

**COLORADO RIVER RECOVERY PROGRAM
FY-2018-2019 PROPOSED SCOPE OF WORK for:**

Project No.: 28a

Passive interrogation arrays in the Green River Canal, Green River, UT

USU cooperative agreement number R15AC00021

Lead Agency: U.S. Bureau of Reclamation

Submitted by:

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

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Category:

- Ongoing project
- Ongoing-revised project
- Requested new project
- Unsolicited proposal

Expected Funding Source:

- Annual funds
- Capital funds
- Other (explain)

- I. Title of Proposal: Passive interrogation arrays in the Green River Canal, Green River, UT

II. Relationship to RIPRAP:

Green River Action Plan

II. Restore habitat

II.B.2 Screen Tusher Wash diversion to prevent endangered fish entrainment.

II.B.2.b Design.

III. Study Background/Rationale and Hypotheses:

The Upper Colorado River Endangered Fish Recovery Program (Recovery Program) plans to construct a fish exclusion weir at the head of the Green River Canal (GRC) near Green River, UT. To evaluate effectiveness of the structure in preventing entrainment of endangered fish, entrainment rates in the canal have been monitored via passive interrogation arrays (PIAs) since 2013 and will be monitored following construction of the fish exclusion weir. The goal of this project is to operate and maintain the PIAs that monitor fish current entrainment and the PIAs that will monitor fish exclusion weir effectiveness. Two PIAs currently installed in the canal monitor entrainment, and will continue to collect data during the 2018 irrigation seasons. The fish exclusion weir is expected to be constructed in FY19. Following the fish exclusion weir construction, a set of three PIAs will monitor the weir's effectiveness.

IV. Study Goals, Objectives, End Product:

Goal: Evaluate entrainment of non-listed native and endangered fish in the GRC prior to construction of a fish exclusion weir and again after the weir has been installed and is operational.

Objectives:

- 1) Operate and maintain PIAs prior to and following construction and initial operation of an electrical fish barrier at the canal intake.
- 2) Dismantle and remove PIAs at close of the study.
- 3) Analyze results and compare pre-weir entrainment rates to post-weir rates.

End Products:

- 1) Operational PIAs in the GRC prior to and following installation of a fish exclusion weir (costs of weir antennas covered by capital funds).
- 2) Annual reports on PIA operations and results.
- 3) Final report on entrainment of non-listed native and endangered fish prior to and following construction and operation of a fish excluding weir.

Revision from previous SOW: This SOW was extended to include FY18 costs (fish exclusion will not be in place) and to include FY19 costs for operation and maintenance of antennas that will monitor the fish exclusion's effectiveness.

V. Study area

The study area is near the top of the GRC near the town of Green River, UT. The flume PIA is located immediately below a concrete flume about 100 m below the canal radial head gates (Figure 1); a second PIA is located roughly 200 m below the first PIA, immediately below a canal siphon.

VI. Study Methods/Approach

Overview. Passive interrogation arrays function by using stationary antennae which scan the overlaying water column for the presence of fish containing passive internal transponder (PIT) tags, which are tiny transponder tags implanted into the body cavity of the fish by various fisheries agencies. In 2013, we installed an automated, solar powered PIA in the GRC immediately below a concrete flume about 100 m downstream the top of the canal (Figure 1). The purpose of this installation was to collect data on entrainment rates of PIT-tagged endangered and non-listed native fish prior to and following installation of a fish-excluding weir at the head of the GRC.

The flume PIA consists of two rectangular antennas constructed from schedule 80 PVC (4' x 16') fastened in upright positions in the canal, which creates a “pass-through” type of detection array. Originally operated by a Destron Fearing FS1001 multiplexer, the flume system was upgraded in 2015 to utilize the more advanced master controller/node configuration, which increases the read range of the array and is less vulnerable to electrical interference. A second PIA was installed immediately below the siphon in 2014 to evaluate the downstream extent of entrainment, fish passage through the siphon and increase overall detection efficiency. The siphon PIA consists of the controller/node configuration and includes PVC antennas similar to those of the flume PIA. The flume PIA has been operational since 2013 and the siphon PIA since 2014.

Throughout the 2013-2016 irrigation seasons, 1604 tagged individuals have been detected by at least one antenna in the canal. The most commonly detected species is razorback sucker *Xyrauchen texanus* (69%), followed by Colorado pikeminnow *Ptychocheilus lucius* (9%) and bonytail *Gila elegans* (7%). Other minimally represented species include humpback chub *Gila cypha*, flannelmouth sucker *Catostomus latipinnis*, a hybrid between flannelmouth and razorback sucker, and individuals currently unidentified within the Species Tagging, Research and Monitoring System (STReAMS; streamsystem.org; Table 1). At least one individual of each of the four endangered species has been detected in each year of operation. The number of individuals detected in the canals has decreased every year of operation, which may be related to flows in the Green River.

Originally, this study called for collection of entrainment data during at least one pre-weir and one post-weir irrigation season. Delays in in weir implementation timeline resulted in the collection of at least four years of pre-weir entrainment data. Although one year of post-weir monitoring could fulfill the criteria of the original scope of work, some replication may be

desired pending analysis of the first post-weir season, particularly if the weir continues to allow some degree of entrainment. This scope of work assumes that at least two more years of monitoring will be necessary to complete the project provided the weir is constructed and becomes operational prior to the 2018 irrigation season.

Operation and maintenance: Basic system troubleshooting and adjustment can be done remotely when the system is operating. However, should site visits become necessary (to complete repairs or remove debris, for example) we will make prior arrangements for access with GRCC representatives on an as-needed basis.

All PIA operation and maintenance activities will be done at no cost to the Green River Canal Company (GRCC). Personnel involved with installation are covered by workman's compensation and the Canal Company will not be held liable for any incidents or mishaps during installation, operation, maintenance and dismantling.

Annual reports: We will report to the Recovery Program each year on PIA operation and maintenance and provide whatever data is available at the close of the irrigation season. A final report summarizing and interpreting data over the life of the project—include pre- and post-fish exclusion—will also be provided.

VII. Task Description and Schedule.

- 1) March of FY18: Coordinate with the GRCC on activation of PIA systems prior to irrigation seasons; activate systems and check performance.
- 2) April through November FY18: Operate and maintain the two PIAs (remote performance monitoring, physical visit for repair if needed, removal prior to winter).
- 3) Complete annual reporting (contributions by BOR/FWS under separate project, not included in budget).
- 4) FY19: Removal of two PIA systems in Green River Canal. Installation and operation of new PIAs as part of fish exclusion system. (*Installation costs and first year of operation will be covered under capital funding dollars.*)
- 5) FY20 through FY22: Operation and maintenance of 3 PIA systems monitoring fish exclusion device.
- 6) FY21: Complete final report on entrainment rates and success rate of fish exclusion weir.

VIII. FY18 – FY19 work and budget

FY18 Budget:

Task Description		Cost/unit	Units/hours	Total
Tasks	Item			
1-3: Activation, operation/maintenance and shut down of two PIA Systems on the Green River Canal; assist in annual reporting	Utah State University Electronic Engineer/RFID Specialist	\$45.90	100	\$4,590.00
	Vehicle mileage (Logan to Green River roundtrip)	\$0.61	800	\$488.00
			Total tasks 1-2	\$5,078.00
			Sub totals all tasks	
			Salary	\$4,590.00
			USU Fringe 8%	\$367.20
			Travel expenses	\$488.00
			Equipment	\$0.00
			Total	\$5,445.20
			Include USU Indirect rate 17.5%	\$6,398.11
1-3: Coordinate with GRCC; monitor data; complete annual reporting	Recovery Program and Bureau of Reclamation Staff			\$0.00
			Total	\$6,398.11

FY19 Budget (includes 3% COLA):

Task Description		Cost/unit	Units/hours	Total
Tasks	Item			
3, 4: Removal of two existing PIAs, contribute to annual reporting;	Utah State University Electronic Engineer/RFID Specialist	\$47.28	100	\$4,727.70
	Vehicle mileage (Logan to Green River roundtrip)	\$0.63	800	\$502.64
			Total task 2	\$5,230.34
		Sub totals all tasks	Salary	\$4,727.70
			USU Fringe 8%	\$378.22
			Travel expenses	\$502.64
			Equipment	\$0.00
		Total		\$5,608.56
		Incl USU 17.5%		\$6,590.05
3: Complete annual report	Recovery Program and Bureau of Reclamation Staff			\$0.00
			Total	\$6,590.05

FY20 Budget (includes 3% COLA):

Task Description		Cost/unit	Units/hours	Total
Tasks	Item			
5: Operation and maintenance of three PIAs monitoring the fish exclusion	Utah State University Electronic Engineer/RFID Specialist	\$48.70	100	\$4,869.53
	Vehicle mileage (Logan to Green River roundtrip)	\$0.65	800	\$517.72
			Total task 2	\$5,387.25
		Sub totals all tasks	Salary	\$4,869.53
			USU Fringe 8%	\$389.56
			Travel expenses	\$517.72
			Equipment	\$0.00
		Total		\$5,776.81
		Incl USU 17.5%		\$6,787.75
1-3: Coordinate with GRCC; monitor data; complete annual reporting	Recovery Program and Bureau of Reclamation Staff			\$0.00
			Total	\$6,787.75

FY21 Budget (includes 3% COLA):

Task Description		Cost/unit	Units/hours	Total
Tasks	Item			
5: Operation and maintenance of three PIAs monitoring the fish exclusion;	Utah State University Electronic Engineer/RFID Specialist	\$50.16	100	\$5,015.62
	Vehicle mileage (Logan to Green River roundtrip)	\$0.67	800	\$533.25
			Total task 2	\$5,548.87
		Sub totals all tasks	Salary	\$5,015.62
			USU Fringe 8%	\$401.25
			Travel expenses	\$533.25
			Equipment	\$0.00
		Total		\$5,950.12
		Incl USU 17.5%		\$6,991.39
1-3, 6: Coordinate with GRCC; monitor data; complete annual reporting, final report	Recovery Program and Bureau of Reclamation Staff			\$0.00
			Total	\$6,991.39

FY22 Budget (includes 3% COLA):

Task Description		Cost/unit	Units/hours	Total
Tasks	Item			
5: Operation and maintenance of three PIAs monitoring the fish exclusion;	Utah State University Electronic Engineer/RFID Specialist	\$51.66	100	\$5,166.09
	Vehicle mileage (Logan to Green River roundtrip)	\$0.69	800	\$549.25
			Total task 2	\$5,715.33
		Sub totals all tasks	Salary	\$5,166.09
			USU Fringe 8%	\$413.29
			Travel expenses	\$549.25
			Equipment	\$0.00
		Total		\$6,128.62
		Incl USU 17.5%		\$7,201.13
1-3, 6: Coordinate with GRCC; monitor data; complete annual reporting (if needed)	Recovery Program and Bureau of Reclamation Staff			\$0.00
			Total	\$7,201.13

IX. Budget Summary

FY	Total
2018	\$6,398.11
2019	\$6,590.05
2020	\$6,787.75
2021	\$6,991.39
2022	\$7,201.13
Total	\$33,968.43

Table 1. Number of detections by fish species in the Green River Canal, 2013 through 2016.

Species	2013	2014	2015	2016	Total
flannelmouth sucker	7	6	2		14
FM x RB	1	1		1	3
humpback chub	1	1	1	2	5
bonytail	8	26	77	7	116
Colorado pikeminnow	102	21	18	15	149
unidentified	45	59	25	92	214
razorback sucker	531	302	182	126	1103
Total	695	416	305	243	1604

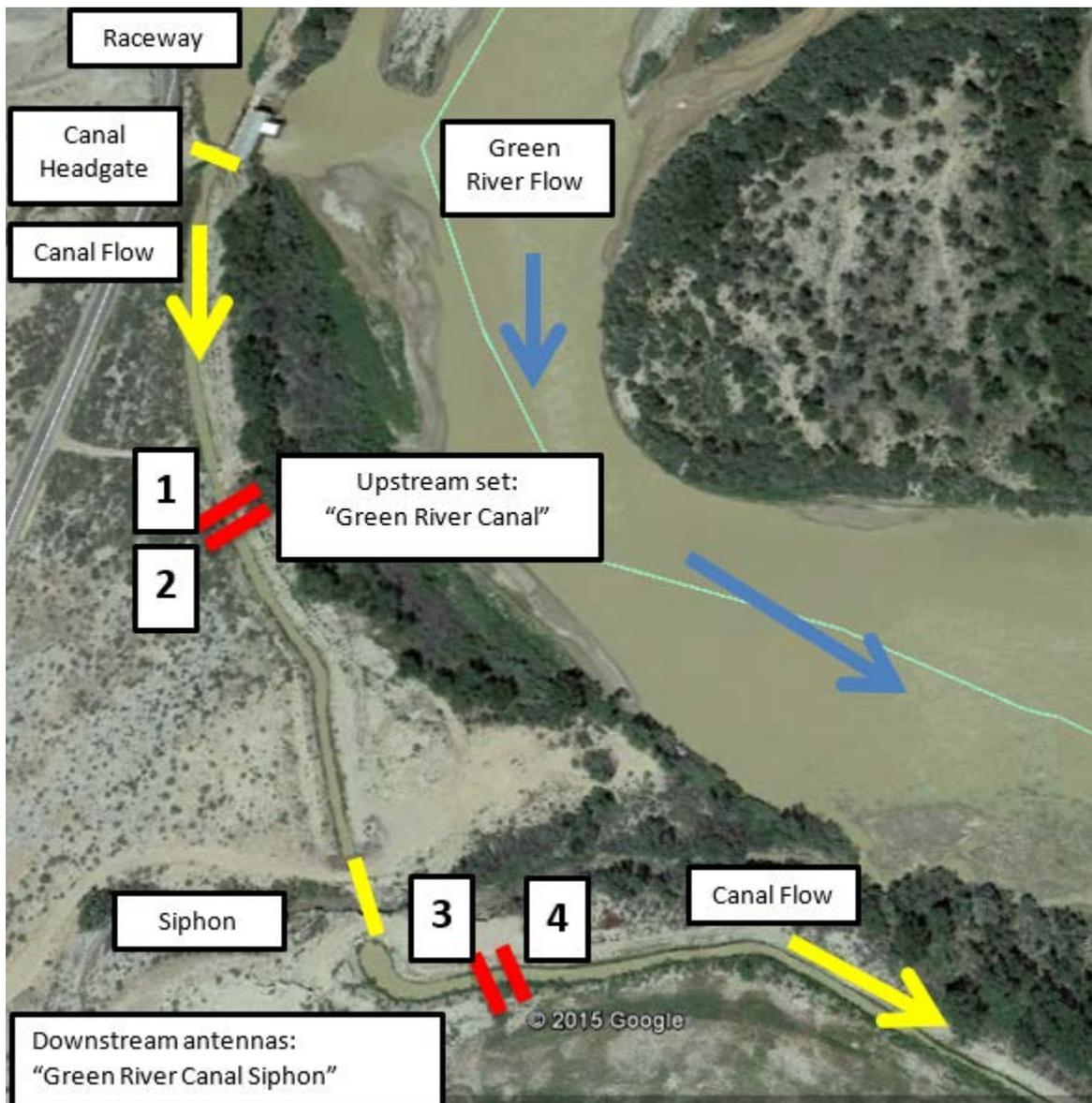


Figure 1. Locations of PIAs in relationship to the Green River Canal (GRC) and the Green River.