

Management Strategies for Sustainable Western Water

U.S. National Science Foundation Workshop: Quenching a Thirsty West; Lake Tahoe, Nevada/California, 29–30 August 2016



During the prolonged California drought, groundwater depletion led the state's Central Valley agricultural industry to become less resilient to climate change, as this dying orchard makes evident. At a workshop preceding last year's annual Lake Tahoe Summit, attendees discussed western water issues in the 21st century. Credit: Beatrice Murch ([CC BY-SA 2.0](#))

By [Scott Tyler](#), Sudeep Chandra, and Gordon Grant © 25 April 2017

With the effects of the dramatic western U.S. drought still reverberating across the country, researchers gathered in advance of the 20th Annual Lake Tahoe Summit to discuss western water issues in the 21st century.

The 2-day workshop brought together some 40 researchers from universities and governmental agencies, motivated by the urgent need to improve knowledge of the resilience or “brittleness” of western water supplies. The researchers discussed water challenges in the face of changing climate and large-scale disturbances, focusing on [water pollution](https://eos.org/editors-vox/sustaining-existence-geoethical-dilemma) (<https://eos.org/editors-vox/sustaining-existence-geoethical-dilemma>), [wildfires](http://www.nbcnews.com/storyline/western-wildfires) (<http://www.nbcnews.com/storyline/western-wildfires>), floods, and [droughts](https://eos.org/articles/satellites-show-true-extent-california-drought) (<https://eos.org/articles/satellites-show-true-extent-california-drought>).

Addressing western water challenges requires a convergence of ideas from a range of disciplines and organizations. Attendees primarily hailed from the environmental sciences but included science communication experts and representatives from funding agencies.

Discussions at the workshop focused on three main issues: improving projections of the causes and consequences of changing river flows; integrating knowledge of forest ecosystem dynamics, water stress, wildfires, and climate to maintain the “infrastructure” of western headwaters while reducing

increasingly intense and expensive fires; and the current state of water-monitoring infrastructure and knowledge gaps.

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With booming population growth and increasing demands for water from industry and agriculture exacerbating the challenges of water management across the West, participants agreed that a bold integration of intellectual power from academia and government agencies is needed to address current issues.

Much of the landscape of the American West is under federal and state management, and the workshop identified five key initiatives that the research community, in partnership with management agencies, could implement to improve water management:

Implement a new cross-agency/cross-disciplinary audit of monitoring networks. An examination of our existing research networks, including critical zone observatories, [long-term ecological research](https://lternet.edu/) (<https://lternet.edu/>) sites, and other experimental forest and range sites, would help determine their sustainability and value in assessing how extreme climate events influence hydrology and ecology.

Integrate research programs to design resilient forests. Research should focus on reducing water stress, quantifying the water storage potential in snow and the subsurface, and incorporating emerging science on ecophysiology and mortality, climate variation, and climate change.

Implement a major program to advance hydrologic monitoring in the mountains of the western United States. Measurements should focus on precipitation, snowpack, evapotranspiration, soil moisture, and groundwater across the West.

Couple atmospheric, terrestrial, and marine observatory networks to improve prediction. Linking offshore measurements to the land at both regional and river basin scales would improve predictions of [atmospheric rivers](https://eos.org/meeting-reports/setting-the-stage-for-a-global-science-of-atmospheric-rivers) (<https://eos.org/meeting-reports/setting-the-stage-for-a-global-science-of-atmospheric-rivers>), drought, El Niño–Southern Oscillation ([ENSO](https://www.climate.gov/news-features/blogs/enso/what-el-ni%C3%B1o%E2%80%93southern-oscillation-enso-nutshell) (<https://www.climate.gov/news-features/blogs/enso/what-el-ni%C3%B1o%E2%80%93southern-oscillation-enso-nutshell>)), and other episodic events ranging from days to decades.

Target field campaigns using novel technologies. Novel technologies (i.e., new sensors, drones, and airborne platforms) can help assess and fill data gaps that currently limit the accurate understanding of water availability at all geographic scales.

The workshop concluded that it is time for a western-focused, integrated center to develop science- and social science–based solutions for addressing water scarcity and resilience to change in the West. Such a center would bring state-of-the-art scientific, engineering, and socioeconomic findings to bear on critical water issues in the context of public policy, planning, and socioeconomic trends. And now given the [swing to flood conditions](https://eos.org/opinions/defining-snow-drought-and-why-it-matters) (<https://eos.org/opinions/defining-snow-drought-and-why-it-matters>) as we enter the spring of 2017, the need for resilience is even more pronounced.

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Western water—whether in the atmosphere, rivers, or aquifers—flows without regard to state or federal boundaries. Scientists, engineers, and policy researchers must therefore also work across boundaries to ensure the resiliency of water supplies and landscapes through the coming century.

A full summary of the workshop, participants, and presentations will be made available on the University of Nevada’s Global Water Center [website](https://www.unr.edu/water-center) (<https://www.unr.edu/water-center>).

—Scott Tyler (email: styler@unr.edu (<mailto:styler@unr.edu>)), Department of Geological Sciences and Engineering, University of Nevada, Reno; Sudeep Chandra, Global Water Center, Department of Biology, University of Nevada, Reno; and Gordon Grant, U.S. Forest Service, Corvallis, Ore.

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