

Western Water and Power Solution Bulletin

Research and Development Office — Denver, Colorado

Bulletin No. 33

April 2010

Combining Radio-Telemetry and DNA Studies to Understand Fish Behavior

Meeting Endangered Species Act requirements to protect fish in order to ensure continued water deliveries

What Is The Problem?

Water resource facilities are increasingly managed for competing uses based on compromises between water and hydroelectric power demands and fish and wildlife requirements. Water releases from dams and powerplants, which affect aquatic habitat, often need to be adjusted to meet Endangered Species Act (ESA) requirements to protect threatened and endangered (T&E) fish. Facility modifications for fish passage, such as fish ladders, are needed at some sites to address ESA requirements.

Fish behavior studies are typically employed to determine appropriate measures to protect T&E fish. Radio-telemetry, video and sonar monitoring methods, as well as direct observations, are sometimes used to study fish behavior. Traditional fish behavior studies alone are sometimes insufficient to fully understand the potential need for changes to water resource facility structures and operations.

What Is The Solution?

Reclamation has collaborated with the Washington Department of Fish and Wildlife to combine radio-telemetry and genetics (DNA) studies to understand fish migration and species isolation impacts caused by water resource facilities. Radio-telemetry devices (tags) are used to monitor movements and DNA samples are collected and analyzed to determine genetic structure that can be correlated to ancestry. Fish are captured from various locations within a river basin and anesthetized, then DNA samples are taken from fin clips and radio-telemetry tags are surgically implanted in the body cavities. Radio tags transmit a uniquely coded frequency that allows biologists to locate and identify individual fish.

The tagged fish are tracked for extended periods and the data are analyzed to determine migration and spawning patterns. The results of the DNA analyses are then compared to the tracking results in an effort to correlate changes in fish behavior to water resources related facilities. For example, changes to a population of fish (e.g., its location, size and diversity) can be identified when the origin of the individual fish are known based on genetic information. The genetic information provides evidence of where the population existed within the basin before development and conclusions can be drawn regarding the apparent impacts water resources structures and operations have had on these populations.

Who Can Benefit?

This combination of study methods can provide meaningful results where previous methods have been inadequate to fully understand fish population dynamics. Reclamation managers can use these findings to make informed decisions about whether

water release schedules and/or control structures need to be altered. Water and power users benefit when effective solutions achieve environmental compliance with minimal impacts to water and power deliveries.

Where Have We Applied This Solution?

Combined radio-telemetry and genetics studies have been used extensively in the Yakima River Basin of Washington State to understand bull trout behavior. Study results correlate



observed bull trout movements to water flow and temperature, and the presence of Reclamation dams and fish passage facilities. The findings also document the origins of certain populations and draw conclusions regarding historic impacts due to structures and operations that have caused genetic isolation, resulting in population declines. This has provided significant information on the relative value of proposed structural and operational modifications with regard to improved bull trout habitat and migration conditions in this basin.

Future Development Plans

Reclamation has also recently funded similar work looking at genetic diversity of bull trout above and below natural and man made barriers in Northern Montana. Research should also transfer to other species of fish in other regions to evaluate possible impacts by Reclamation structures.

More Information

Copies of the reports of findings associated with the Yakima River Basin bull trout studies are available at <http://www.usbr.gov/pmts/fish/Reports.html>.

Contact Information

Eric Best, Bureau of Reclamation, Technical Services Center, EBest@usbr.gov (303) 445-2179

Collaborators

Reclamation's Science and Technology Program and Columbia-Cascades Area Office, Washington Department of Fish and Wildlife and U.S. Fish and Wildlife Service