Project Title
Matheson Preserve Larval Razorback Sucker Entrainment

Bureau of Reclamation Agreement Number:
R14AP00059

Project/Grant Period:
Start date: 10/01/2018
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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 the year (YOY) razorback sucker to the Colorado River. This year's operation saw greater river discharge compared to 2021, resulting in more extensive flooding and improved water quantity throughout the rearing season. An apparently sudden proliferation of nonnative sunfish occurred early in entrainment, when suckers are most vulnerable. No razorback sucker or any other native species were encountered during draining in 2022.

Study Schedule:
2019-Ongoing

Relationship to RIPRAP:
GENERAL RECOVERY PROGRAM SUPPORT ACTION PLAN

III.A.	Reduce negative interactions between nonnative and endangered fishes.
V.	Monitor populations and habitat and conduct research to support recovery actions (research, monitoring, and data management).

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 2022 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 from 25 April to 06 June 2022 using quadrafoil light traps. Sampling typically consisted of three to four light traps spaced evenly along the length of the inlet channel (between the Colorado River and the water control structure). A total of 19 light trap samples were collected from the inlet, 11 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 presence of razorback sucker larvae in the inlet channel as early as 04 May 2022. Larval catostomids appeared to increase in abundance and distance inland in the subsequent weeks leading to entrainment.

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 while deploying a fish screen to exclude large bodied non-native fishes from the wetland.

Early in 2021 it was determined the wetland gate is incapable of achieving bi-directional control of water, contrary to project design goals. Rather, seals on the gate hold water inside the wetland acceptably, but leak substantially when subjected to pressure from the river side. This phenomenon was apparently exacerbated by continuous wetland input from wetland-adjacent springs, which fill the wetland from the inland side while the gate is closed. To maximize entrainment potential and counter this leaking, two tactics were developed. First, in order to keep the wetland elevation as low as possible prior to entrainment, the gate was kept open (draining continuously to the river with the fish screen in place) from approximately 04-22 April, and only closed as increasing river elevation neared the gate bottom via the inlet channel. Second, stop logs were placed between the river and the gate water control structure in 2022. The stop logs proved largely ineffective at keeping river water out of the wetland, and the ability to harness hydraulic pressure to drive entrainment—while still possible—remained impaired.

The gate was opened to entrain water and larvae from 17-20 May, and again briefly on 21 May. Due to the combination of gate leaking water into the wetland, and filling from the inland side, entrainment was a relatively gentle pulse into an existing water body versus flooding a dry bottomland. Peak discharge was approximately 16,000 cubic feet per second (cfs) at the closing of the wetland, corresponding to 1.6 meters of wetland depth and 3.1 acres of wetted area as entrainment concluded.

Post-entrainment water quality and fish community monitoring

An effort to remove nonnative fishes from the wetland was conducted on 14-15 and 22-23 June 2022, after apparently high densities of centrarchids were observed post-entrainment, following the return of water clarity. No such observations were made prior to entrainment, although no physical sampling other than light-trapping was conducted. Baited hoop nets were used during overnight and daytime sets.

More than 5.5 kg of nonnative fish biomass was removed, and no native fishes were encountered. Fishes enumerated during removal may be found in Table 1.

Dissolved oxygen concentrations and temperatures in the wetland were measured periodically via a handheld reader at 0.5 meter depth increments. These parameters remained in acceptable ranges for the duration of entrainment, and no evidence of fish kills was observed. Pond elevation remained substantially higher than in 2021 throughout the summer, roughly twice the minimum elevation of the previous season (1.2 vs. 0.6 meters). Precise gauge data from permanent, on-site Utah Geologic Survey instrumentation will be available in the near future.

Wetland draining and fish collection

Similar to 2021, the timing of wetland draining was not determined by degrading water quality. Rather, wetland draining was conducted from 10-13 October 2022 in order to accomplish project objectives prior to opening of the fall waterfowl hunt. Fish were collected by deploying a fyke net across the pond outlet for the duration of draining. The net was checked every few hours, constituting 11 distinct samples, and left in place overnight to prevent uncontrolled release of fish from the wetland. Standing water remaining in the wetland after draining was sampled via two thorough passes with a backpack electrofisher to salvage any remaining native fish.

Nonnative fish from each sample were weighed en masse, and then a random subsample from each was weighed and enumerated by species. Individuals from subsamples were measured to gain insight into size structure. All nonnative fish collected were euthanized.

The wetland pond was left at minimum elevation for a duration of 11 days following draining, after which the gate was closed and natural re-filling began.

Composition of fish community at draining

No razorback sucker, nor any other native fish species, were collected in the Matheson Wetlands in 2022. Nonnative fish biomass removed from the wetland during draining exceeded 10 kg (in addition to over 5 kg earlier in the season). Green sunfish (*Lepomis cyanellus*) were the most abundant species enumerated in subsamples. Percent frequency of nonnative fish collected during wetland draining may be found in Table 2.

Task 3: Data entry, analysis and reporting

Larval and juvenile fish collections and accompanying data were transferred to CSU LFL in FY 2022.

Additional noteworthy observations:

- Total lengths of green sunfish removed during June hoop netting ranged from 50-108 mm. Visual surveys suggested that larger individuals were likely present, but none were captured.
- Four white sucker (TL = 51-326 mm) were collected during wetland draining. Due to their large disparity in size, these fish likely represent multiple year-classes. The largest individuals may indicate that some fish survived the 2021 reset.
- During the pre-entrainment draining of the wetland, TNC staff employed a marsh buggy to flatten cattail and bulrush which had proliferated within the wetted area of the Central Pond since excavation.

- A submersible PIT antenna was deployed in the inlet channel from May 17 to June 11. Sixty unique PIT tags were detected. As of reporting, only 5 of these tags are attributed to known fish in STReaMS—3 bonytail and 2 razorback sucker.

Recommendations:
Wetland water elevation was substantially higher than in 2021, most likely due to entraining a greater volume of water at the outset of the rearing season. As a result, draining required substantially more time to accomplish than in past years. Planning for future operations should include a reasonable buffer of time and personnel in case of extended fish processing or unforeseen complications.

The multiple cohorts of nonnative fishes present during the critical early entrainment period have a number of possible sources: incomplete reset in the fall of 2021, an invasion of small bodied individuals through the fish screen during the period preceding entrainment in 2022, and/or invasion from other intermittently-connected bodies of water in the wetland complex. While the 2021 fall reset period was brief, there was no visual evidence of centrarchid presence in the pond until after entrainment in 2022.

In addition to fall draining and reset, conducting a more thorough spring reset and sampling/removal effort in future years will help evaluate the fall reset, and shed light on the timing and sources of invasions. Additionally, until sources of nonnative fish in the wetland are identified and mitigated, post-entrainment monitoring should focus on removal of centrarchids with baited hoop nets. Potential overwinter survival of nonnative fishes, while problematic for larval razorback survival, may indicate promise for eventual overwintering of future razorback sucker cohorts.

Ground and surface water inputs into the wetland support water quality and quantity critical to razorback sucker survival, with the tradeoff of complicating entrainment as detailed in "Task 2: Wetland Filling." Currently, the main gate is left open in order to draw down the wetland prior to entrainment each spring. While the fish screens are typically deployed during this period, individuals (including nonnative species) small enough to pass the screen are likely able to move upstream into the wetland from the river via this continuously draining water. Retrofitting the gate with an aluminum stop log system, paired with a siphon or other method to drain the wetland without opening the main gate (and thereby allowing inland movement of small-bodied fishes), could lead to more favorable outcomes for both entrainment dynamics and fish community manipulation. In the absence of these improvements, allowing entrainment to occur passively (i.e., with gate open and fish screen deployed throughout the ascending limb of the hydrograph, as in 2021), may be a more efficient entrainment tactic.

Project Status:
On track & ongoing

FY2022 Budget Status
Funds Provided: $31,109
Funds Expended: $31,109
Difference: -0-
Percent of the FY 2022 work completed, and projected costs to complete: 100%
Recovery Program funds spent for publication charges: -X-

Status of Data Submission
Data will be uploaded into STReaMS by the end of December, 2022.

Signed:
Zach Ahrens
Principal Investigator
19 November 2022

Table 1.
Fish enumerated during wetland monitoring, 14-23 June, 2022.

Species	Number of fish	Percent frequency
green sunfish (*Lepomis cyanellus*)	458	90.9%
bluegill (*Lepomis macrochirus*)	28	5.6%
red shiner (*Cyprinella lutrensis*)	7	1.4%
sand shiner (*Notropis stramineus*)	7	1.4%
fathead minnow (*Pimephales promelas*)	4	0.8%

Table 2.
Fish enumerated during wetland draining, 10-13 October, 2022.

Species	Number of fish	Percent frequency
green sunfish (*Lepomis cyanellus*)	234	36.8%
black bullhead (*Ameiurus melas*)	105	16.5%
bluegill x green sunfish (*L. macrochirus x L. cyanellus*)	97	15.3%
red shiner (*Cyprinella lutrensis*)	96	15.1%
sand shiner (*Notropis stramineus*)	59	9.3%
fathead minnow (*Pimephales promelas*)	18	2.8%
largemouth bass (*Micropterus salmoides*)	12	1.9%
bluegill (*Lepomis macrochirus*)	9	1.4%
white sucker (C*atostomus commersoni*)	4	0.6%
western mosquitofish (*Gambusia affinis*)	1	0.2%
plains killifish (*Fundulis zebrinus*)	1	0.2%