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Alternative Policies on the Colorado River

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Kevin Wheeler is currently a research associate with the Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) and the Institute for Arctic and Alpine Research (INSTAAR) at the University of Colorado in Boulder. He has also worked at the International Institute for Applied Systems Analysis in Laxenburg, Austria with a focus on water quality modeling in developing countries. He is a graduate of the University of Colorado with an MS and BS in Environmental/Water Resource Engineering.

Timothy M. Magee is an operations research analyst at University of Colorado CADSWES. He designed and implemented optimization components of RiverWare, a linear goal program which included an extension of minimax optimization. With Mr. Wheeler and Dr. Fulp he developed the Graphical Policy Analysis Tool (GPAT), an add-in to Microsoft Excel to compare policy differences across multiple measurements, time periods, and scenarios. He has BS degrees in Chemical Engineering and Mathematics (1984).

Terrance J. Fulp is an operations research analyst for the Lower Colorado Region of the US Bureau of Reclamation. He is a co-principal investigator for the Department of Interior's Watershed and River Systems Management Research Program, a joint program with the Bureau of Reclamation and Geological Survey to research and develop decision support systems for watershed and river system management. In 2000, he led the technical modeling effort for the Dept. of Interior in the preparation of an environmental impact statement for interim surplus criteria for the Colorado River. In addition, he has coordinated a multi-agency effort (Dept. of Interior and Dept. of Energy) in the assessment of the economic benefits of integrated power pooling of Lower Colorado River hydroelectric resources. He holds a BS in Earth Sciences from the University of Tulsa (1975), an MS in Geophysics from Stanford University (1977), an MS in Civil Engineering from the University of Colorado (1988), and a PhD in Mathematical and Computer Sciences from the Colorado School of Mines (1996).

Edith A. Zagona is a research engineer at University of Colorado CADSWES, leads the research and development of RiverWare and is the Interim Director of the CADSWES. As a researcher at CADSWES since 1988, she has lead a variety of projects focusing on water resources management modeling and decision support systems funded by TVA, US Bureau of Reclamation, US Army Corps of Engineers and others. Since 1992 she has lead a team of researchers in the R&D of RiverWare, a modeled-based decision support software for planning and operating reservoir and hydropower systems. She holds a BA in Philosophy and Mathematics (1975) and a BS in Civil Engineering (1978) from the University of Arizona, an MS from Colorado State University (1983) focusing on Hydraulics and River Mechanics, and a PhD from the University of Colorado (1992) in Water Resources Engineering focusing on automation in water management. From 1978 to 1987 she modeled and designed large automated canal systems and other hydraulic structures with the US Bureau of Reclamation. She is a registered engineer in Colorado.

ABSTRACT

The Colorado River has a long history of litigation over a limited water supply. Projected increases in water consumption and recognition of environmental needs will lead to further litigation unless a consensus of interested parties can be reached. Recent developments in computer modeling suggest a way of reaching such a consensus on sustainable policies that could be transferred to other river basins. The United States Bureau of Reclamation (Reclamation) has modeled the Colorado River within a general modeling environment, RiverWare, developed at the Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) at the University of Colorado at Boulder under joint sponsorship by Reclamation and the Tennessee Valley Authority. The Colorado River model includes the existing policy, frequently called the "Law of the River." The structure of RiverWare allows policies to be extended and modified easily by model users. This flexibility in modeling alternative policies, combined with graphical comparison of the results, has led to the evaluation of a wide range of alternative policies by Reclamation, CADSWES, and several environmental groups. Rapid comparison of policy alternatives has led to generating improved alternatives that better balance the multiple uses of the river and exploit win-win opportunities. Recent studies include:

- 1) Interim Surplus Guidelines for developing a strategy to decrease California's dependency on surplus Colorado River water;
- 2) Secretarial Implementation Agreement to analyze the effects of water transfers and potential inadvertent overrun withdraws as proposed in California's Quantification Settlement Agreement and Reclamation's Inadvertent Overrun Policy;
- 3) Multiple Species Conservation Program, designed to conserve habitat and work toward the recovery of threatened and endangered species, while accommodating future water and power development;
- 4) The impact on water users of alternative plans for supplying sustainable flows to restore biodiversity in the Colorado River Delta; and
- 5) The operation of the Flaming Gorge Dam to simulate natural flow patterns and meet minimum flow recommendations and consumptive use demands.