Summary of White Paper 2

Water Resource Modeling of the Colorado River: Present and Future Strategies

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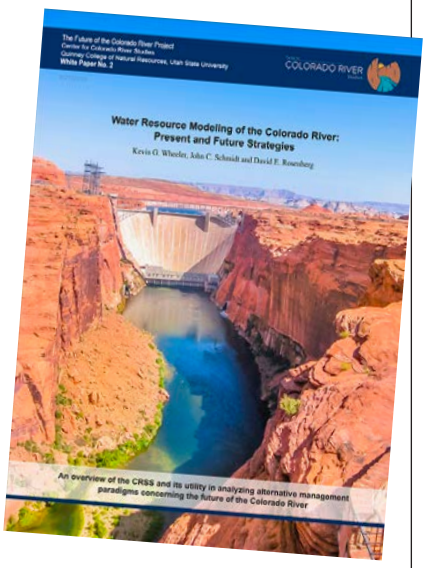
The referenced white paper describes the structure of the CRSS and how it is used in long-range planning. It also introduces the concept of alternative management paradigms for planning the future of Colorado River water supply and ecosystems.

Understanding the Basics of CRSS

The Colorado River Simulation System (CRSS) is an influential water-policy planning tool developed by the Bureau of Reclamation and used by other stakeholders to simulate the complex management of the Colorado River and its major tributaries. The CRSS has been used extensively to explore alternative policies during activities such as the development of the 2007 Interim Shortage Guidelines, the 2012 Basin Water Supply and Demand Study, and bi-national negotiations concerning coordinated adaptive allocations and environmental releases for the Delta.

Today, an increasing range of stakeholders seeks to participate in a new era of conversations about how to manage the Colorado River. However, a lack of understanding of the CRSS complexities hinders its use by many non-traditional stakeholders, such as those focused primarily on river ecosystems and tribal use of water. The purpose of this white paper is to present a concise description of how the CRSS works and elucidate its strengths and weaknesses so that more stakeholders can better understand the CRSS, the results it produces and the model's inherent limitations, thereby empowering more participation and conversations about how the river can be better managed.

"The CRSS is appropriate for addressing basin-wide issues, but is not designed to address issues within specific tributaries, or those that require finer temporal scales."



The current model network consists of 12 reservoirs, 29 headwater tributary and within-basin stream-flow gages, 520 water user objects; 145 operating rules codify many aspects of a complex set of treaties, compacts, laws, decrees, Records of Decision, and other administrative rules that represent the modern interpretation of the Law of the River. The CRSS is used to explore potential changes to this collection of regulations.

What you'll find in the paper:

- Introduction to the modern Colorado River and its management
- CRSS structure, representation of the channel network and solution sequence
- The current management paradigm for operations of Lake Powell, Lake Mead and other major federal dams in the Colorado River Basin.
- CRSS management and updating
- The challenge of incorporating environmental considerations into CRSS modeling
- Alternative management paradigms and performance metrics

Additional resources in the paper:

- Details on Colorado River consumptive uses and losses in the 21st Century
- Detailed information on the Upper Colorado River, Green River, San Juan River watersheds, Grand Canyon Segment, and the Lower River
- Explanation of Fill Mead First and Fill Powell First alternative management paradigms

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How the Modeling System is Currently Used

The primary focus of the CRSS is simulating the operation of the major federal reservoirs of the mainstem Colorado River and its major headwater branches. It is primarily configured to address water allocation of the lower Colorado River, simulate the management of stream flow through the Grand Canyon between Lake Powell and Lake Mead, and simulate the operations of the reservoirs of the mainstem of Green River (Fontenelle and Flaming Gorge), the Aspinall Unit on the Gunnison River (Blue Mesa, Morrow Point and Crystal), and releases from Navajo Reservoir. Current management of these infrastructures can be understood using CRSS and alternative management approaches can be explored.

Limits of the System

The CRSS is imprecisely configured to address water supply and environmental management issues within many large tributaries of the headwater branches. This includes the Colorado River upstream from Glenwood Springs, the Yampa River upstream from Maybell, the Dolores River, the Duchesne River watershed, the Animas River, and every tributary in the Lower Basin. Today, river management programs, endangered fish recovery programs, and some Native American tribes are focusing on these tributaries. It is important for stakeholders to understand that the CRSS is most appropriate for addressing basin-wide issues, but is not designed to address issues within these tributaries.

Using a monthly time scale over a multi-decadal planning horizon, the CRSS is not configured to simulate many modern environmental management issues that require finer temporal scales, such as those critical to river ecosystems. Using the CRSS to develop policies to enhance river ecosystems will require bridging the gap between the monthly time scale at which the CRSS operates and the daily or hourly time scales at which many river ecosystems respond to natural processes, reservoir releases, and water withdrawals. Expanding the spatial or temporal resolution of the CRSS would require a significant effort.

Expanding the Pool of Informed Users

Many stakeholders from government agencies, institutions, and consultancies currently use the CRSS. However, newly interested stakeholders must invest significant resources to understand how the model works and how to use it to meaningfully explore alternative paradigms to manage the Colorado River in ways that enhance water supply reliability, hydroelectricity production, and/or river ecosystem health. Expanding the pool of people who have sufficient expertise to use the CRSS is a significant challenge. To demonstrate the process and value of doing so, we describe the effort required to evaluate alternative strategies for storing water in Lake Powell and Lake Mead.

This white paper is part of a series by the Future of the Colorado River Project that seeks to explore alternative management paradigms for the Colorado River to benefit water supply users and river ecosystems and that empower more stakeholders to participate in planning the future of the river system. To read the full paper, visit our website or go directly to our website: qcnr.usu.edu/coloradoriver/futures