I. Title of Proposal: Matheson Preserve Larval Razorback Sucker Entrainment

II. 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
   II.A.7.e. Monitor and evaluate success

III. Study Background/Rationale and Hypotheses:

Recent adaptive management of floodplain wetlands, particularly at Stewart Lake on the middle Green River, highlights the potential of these habitats to boost recruitment of wild-spawned razorback sucker larvae (Schelly et al. 2016 & 2014, Schelly and Breen 2015). A portion of the Scott M. Matheson Wetland Preserve (Preserve) near Moab, UT is currently being augmented to connect and enhance historic floodplain habitat. We
expect these augmentations to increase intra-annual duration and inter-annual frequency of the Colorado River flooding in the Preserve’s Central Pond.

Competition and predation by non-native fishes is linked to reduced survival and growth rates of stocked razorback sucker larvae in wetlands (Webber 2009, Webber and Haines 2014). However, experimental survival rates of razorback sucker larvae in ‘reset’ floodplains are thought adequate to sustain populations (Modde and Haines 2005), and age-0 razorback sucker in floodplain environments may outgrow predation risk from concurrent non-native fish cohorts (Christopherson and Birchell 2004). Based on this information and practical results at Stewart Lake, we propose to manage flooding and fish entrainment via a gate and fish screens and evaluate larval razorback sucker entrainment and growth at the Preserve.

IV. Study Goals, Objectives, End Product(s):

**Goal:** This project will operate an existing floodplain wetland within the Preserve to provide access to floodplain wetland rearing habitat for endangered fishes.

**Objective 1:** During the ascending limb of the hydrograph (mid-April to June), we will determine presence of larval razorback sucker between the river and water control structure using quadrafoil light traps (April – June). Upon confirmation of larval razorback sucker presence adjacent to the water control structure, we will operate the fish screen and water control structure to: 1) exclude large-bodied nonnative fishes, 2) maximize larval razorback sucker entrainment and water storage in wetland (May – July).

**Objective 2:** We will document larval dispersal, growth, water quality and quantity throughout filling and entrainment period (May – October). When water quality and/or quantity have degraded or growing season has ended, we will drain the wetland; enumerate, tag and return native fish to river (July – October).

**End Products:**

- Annual management of floodplain wetland habitat with the goal of entraining, rearing and releasing wild-spawned razorback sucker while excluding large-bodied nonnative fishes.
- Annual report detailing temporal patterns of pre-entrainment larval razorback sucker presence, post-entrainment fish community composition & size structure, and evaluation of annual operations.

V. Study Area:

The Scott M. Matheson Wetland Preserve (Preserve) is co-owned and managed by Utah Division of Wildlife Resources (UDWR) and The Nature Conservancy (TNC). Located immediately adjacent to the city of Moab, UT on the river-left bank of the Colorado
River miles 64 to 61.3, the Preserve contains 875 acres of bottomland along the inside bend of a Colorado River meander in the Moab Valley.

Wetland augmentations currently underway at the Preserve’s Central Pond site have deepened and widened the pond’s connection to the Colorado River at river mile 62. Additionally, a concrete control structure to house a gate and fish screens has been constructed (Figures 1 & 2).

VI. Study Methods/Approach:

Razorback sucker larval drift typically occurs during the ascending limb of the hydrograph between April and June in the Colorado River adjacent to Moab (Howard 2014, Gibson & Caldwell 2018). To determine larval presence or absence during this period, we will sample the river-floodplain interface (“backwater channel”, Figure 1) via quadrafoil larval light traps or 500 micron seine twice weekly. We will preserve all larvae collected and conduct preliminary identification on-site at the Moab Field Station. We will then send preserved samples to the Larval Fish Lab at Colorado State University for rigorous identification.

Upon positive preliminary identification of razorback sucker larvae at the inland-most point of the river-floodplain interface, we will initiate filling of the Central Pond (with 1/2-inch fish screen in place). During or immediately after the filling period, we will conduct additional larval sampling within the wetland to confirm successful entrainment of razorback sucker larvae and characterize larval dispersal.

To maximize water storage (and thus duration of growing period), we aim to close the water control structure immediately following peak river stage. In the interest of minimizing water loss through the control structure, we may also place stop logs in the control structure, adjacent to the gate if necessary.

After filling the wetland and closing the gate, we will monitor post-entrainment fish community composition twice monthly. We may employ a variety of sampling gear types, including (but not limited to) seines, fyke nets, hoop nets, traps and/or weirs to determine the most efficient method of sampling.

We will also continuously monitor water temperature and dissolved oxygen using MiniDot loggers suspended in the water column. Additionally, to avoid anoxia-induced fish mortality events, we will directly measure temperature and dissolved oxygen during extreme low water and/or high temperature periods, and may use these data to trigger draining of the wetland.

Upon draining of the Central Pond, we will collect fish from the depression adjacent to the exit screen (Figure 2). We will weigh, measure, and transfer to the mainstem Colorado River all native fishes. We will implant PIT tags in all endangered fishes of
suitable size prior to release. We will also euthanize any nonnative fishes after identifying, measuring, and weighing a subsample.

VII. Task Description and Schedule:

Task 1: During ascending limb of the hydrograph (mid-April to June), determine presence or absence of larval razorback sucker between river and water control structure using quadrafoil light traps (April – June).

Task 2: Upon confirmation of larval razorback sucker presence adjacent to water control structure:

- Operate fish screen and water control structure to maximize larval razorback sucker entrainment in wetland and sample wetland to determine larval presence and document dispersal (May – July).

- Sample fish community, water quality and quantity throughout filling and entrainment period (May – October).

- Drain wetland; enumerate, tag and return native fish to river when water quality has degraded or growing season has ended (July – October).

Task 3: Data entry, analysis and reporting (September – December).

Schedule:

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VIII. Deliverables, Due Dates, and Budget by Fiscal Year:

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In addition to annual reports, the PIs will submit a short article and photos for inclusion in the 2020 *Swimming Upstream* field report.
IX. Budget Summary:

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X. Reviewers:

XI. References:


Figure 1. Plan of excavation to augment Central Pond site at Matheson Wetland Preserve. Proposed gate and screen will be installed at concrete control structure.
Figure 2a. Proposed headworks, plan view.
Figure 2b. Proposed headworks, elevation view.