and the final day the wetland was iced over, decreasing fish collection efficacy. Shifting the procedure slightly earlier may increase efficacy in the future.

Project Status:
On track & ongoing

FY2023 Budget Status
Funds Provided: $31,109

Funds Expended: $31,109
Difference: $0
Percent of the FY 2023 work completed, and projected costs to complete: 100%

Status of Data Submission
Data will be formatted for the STReaMS database and transferred to the Database Manager by January 12th 2024.

Signed:
Sam Brockdorff
Principal Investigator
November 6th 2023

Table 1. Fish enumerated during wetland draining period. October 24th-30th, 2023

Species	Scientific name	Number of fish	Frequency
green sunfish	*Lepomis cyanellus*	320	31%
black bullhead	*Ameiurus melas*	198	19.1%
fathead minnow	*Pimephales promelas*	132	12.8%
western mosquitofish	*Gambusia affinis*	111	10.7%
razorback sucker	*Xyrauchen texanus*	53	5.1%
bluegill	*Lepomis macrochirus*	52	5%
gizzard shad	*Dorosoma cepedianum*	43	4.2%
largemouth bass	*Micropterus salmoides*	43	4.2%
common carp	*Cyprinus carpio*	40	3.9%
red shiner	*Cyprinella lutrensis*	26	2.5%
white sucker	C*atostomus commersoni*	7	.7%
black crappie	*Pomoxis nigromaculatus*	3	.3%
Unidentified chub	*Gila spp.*	2	.2%
sand shiner	*Notropis stramineus*	2	.2%
speckled dace	*Rhinichthys osculus*	1	.1%

Table 2. Physical parameters of fish enumerated during wetland draining period. October 24th-30th, 2023

Species	Length range (mm)	Mean length (mm)	Weight range (g)	Mean weight (g)
green sunfish	21-192	55	1-60	7
black bullhead	15-236	57	1-195	6
fathead minnow	42-75	63	1-5	3
western mosquitofish	31-83	46	1-3	1
razorback sucker	98-171	141	7-56	31
bluegill	13-118	62	1-28	8
gizzard shad	112-195	160	12-66	38
largemouth bass	62-272	112	4-410	34
common carp	89-296	173	9-400	104
red shiner	53-79	64	1-6	3
white sucker	60-131	96	3-30	10
black crappie	68-150	111	4-41	20
Unidentified chub	57-71	64	3-5	4
sand shiner	50	50	1	1
speckled dace	60	60	10	10

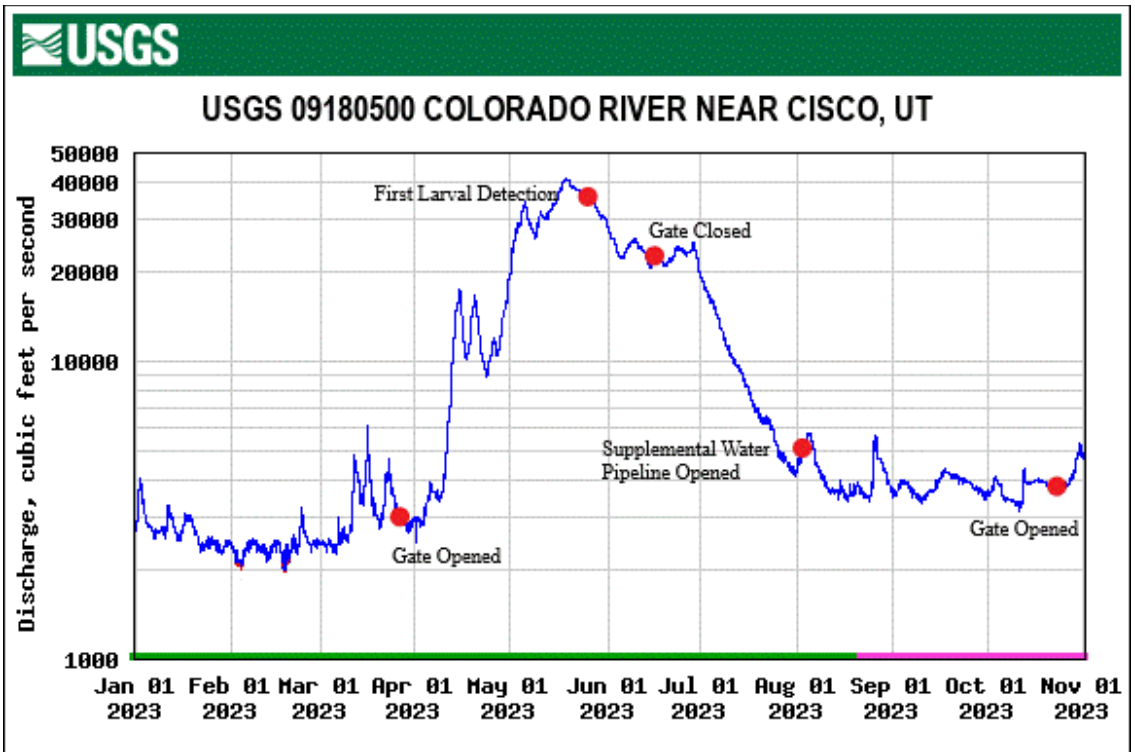

Figure 1. Hydrograph of Colorado River Discharge for 2023 measured at USGS Gage 09180500 near Cisco Utah. Key events of this project are indicated by red dots.

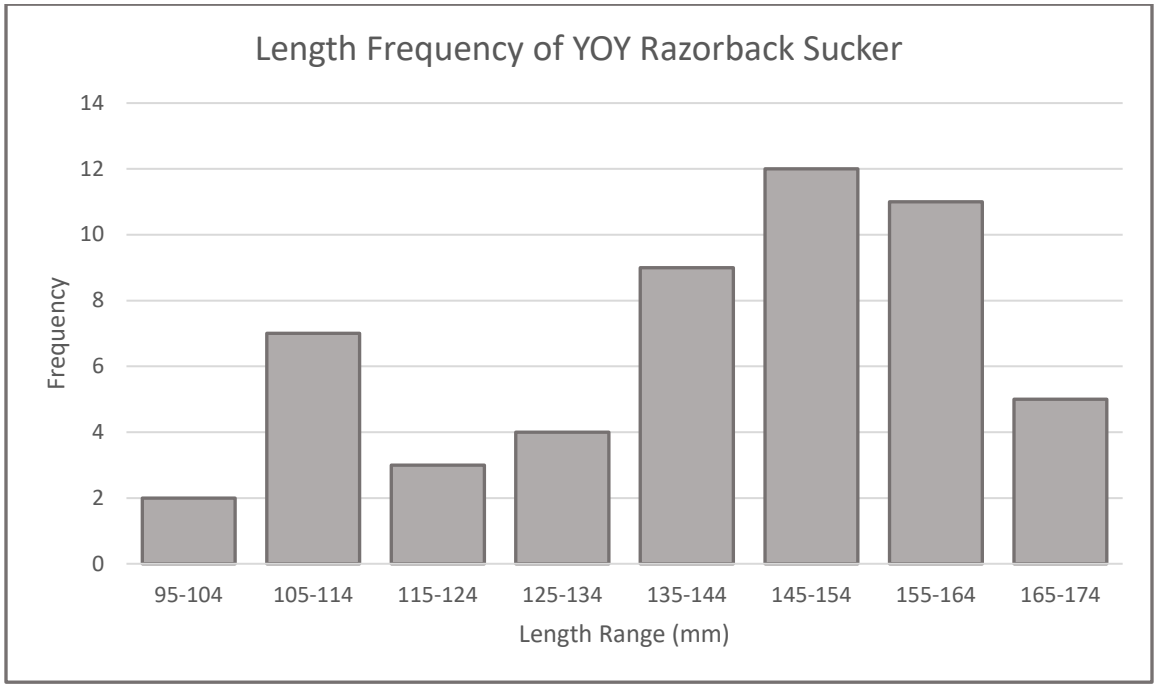

Figure 2. Length frequency histogram by size class of razorback sucker encountered in Matheson Wetlands between October 24th and October 30th 2023.