# Colorado River Water Availability Study

## Phase I

## Upcoming Meetings*

**Yampa/White/Green Basins Roundtable**
Wed. Oct 21, 2009
Craig, CO

**Colorado Basin Roundtable**
Mon, Oct 26, 2009
Glenwood Springs, CO

**North Platte Basin Roundtable**
Tue, Oct 27, 2009
Walden, CO

**CWCB Board Meeting**
Tue, Nov 17, 2009
Denver, CO

**IBCC Meeting**
Wed, Dec 2, 2009
Denver, CO

* Confirm dates and times and check agendas for meetings where the CRWAS will be presented at http://ibcc.state.co.us/.

## Newsletter Topics



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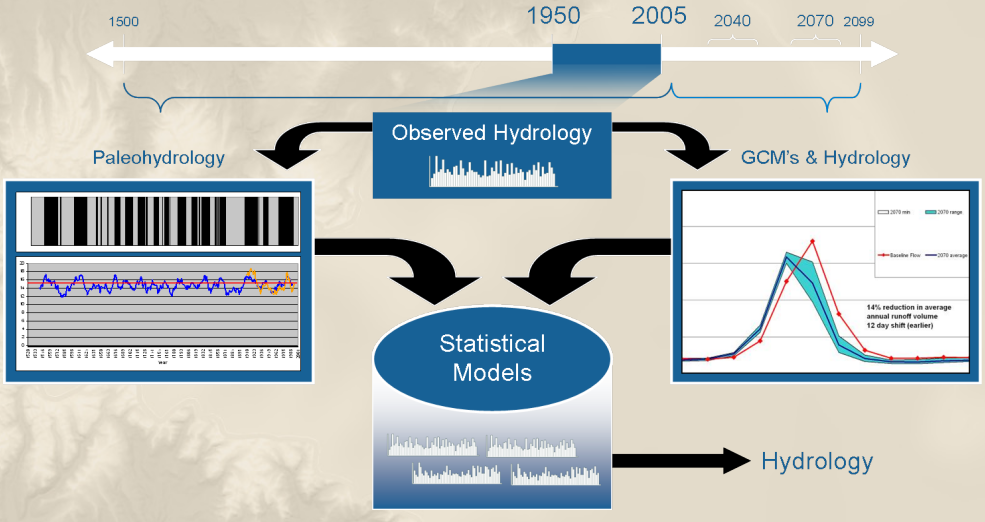
## Study Purpose and Progress


The Colorado River Water Availability Study (CRWAS or Study) is a multiphase study being conducted under the direction of the Colorado Water Conservation Board (CWCB or Board). The Study's primary purpose is to estimate the amount of water still available for consumptive and non-consumptive (in-stream) uses in the Colorado River basin in the State of Colorado. The Study will provide important information for the State of Colorado, Colorado River water users, and other stakeholders throughout the State regarding water supply variability and uncertainty.

The Study will analyze water supply and use for the State's major Colorado River tributaries; shown on the adjacent map, including 1) Yampa/White/Green; 2) Colorado; 3) Gunnison and 4) Dolores/San Juan/San Miguel. These basins are represented by the four Basin Roundtables (BRTs).

The CRWAS is being conducted in two phases. Phase I, now underway, focuses on existing levels of water use (based on absolute water rights and operating agreements now in place). In addition to analyses based on historic hydrology, alternate hydrologic scenarios will also be assessed. These alternate hydrologic scenarios incorporate paleo-hydrology to extend estimates of historical hydrology back 450 years and newly developed estimates of the effects of global climate change.

*Figure 1 - Development of Hydrologic Scenarios*



Phase I is scheduled to be completed in December 2009. Phase II, now in its scoping phase, will address projected future water use levels including beneficial uses recognized under Colorado water law and other potential "non-water right" consumptive and non-consumptive uses.

*Figure 2 - Modeling Hydrologic Scenarios for Water Availability*


## Study Process and Interim Results

The assessments of current (Phase I) water availability will be made for three alternative hydrologic scenarios. In Step 1, current levels of water use (or water demands) will be superimposed on historical hydrology to determine how much water would still be available if this level of demand had existed from the 1950's forward. This will allow an estimation of the effects of severe drought years like 1977 and 2002 if these dry years were to occur again with the higher water demands of today. It also allows us to look at how water supply and storage facilities, that exist now, but may not have existed in the 1950's, would likely be operated under their current water rights and operating strategies in years ranging from dry to wet. Figure 3 shows the average historical consumptive use from 1970 through 2006. Results such as these will be compared to current consumptive demands with historical hydrology.

In Step 2, the historic hydrologic records are extended back 450 years using previously published tree-ring studies (paleohydrology). Since it is statistically implausible that the exact same sequence of years ranging from wet to dry would occur in the future, the Study is analyzing 100 different variations of these years "re-sequenced" for comparisons with the results in Step 1. Figure 4 highlights the potential

*Figure 3 - Historical Consumptive Use in Colorado River Basin*

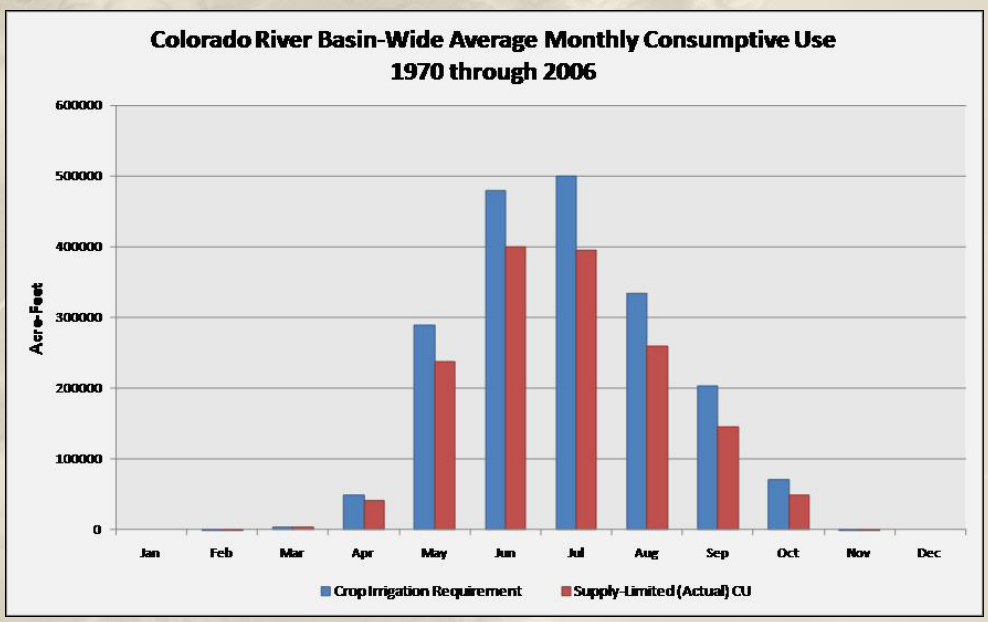



*Figure 4 - Drought Comparison - Observed vs. Paleo (Colorado River at Cameo)*

| | |
|---|---|
| Observed Maximum Length of Drought (years) | 6 |
| Paleo Average Maximum Length of Drought (years) | 6.6 |
| Paleo Worst-case Maximum Length of Drought (years) | 12 |

*Figure 5 - GCM Resulting Change to Temperature 2040 and 2070*

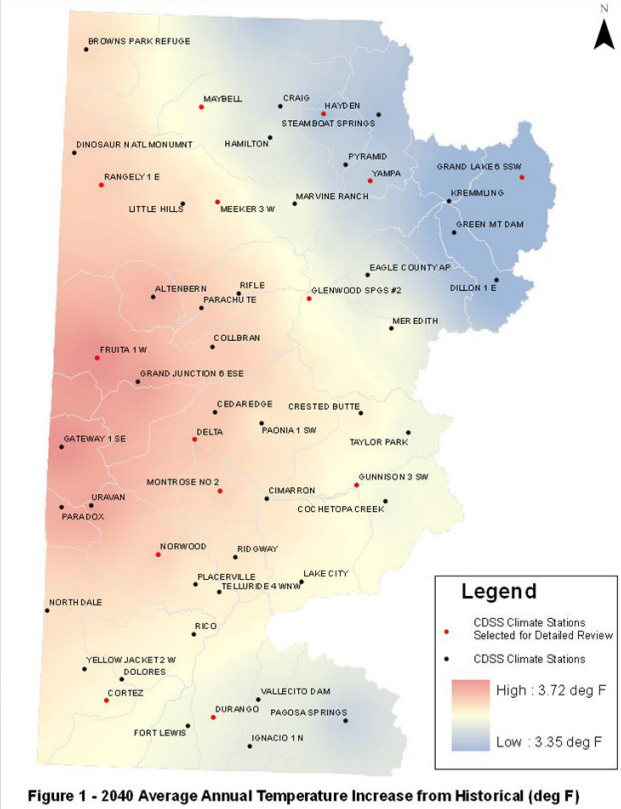



**Figure 1 - 2040 Average Annual Temperature Increase from Historical (deg F)**

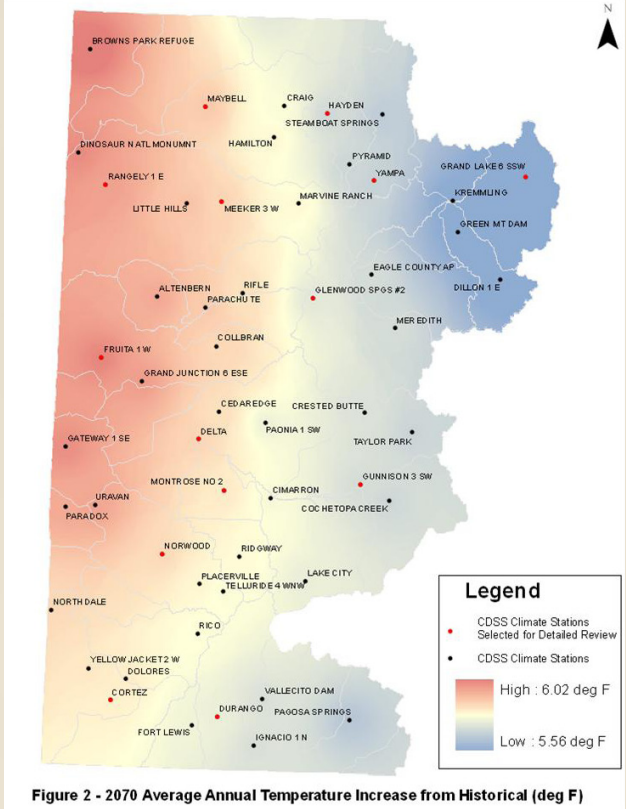


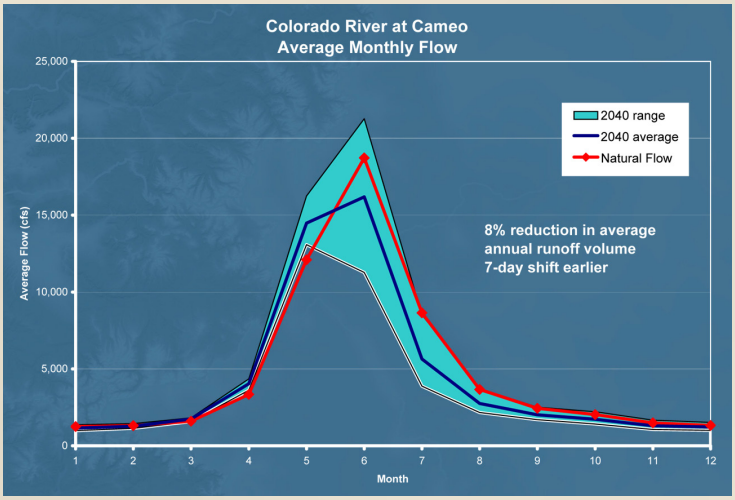

**Figure 2 - 2070 Average Annual Temperature Increase from Historical (deg F)**

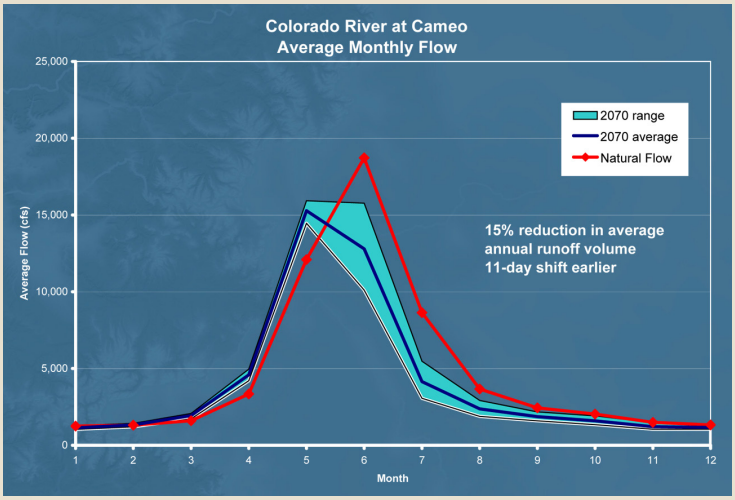
difference in duration of droughts in the historical record to that of a paleo record. The maximum drought duration over the paleo-record is 12 years versus 6 years over the observed record.

In Step 3, the potential effects of climate change are estimated using recently published results of global climate models (GCM) that the Study has "down-scaled" specifically for the Colorado River basin. Figure 5 and 6 illustrate the changes to temperature and resulting streamflow that are derived from the GCM results. Average annual temperatures in the Colorado basin are estimated to rise in excess of 3° F by 2040 and by as much as 6° by 2070. A reduction in average annual Colorado River flows at Cameo are estimated at 8% and 15% by 2040 and 2070 respectively.

To facilitate public acceptance of CRWAS results and to limit the overall level of effort, CRWAS will use the existing Colorado River Simulation System (CRSS) from the Bureau of Reclamation and the existing StateMod of the Colorado River Decision Support System (CRDSS) from the CWCB. Each of these models includes streamflow and water use data that are maintained on an ongoing basis. These models and data are the most widely accepted means for evaluating and comparing operating policies on Colorado River water management.

*Figure 6 - GCM Resulting Flow at Cameo 2040 and 2070*



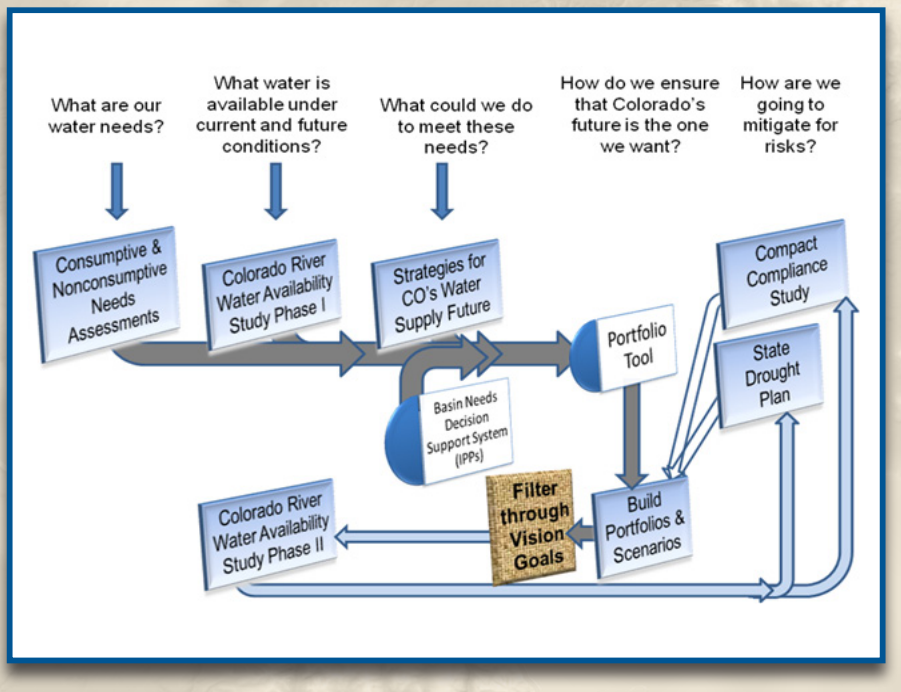
# Coordination with Other Studies and Programs

The CRWAS is being prepared in close coordination with other State sponsored programs involving climate change and with other programs in which the state is a participant. For example, the detailed methodologies being used in the Study are being reviewed by the CWCB Climate Change Technical Advisory Group (CCTAG) comprised of representatives of the leading federal agencies involved in climate change studies and members of the International Panel on Climate Change.

In addition, the Study's processes and methods are being coordinated with an on-going study of the effects of climate change on Front Range water suppliers (called the Front Range Vulnerability Study or FRVS; see http://cwcb.state.co.us/Home/ClimateChange/JointFRCCVulnerabilityStudy). The FRVS is a cooperative study among several front-range water providers that involves simulating climate change impacts on hydrology in the Upper Colorado River Basin, Upper South Platte River Basin and Upper Arkansas River Basin. The CRWAS and FRVS will use the same time frames for projection of climate change impacts, and the same climate projections. However, the two studies will use different computer models to simulate the hydrology of the watersheds. These studies are being coordinated to assure that, in cases where the two studies use different hydrologic data, assumptions and models, there are valid reasons for the differences based on the purposes of the studies.

The State is also coordinating the CRWAS with its other on-going water policy and management programs, especially the Inter-Basin Compact Commission (IBCC) and the Basin Round Table (BRT) processes and the upcoming study of Colorado River Compact Compliance authorized by the Colorado General Assembly. Figure 7 shows the primary relationships, or information exchange, between these important State water planning programs.

*Figure 7 - Integration of the CRWAS with other State Programs*




# Posted Documents

*See: www.cwcb.state.co.us/WaterInfo/CRWAS*

- Glossary of Terms
- 6 CDSS Model Briefs - CDSS Overview, Yampa, White, Colorado, Gunnison, San Juan/Dolores
- BRT Workshop & other presentations – e.g. Yampa/White, Colorado, Gunnison, Southwest
- Recommended Model Refinements
- Alternate Historical Hydrology - Literature Review, Method Evaluation, Analysis of Tree-Ring Data, and Recommendations
- Climate Change Literature Review and Methods Evaluation
- Climate Change Approach
- Colorado River Compact Key Issues