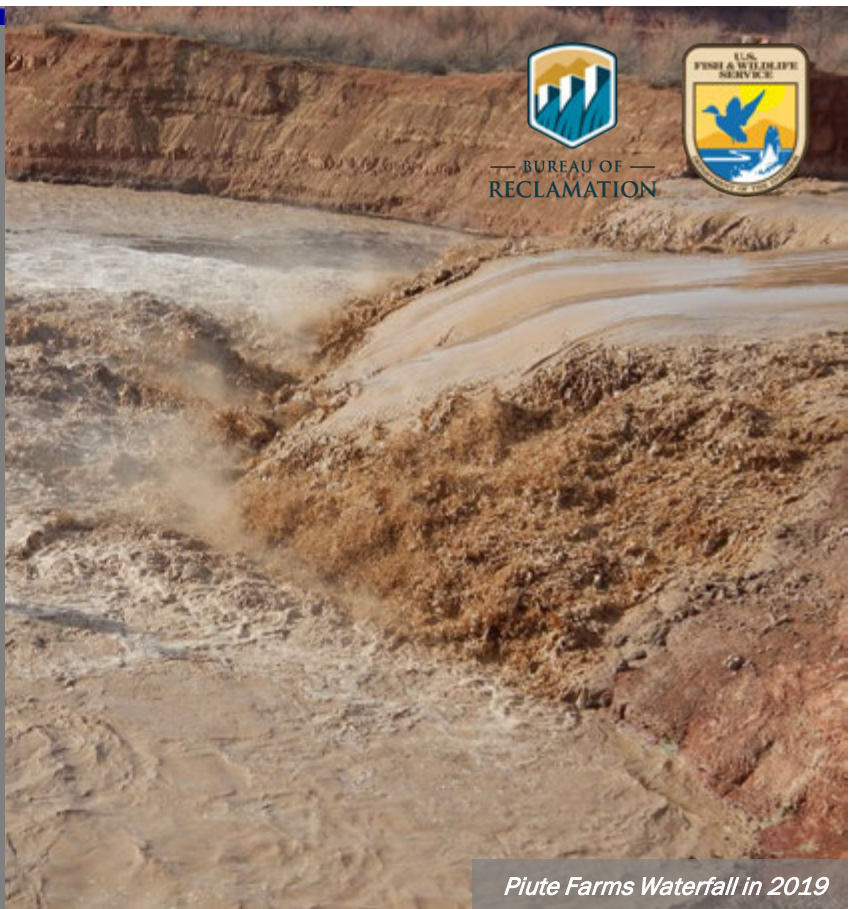
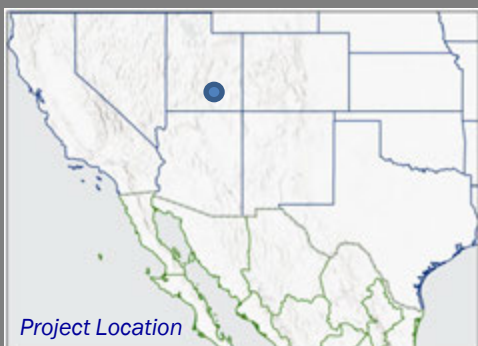


## ACTIONABLE SCIENCE

# Waterfall Effects on Native and Non-Native Fish Movement in the San Juan River



Lake Powell was created at the junction of the San Juan and Colorado Rivers at the completion of Glen Canyon Dam in 1963. The accumulation of sediment and the subsequent decline in reservoir water levels resulted in the river rerouting out of the original channel and forming a waterfall at Piute Farms that impedes fish movement. River managers stock Razorback Sucker (RS; *Xyrauchen texanus*) and Colorado Pikeminnow (CP; *Ptychocheilus lucius*) as part of the species' recovery plans. The San Juan River Basin Recovery Implementation Program (SJRRIP) moved stocked CP and RS upstream of the waterfall, then implanted them with passive integrated transponder (PIT)-tags to determine how the waterfall affects their movement.



## KEY ISSUES ADDRESSED

Fish in Lake Powell have no access to upstream habitat due to the Piute Farms waterfall. Researchers hypothesize that RS experience a recruitment bottleneck in early life stages with few wild-spawned larval fish surviving to the juvenile life stage. Improving access to upstream habitat for spawning adults would increase the number and distribution of wild-spawned larvae. Researchers needed to determine the effectiveness of current management strategies where they translocate fish upstream of the waterfall. Because of the difficulty of sampling this remote location, SJRRIP managers remotely monitored PIT-tagged fish to determine how RS and CP use upstream habitat and if they return back downstream of the waterfall after translocation.

## PROJECT GOALS

- Quantify what proportion of fish return to areas below the waterfall after translocation above it
- Develop methods to remotely monitor movement of PIT-tagged fish in Lake Powell and the San Juan River
- Collaborate with partners for PIT-tagging, monitoring, and compiling location data

## NON-NATIVE BARRIER

While the waterfall has negative impacts on native fish, it also serves as a barrier to non-native fish, preventing them from entering the San Juan River from Lake Powell.



*A Razorback Sucker in the San Juan River*

## PROJECT HIGHLIGHTS

**PIT-Antenna to Assess Passage:** SJRRIP Researchers used a remote antenna to monitor PIT-tagged RS and CP that congregated below the waterfall barrier each spring from 2014 to 2022. Antennas replaced more laborious capture/recapture methods formerly used to assess population dynamics.

**Translocating Upstream:** River managers have detected more than 2000 individual RS since deploying their PIT-tag antenna in 2014. Movement studies are ongoing; however, river managers found that translocations are temporary, and fish return to downstream habitats where they originated after making some use of upstream habitats.

**Collaboration for Data Compilation:** U.S. Fish and Wildlife Service (USFWS), Bureau of Reclamation, National Park Service, and the Navajo Nation collaborated to help with permitting of this project. Kansas State University (KSU) graduate students implanted PIT-tags and translocated fish upstream of the waterfall. USFWS, Navajo Nation, New Mexico Department of Game and Fish, Utah Division of Wildlife Resources, and KSU students conducted surveys and collected location data.

## Collaborators

- U.S. Fish and Wildlife Service
- Bureau of Reclamation
- San Juan River Basin Recovery Implementation Program
- See online for full list of collaborators

CCAST Author: Nilisha Patel, Johns Hopkins University, May 2022.

Photos courtesy of SJRRIP

For more information on CCAST, contact Genevieve Johnson ([gjohnson@usbr.gov](mailto:gjohnson@usbr.gov)) or Matt Grabau ([matthew\\_grabau@fws.gov](mailto:matthew_grabau@fws.gov)).

Visit CCAST:



## LESSONS LEARNED

Using PIT-antennas continuously in a location within the Colorado River Basin illustrated how remote data collection can more efficiently track movements and population numbers compared to capture and recapture methods. Antennas are especially useful for expanding survey duration because of the reduced labor needed compared to capture and recapture. Increasing the sampling period from 40 days in 2014, 2015, and 2016 to 110 days in 2017 yielded more unique fish detected on the PIT-antennae.

The high number of the RS stocked in the San Juan River that were later found downstream of the waterfall surprised SJRRIP biologists. The waterfall impedes adult fish below the waterfall from spawning in the San Juan River.

Relationships among federal and state agencies, universities, and tribal nations played a vital role in helping track fish and collect data. Many partners provided staff time to conduct surveys and collect field data, helping researchers cover more territory in the Colorado River Basin.

## NEXT STEPS

- Quantify spawning habitat between Lake Powell and the waterfall
- Collect more data from PIT-antenna to track fish movements and continue filling gaps in movement data
- Quantify the number of translocated fish spawning above the waterfall
- Consider constructing fish passage infrastructure based on future numbers of fish requiring translocation

For more information on this project, contact Scott Durst:

([scott\\_durst@fws.gov](mailto:scott_durst@fws.gov)) or Mark McKinstry ([mmckinstry@usbr.gov](mailto:mmckinstry@usbr.gov))



*Researchers Hold Native Fish from the San Juan River*