

# Hydrologic Model Adaptation for Snowpack Runoff in the Upper Colorado River Basin

U.S. BUREAU OF RECLAMATION, COLORADO WATER CONSERVATION BOARD

## PROJECT SUMMARY

The U. S. Bureau of Reclamation and the Colorado Water Conservation Board needed a means to improve snowpack assessment and hydrologic modeling in Colorado by incorporating spatially-distributed datasets and modeling techniques. Riverside Technology, inc. investigated gridded snowpack data produced from the Snow Data Assimilation System for the Upper Colorado River basin and developed distributed hydrologic models for selected basins to be used operationally by a local river forecasting center.

LOCATION  
Colorado, U.S.A.

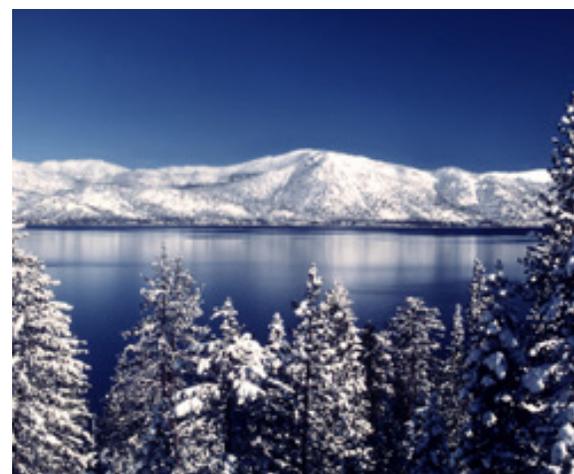
PERIOD  
2006 – 2009

## PROJECT DETAILS

The objective of the project was to improve snowpack assessment in Colorado for water supply and flood protection planning using distributed data and modeling techniques. Riverside Technology, inc. (Riverside) evaluated gridded snowpack estimates from the National Weather Service's (NWS) Snow Data Assimilation System (SNODAS).

In addition, Riverside investigated using the NWS' Research Distributed Hydrologic Model (RDHM) in selected Colorado sub-basins.

A water balance analysis was performed over most of the Colorado River basin within the State of Colorado to understand the SNODAS estimates. Three sub-basins (Blue River below Dillon Reservoir, Colorado River below Lake Granby, and Williams Fork below Williams Fork Reservoir) were selected for detailed hydrologic modeling using the RDHM.



Riverside utilized snowmelt and precipitation grids from SNODAS to drive the RDHM rainfall-runoff model. The distributed modeling results were evaluated and compared to results from the lumped modeling process used operationally at the Colorado Basin River Forecast Center (CBRFC). The initial results demonstrate that quantitative use of SNODAS in hydrologic modeling was hampered by the limited period of data availability and volume biases in the precipitation inputs.

In the next phase of the project, which concluded in January 2009, a revised approach was developed to address previous limitations. The CBRFC developed historical datasets of gridded precipitation and temperature that allowed Riverside to calibrate the distributed snow and rainfall-runoff models in RDHM for the three selected sub-basins for a long period of record (1980-2005).

Riverside developed procedures for updating the distributed snow model states that will allow the CBRFC to run the models operationally and correct errors in real-time precipitation and temperatures. The updating procedure can make volume adjustments from snow observations and/or spatial adjustments from the SNODAS snow water equivalent (SWE) product. CBRFC will run the calibrated RDHM operationally for the three sub-basins in the future. This study showed that combining information from SNODAS, the calibrated RDHM, and the snow updating procedures can produce the enhanced, gridded snowpack assessment information that could lead to more accurate streamflow and water supply forecasts.

## RELATED PROJECTS

SNODAS Adaptation for Water Supply Decisions in the Upper Rio Grande Basin

Snowpack Characterization and Hydrologic Modeling in the Upper Rio Grande Basin

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