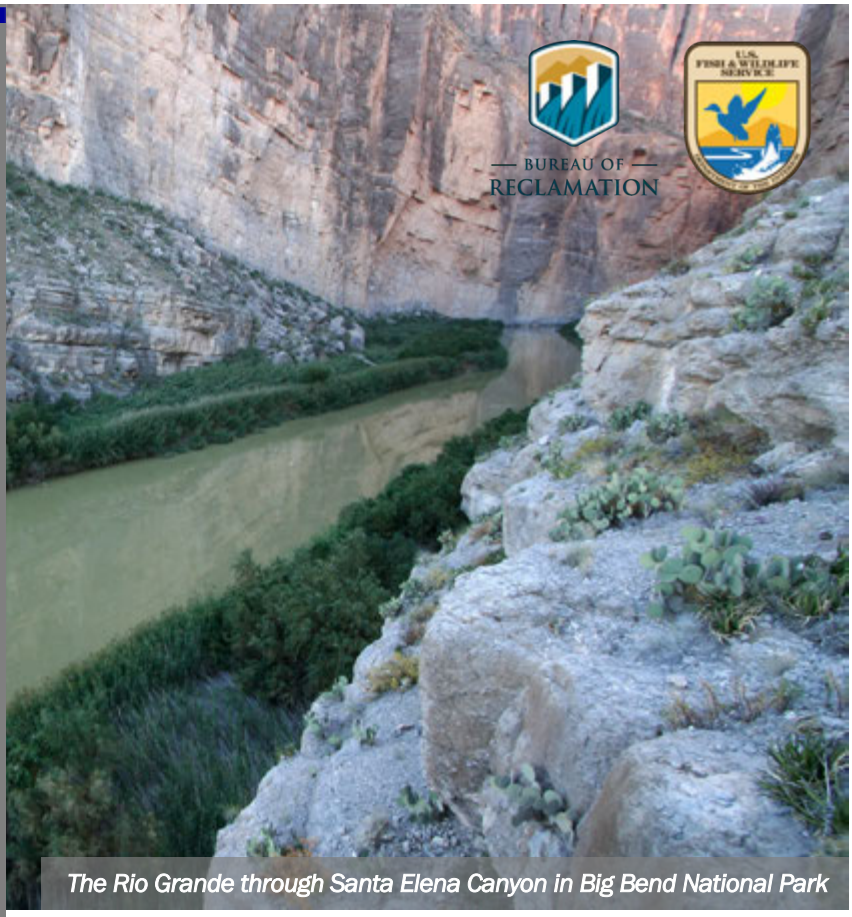
ACTIONABLE SCIENCE

Assessing the State of Water Resource Knowledge and Tools for Future Planning in the Lower Rio Grande-Río Bravo Basin



The Rio Grande through Santa Elena Canyon in Big Bend National Park

The Rio Grande/Río Bravo (hereinafter referred to as the Rio Grande) forms 2,034 km of the border between the United States and Mexico and provides a crucial water source for 13 million people. Developing effective water-management strategies requires the binational coordination of diverse stakeholders with sometimes different regulations, societal interests, and objectives. To better evaluate the human and environmental water needs of this highly constrained river system, University of California-Davis researchers described the state of the art in water-management policies and provided an inventory of available water-resource data and models.


Project Location

KEY ISSUES ADDRESSED

The Rio Grande Basin is a highly constrained river system that has undergone habitat degradation as a result of channel narrowing, loss of reliable streamflow, and the introduction of invasive species, with the near-extinction of endemic aquatic species one of the consequences. The multi-national, multi-state, and ecologically diverse nature of the Rio Grande Basin makes resource management a complex task. Although water-resource data and water-supply models exist for the different reaches of the basin, there have been no previous efforts to compile this information to make it easily accessible to water-resource managers or to integrate existing models into a holistic watershed decision-support tool.

PROJECT GOALS

- Compile georeferenced water-related data for the Rio Grande Basin
- Develop an inventory of water-resource modeling tools for evaluating human and environmental water management objectives
- Assess applicability of available modeling tools for evaluating trade-offs between societal and environmental flow requirements

Rio Grande through Boquillas Canyon, Big Bend National Park

ALL IN ONE PLACE

This project compiled data from hundreds of different sources, including datasets in Spanish, allowing researchers to quickly access previously dispersed water management information.

PROJECT HIGHLIGHTS

Two-Step Approach: The research was divided into two main tasks. First, all relevant water-management data were collected, compiled and spatially referenced to a map projection. Second, a thorough analysis of water-resource modeling tools for the basin was completed. Relevant water-management data were collected from different sources and merged into a single spatial dataset.

A Comprehensive Toolbox: This work provides water resource managers with an easily accessible and comprehensive inventory of existing tools that evaluate human and environmental water management strategies in the Rio Grande Basin across the U.S. and Mexico. A review of almost 60 water-supply models was performed. This analysis includes a thorough review of the motivations and decision-making processes for which these tools were developed.

Data Collection: A collection of geographic datasets of water-related elements on the Rio Grande Basin was made and categorized. Data coming from different agencies is frequently found with different characteristics or formats and an important part of this work was to homogenize such differences when possible.

LESSONS LEARNED

The Rio Grande needs to be managed as a single system. Water management is an important part of its history, and water management information from both sides of the border needs to be considered to best address complex problems in the basin.

The results of this research show that there are a variety of models available for planning activities across the basin. However, there were not enough models to cover the needs of the entire basin or with the necessary time-step (daily or hourly) for developing operational environmental flow targets in the basin.

Implementing an adaptive management strategy would help facilitate the evaluation and correction of environmental flow releases. Project researchers recommend moving from monthly planning models into weekly (or smaller) time-step models and operational models that mix surface water and hydraulic characteristics to account for factors such as sediment concentration, water quality, and floodplain inundation.

NEXT STEPS

- Implement another two-fold study to estimate the Rio Grande's daily natural flow regime from 1900-2015 to better understand the evolution of its natural hydrology and to characterize drought patterns and flood events
- Have project serve as a strong foundation of literature review and data for future research on the complex water-resource management issues of the Rio Grande Basin

Collaborators

- Water Management Lab, University of California-Davis
- Union of Concerned Scientists

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Photos courtesy of Alan Cressler/USGS
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Rio Grande upstream of Boquillas Canyon, Big Bend National Park