

THE CALIFORNIA WATER DELIVERY SYSTEM: IMPACTS OF CLIMATE VARIABILITY

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An increase in temperature from global climate change will have a substantial effect on California water resources, including water supply, flood control operations, Delta levees, instream flows, and Delta water quality. Hydrology related impacts include larger extreme precipitation events, changes in stream runoff patterns due to reduced snowpack, sea level rise, and increased flood flows. Potential demand side impacts include higher irrigation requirements for crops, however an increase in carbon dioxide could be beneficial to many common crops. The California Water Plan, Update 2003 will include a significant chapter on the implications of global climate change on the status and operation of California's existing and planned water system infrastructure, and future water supply and management. The Update 2003 65-member public Advisory Committee have identified climate change as one of the key drivers and constraints for considering future water management scenarios and generated greater expectations for DWR to collect additional data, conduct additional analyses, and use more sophisticated planning tools and models. DWR is also beginning to analyze the potential impacts of climate change in its evaluation of new facilities.

Regular, consistent and sustained measurements of hydrological important variables are essential to track what is happening, to analyze what the data is showing and to verify model predictions. This will guide us in adapting to change and in verifying whether the climate models used to project future climate changes are reasonably correct and in upgrading current runoff forecasting procedures to reflect such climate changes which are shown to be occurring.

The Department of Water Resources is working with the California Energy Commission in developing a research roadmap of objectives to address climate change impacts on water resources. The following is a list of short-term objectives (1-3 years):

- Support the regular, consistent, and sustained measurement of hydrological important variables.
- Support the processing and dissemination of up-to-date depth-duration-frequency rainfall data.

- Conduct a simple test of the impact on water supply of the CVP-SWP system of a possible 3°C warmer climate scenario with the expected changes in snowmelt volume and timing.
- Conduct detailed tests of the impact on CVP-SWP system water supply of a possible 3°C warmer climate scenario with the expected changes in snowmelt volume, including likely upstream reservoir operational changes,
- Support the development of global climate models that can better project future precipitation in California,
- Use empirical and satellite techniques to confirm the stability of the datum of the Golden Gate tide gage,
- Conduct a thorough survey of all the tide gage data and any other sea level references along the California coast,
- Measure current evapotranspiration (ET) to compare current data with earlier data,
- Assess likely changes in ET in a year 2050 or 2100 scenario with warmer average temperatures and higher carbon dioxide content of the atmosphere.
- Conduct a systematic review and evaluation of flood protection adequacy in major multipurpose flood control reservoirs under projected climate scenarios.
- Model water temperatures in both regulated rivers and natural streams.
- Support monitoring of studies and research on climate change effect on runoff in the adjoining Pacific Northwest and Colorado River regions.

Climate change is expected to decrease usable California water supplies, but cause somewhat higher demands, in addition to the increasing needs of a growing population. From initial looks, even assuming precipitation remains about the same as in the last century, the projected changes will reduce somewhat the capability of water facilities to deliver planned yields of water and hydroelectric power. If climate change produces surprises, then

the tools we possess for dealing with those unexpected changes will determine how successful California will be. If we have not invested in developing useful and flexible management options, then climatic surprises can quickly become economic or ecological disaster.