

Scope of Work

Dealing With Drought: Adapting to a Changing Climate

**A Proposal by Western Water Assessment to the Colorado Water Conservation Board
25 August 2009**

Summary and Justification

The objective of this project is to develop and implement a series of climate workshops across Colorado. The overarching goal of these workshops is to improve climate literacy across different stakeholder groups by focusing on climate change and variability in Colorado, with an emphasis on drought and on the impacts of climate change on water resources. The workshops will also provide feedback to CWCB on potential stakeholder vulnerabilities to drought and climate change for input into the development of the updated state Drought Plan and the water adaptation planning component of the Colorado Climate Action Plan.

Periodic drought is a fact of life in Colorado and the western United States. Mitigating the impacts of drought is a goal of the Colorado Drought Mitigation and Response Plan (“Drought Plan”). The state’s Drought Plan, however, does not remove the responsibility from local water providers to plan for drought. The 2007 “Updated Information” to the 2002 (current) Drought Plan indicates the need to educate stakeholders about drought:

The state will plan to work with U.S. government agencies such as Western Water Assessment, the Regional Integrated Sciences and Assessments program in the Rocky Mountain region, to provide scientific knowledge to public and private water providers and stakeholders to anticipate, track, assess, and respond to drought threats at regional and local levels.

This document also explicitly states the need to consider drought planning as a part of the adaptation strategy to climate change:

Increased awareness and attention to climate change and the associated potential impacts to state water supplies as a result of predicted changes warrants further analysis and proactive adaptive planning strategies ... efforts should be made to focus on vulnerabilities and building increased resiliency to climatic extremes such as drought.

In addition, the Governor’s Colorado Climate Action Plan calls for the development of a Water Adaptation Plan.

The *Climate Change in Colorado: A Synthesis to Support Water Resources Management and Adaptation* Report, commissioned by CWCB and prepared by the Western Water Assessment, provided a summary of the state of the science on the physical aspects of climate change – temperature, precipitation, runoff. The scientific studies cited in this report indicate that by mid-century, climate change may lead to significant changes in Colorado’s water resources, from earlier snowmelt and runoff to potentially less annual water supply, and even the increased chance of a “compact call” on the Colorado River. Indeed, the prospect of longer, more intense

droughts provides increased motivation for drought planning at the regional and local level. Clearly, the state has expressed the need to get scientific information about drought and climate change into the hands of stakeholders, and at the same time learn more about stakeholder requirements for adaptation planning.

To meet these needs we propose to develop a workshop, to be presented at three locations across the state, with the following goals:

- To introduce and reinforce the basics of climate change and variability to stakeholders in both a local and a global context;
- To make climate a more salient issue with Colorado stakeholders by presenting information from the CWCB Climate Change in Colorado Report;
- To enable stakeholders to identify impacts and vulnerabilities to climate variability, drought, and future climate change; and
- To gather and synthesize information from stakeholders that will inform drought planning and climate adaptation strategies in Colorado.

The target participants for these workshops are those individuals and organizations potentially impacted by changing water resources and who are involved in, or who might benefit from, drought and climate adaptation planning. However, we anticipate participation by a wide range of stakeholders who are interested in drought and climate change in their region of the state. These workshops are not geared towards the relatively small number of stakeholders who are already experts in climate. Rather it is intended for those who need to learn the basics or update their knowledge on climate, and would like to have some input into the state's planning efforts. The workshops will be advertised through CWCB's stakeholder database as well as those of WWA and the State Climatologist's Office.

Workshop Description and Agenda

The proposed workshop, titled "Dealing With Drought: Adapting to a Changing Climate", will be constructed as a series of modular lectures, discussions, and activities during a single day. The proposed agenda for this workshop will include the following topics. Each workshop will be team-taught, with note-taking provided by a Research Associate. The primary presenters for each topic are noted in parentheses below:

- Colorado climate basics (Doesken, Barsugli) ~40 min
Introduction to the basics of climate, with an emphasis on Colorado's climate, including the geographic and seasonal distribution of temperature and precipitation in the state, and the physical, geographical, and meteorological reasons behind the observations.
- Climate variability (Barsugli, Doesken) ~30 min.
Variability is a fact of life in Colorado; where does the year-to-year variation come from? Review of El Nino and other climate factors that can influence variability.

- Drought (including paleoclimate) (Lukas, Doesken, McNutt) ~40 min
Discussion of the observed record of droughts and the evidence from tree rings for extended dry and wet periods in the state's past.
- Small-group breakouts (~8 person) on drought ~ 45 min (McNutt, Averyt)
Using information presented in the morning sessions, discuss past and potential impacts of drought; potential adaptation strategies; barriers to adaptation and planning; what would help to mitigate these barriers?
- Web Resources for Climate and Drought Information (Barsugli, Doesken) ~30 min.
Introduction to resources at the Colorado Climate Center, NIDIS's drought.gov, and other
- Scenarios of Climate Change in Colorado (Barsugli) ~40 min.
Based on the Climate Change in Colorado report, we present scenarios of how Colorado's climate might be different by mid-century, and the global and local reasons this may happen.
- Potential Implications of climate change for water in the state (Lukas) ~45 min.
Using information from the Climate Change in Colorado report and recent research articles, we will highlight some of the potential implications for water resources in the state.
- Breakout/work session on climate change perceptions and vulnerability ~ 45 min (Averyt)
Using information presented during the day, discuss potential impacts of climate change; potential adaptation strategies and barriers to adaptation and planning; what would help to mitigate these barriers? The goal is to inform development of the State's Water Adaptation Plan as part of the Colorado Climate Action Plan.
- Reports from the breakout groups to the full group. Open discussion. ~45 min.

If possible we will include a presentation by a water manager from the area who has already become a "local expert" on climate variability and change in the particular region of the state (for example, Eric Kuhn, Colorado River Water Conservation District, for Western Slope issues; Mark Waage, Denver Water, for Front Range issues). An evaluation component (feedback on the workshop content, and an assessment of climate literacy and application of information to decision making by participants) will also be included in the proposed workshops.

Task 1: Project Planning and Workshop Development

Project planning includes locating and reserving venues for the workshops, building and maintaining the registration website and tracking reservations; and planning for day-of-workshop logistics.

Workshop development includes creation of Powerpoint presentations for each topic; coordination among the presenters; creation of handout materials to be included in the workshop binder, and development of the evaluation component of the workshop. Special attention will be devoted to the development of structured group activities for the drought and climate change breakout modules. We will work closely with CWCB staff to assure that these sessions best meet the state's needs for the Drought Plan and Water Adaptation Plan. We will also coordinate with NIDIS (through the involvement of Chad McNutt) and their "Upper Colorado River Pilot".

For each of the workshops, we will provide registration through a webpage hosted at Western Water Assessment and linked from the WWA homepage (<http://wwa.colorado.edu>). A fee of \$5 payable at the door will be requested for snacks and drinks throughout the day, and \$10 for lunch (pre-ordered on the registration website).

Roles and Responsibilities for Task 1

CWCB Support:

Doesken: 0.1 mo (2 days)

- **workshop content development**

-

Provided at no cost by CU:

Barsugli: 0.25 mo

- workshop content and evaluation development

McNutt: 0.25 mo

- workshop content and evaluation development; coordination with NIDIS.

Alvord: 0.5 mo

- logistics, assemble and assist with development of workshop manuals/materials

Averyt: 0.25 mo

- registration website, evaluation development

Lukas: 0.25 mo

- workshop content development

Task 2: Presentation of Workshops

Workshop 1

Presentation of the first workshop, in the southern Front Range (e.g. Castle Rock) region of Colorado on or about October 13, 2009. Attendance capped at 50 participants.

Workshop 2

Presentation of the second workshop, in the Western Slope region (e.g., Glenwood Springs) on or about October 16, 2009. Attendance capped at 50 participants.

Workshop 3

Presentation of the third workshop, in Durango, Colorado, on or about October 28, 2009. Attendance capped at 30 participants. This workshop would not use the full agenda, but would have a smaller set of presenters (Barsugli and Lukas), and involve the Mountain Studies Institute staff and collaborators.

Roles and Responsibilities for Task 2; specific topics noted in description of workshop above)

CWCB Support:

Doesken: 0.1 mo (2 days)

- **presentation (workshops 1-2); facilitation of discussions and breakout**

Provided at no cost by CU:

Barsugli: 0.15 mo

- presentation; facilitation of discussions and breakout;

Lukas: 0.15 mo

- presentation; facilitation of discussions and breakout;

Alvord: 0.25 mo

- workshop logistics, note-taking during presentations in workshops 1 and 2.

Task 3: Collation of workshop data and drafting of report to CWCB.

Collate and summarize the data obtained at the workshops for inclusion in project report. Preparation of a draft report will be delivered in electronic form to CWCB for comment. The report will describe workshop development and materials, workshop attendance, and summarize results from the drought breakout and climate change breakout modules. The final project report completed by project team and delivered to CWCB in electronic form (Adobe PDF format).

Roles and Responsibilities for Task 3

CWCB Support:

Doesken: 0.05 mo (1 day)

- **reviewing draft and final reports**

Provided at no cost by CU:

Alvord: 0.5 mo

- collation and evaluation of workshop data

- drafting report

Averyt: 0.25 mo

- collation and evaluation of workshop data

Barsugli: 0.5 mo

- drafting report

McNutt: 0.5 mo

- drafting report

Budget Lines for Tasks

Task	Budget line in request to CWCB
1: Project Planning & Workshop Preparation	D: "Other Direct Costs"
2: Workshops 1-3	C: "Travel" D: "Other Direct Costs"
3: Collation of workshop data and drafting of report	D: "Other Direct Costs"

References

The Colorado Drought Mitigation and Response Plan, 2002. Available online at <http://www.cde.state.co.us/artemis/nr3/NR32M692002INTERNET.pdf>

Updated Information Provided in Support of the 2002 Drought Mitigation and Response Plan, 2007. Available online at <http://cwcb.state.co.us/NR/rdonlyres/1F537E1C-A4FC-4B8D-A553-7C5D381BA250/0/FinalReportJune2007.pdf>

Climate Change in Colorado: A Synthesis to Support Water Resource Management and Adaptation, 2008. Available online at <http://cwcb.state.co.us/Home/ClimateChange/ClimateChangeInColoradoReport/>

Colorado Climate Action Plan: A Strategy to Address Global Warming, 2007. Available online at http://www.colorado.gov/energy/in/uploaded_pdf/ColoradoClimateActionPlan_001.pdf