

Electric Fish Barrier Research



Background

There are over 105,000 irrigation structures on rivers and streams across Colorado, most in fish bearing waters. Fish loss in irrigation canals is known to be a large problem in the western U.S. but the impact on fish populations in Colorado is unknown. The South Canal is an irrigation ditch near Montrose, Colorado that diverts an average of 857 cubic feet per second from March to November from the Gunnison River for agriculture. The construction of a hydropower plant was expected to increase mortality of fish in the canal so an electric fish barrier was installed at the diversion structure in 2012.

Research Objectives

The objective of this work is to evaluate if electric fish barrier technology can reduce the loss of sport fish in irrigation canals in Colorado by monitoring fish populations in the South Canal and documenting tagged fish that cross the barrier.

Electric Fish Barrier

The fish barrier was operational before the 2013 irrigation season. It consists of a series of vertically suspended electrodes across the east portal of the Gunnison Tunnel. The system uses pulsed direct current (DC) to deter fish. DC is the safest type of electrical current for fish and has been shown to repel fish without injuring them. The barrier was designed to exclude broodstock rainbow and brown trout with a field strength of 1 volt per inch, a relatively low power setting for electric fish barrier designs in the United States. Pulsed DC current is size-selective; it affects larger fish more than smaller fish.

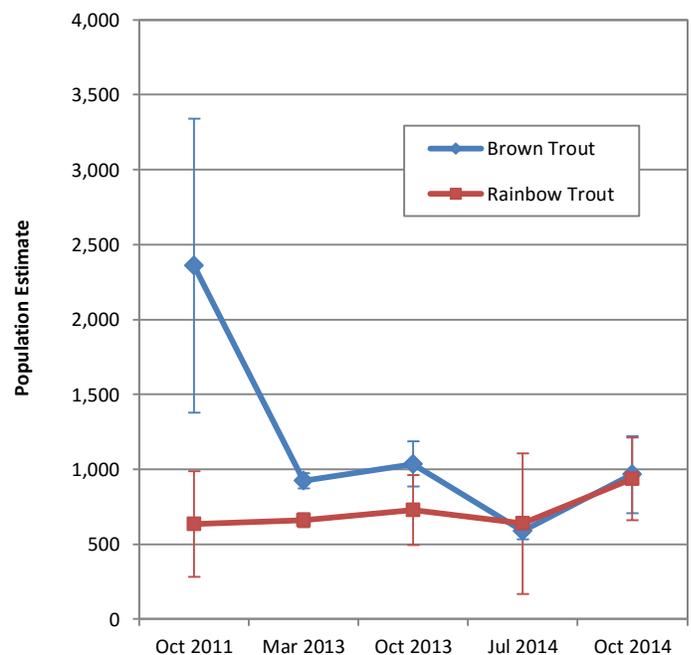
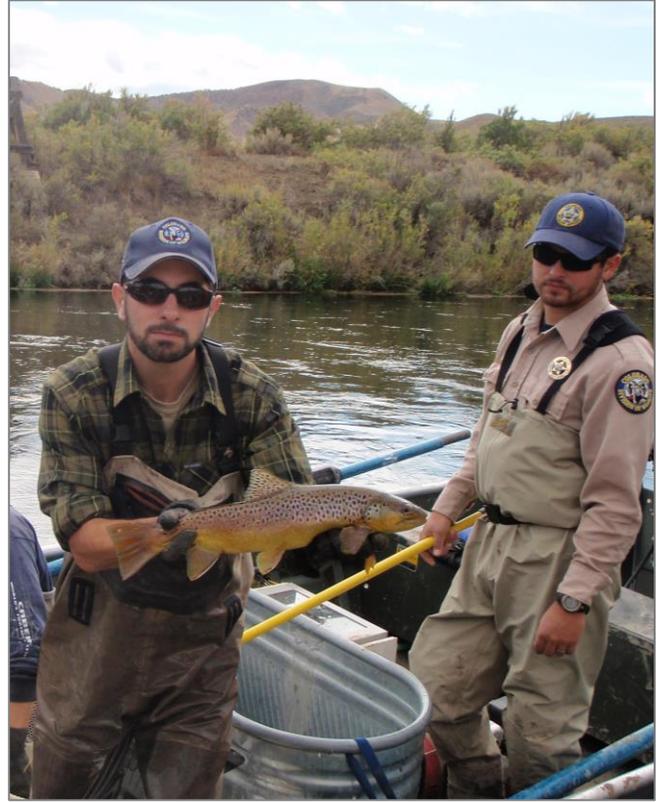
Approach

A total of 23,031 fish from 3 to 29 inches in length were tagged and released in the Gunnison River above the barrier. Fish were removed from the canal before the barrier was operational and annual electrofishing surveys were used to estimate fish populations and look for tagged fish.



Results and Conclusions

- The electric barrier successfully prevents large fish from entering the canal and being lost to the Gunnison River population.
- No fish larger than 16 inches in length have passed the barrier, and only four fish larger than 12 inches have passed through the barrier.
- Smaller age 1, age 2, and some age 3 fish can pass through the barrier.
- The barrier prevents 26-71% of all of the spawning sized fish from entering the canal and being lost to the Gunnison River population.
- The number of brown trout in the canal declined after the barrier, but growth and survival of smaller fish that pass the barrier maintain a stable fish population.
- The electric barrier successfully protects larger brood fish in the Gunnison River but more work is needed to see if it can be adjusted to better exclude smaller fish.



Brown trout numbers have declined since the barrier was built in 2012 but small fish that pass into the canal maintain a stable trout population.