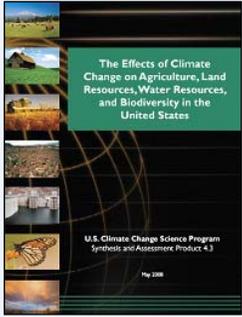


Resources for Climate Planning and Adaptation

Holly Hartmann – University of Arizona

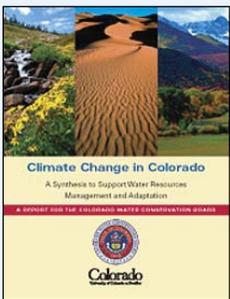
Numerous resources are available to water managers and planners who want to consider climate change and its impacts on water resources in their planning process, and to help their region adapt or increase resilience to change. The following resources provide information about anticipated impacts of climate change on water resources in the Southwest and offer approaches and tools to integrate that information in scenario planning to support adaptation. These are among the most recent and comprehensive available.



The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States

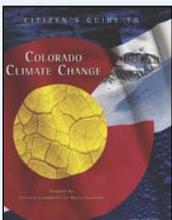
*A Report of the U.S. Climate Change Science Program, published May 2008.
Source: www.climatechange.gov/Library/sap/sap4-3/final-report/*

Written by 38 authors from universities, national laboratories, nongovernmental organizations, and federal agencies, this peer-reviewed report summarizes evidence that climate change is already affecting U.S. water resources, including those in the Southwest, and will continue to do so in the coming decades. The anticipated effects of climate change on water resources are based on climate simulations produced for the Fourth Report of the Intergovernmental Panel on Climate Change. Among the most important findings for the Southwest: the more certain temperature increases will cause hydrologic changes as significant as those anticipated from precipitation changes, particularly by affecting snowmelt timing and increasing stresses on both water quality and quantity. Although this work does not provide the level of detail required for planning scenarios or changing water management practices, it provides a concise summary of the best available science on recently observed trends and anticipated patterns of change.



Climate Change in Colorado: A Synthesis to Support Water Resource Management and Adaptation

*A Report for the Colorado Water Conservation Board by the University of Colorado-Boulder, released October 2008.
Source: cwcb.state.co.us/Home/ClimateChange/ClimateChangeInColoradoReport/*



Citizen's Guide to Colorado Climate Change

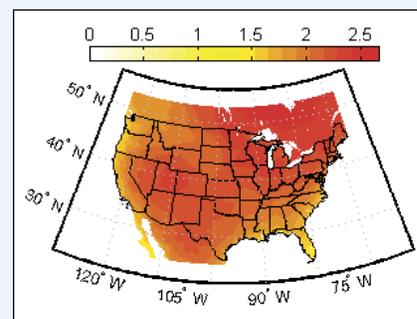
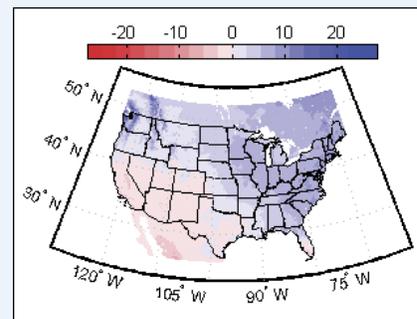
*A Report of the Colorado Foundation for Water Education, released October 2008.
Source: [www.cfwe.org/CitGuides/CG-Climate\(2008\).pdf](http://www.cfwe.org/CitGuides/CG-Climate(2008).pdf)*

These two reports present the most up-to-date scientific knowledge about climate change and

its impacts on water resources in Colorado for water managers, decision making boards, and citizens. The first synthesizes the recent scientific literature to describe observed trends in temperature, precipitation, snow, and runoff, and projected impacts due to climate change, from a technical yet understandable perspective. The second, clearly targeted for nontechnical audiences, also connects predicted climate change impacts to water and agricultural policies and practices. While focused on Colorado, the reports have broader relevance since the state's mountain ranges are the source of a large proportion of the flows in both the Colorado River and the Rio Grande basins. They also set a standard for the kinds of analysis and discussion that will be useful for citizens and water managers of any state to plan for drought and climate change.

Statistically Downscaled World Climate Program's Coupled Model Intercomparison Project Phase 3 Multi-Model Dataset

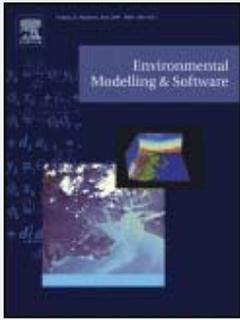
*Released December 2007.
Source: gdo-dcp.ucllnl.org/*



Median projected change in average-annual precipitation (top, cm/year) and temperature (bottom, °C), 2041-2070 versus 1971-2000.

Water managers and planners may want to conduct their own studies of climate change impacts and management options (or have consultants conduct studies for them), but the coarse spatial scale of climate model projections limits the utility for most impact studies. The Lawrence Livermore National Laboratory, working with the U.S. Bureau of Reclamation and others, used statistical relationships to convert 112 different global projections of monthly precipitation and temperature over the continental United States to a grid with

cells about 7.5 miles in each direction, for the years 1950-2009. Using the projections takes a real investment in learning how to use and interpret these data, including their limitations, but the multitude of projections offers a rich resource of data to explore, with tools for efficiently accessing the data in usable formats.



A Formal Framework for Scenario Development in Support of Environmental Decision Making

Journal of Environmental Modeling and Software, 24(7): 798-808.
Source: doi:10.1016/j.envsoft.2008.11.010.

This peer-reviewed article by 21 researchers involved in scenario studies and environmental modeling provides an

understandable introduction to developing scenarios for resource management and planning. Water managers and scientists often have trouble talking with each other about creating or using scenarios: jargon used within different disciplines about modeling, risk management, and scenario planning has diverged, with even the word *scenario* having different meanings. This article explains that scenarios used for model testing are different from those that use projections of potential future conditions or that are based on envisioning desired or undesirable futures. It also describes the steps required to conduct scenario studies and how to link them to monitoring studies and risk management.

SAHRA Scenario Development Website

Published by the Center for Sustainability of Semi-Arid Hydrology and Riparian Areas.

Source: www.sahra.arizona.edu/scenarios/



Many web and print resources focus on scenario development, but very few specifically address the unique problems of developing scenarios for natural

resource management and planning, supported by environmental modeling. This website is home to a growing community of scientists and others working with scenarios and environmental models in management and planning applications. It provides a fact sheet about conducting scenario studies; links to case studies where scenarios have been used in a broad range of environmental applications, including water management; and a community forum for discussion of scenario development, analysis, and applications, among other topics.

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