I. Project Title: C-6 Habitat Construction, Stirrup Bottom modification for endangered fish recovery (*(Note: The accomplishments described herein are the result of an initial design/feasibility effort (funded through capital projects) which received general support from the Biology and Management committees during 2017. A formal scope of work for development of Stirrup Wetland has yet to be completed for Recovery Program approval, most likely following revision of project designs and associated cost estimates).*

II. Bureau of Reclamation Agreement Number: N/A

III. Principal Investigator(s):

David Speas
Bureau of Reclamation
445 West Gunnison Ave., Suite 221
Grand Junction Colorado 81501
970-248-0604
dspeas@usbr.gov

Tildon Jones
Upper Colorado River Endangered Fish Recovery Program (Recovery Program)
U.S. Fish & Wildlife Service
1380 S 2350 W
Vernal, UT 84078
303.588.4074
Tildon_Jones@fws.gov

Ryan Christianson
Bureau of Reclamation
445 West Gunnison Ave., Suite 221
Grand Junction Colorado 81501
(970) 248-0652 (office)
(970) 799-3179 (mobile)
rchristianson@usbr.gov

Source of funds: Capital projects

IV. Abstract: Floodplain wetlands in the Jensen/Ouray reach of the Middle Green River provide productive rearing habitat for larval through juvenile stages of razorback sucker and bonytail. Speas et al. (2017) identified three management attributes of floodplain wetlands which optimize survival of larval endangered fish to juvenile stages in such habitats: 1) Screening to prevent invasion of large-bodied nonnative fish during spring peak flows; 2) Ability to control water levels for successful rearing of endangered fish, including a) maximizing entrainment of larvae in the spring and b) providing complete or nearly complete drainage of the wetland in the fall; and 3) adequate water quality for successful rearing during summer months, which may require a supplemental water

supply. In 2017, representatives of several State and Federal agencies recommended modification of the Stirrup Wetland (located on the Green River between Bonanza Bridge and Ouray National Wildlife Refuge, Green River mile 275.5) to create the three management capabilities identified in Speas et al.(2017). Initial plans for modification of the wetland were completed by Reclamation in March of 2018 and subsequently revised in August 2018, as was an initial cost estimate for completion of the project on the order of $518,000. The draft plans call for a box culvert and Rubicon gate to control water levels and also a fish kettle to facilitate harvest of juvenile endangered fish. Project partners have identified several positive attributes to the project including retention of up to 6-8' of water which would create favorable water quality conditions, prevent invasion of cattail, and increase management flexibility to include overwintering options; however, the ability to completely drain the wetland for endangered fish escapement is hindered by the wetland's elevation in relation to Green River average base flow levels. Options to maximize drainage are currently being evaluated.

V. Study Schedule: March 2017 – TBD.

VI. Relationship to RIPRAP: Colorado River Action Plan: Green River II.A.5

GENERAL RECOVERY PROGRAM SUPPORT ACTION PLAN II. Restore habitat (habitat development and maintenance). II.A. Restore flooded bottomland habitats. II.A.1. Conduct inventory of flooded bottomlands habitat for potential restoration.

GREEN RIVER ACTION PLAN: MAINSTEM II. Restore habitat (habitat development and maintenance). II.A. Restore and manage flooded bottomland habitat. II.A.1. Conduct site restoration. II.A.2. Acquire interest in high-priority flooded bottomland habitats between Ouray NWR and Jensen to benefit endangered fish. II.A.2.a. Identify and evaluate sites

VII. Accomplishment of FY 2017-2018 *(Note: A scope of work for development of Stirrup Wetland has yet to be completed pending revision of project designs and associated cost estimates. Specific deliverables and tasks will be identified at that point. This annual report is simply intended to document accomplishments during the initial planning phases of the project and technical aspects of the final design are forthcoming).*

Discussion of Initial Findings and Shortcomings: Under the auspices of the Larval Trigger Study Plan (LTSP; Larval Trigger Study Plan ad hoc committee, 2012), Reclamation works with Recovery Program and partners to time spring peak releases with the appearance of larval razorback sucker in the Middle Green River which allows drifting larvae to gain access to low elevation floodplain wetlands in the Jensen/Ouray reach. These habitats provide productive rearing habitat for larval through juvenile stages of razorback sucker and bonytail. Speas et al. (2017) identified three key management attributes of floodplain wetlands which optimize survival of larval endangered fish to juvenile stages in such habitats: 1) Screening to prevent invasion of large-bodied nonnative fish during spring peak flows; 2) Ability to control water levels for successful rearing of endangered fish, including a) maximizing entrainment of larvae in the spring and b) providing complete or nearly complete drainage of the wetland in the fall; and 3) adequate water quality for successful rearing during summer months, which may require a supplemental water supply.

In March 2017, representatives of Reclamation, U.S. Bureau of Land Management (BLM), U.S. Fish and Wildlife Service, the Recovery Program, and the Utah Division of Wildlife Resources (UDWR) made a site visit to the Green River between Bonanza Bridge (Highway 45) and Ouray National Wildlife Refuge (near Ouray, UT) to evaluate potential of several floodplain wetlands for renovation for endangered fish recovery. Wetland sites at Above Brennan, Baeser Bend and the Stirrup (Figure 1, top) were evaluated for modifications to provide the three management capabilities (screening, water control, water supply) described in Speas et al. (2017) as well as logistical factors such as NEPA/ESA compliance, topographical and related construction or access issues, land ownership, and other factors. At that time, the group ranked the Stirrup Wetland at RM 275.5 as having the most likelihood for success from the vantage point of construction, compliance, operation and maintenance, and overall potential for successful fish rearing.

Specifically, the group identified the following positive attributes associated with modification and operation of the Stirrup Wetland:

1) Relatively simple topographic setting with a single inlet/outlet
2) Well-defined outlet which should maintain its elevation under operations similar to those at Stewart Lake (see FR-165 annual reports), specifically fall draining
3) 28 acres in size when full and relatively deep (current plans indicate ca. 6-8' depending on time of year and pumping capabilities) ')
4) Access by 4WD road directly to site
5) High levee to prevent upstream connection in all but the highest peak flow years (ca. 25,000-30,000 cfs)
6) No gallery cottonwoods, which are a management priority for BLM habitat and proposed critical habitat for the threatened western yellow-billed cuckoo
7) 100% BLM ownership
8) No cattails, cobble substrate
9) Much existing information on Stirrup water quality, pumping requirements, entrainment, fish community, etc.
10) Tends to retain water throughout the course of a year, which affords overwintering options.

However, several challenges were also identified at the March 2017 site visit:

1) Bathymetric surveys would need to be conducted prior to design development, and both actions would need funding to get the project started.
2) Winter kill documented periodically
3) Dredging of ~3,500 cubic yards of material would have to extend into the deepest part of the wetland to ensure drainage; the maintenance necessary to maintain functionality remains to be characterized.
4) Roads leading to the Stirrup Wetland may need to be graded prior to access by heavy equipment.

Additionally, representatives from UDWR and BLM tentatively agreed to develop a scope of work for the operation and maintenance of the Stirrup Wetland (a draft SOW was provided to the PDO in the fall of 2017 but has not been submitted or discussed).

Findings from the initial site visit were presented to the Biology Committee in May 2017. At that point it became clear there was support for the project in principle, but that some funding would be necessary to continue with bathymetric surveys and designs. In June 2017 Reclamation agreed to conduct the necessary bathymetry survey in advance of the design phase, and the survey was completed by the following August, during which time the Green River was flowing at about 3,000 cfs or about 4680' msl. The Reclamation Provo Area Office (PAO) Force Account design team used these survey results to construct a profile of the project which identified minimum elevations of water control structures and associated excavation requirements for drainage (under revision at this time). At the December 2017 Management Committee meeting, a recommendation was made (and approved) to make available $20,000 for the PAO Force Account design team to complete plans for the modified Stirrup Wetland.

Initial plans for modification of the wetland were completed by Reclamation in March of 2018. The project partners met in Provo, UT at that time to discuss the designs, which called for placement of a box culvert in the excavated outlet of the Stirrup and a Rubicon gate to control water levels. A water control structure could conceivably maintain the Stirrup water surface elevation at about 4686' to 4687' msl (maximum elevation of 4688' was later identified), at which time the wetland's maximum depth would be about 6-7' providing excellent conditions for fish (Tildon noted later that this depth would also discourage cattail colonization). With excavation of the existing breach by about 4 feet, it appeared that the Stirrup could be drained down to about 3' in depth. The group noted that the best design would enable managers to completely drain the pond, or close to it. Recommendations were made to revise the plans to address increased drainage (current water depth remaining after draining is thought to be about 2'), and also to design the features and placement of a fish kettle.

Environmental compliance was also discussed at the March 28 meeting. Representatives from BLM, who had previously agreed to lead NEPA/ESA compliance procedures, indicated that the most favorable way the Stirrup proposal would be received by BLM would be for the Recovery Program to develop a project proposal (which includes a construction plan) and present it to them. This could smooth the permitting process considerably.

Plans for the Stirrup Wetland modification were subsequently revised in August 2018 as was an initial cost estimate for completion of the project on the order of $518,000. The project partners discussed the revised plans on October 29, 2018 (conceptual schematics based on these revised plans for the Stirrup Wetland modification are shown in Figure 2, which were shared with the Biology Committee on November 7, 2018). Based on revisions from August, project partners reaffirmed positive attributes of the project including retention of up to 8' of water, which resulted from the lowered elevation of the water control box culvert and gate. This depth of water would create favorable water quality conditions, prevent invasion of cattail, and increase management flexibility to include overwintering options. Another positive attribute which became evident with revised designs would be a relatively low connection elevation of roughly 4680' msl, which is thought to correspond to a flow of about 3,000 cfs, making Stirrup Wetland the lowest connecting wetland in the Jensen/Ouray reach. However, it was also clear that the

ability to completely drain the wetland for endangered fish escapement was still greatly hindered by the wetland's elevation in relation to Green River average base flow levels (ca. 3,000 cfs for the purpose of this project, which was the elevation of the bathymetry survey in September 2017).

Under the current design, roughly 2' of wetland water would remain in the wetland which would cover about 10 acres (ca. 20 acre-feet of water). Options to maximize drainage are currently being evaluated, with one promising alternative involving lowering the fish kettle elevation so that it is even with, or slightly below, the elevation of the wetland, which would allow evacuation of the wetland's remaining water with pumps while fish are removed from the kettle. Conceptual schematics for the Stirrup Wetland modification are shown in Figure 2. The Reclamation PAO design team is currently revising the Stirrup Wetland designs to show layout of the fish kettle and also feasibility of lowering its elevation for enhanced drainage which would require pumping.

Originally, partners believed that construction on the Stirrup Wetland could begin as early as the spring of 2019, but uncertainties in the PAO Force Account Crew schedule as well as the need for more time to complete compliance procedures has since pushed the onset of construction out to spring of 2020 at the earliest. A project proposal (scope of work) for Biology and Management Committee approval needs to be developed, and a detailed construction plan must be created for presentation to BLM to begin the compliance process.

VIII. Additional noteworthy observations: None

IX. Recommendations: 1) If necessary and approved, provide a small amount of funding in FY19 to PAO (Reclamation) to continue design refinements and create construction plan for BLM consideration. 2) Continue to evaluate feasibility of lowering the fish kettle elevation for more complete drainage of the Stirrup Wetland, as well as pumping and labor requirements to drain the wetland as completely as possible. 3) Continue to refine estimates of river elevation in relation to proposed Stirrup Wetland minimum elevations such that maximum drainage can be described prior to moving forward with construction. 4) Prepare formal scope of work of project attributes and requirements for BC and MC approval. 5) In the first half of 2019, prepare more detailed project proposal (including a construction plan) for presentation by the Recovery Program to BLM as formal initiation of the NEPA/ESA compliance process. 6) Finalize operation and maintenance SOW for consideration by the BC alongside capital construction SOW.

X. Project Status: Ongoing; Program SOW showing project attributes, requirements and benefits required as soon as possible.

XI. FY 2018 Budget Status

A. Funds Provided: $20,000.00
B. Funds Expended: $18,172.00
C. Difference: $1,828.00
D. Percent of the FY 2018 work completed, and projected costs to complete: 91% complete; additional funds for design/construction plan may be required (cost

TBD).

E. Recovery Program funds spent for publication charges: $0

XII. Status of Data Submission: N/A

XIII. Signed: Dave Speas and Tildon Jones — Principal Investigators; Nov 20, 2018 — Date

Literature Cited:

Larval Trigger Study Plan Ad Hoc Committee. 2012. Study Plan to Examine the Effects of Using Larval Razorback Sucker Occurrence in the Green River as a Trigger for Flaming Gorge Dam Peak Releases. March, 2012.

Speas, D., M. Breen, M. T. Jones, and R. Schelly. 2017. Updated floodplain wetland priorities for recovery of endangered fish in the middle Green River. Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado.

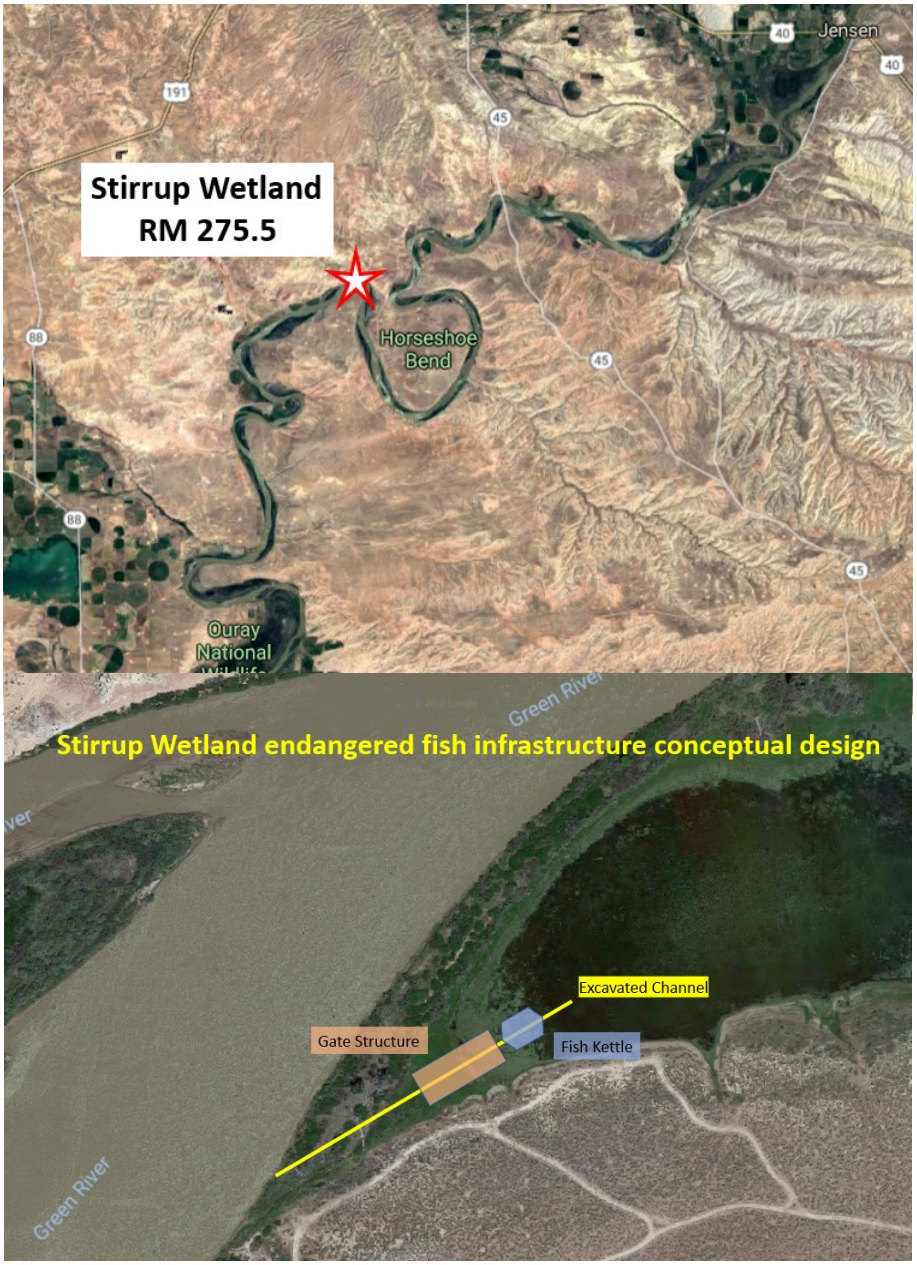

Figure 1. Top: Location of the Stirrup Wetland in the Middle Green River, Utah. Bottom: Conceptual layout of Stirrup Wetland modification for endangered fish recovery purposes.

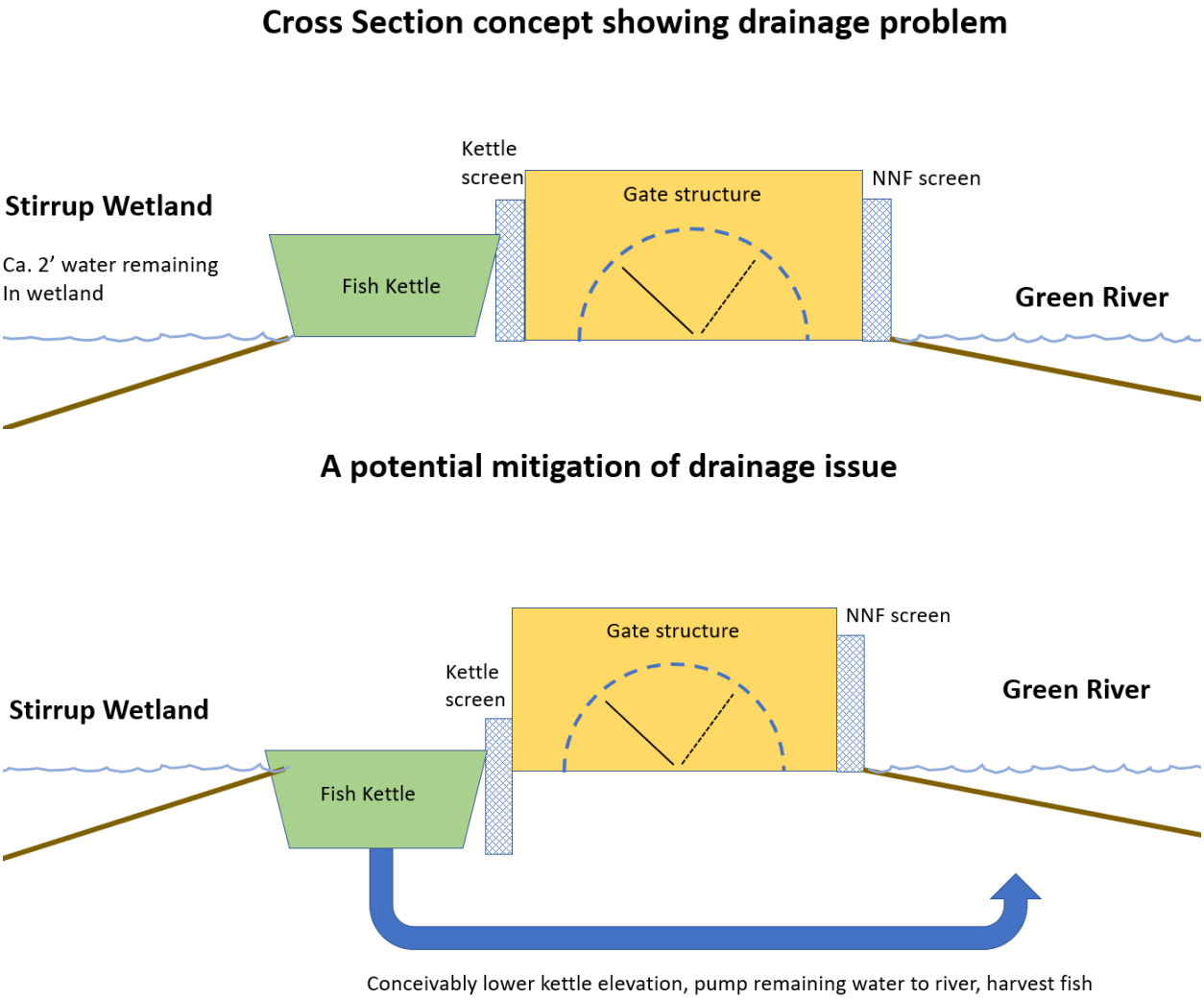

Figure 2. Top: Cross section schematic of current Stirrup Wetland design showing incomplete drainage. Bottom: a potential remedy for the drainage problem.