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Floating PIT Tag Detection System

New Passive Integrated Transponder (PIT) tag antenna system detects fish in waterways while floating over them.

What Is The Problem?

Reclamation funds and manages several programs concerned with the recovery of endangered fish species. Accurate fish counts are an important aspect of these programs. Yet, accurately detecting fish moving through rivers and streams is difficult and costly. Capture by electrofishing or trapping is typically required, involving large amounts of personnel and equipment. Also, capturing can lead to mortality or changes in behavior and movements.

Existing systems that detect tagged fish are only effective for species with predictable movement patterns that can be funneled past the tag antennae. Improvements to these systems are needed to detect other species without involving their capture to reduce costs and cause less disruption to the fish.

What Is The Solution?

Reclamation and Utah State University (USU) researchers have developed a system to detect fish as an antenna network floats over them. The fish are captured and tagged with Passive Integrated Transponder tags (PIT tags) to allow researchers to track their movements and survival. PIT tags resemble a grain of rice and function similarly to bar codes used to scan goods in stores. The researchers developed an innovative floating antenna system which allows the remote detection of fish that have been PIT tagged but that do not have predictable movement patterns like salmon, that can be funneled through elaborate antenna systems and detected during their migration. Unlike other PIT tag systems that require fish to travel through a detection device, this system floats on the river and does not disturb the fish.

The system's antenna modules are 3 feet wide by 10 feet long, made of PVC and foam with internal antennae, and float on the surface of the water. This system is patent pending (U.S. Patent Application Number 61/431,622). The entire system consists of a raft to provide a platform for the floating antenna modules, a multiplexer to operate the antennas, battery power supply, an integrated GPS, and data recorder to record tag number, date, time, and location of tag in the river. This floating antennae system can be mounted to a moveable or stationary raft.

Who Can Benefit?

Reclamation programs, as well as other programs for detecting fish, can benefit from this technology. Better data on fish populations would assist numerous Reclamation programs in managing fish species and give Reclamation more information to manage its facilities in an efficient manner. For example, if the successful use of this system allowed better estimates of fish populations, progress toward recovery would be improved through better-informed stocking goals, flow recommendations,

and management activities. PIT-tagged fish would not have to be individually captured and handled, thus reducing mortality.

Where Have We Applied This Solution?

An early prototype of the system was constructed and tested in 2008. The system's efficiency at detecting endangered fish that were free swimming in the San Juan River was proven and documented. It was floated over a 19-mile reach of the river and was able to detect 76 tags, including 22 that were in a side channel inaccessible by electrofishing boats. An electrofishing effort that was running concurrently with the test detected approximately the same number of fish at a much higher cost.



Raft deployed floating PIT tag antennae system on the San Juan River.

This comparison effectively demonstrated that fish can be detected with the floating antennae system and that it is less harmful to the fish and much cheaper to operate.

Future Development Plans

The Reclamation-USU collaborative project was completed in November 2010. Plans are underway to construct a stationary floating antenna in tributaries of the San Juan River as well as a large stationary floating system in the lower river above a large waterfall. The results of this research project have generated considerable interest, and BioMark, Inc. is potentially interested in commercial development of the system.

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Collaborators

Reclamation, Utah State University, and the San Juan River Recovery Implementation Program