I. Project Title: **Stationary PIT detection system in the Green River Canal, Green River, UT**

II. Bureau of Reclamation Agreement Number(s):
USU Cooperative Agreement Number: R11AC40005
Lead Agency: U.S. Bureau of Reclamation

Project/Grant Period: Start date (Mo/Day/Yr): 9/1/2013
End date: (Mo/Day/Yr): 2022 (approx.)
Reporting period end date: November 15, 2018
Is this the final report? Yes _____ No _X____

III. Principal Investigators:

Dave Speas
Fish Biologist, U.S. Bureau of Reclamation—Upper Colorado Regional Office
445 West Gunnison Ave Suite 221, Grand Junction, CO 81501
dspeas@usbr.gov

Julie Stahli
Database Manager, Upper Colorado River Endangered Fish Recovery Program
44 Union Blvd, Suite 100, Lakewood, Colorado 80228
julie_stahli@fws.gov

Peter MacKinnon
Fish Detection Engineer, Department of Watershed Sciences Utah State University
pdmackinnon@gmail.com

Kevin McAbee
Nonnative Fish Coordinator, Upper Colorado River Endangered Fish Recovery Program
44 Union Blvd, Suite 100, Lakewood, Colorado 80228
kevin_mcabee@fws.gov

Date: November 19, 2017

IV. Abstract: The goal of this project is to evaluate entrainment of native fish (PIT-tagged non-listed and endangered individuals) in the Green River Canal (near Green River, Utah) using a passive interrogation array (PIA). The PIA includes two sub-arrays (one each below the first flume and the first siphon downstream of the canal head gates) consisting of two antennas each. In 2018, the antennas below the flume were inactive for the vast majority of the irrigation season (March-September 20). The operation of only the siphon antenna likely accounts for the dramatic decrease in detections compared to

previous years. In 2018, 118 individual fish were detected in the Green River Canal during the irrigation season (March – November), which represents the lowest number of individual fish detected on the siphon antenna annually since antennas were installed in 2013. Of these, 91 were identified through Species Tagging, Research and Monitoring System (STReaMS; streamsystem.org) and were comprised of 58 razorback sucker, 18 bonytail, 12 Colorado pikeminnow, 2 flannelmouth sucker and 1 bluehead sucker.

V. Study Schedule: FY13-FY22 (approx.)

VI. Relationship to RIPRAP:

Green River Action Plan

II.	Restore habitat
II.B.2	Screen Tusher Wash diversion to prevent endangered fish entrainment, if warranted
II.B.2.b	Design.
II.B.2.c	Construct.

VII. Accomplishment of FY 2018 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1: March-November, 2018 (irrigation season): Activate and operate system; download antennae data, perform diagnostics, repair system if necessary; system shut-down.

The flume and siphon PIA sub-arrays were activated prior to the onset of the 2018 irrigation season (late March). A disruption occurred soon thereafter, causing the flume antenna to stop acquiring detections. The system was repaired on September 20th, but resulted in a loss of all data for the flume antenna until that date. Our fish detection engineer worked closely with the Colorado Natural History Program to upload data, monitor data files, and answer data- or site-related questions pertaining to the Green River Canal PIA. All antennas were removed from the canal on November 7, 2018 as part of the transition to a permanent fish exclusion structure being constructed in winter of 2018 (see section VIII below). Antennas are retained for use for other Recovery Program projects as needed.

Task 2: December: Annual report.

A total of 118 individual tagged fish were detected by at least one PIA sub-array in the Green River Canal in 2018. Of these, 27 were not identifiable using STReaMS and will need to be revisited after recent stocking and field collection data is added to the system. Razorback sucker comprised 64% (58 fish) of all identifiable fish detected in 2017, followed in order of frequency of detection by bonytail (20%; 18 fish), Colorado pikeminnow (13%; 12 fish), and flannelmouth sucker (2%; two fish) and bluehead sucker (1%; one fish).

The highest rates of entrainment (primarily razorback sucker) occurred throughout the irrigation season with 19 unique entrainments in July, 18 in May, 17 in September and 15 in June (Figure 1). Entrainment rates were lowest in August (5 fish entrained). Razorback sucker entrainment was consistently high through spring and early summer (May, June and July; Figure 2). Bonytail were detected at low levels throughout the irrigation season but increased dramatically in early September. Most of the bonytail detected in September were stocked upstream in the Green or in the White in August. Colorado pikeminnow entrainment occurred from May to October, peaking in July with seven individuals entrained. None of the fish detected in the canal have been detected or captured elsewhere since entrainment.

VIII. Additional noteworthy observations: This will be the final year of unscreened canal operation and the final year of this project; a weir wall and fish screen will be constructed before irrigation begins in Spring of 2019. New antennas will be installed to document use of the fish screen and document any continued entrainment. These new antennas will be built as part of the facility and will be more permanent in nature.

IX. Recommendations:

- Collect and analyze data from newly installed antennas to determine the effectiveness of the weir wall and fish screen at solving the entrainment issue at the Green River Canal.
- Determine the best way to ensure continuous antenna operation and gather data from the antenna. Upcoming changes to BioMark's reporting system may require/permit new solutions that allow for more effective remote monitoring of the antennas. A basin-wide SOW for antenna monitoring and maintenance is suggested to provide ongoing operation of these facilities.

X. Project Status: Ongoing

XI. FY 2018 Budget Status

A. Funds Provided: $6025.00
B. Funds Expended: $6025.00
C. Difference: $0
D. Percent of the FY 2018 work completed, and projected costs to complete: 100%
E. Recovery Program funds spent for publication charges: $0

XII. Status of Data Submission (Where applicable): Data are automatically uploaded into STReaMS.

XIII. Signed: _____

Principal Investigator Date

(Just put name and date here, since you will be submitting the report electronically)

Figure 1. Detections by date and species in the Green River Canal (siphon PIA only until September 20).

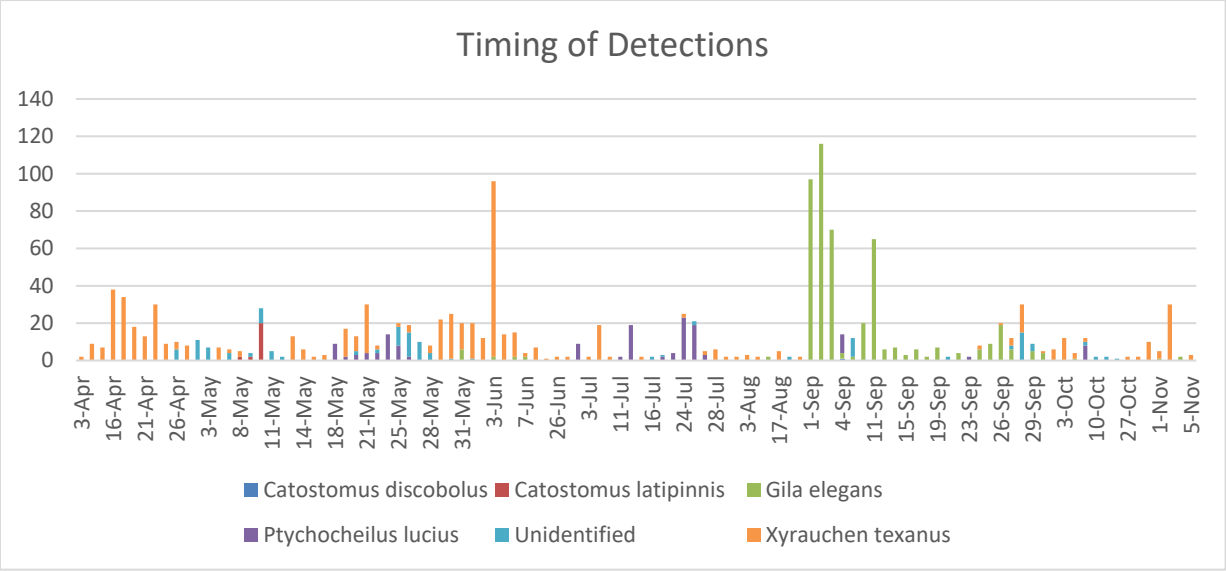

Figure 2. Proportion of Individuals Entrained by Month.