

Colorado River Modeling Work Group Charter

The Colorado River Modeling Work Group (Work Group) is comprised of technical staff from Reclamation's Lower Colorado and Upper Colorado Regions. The Work Group is responsible for maintenance and development of operations and planning models for the Colorado River Basin. Descriptions of these models can be found at the bottom of the page. Model maintenance includes ongoing work to keep models synchronized with physical, policy and data changes of the Colorado River Basin. Model development entails incorporating new science and technology as available and expanding model capabilities to meet anticipated future needs from within Reclamation and the Colorado River Basin stakeholder community.

Interaction with the Colorado River Basin stakeholder community regarding technical modeling issues, i.e. maintenance activities and anticipated development, is conducted through the Colorado River Stakeholder Modeling Work Group (Stakeholder Work Group). Members of the Stakeholder Work Group are comprised of technical stakeholders that have the capability to run Reclamation's models or have a vested interest in learning to do so. The Stakeholder Work Group is led by a member of the Work Group. This group meets annually or as necessary. *Further information regarding this group will be added at a future date.*

The Work Group meets as necessary throughout the year either in person or via tele-conference. A member of each region is designated as a lead and works jointly as the group co-leads. Leads rotate annually upon completion of the Annual Operating Plan or at the end of each calendar year. Tasks are assigned to group members to meet maintenance and development goals proposed by the group. The co-leads manage work flow for the group and interact with the management sponsors.

Membership and Primary Contacts

Lower Colorado Region

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Upper Colorado Region

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Management Sponsors

Lower Colorado Region

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Upper Colorado Region

Dave Trueman
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Description of Models

The Work Group currently administers the Colorado River Simulation System (CRSS) for long-term planning and policy studies, and the 24-Month Study for mid-term operations. Both models are implemented in the RiverWare™ modeling framework. RiverWare™ is a commercial software package developed and maintained by the Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) at the University of Colorado for general river basin management and decision support. For more information on RiverWare™ and its applications see the [CADSWES website](#).

CRSS

CRSS is Reclamation's long-term planning and policy model for the Colorado River Basin. Originally developed by Reclamation in the early 1970s as a Fortran-based modeling system, CRSS was implemented in the RiverWare modeling framework in the mid-1990s with the same spatial and temporal resolution, basic input data, and physical process algorithms as the original CRSS. A set of operational rules was also developed to mimic the policies contained in the original model. Since then, CRSS has undergone constant development and enhancements to reflect current operational policy as well as investigating and improving, where necessary, the physical process methodologies being simulated.

CRSS is used to project future river and reservoir system conditions on a monthly time-step decades into the future. The basis of the simulation is a mass balance (or water budget) approach that accounts for water entering the system, e.g., natural inflows, water leaving the system, e.g., consumptive use and evaporation, and water moving through the system, i.e. either stored in reservoirs or flowing in river reaches.

Input data required for model simulation include physical process parameters, inflow hydrology, and future diversion and depletion schedules for entities in the United States and Mexico. In addition, assumptions regarding mainstream reservoir operations, particularly for Lake Powell and Lake Mead, are also provided as input to describe how water is released and delivered under various hydrologic conditions. Although these data are generally the best available, there are several sources of uncertainty associated with model input, especially when simulating system conditions over several decades. Data uncertainty limits the absolute accuracy of the model; consequently, CRSS is not used to predict future system conditions, but rather to project possible outcomes over a range of hydrologic conditions.

Model output from CRSS is specified by the user based on the data requirements of the study. For example, over 300 variables were output for analysis used in developing the Colorado River

Interim Guidelines (2007). CRSS can be run as a deterministic (single hydrology) or probabilistic (multiple hydrology) model. Typically, long-term policy and planning studies evaluate multiple hydrologic sequences and produce probabilistic output for each parameter including reservoir operations, e.g., elevation, releases and power generation, river flows and water deliveries. Post-processing techniques used to sort, aggregate, and visualize probabilistic output data include standard statistical methods and other numerical techniques.

24-Month Study

The 24-Month Study model is used by Reclamation for planning annual and monthly operations of the major reservoirs in the Colorado River Basin for a period of 24 to 30 months. The model is implemented in RiverWare™ and updated once each month to establish targets for parameters such as power generation and reservoir elevations. Annual operations are adjusted as prescribed by the model during the year as runoff forecasts and water orders are updated. In addition, the 24-Month Study is used to update the Annual Operation Plan in the fall of each year.

Inputs to the model include forecasted inflows (provided by the Colorado basin River Forecast Center), water uses, and planned hydropower generating unit outages. Each month, historic releases and reported uses, as well as changes in unit maintenance schedules are updated for the previous month and inflow estimates and water use forecasts are updated for future months. The model is then re-run for an updated plan of operations.

The 24-Month Study is a deterministic model that uses a single forecasted inflow hydrology to generate a single set of model output. Results are posted on Reclamation's [Lower Colorado River Operations webpage](#) after each monthly study is complete (usually in the second week of each month). The principal model output used for decision support includes reservoir parameters, e.g. elevation, releases and power generation, and water deliveries to users in the Lower Basin. The model output is also an information source for Reclamation's Phoenix and Yuma Area offices to advise area residents and water users of forecasted impacts at the local level, which may arise due to flood control releases or other adverse conditions.