

**SJRIP O&M Existing PIT Tag Antennas
2020 Project Proposal**

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BACKGROUND:

PIT tags are implanted in various fish species captured through various projects directly supported by the SJRIP, or funded through other agencies and projects (CDP&W, BOR, BLM, NMG&FD, and UDWR). Stationary PIT Tag antennas have been installed at various locations in the San Juan River Basin to passively detect fish as they swim above, through, or underneath the antennas. This proposal is to add another series of PIT Tag antenna at the Hogback Fish Passage to detect fish that either may or may-not use the fish passage. Existing antennas at Hogback currently cover the intake structure, the fish bypass at the weir, and the canal, in addition to the bypass at the canal headgate. Installation of this new set of antennas will provide almost full coverage of the river at Hogback under all but the highest of flows.

- 1) Hogback Irrigation Canal and Fish Weir, ~ 20 miles upstream of Shiprock, NM
 - a. Seven pass-through antennas are installed at various locations in the Hogback Fish Weir facility.
 - b. Five antennas are served by a master controller and bank of batteries in a protected shed at the Hogback Irrigation Site that controls the various gates connected to the fish weir. The master controller is accessed using a Verizon cell data modem.
 - c. Two antennas are located approximately 0.5 mi upstream of the fish weir near the canal headgate. These antennas are served by a master controller and bank of batteries (connected to 110 AC power source) located at the antennas. This site is accessed using a Verizon cell data modem.
 - d. Six antennas are located in the Hogback Bypass and raft-launch channel that is south of the canal. These antennas are served by the same Master Controller and power source used to operate the antennas at the head of the headgates.

Antennas installed at Hogback Canal are being used in a "design" to give us information on how many, when, where, and how fish use the Hogback canal and fish weir. These antennas have been used under controlled experimental conditions and have given us some good information. If VFD pumps are replaced in the canal we can get good information on how the weir works under more normal operating conditions. Antennas were installed at the canal intake, in the canal downstream of the fish weir, and in the fish bypass that leads back to the river. Under this design, in theory, we can evaluate numbers of fish that enter the intake, numbers of fish that are entrained or bypassed back to the river, direction of fish movement, as well as date and timing of movements.

Antennas installed at Hogback Bypass were installed primarily due to proximity to existing infrastructure and antennas in the Canal portion of the project. These antennas are not part of a design, but are giving us information on recaptures (i.e., survival), timing of fish movements, and potential information about use of the fish passage right next to it. There were two arrays of antennas installed at this site so, theoretically, movement direction as well as date and time can be evaluated at this bypass. Since this site is protected by a radial gate just upstream that regulates the amount of water than can go through this channel the antennas cannot be flushed out during high water.

- 2) TNC Restoration Site ~ 20 miles west of Shiprock
 - a. Four pass-over antennas are installed in a secondary channel created by restoration activities conducted by TNC.
 - b. The four antennas are served by a single master controller and solar-energy supplied battery bank on an island created by the restoration activities. The site is accessed using a satellite data modem.

Antennas installed at TNC Restoration site were incorporated as a component of the evaluation of this habitat restoration and were installed in the secondary channel near the downstream mouth. Antennas were not installed as part of a "design" but can be used to provide information on movements of fish, timing, as well as simply increasing total number of detections river-wide. There are two arrays of antennas at this site so, theoretically, movement direction can be evaluated. For fish that are detected here there is little more that can be said other than they were present at a certain date and time since there is no comparison being made to main channel sites, control sites, or other restoration sites.

- 3) McElmo Creek, ~ 25 miles upstream of Bluff, UT
 - a. Five pass-over antennas were installed in McElmo Creek approximately 200m upstream of the confluence with the San Juan River.
 - b. The antennas are served with a multiplexing antenna controller and the controller is accessed using a Verizon cell data modem.
 - c. Four more antennas, along with a master controller and solar panel, were installed at the bridge crossing on McElmo Creek as part of a rehabilitation project for the bridge conducted by Utah Department of Transportation.

Antennas were initially installed in McElmo Creek near the mouth where it joins the San Juan. These antennas were installed as part of a "design" to look at fish movements (all fish) in and out of McElmo Crk. There are two arrays of antennas at this site so movement direction can theoretically be evaluated. These antennas are continuing to function even though they are past their planned life-span, albeit at a reduced level of effectiveness due to burial by sediment and two of the 5 antennas being flushed away from floods.

McElmo Creek Bridge--These antennas were installed as part of a rework of the bridge abutment and, since the contractor had heavy equipment and was going to be using large rip rap to create a new channel, it was relatively easy and cheap to install a series of antennas. Antennas installed at the McElmo Creek Bridge were not installed as part of a "design", although there are two arrays of antennas, one upstream and the other downstream of the Bridge. Thus movement direction and ability of fish to swim up the channel can be assessed. Additionally, when combined with antennas approximately 300

yards downstream at the mouth of McElmo, the antennas can be used to assess direction, timing, and movements of fish that come in and out of McElmo Creek.

- 4) Submersible antennas located near the waterfall on the San Juan River near Gouldings, AZ.
 - a. Submersible antennas are installed at various locations including the Piute Farms Waterfall near Gouldings, AZ, and Colorado pikeminnow spawning bar near 4-Corners Bridge, CO, UT, AZ, NM.
 - b. Additional submersible antennas and batteries are being purchased in 2016 to augment detections at additional sites.

A single semi-permanent concrete antenna has been installed at the Piute Farms Waterfall downstream of the falls. This antenna was installed as part of a design to determine species, timing, and numbers of fish visiting the Piute Farms Waterfall and which are precluded further movement upstream.

- 5) Shiprock Bridge Secondary Channel--This site consists of a restored secondary channel that has a concrete inlet at the mouth. We installed a three-array system in October of 2018 as part of the concrete apron, which reduces risk of antennas being destroyed by flooding. Antennas installed here of a three-array system that provides information on species and timing of use, as well as direction of movement in and out of the secondary channel.

Proposed sites:

1) 2) Four-Corners Bridge---The Four-Corners Bridge is being reworked due to erosion of rip rap on the bridge abutment on the upstream side of the north abutment. Antennas could be installed at this site as part of the repair work on the rip rap. River-wide antennas would be ideal, but incorporating the antennas into the rip rap at the foot of the bridge is more likely. These antennas would not be part of a "design" but could provide more detections of fish in this portion of the river as well as information on a potential spawning bar for Colorado pikeminnow that may be located just upstream. Since this would not be a multiple-array system the data would only provide information on species, number, and timing of movements.

METHODS:

- 1) Stationary PIT tag antennas will be contacted periodically (bi-weekly) to check the settings, download the data, and perform diagnostics of the systems. Sometimes problems arise (batteries drain down due to lack of sun, antennas are washed away, wires are cut) that cannot be solved remotely. In these cases a site visit must be conducted by a technician to repair the system. The SOW and budget include the replacement of one antenna during the work period. If an antenna is not replaced the funding will be used to purchase additional PIT tags or submersible antennas to be used by other biologists.
- 2) Submersible antennas will be deployed at the waterfall for a continuous period from late February 2020 till August 2020, IF the cement semi-permanent antenna is not working, in an attempt to document fish movements and usage of the river immediately downstream of the waterfall.

TASKS – 2020

1. Maintain and operate stationary and portable PIT tag antennas
2. Replace one PIT tag antenna (location unknown, probably PNM)
3. Data will be remotely or manually entered into SJRIP and STReAMS databases.

FY 2020 BUDGET

O&M of Existing Antenna Systems, Replacement of one Antenna, and Data Management

A) Labor

Position	Salary total/hr	No. persons	Total Hours	Total cost
BOR Technical Representation for Contracts and Agreements	\$80.00	1	40	\$3,200.00
BioMark or USU Staff (contract)	\$80.00	1-2	100	\$6,400.00
Total				\$9,600.00

B) Travel

Position	Destination	Purpose	Days	Lodging per day/total	Per diem per day/total	Other*
Reclamation Technical representative	Farmington, Shiprock	Project evaluation or field trips	2 trips @ 5 days/trip	\$100/\$500	\$40/\$400	\$0
BioMark/USU representative	Boise, ID; Kennewick, WA; various	Field trips O&M Antennas	2 trips @ 5 days/trip	\$100/\$1000	\$40/\$400	\$2500
Total				\$1,500.00	\$800.00	\$2,500.00

*mileage of 5,000 mi at \$0.55/mile

C) Equipment

Item	Unit Cost	Number	Total cost
Antenna system	\$10,000	1	\$10,000
Total			\$10,000.00

**Budget Summary
FY-2020**

Category	Total
Labor	\$9,600.00
Travel	\$4,800.00
Equipment	\$10,000.00
Total FY2020 Budget	\$24,400.00

Projected funding:
FY-2021 \$30,000.00
FY2022 40,000.00