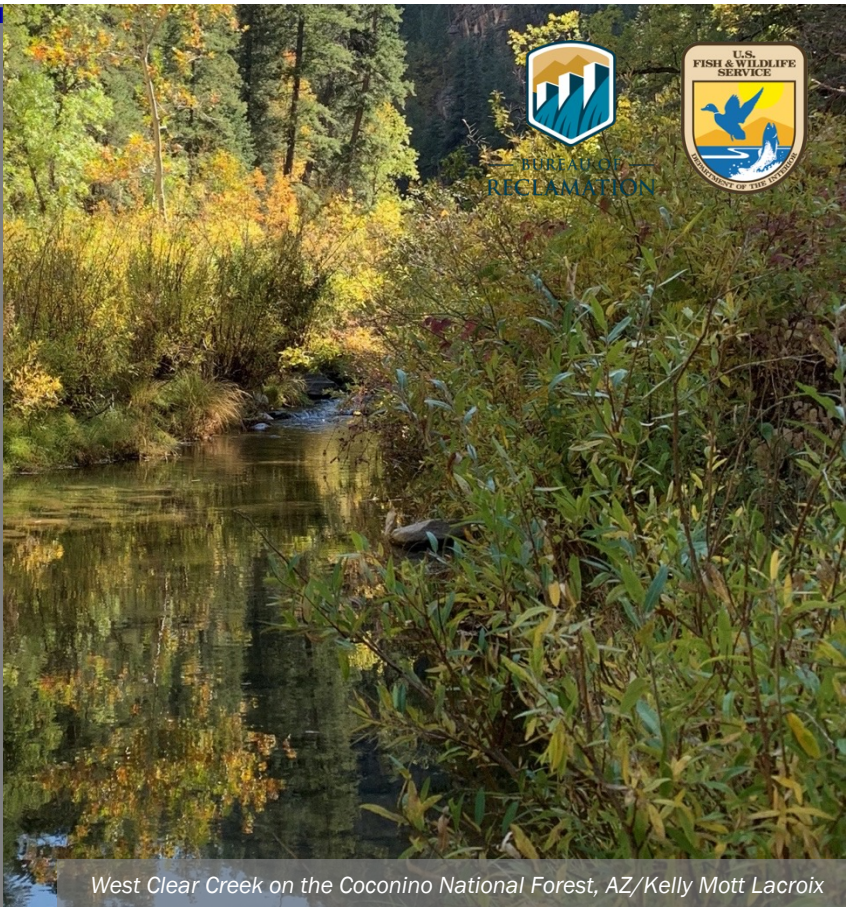
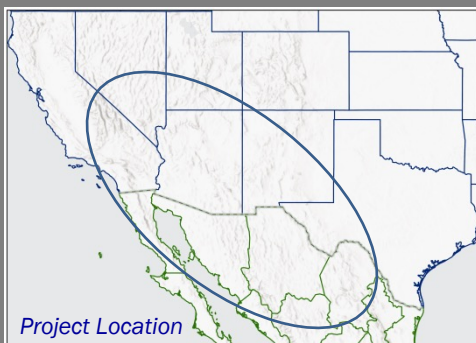


ACTIONABLE SCIENCE

Developing a Database to Examine Environmental Flows in Desert Rivers of the United States and Mexico



Riparian ecosystems are essential for wildlife habitat in deserts. Though surface and shallow groundwater flows are crucial to maintain riparian ecosystems, there is limited information regarding the specific flow characteristics needed. To address this need, University of Arizona's Water Resources Research Center (WRRC) and Northern Arizona University's Watershed Ecohydrology Program created the Desert Flows Database. The Database contains high-quality information to help resource managers better understand environmental flows in desert streams of the U.S. and Mexico. Using the Database, the research team conducted a study to analyze environmental flow data throughout the region's river basins.



KEY ISSUES ADDRESSED

Groundwater pumping, urban development, and pollution can hinder nature's ability to provide the water needed to support ecosystems in arid regions. Furthermore, climate change is altering the timing and intensity of rainfall, and increasing temperatures are causing water to evaporate in larger amounts. These factors make it difficult for surface water and groundwater reserves to replenish. Baseline data on environmental flows, different amounts of water necessary to sustain species and ecosystems, is lacking for most species in arid regions. Without information on environmental flow extent, quality, quantity, and timing, natural resource managers cannot make informed environmental flow management decisions or inform policy or law.

PROJECT GOALS

- Provide managers with information to better understand environmental flows
- Determine the distribution of environmental flow data and identify gaps in knowledge
- Determine the most studied species and pressing risks to riparian ecosystems
- Catalog methods used to determine flow needs

DATABASE REACH

The U.S Forest Service uses the Database to help with environmental compliance, instream flow water right applications, and stream restoration in the Tonto National Forest Plan.



Jemez River on the Santa Fe National Forest, AZ/Kelly Mott Lacroix

PROJECT HIGHLIGHTS

Responding to Manager Needs: The research team surveyed 47 resource managers in the U.S. and Mexico to determine the most important information for the management of riparian and aquatic ecosystems.

Methodology: Based on the results of these surveys, the WRRC established a strict set of query parameters to find all the literature possible from reliable research sources. Many of these works were not developed as environmental flow papers but contained valuable information, allowing them to be part of the Database.

Results of the Study: Among the six ecoregions in this study, the Arizona/New Mexico Mountains and Plateau made up 33% of the 310 studies mentioning water requirements for the environment. The Mojave Desert and the Sierra Madre Occidental held the fewest studies. In these six ecoregions, the most commonly studied species were cottonwood (*Populus* spp.), mesquite (*Prosopis* spp.), tamarisk (*Tamarix* spp.), willow (*Salix* spp.), and chub (*Gila* spp.). In addition, the most common risks and stressors to riparian and aquatic species and ecosystems were altered flows, climate change, invasive species, groundwater impacts, water quality, and engineered structures such as dams. Overall, the Database contained 34 different methods for determining environmental flow needs.

Collaborators

- University of Arizona
- Northern Arizona University

Case Study Authors: Tam Luong, University of California, Los Angeles, and Kelly Mott Lacroix, U.S. Forest Service, October 2022. For more information on CCAST, contact Genevieve Johnson (gjohnson@usbr.gov) or Matt Grabau (matthew_grabau@fws.gov).

Visit CCAST:



LESSONS LEARNED

There was a bias toward researching specific systems and species. For example, more environmental flow-related studies have been conducted on cottonwoods, but hardly any for the Arizona walnut (*Juglans major*). As such, basic data on certain systems are still limited. This data collection bias leads to gaps on key species and does not accurately represent the region.

A solid understanding of the regulatory framework is crucial to properly manage riparian and aquatic ecosystems. Managers will struggle to allocate environmental flows if the law does not allow it. Therefore, it is essential to thoroughly examine the region's policy standards and regulatory frameworks so that both human and riparian ecosystem flow needs are met. Even with this knowledge, managers need to determine if any stakeholders are interested in preserving or restoring these ecosystems. They will need to be involved in management as these changes will directly affect them.

Although the Database is a powerful tool, it needs to be marketed and updated; otherwise, it will not have adequate reach to its intended audiences and the usefulness of it will fade overtime. This circumstance provides a partnership opportunity among WRRC and partners to periodically update the Database.

NEXT STEPS

- The Database is up to date as of July 2015, but the long-term utility of the Database depends on periodic updates. The team is pursuing collaborations to use working groups from federal, state, local managers, non-profits, and academics to maintain the Database.

For more information on this project, contact Kelly Mott Lacroix: kelly.mottlacroix@usda.gov



Rio Grande in Big Bend/Genevieve Johnson/Bureau of Reclamation