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Informing Adaptive Strategies for the Colorado Basin

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\textbf{Abstract:} The Colorado River is the single most important source of water in the southwestern United States, providing water and power for nearly 40 million people and water to irrigate more than five million acres of farmland across seven states and for 22 Native American tribes. A vast physical and institutional infrastructure exists to provide water, as well as hydropower, recreational opportunities, environmental services, and other benefits to all these users. However, increasing demand, a decade of drought, and expectations of a significantly changing future climate have put the system under significant and deeply uncertain stress. This paper employs and extends Robust Decision Making (RDM) to support Basin planners as they create, evaluate, and deliberate about adaptive strategies. The work builds on, but goes beyond the 2012 Colorado River Basin Supply and Demand Study developed in collaboration by the seven Colorado Basin States and the U.S. Bureau of Reclamation, with technical support from RAND. This new analysis places the challenge facing these decision makers into a formal structure of adaptive strategies, explores choices that planners may make when considering how to respond to new information and tradeoffs between alternative responses. The study employs planning scenarios generated by scenario discovery methods, which identify the conditions under which specific near-term actions or contingencies are necessary and long-term implementation schedules perform well. The study also employs a naïve-Bayes' model to assist planners in integrating new information with their current beliefs, providing guidance on what information in the next decade may cause them to adjust the strategy. Finally, the approach allows decision makers to consider the extent to which the current options under consideration may prove sufficient, and the extent to which they may need to consider transformational strategies.

\textbf{Keywords:} water management, deep uncertainty, adaptive strategies, robust decision making, Colorado Basin, climate change