

Is New Mexico Resilient to the Coming Water Supply Challenges?

Dagmar Llewellyn, Bureau of Reclamation

Dagmar Llewellyn is a hydrologist, with an educational background in geosciences and civil engineering, and post-graduate studies in climate dynamics, paleoclimatology, river restoration, GIS, and water law and management. Since 2000, her work has focused on water management and endangered species issues in the Upper Rio Grande Basin. Her work has involved water supply and demand evaluation, groundwater/surface-water interaction, irrigation efficiency, habitat and hydrologic requirements of endangered species, accounting under the Rio Grande Compact, and Reclamation project operations. After 26 years in environmental and water-resource consulting, her interest in working for the federal government was sparked by the passage of the SECURE Water Act, which assigned to the Bureau of Reclamation a west-wide evaluation of the potential hydrologic implications of climate change. Since 2010, she has worked Reclamation on programs authorized under the SECURE Water Act, as well as on Rio Grande water management and endangered species/environmental compliance issues.



Figure 1. Introduction.

Figure 2. Coloring outside the lines.

Figure 3. The hopeful outcome of coloring outside the lines.

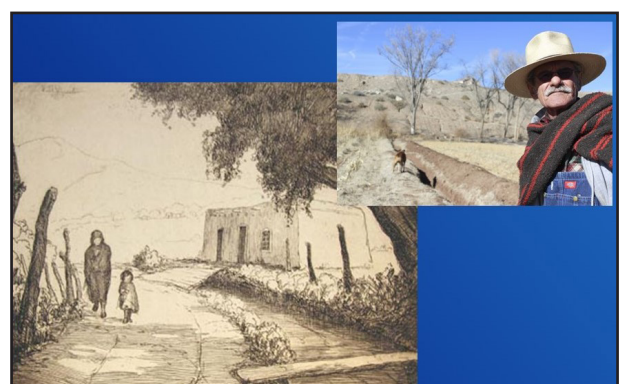


Figure 4. New Mexico's water management history.

Key Successes

- Culture of shortage sharing and governance based on water
- Development of a network of infrastructure that provides a reliable supply in a highly variable hydrologic system.
- Recognition of the connections between surface water and groundwater.
- Legal and administrative infrastructure to equitably share a short supply--State administration, irrigation districts and Federal projects, and interstate Compacts
- Flood control and drainage, providing safety for development

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Figure 5. Key Successes.

But...why do we now need to think beyond our past approaches

- Cumulative Impacts of Human development
- Population/Urban growth
- Forest management
- Agricultural and Grazing practices
- Groundwater mining
- **Climate change...**





Figure 6. Reasons to change up past approaches. Disturbances include the cumulative impacts of local human activities over time, as well as global impacts of human activities.

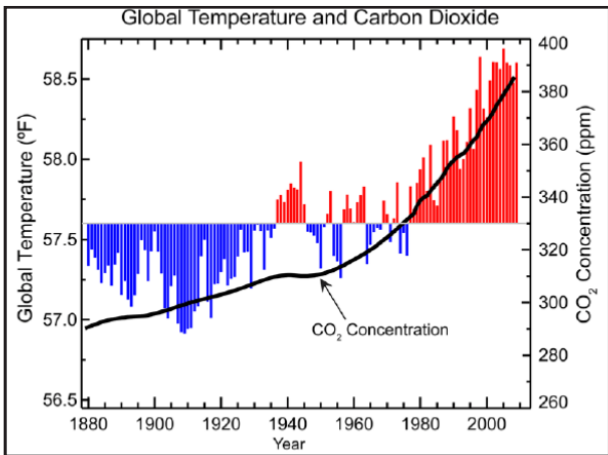


Figure 7. Rio Grande Basin (1971-2011). Average temperature increase by 0.7 degrees Fahrenheit per decade. Twice the global average.

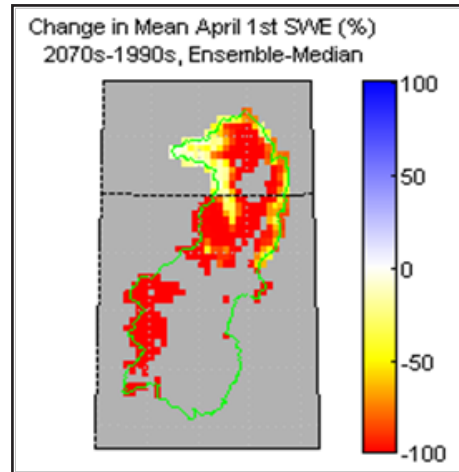


Figure 8. Future climate. Basin distributed snow (2070s). Overall, there will be a slight decline in precipitation and snow, especially in low-elevation areas.



Figure 9. Projected increases in hydrologic variability, meaning more drought and more floods.



Figure 10. Feedbacks and cascading impacts. Drying of soil due to high temperatures, in concert with grazing practices, can lead to dust on our snowpack. Bark beetle infestations (made possible in part by higher temperatures and longer warm seasons) can increase the exposure of our snowpack to sunlight. Sunlight on dusty snow can lead to rapid melting. Loss of snowpack can lead to moisture stress on trees, which can lead to catastrophic fire, debris flows, ash in the river, fish kills, and implications for water diversions.



Figure 11. What are our goals?



Figure 12. Resilience.



Figure 13. Recent steps to increase flexibility.



Figure 14. Where are we locked down in the old and comfortable?



Figure 15. How can science help us?

- **Learn about how our water systems are changing**
 - Groundwater availability (*Kevin Dennehy, USGS*)
 - Climatic changes in our region and around the world (*Brad Udall; John Wilson, Mark Williams*)
- **Learn about how we can be leaders during change** (*Michael McElhenie*)

Figure 16. How can we learn about our changing water systems?

- **Be sure we are up to date on water management issues**
 - Be reminded of our history of democracy build around shared water management (*David Arguello, Acequia Commissioner*)
 - Get up to date on Statewide water issues (*John Romero, OSE*).
 - Learn the latest on Indian water rights settlements and their implications (*Darcy Bushnell, Utton Center*)
 - Find out the latest on how irrigation districts are balancing agricultural uses of surface and groundwater (*David Gensler for MRGCD and Phillip King for EBID*).
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Figure 18. How can we stay up to date on water management issues?



Figure 20. Conclusion.

How can this conference help us?

- **Discuss new ideas and scientific advances**
 - How can we better use tree rings to understand our climate and hydrology (*Franco Biondi, Univ. of Nevada, Reno*)
 - Learn about integration of datasets, for social and economic benefit (*Elizabeth Zeiler, NMED, and Carol Giffin, USGS*)

Figure 17. How can this conference help us?

- **Learn about the possibilities for building resilience to change**
 - Discuss the capability of change within the current policy and management paradigm (*Fred Phillips, NM Tech*).
 - Learn about a new management and adaptation idea that is being implemented to save our upland forests and their ability to store water (*Laura McCarthy, The Nature Conservancy*)
 - Learn about how similar challenges are being met in other parts of our country, and other parts of the world (*Karen MacClune, Institute for Social and Environmental Transition; Tanya Trujillo, Colorado River Board of CA*).

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Figure 19. How can we learn about building resilience to change?