

Roger C. Bales

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Homepage: <http://www.rogerbales.com/>**EDUCATION**

- Ph.D. 1985 Environmental Engineering Science, California Institute of Technology
 M.S. 1984 Social Science, California Institute of Technology
 M.S. 1975 Civil Engineering, University of California, Berkeley
 B.S. 1974 Civil Engineering, Purdue University

ACADEMIC EXPERIENCE

- 2003-present: School of Engineering, University of California, Merced (Distinguished Professor 2015-present, Professor 2003-15, founding faculty member). Departments of Civil and Environmental Engineering (primary), and Management of Complex Systems.
 2013-present: Adjunct Professor, Civil and Environmental Engineering, University of California, Berkeley.
 2003-present: Sierra Nevada Research Institute, University of California, Merced (Director 2008-2021, Acting Director 2007-08).
 2004-2015. Member, Hydrology Graduate Group, University of California, Davis.
 1984-2003: Department of Hydrology and Water Resources, University of Arizona, (Assistant Professor 1984-1989, Associate Professor 1989-1995, Professor 1995-2004).
 1994-2000: Investigator, Center for Toxicology, University of Arizona.
 1994-1995: Visiting Fellow, Udall Center for Studies in Public Policy, University of Arizona.
 1989-93: Associate Researcher, Department of Geography, University of California, Santa Barbara.
 1980-84: Graduate Research Assistant, California Institute of Technology.

PROFESSIONAL ENGINEERING EXPERIENCE

- 1975-80: Project Manager and Project Engineer, Brown and Caldwell, Pasadena, California

PROFESSIONAL REGISTRATION

- Civil Engineer 27677, California

CURRENT PROFESSIONAL AFFILIATIONS

- American Geophysical Union (Fellow), American Society for the Advancement of Science (Fellow), American Meteorological Society (Fellow), American Society of Civil Engineers (Life Member), Association of Environmental Engineering Professors (Life Member).

RESEARCH INTERESTS

- Current focus.** Climate solutions, climate applications, water resources, hydrology.
Prior areas. Polar glaciology and atmospheric chemistry, contaminant hydrology of colloidal and organic compounds.

PUBLICATIONS**Peer-reviewed journals**

196. H. Guo, M. Goulden, M.G. Chung, C. Nyelele, B. Egoh, C. Keske, M. Conklin, R. Bales, Valuing the benefits of forest restoration on enhancing hydropower and water supply in California's Sierra Nevada. *Sci. Total Environ.* doi:10.1016/j.scitotenv.2023.162836, 2023.
 195. G. Cui, M. Anderson, R. Bales. Mapping of snow water equivalent by a deep-learning model assimilating snow observations. *J. Hydrol.* doi:10.1016/j.jhydrol.2022.128835, 2023.
 194. M. Eriksson, M. Safeeq, T. Pathak, B. Egoh, R. Bales. Using stakeholder-based fuzzy cognitive mapping to assess benefits of restoration in wildfire-vulnerable forests. *Restor. Ecol.* doi: 10.1111/rec.13766, 2022.
 193. J.W. Roche, K.N. Wilson, Q. Ma, R.C. Bales, Water balance for gaged watersheds in the Central Sierra Nevada, California and Nevada, United States. *Front. For. Glob. Change* doi:10.3389/ffgc.2022.861711, 2022.
 192. Y. Yang, A.A. Berhe, M.E. Barnes, K.C. Moreland, Z. Tian, A.E. Kelly, R.C. Bales, A.T. O'Geen, M.L. Goulden, P. Hartsough, S.C. Hart. Climate Warming Alters Nutrient Storage in Seasonally Dry Forests: Insights From a 2,300 m Elevation Gradient. *Global Biogeochem. Cycles* doi: <https://doi.org/10.1029/2022GB007429>, 2022.
 191. G. Cui, R. Rice, F. Avanzi, P. Hartsough, W. Guo, M. Anderson, M. Conklin, R. Bales, Precipitation Estimates and Orographic Gradients Using Snow, Temperature, and Humidity Measurements From a Wireless-Sensor Network. *Wat. Resour. Res.* doi:10.1029/2021WR029954, 2022.
 190. W. Guo, M. Safeeq, H. Liu, X. Wu, G. Cui, Q. Ma, M. Goulden, M. Lindeskog, R. Bales. Mechanisms controlling carbon sinks in semi-arid mountain ecosystems. *Global Biogeochem. Cycles* doi:10/1029/2021GB007186, 2022.
 189. T. Maurer, F. Avanzi, S.D. Glaser, R.C. Bales. Drivers of drought-induced shifts in the water balance through a Budyko approach. *Hydrol. Earth Syst. Sci.* doi:10.5194/hess-26-589-2022.
 188. Y. Yang, A.A. Berhe, C.T. Hunsaker, D.W. Johnson, M. Safeeq, M.E. Barnes, E.P. McCorkle, E.M. Stacy, R.C. Bales, R.R. Bart, M.L. Goulden. Impacts of climate and disturbance on nutrient fluxes and stoichiometry in mixed-conifer forests. *Biogeochemistry*, doi:10.1007/s10533-021-00882-9, 2022.
 187. G. Cui, Q. Ma, R. Bales. Assessing multi-year-drought vulnerability in dense Mediterranean-climate forests using water-balance-based indicators. *J. Hydrol.* doi:10.1016/j.jhydrol.2022.127431, 2022.
 186. K. Moreland, Z. Tian, A.A. Berhe, K.J. McFarlane, P. Hartsough, S.H. Hart, R.C. Bales, A.T. O'Geen. Deep in the Sierra Nevada critical zone: saprock represents a

- large terrestrial organic carbon stock. *Environ. Res. Lett.* doi:10.1088/1748-9326/ac3bfe, 2021.
185. T. Stillinger, C. Costello, R.C. Bales, J. Dozier. Reservoir Operators React to Uncertainty in Snowmelt Runoff Forecasts. *J. Water Resour. Plan. Manag.* doi:10.1061/(ASCE)WR.1943-5452.0001437, 2021.
184. T. Maurer, F. Avanzi, C.A. Oroza, S.D. Glaser, M. Conklin, R.C. Bales. Optimizing spatial distribution of watershed-scale hydrologic models using Gaussian Mixture Models. *Environ. Model. Softw.* doi:10.1016/j.envsoft.2021.105076, 2021.
183. B. McKuin, A. Zumkehr, J. Ta, R. Bales, J.H. Viers, T. Pathak, J.E. Campbell, Energy and water co-benefits from covering canals with solar panels, *Nat. Sustain.* doi:10.1038/s41893-021-00693-8, 2021.
182. A. Cantor, M. Kiparsky, S.S. Hubbard, R. Kennedy, L.C. Pecharroman, K. Guivetchi, G. Darling, C. McCready, R. Bales. Making a water data system responsive to information needs of decision makers. *Front. Clim.* doi:10.3389/fclim.2021.761444, 2021.
181. H. Guo, M. Conklin, T. Maurer, F. Avanzi, K. Richards, R. Bales. Valuing enhanced hydrologic data and forecasting for informing hydropower operations. *Water* doi:10.3390/w13162260, 2021.
180. T. Maurer, F. Avanzi, S.D. Glaser, R.C. Bales, Drivers of drought-induced shifts in the water balance through a Budyko approach, *Hydrol. Earth Syst. Sci.* (2021) doi: 10.5194/hess-2021-55.
179. R.R. Bart, R.L. Ray, M.H. Conklin, M. Safeeq, P.C. Saksa, C.L. Tague, R.C. Bales. Assessing the effects of forest biomass reductions on forest health and streamflow, *Hydrol. Process.* doi:10.1002/hyp.14114., 2021.
178. G. Cui, R. Bales, R. Rice, M. Anderson, F. Avanzi, P. Hartsough, M. Conklin, Detecting Rain-Snow-Transition Elevations in Mountain Basins Using Wireless Sensor Networks, *J. Hydrometeorology* doi:10.1175/JHM-D-20-0028.1, 2020.
177. P.C. Saksa, R.C. Bales, C.L. Tague, J.J. Battles, B.W. Tobin, M.H. Conklin. Fuels treatment and wildfire effects on runoff from Sierra Nevada mixed-conifer forests, *Ecohydrol.* doi:10.1002/eco.2151, 2020.
176. F. Avanzi, T. Maurer, S.D. Glaser, R.C. Bales, M.H. Conklin. Information content of spatially distributed ground-based measurements for hydrologic-parameter calibration in mixed rain-snow mountain headwaters, *J. Hydrol.* doi:10.1016/j.jhydrol.2019.124478, 2020.
175. D. Li, O. Wigmore, M. Durand, B. Vander-Jagt, S.A. Margulis, N. Molotch, R. Bales, Potential of Balloon Photogrammetry for Spatially Continuous Snow Depth Measurements, *IEEE Geosci. Remote. Sens. Lett.* doi:10.1109/LGRS.2019.2953481, 2020.
174. Q. Ma, R.C. Bales, J. Rungee, M.H. Conklin, B.M. Collins, M.L. Goulden. Wildfire controls on evapotranspiration in California's Sierra Nevada, *J. Hydrol.* doi:10.1016/j.jhydrol.2020.125364, 2020.
173. S. Malek, R.C. Bales, S.D. Glaser. Estimation of daily spatial snow water equivalent from historical snow maps and limited in-situ measurements, *Hydrol.* doi:10.3390/hydrology7030046, 2020.
172. J.W. Roche, Q. Ma, J. Rungee, R.C. Bales. Evapotranspiration mapping for forest management in California's Sierra Nevada. *Front. For. Glob. Change* doi:10.3389/ffgc.2020.00069, 2020.
171. J. Ackerer, C. Steefel, F. Liu, R. Bart, M. Safeeq, A. O'Geen, C. Hunsaker, R. Bales. Determining how critical zone structure constrains hydrogeochemical behavior of watersheds: learning from an elevation gradient in California's Sierra Nevada. *Front. Water* doi:10.3389/frwa.2020.00023, 2020.
170. Z. Zheng, Q. Ma, S. Jin, Y. Su, Q. Guo, R.C. Bales. Canopy and terrain interactions affecting snowpack spatial patterns in the Sierra Nevada of California, *Wat. Resour. Res.* doi:10.1029/2018WR023758, 2019.
169. F. Avanzi, J. Rungee, T. Maurer, R.C. Bales, Q. Ma, S.D. Glaser, M.H. Conklin. Evapotranspiration feedbacks shift annual precipitation-runoff relationships during multi-year droughts in a Mediterranean mixed rain-snow climate, *Hydrol. Earth Syst. Sci.* doi:10.5194/hess-2019-377, 2019.
168. M.L. Goulden, R.C. Bales. California forest die-off linked to multi-year deep soil drying in 2012–2015 drought, *Nat. Geosc.* doi:10.1038/s41561-019-0388-5, 2019.
167. S.A. Malek, S.D. Glaser, R.C. Bales. Wireless sensor networks for improved snow water equivalent and runoff estimates, *IEEE Access*, doi:10.1109/ACCESS.2019.2895397, 2019.
166. J.W. Roche, R. Rice, X. Meng, D.R. Cayan, M.D. Dettinger, D. Alden, S. Patel, M.A. Mason, M.H. Conklin, R.C. Bales. Climate, snow, and soil moisture data set for the Tuolumne and Merced River watersheds, California, USA, *Earth Syst. Sci. Data*, doi: 10.5194/essd-11-101-2019, 2019.
165. R.C. Bales, M.L. Goulden. C.T. Hunsaker, M.H. Conklin, P.C. Hartsough, A.T. O'Geen, J.W. Hopmans, and M. Safeeq, Mechanisms controlling the impact of multi-year drought on mountain hydrology, *Sci. Reports*, doi:10.1038/s41598-017-19007-0, 2018.
164. J. Rungee, R.C. Bales, M. Goulden. Evapotranspiration response to multiyear dry periods in the semiarid western United States, *Hydrol. Process.* doi:10.1002/hyp.13322, 2018.
163. R.C. Bales, E.M. Stacy, X. Meng, M.H. Conklin, P.B. Kirchner, Z. Zheng, Z., Spatially distributed water-balance and meteorological data from the Wolverton catchment, Sequoia National Park, California, *Earth Syst. Sci. Data*, doi:10.5194/essd-10-2115-2018, 2018.
162. A. O'Geen, M. Safeeq, J. Wagenbrenner, E. Stacy, P. Hartsough, S. Devine, Z. Tian, R. Ferrell, M. Goulden, J.W. Hopmans, R.C. Bales, Southern Sierra Critical Zone Observatory and Kings River Experimental Watersheds: A synthesis of measurements, new insights, and future directions, *Vadose Zone J.* doi:10.2136/vzj2018.04.0081, 2018.
161. Z. Zheng, Q. Ma, K. Qian, R.C. Bales. Canopy Effects on Snow Accumulation: Observations from Lidar, Canonical-View Photos, and Continuous Ground Measurements from Sensor Networks, *Remote Sens.* doi:10.3390/rs10111769
160. R.C. Bales, E. Stacy, M. Safeeq, X. Meng, M. Meadows, C. Oroza, M. Conklin, S. Glaser, J. Wagenbrenner. Spatially distributed water-balance and meteorological data from the rain–snow transition, southern Sierra Nevada, California. *Earth Syst. Sci. Data*, doi: 10.5194/essd-10-1795-2018, 2018.
159. J.W. Roche, M.L. Goulden, R.C. Bales. Estimating evapotranspiration change due to forest treatment and

- fire at the basin scale in the Sierra Nevada, California. *Ecohydrol.* doi.org/10.1002/eco.1978, 2018.
158. C.A. Oroza, R.C. Bales, E.M. Stacy, Z. Zheng, S.D. Glaser. Long-term variability of soil moisture in the Southern Sierra: measurement and prediction. *Vadose Zone J.* doi:10.2136/vzj2017.10.0178, 2018.
157. Z. Zheng, N.P. Molotch, C.A. Oroza, M.H. Conklin, R.C. Bales. Spatial snow water equivalent estimation for mountainous areas using wireless-sensor networks and remote-sensing products, *Wat. Resour. Res.* doi: 10.1016/j.rse.2018.05.029, 2018.
156. P.Z. Klos, M.L. Goulden, C.S. Riebe, C.L. Tague, A.T. O'Geen, B.A. Flinchum, M. Safeeq, M.H. Conklin, S.C. Hart, A. Asefaw Berhe, P.C. Hartsough, W.S. Holbrook, R.C. Bales. Subsurface plant-accessible water in mountain ecosystems with a Mediterranean climate, *WIRES water*, doi:10.1002/wat2.1269, 2018.
155. Y. Su, R.C. Bales, Q. Ma, K. Nydick, R.L. Ray, W. Li, Q. Guo. Emerging stress and relative resiliency of Giant Sequoia groves experiencing multiyear dry periods in a warming climate. *J. Geophys. Res.: Biogeosci.*, 122, 3063–3075, doi:10.1002/2017JG004005, 2017.
154. Z. Zhang, S. Glaser, R.C. Bales, M.H. Conklin, R. Rice, D. Marks. Insights into mountain precipitation and snowpack from a basin-scale wireless-sensor network, *Water Resour. Res.*, 53, 6626–6641, doi:10.1002/2016WR018825, 2017.
153. P.C. Saksa, M.H. Conklin, J.J. Battles, C.L. Tague, R.C. Bales. Forest thinning impacts on the water balance of Sierra Nevada mixed-conifer headwater basins, *Wat. Resour. Res.* doi: 10.1002/2016WR019240, 2017.
152. Z. Zhang, S. D. Glaser, R. C. Bales, M. Conklin, R. Rice, D. G. Marks. Technical report: The design and evaluation of a basin-scale wireless sensor network for mountain hydrology, *Water Resour. Res.*, 53, 4487–4498, doi:10.1002/2016WR019619, 2017.
151. S.L. Brantley, W.H. McDowell, W.E. Dietrich, T.S. White, P. Kumar, S.P. Anderson, J. Chorover, K.A. Lohse, R.C. Bales, D.D. Richter, G. Grant, J. Gaillardet. Designing a network of critical zone observatories to explore the living skin of the terrestrial Earth, *Earth Surf. Dyn.* doi:10.5194/esurf-5-841-2017, 2017.
150. W.D. Collins, S.J. Davis, R. Bales, J. Burney, R. McCarthy, E. Rignot, W. Torre, D. Victor; Chapter 3. Science and Pathways for Bending the Curve. *Collabra* doi:10.1525/collabra.62, 2016.
149. S. Szabo, R.J. Nicholls, B. Neumann, F.G. Renaud, Z. Matthews, Z. Sebesvari, A. AghaKouchak, R.C. Bales, C. Warren Ruktanonchai, J. Kloos, E. Foufoula-Georgiou, P. Wester, M. New, J. Rhyner, C. Hutton. Making SDGs Work for Climate Change Hotspots. *Environ.: Sci. Policy Sustain. Develop.* doi:10.1080/00139157.2016.1209016, 2016.
148. C.A. Oroza, Z. Zheng, S. D. Glaser, D. Tuia, Optimizing embedded sensor network design for catchment-scale snow-depth estimation using LiDAR and machine learning. *Water Resour. Res.*, 52, 8174–8189, doi:10.1002/2016WR018896, 2016.
147. D.E. Rheinheimer, R.C. Bales, C.A. Oroza, J.R. Lund, J.H. Viers. Valuing year-to-go hydrologic forecast improvements for a peaking hydropower system in the Sierra Nevada, *Wat. Resour. Res.*, 52, 3815–3828, doi:10.1002/2015WR018295, 2016.
146. Z. Zheng, P.B. Kirchner, R.C. Bales. Topographic and vegetation effects on snow accumulation in the southern Sierra Nevada: a statistical summary from lidar data, *The Cryosphere*, 10, 257-269, doi:10.5194/tc-10-257-2016, 2016.
145. B. Harrison, R.C. Bales, Skill Assessment of Water Supply Forecasts for Western Sierra Nevada Watersheds, *J. Hydrol. Eng.* 21(4), doi:10.1061/(ASCE)HE.1943-5584.0001327, 2016.
144. B. Harrison, R.C. Bales, Skill Assessment of Water Supply Outlooks in the Colorado River Basin, *Hydrology*, 2, 112-131; doi:10.3390/hydrology2030112, 2015.
143. AA Harpold, NP Molotch, KN Musselman, RC Bales, PB Kirchner, M. Litvak, P. D. Brooks. Soil moisture response to snowmelt timing in mixed-conifer subalpine forests. *Hydrol. Process.*, 29,12, 2782-2798, doi:10.1002/hyp.10400, 2015.
142. M.L. Goulden, R.C., Bales. Mountain runoff vulnerability to increased evapotranspiration with vegetation expansion. *Proc. Natl. Acad. Sci. U.S.A.*, doi:10.1073/pnas.1319316111, 2014.
141. R.C. Bales, R. Rice, S.B. Roy. Estimated Loss of Snowpack Storage in the Eastern Sierra Nevada with Climate Warming. *J. Water Resour. Plann. Manage.* doi:10.1061/(ASCE)WR.1943-5452.0000453, 2014.
140. J.R. McConnell, O.J. Maselli, M., Sigl, P. Vallelonga, T. Neumann, H. Anchut, R.C. Bales, M.A.J. Curran, S.B. Das, R. Edwards, S. Kipfstuhl, L. Layman, E.R. Thomas. Antarctic-wide array of high-resolution ice core records reveals pervasive lead pollution began in 1889 and persists today. *Nature*, doi:10.1038/srep05848, 2014.
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136. S. Masclin, M.M. Frey, W.F. Rogge, R.C. Bales. Atmospheric nitric oxide and ozone at the WAIS Divide deep coring site: a discussion of local sources and transport in West Antarctica, *Atmos. Chem. Physics*, 13:8857-8877 doi:10.5194/acp-13-8857-2013, 2013.
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134. J. W. Hopmans, R.C. Bales, A. T. O'Geen, M. Meadows, P. C. Hartsough, P. Kirchner, C. T. Hunsaker, D. Beaudette, Response to comment on

- "Soil moisture response to snowmelt and rainfall in a Sierra Nevada mixed-conifer forest", *Vadose Zone J.* doi: 10.2136/vzj2012.0004r, 2012.
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132. B. Kerkez, S.D. Glaser, R.C. Bales, M.W. Meadows, Design and performance of a wireless sensor network for catchment-scale snow and soil moisture measurements, *Wat. Resour. Res.*, 48, doi: 10.1029/2011WR011214, 2012.
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Abstracts of conference papers at (inter)national science meetings

Note: R. Bales and co-authors have published over 300 abstracts of presentations at scientific meetings, with the largest fraction being the annual fall meeting of the American Geophysical Union.

OTHER COMMUNICATIONS

Note: In the current socio-political environment it is no longer possible for the research community to just publish research and expect decision makers to use or even acknowledge the findings. It is now well accepted that we must actively socialize our research. Thus, I have made this a central focus of what I do, finding and using effective means of communicating climate solutions to decision makers and the public. I have also engaged many other UC Merced faculty to be interviewees and contributors.

Film and video (partial list)

California's Watershed: Healing. Hour-long documentary film by the non-profit Chronicles Group, planned for release in summer 2022, with screenings followed by PBS nationwide distribution. My roles: Advising on content, connecting film maker with interviewees, and securing funding. Film draws on the main themes of our ecosystem-climate-solutions work and is a sequel to the 2019 watershed film.

Beyond the Brink: California's Watershed. Half-hour-long film by the non-profit Chronicles Group, released on PBS nationwide in 2019. My roles: Advising on content, connecting film maker with interviewees, and securing funding. Film outlines the main challenges and possible solutions at the forest-wildfire-climate-water nexus.

Beyond the Brink. A 90-minute film by the non-profit Chronicles Group, released on streaming video in 2018. My roles: Advising on content, connecting film maker with interviewees, and securing funding. . Film outlines the main challenges and possible solutions at the food-water-climate nexus.

UCTV, Sustainable California channel. While leading UC Water, I engaged several collaborators to launch (fund) this new UCTV channel and push out monthly video clips. No new content added for 2 years during pandemic, and I aim to reengage partners and resume adding new content in fall 2022.

SNRI video. Professionally made 6-minute video now posted on SNRI homepage and also distributed through AGU-TV. Was screened in common areas throughout fall 2019 AGU meeting in San Francisco, as part of a series highlighting research institutes.

Onward California. Four video clips made by D4D for UCOP in 2012 highlighting R. Bales' water-resources research and how it contributes to the state. Aired in various venues, linked below.

Press reports

Note: The press from across TV, radio, magazines, and newspapers in California have interviewed R. Bales on water and climate issues facing the state, and/or wrote about his research. In the 2-year period ending mid 2018 R. Bales was interviewed or his research was written about in over 40 news reports. More recently, the press reports on our climate-solutions and other global-change research have been too numerous to efficiently track. For example, there have been dozens of reprints of our pieces in *The Conversation*, and also of parallel press releases and news items pushed out by UC Merced Communications. In 2022 alone R. Bales has done interviews with major outlets in the U.S. and Europe, including NPR, PBS, BBC, VOA, Time, and other print media. The frequency has often been at more than one per week.

As an indication of the reach of the outlets that R. Bales has worked with, or that reprinted articles on his work, *The Conversation* reports over 300,000 readers for in 2021-22 for the 4 articles we wrote plus a summary that they wrote on our work (includes outlets that reprinted the articles).

Nationally, in recent years R. Bales has done interviews with Lou Dobbs (Fox), Fresh Air (WBUR, NPR), Science, News Deeply, Physics Today, New York Times (front page of Tuesday Science section), Circle of Blue, Mother Jones, High Country News, Radio and Television of Portugal (RTP), a German TV station, Wall Street Journal, and several smaller outlets. Links to several are at www.rogrbales.com.

Public and stakeholder events (invited)

Note: R. Bales is an invited speaker local, regional and statewide groups. Examples from the past 5 years provided. Recordings of some recent talks are posted online.

April 2022. "Multi-benefit analysis for forest restoration". Pacific Forest Trust webinar, online.

April 2022. "Multi-benefit, sustainable management of California's forested headwaters". North Bay Watershed Association webinar, online.

July 2021. "Hydrology, water resources & the sustainable management of California's forested headwaters". Assistant Secretary, California Natural Resources Agency, online.

September 2021. "Multi-benefit, sustainable management of California's forested headwaters". California Wildfire Symposium, hosted by UC Vice President for Research, online.

October 2021. "Multi-benefit, sustainable management of California's forested headwaters". Yosemite Hydroclimate Meeting, online.

October 2021. "Hydrology, water resources & the sustainable management of California's forested headwaters". Briefing, Executive leadership, State Water Resources Control Board, online.

October 2020. "Economic Drivers of Sustainable Forest Management Matter for California's Headwaters". Association of California Water Agencies, online.

August 2020. "How California's geography & climate shape our water security". California Water Environment Association (CWEA), online.

December 2019. "Forest Restoration: A Water-Resources Perspective". USDA Climate Hub, with participation of

California Natural Resources Agency. San Francisco. November 2019. "Innovation Center for Advancing Ecosystem Climate Solutions". Strategic Growth Council, Climate Change Research Program briefing, Sacramento.

October 2019. "Linking Wildfire, Forest Water Use, and Runoff in the Central Sierra". Yosemite Hydroclimate Meeting, Yosemite National Park.

October 2019. "Forest Restoration: A Water-Resources Perspective". California Council for Environmental and Economic Balance, Sacramento.

June 2019. "Evaluating and partitioning the multi-sectoral benefits of forest restoration; including wildfire risk, erosion, air quality, forest health & resilience, and carbon storage". Mountain Counties Water Resources Association, Auburn, CA.

May 2019. "Forest restoration: a water-resources perspective". California Air Resources Board Public Meeting, Natural and Working Lands and Carbon Neutrality, Sacramento.

November 2018. "Sierra Nevada forests depend on water stored in weathered bedrock during droughts". Sequoia-Kings Canyon Science Symposium, Three Rivers, CA.

October 2018. "Forest disturbance, water management & opportunities for landscape restoration". Yosemite Hydroclimate Meeting, Yosemite National Park.

June 2018. "UC as a scalable collaboratory for society, energy and the environment". California Higher Education Sustainability Conference (CHESC), held at UC Santa Barbara.

February 2018. "Avoiding California's next water crisis: lessons from a warming Sierra Nevada", Ray Dorough Speaker Series, held at Bankhead Theater, Livermore, CA.

October 2017. "Water Security in a changing climate". Water Boards Water Quality Coordinating Committee Meeting, Sacramento CA.

September 2017. "Comments on 21st Century Water Infrastructure". Meeting of the California Water Commission, Sacramento CA.

April 2017. "Water Security in a changing climate". The Association of Water Agencies of Ventura County 25th Annual Water Symposium. Oxnard CA.

Academic talks (invited)

Note: R. Bales has given many invited talks. Examples from the past 5 years listed.

April 2020. "Predicting mountain-ecosystem response to disturbance through scaling subsurface water-storage capacity". UC Davis seminar hosted by Department of Land, Air and Water Resources, online.

April 2020. "Predicting mountain-ecosystem response to disturbance through scaling subsurface water-storage capacity". NSF Critical Zone Observatory Webinar series, online.

October 2019. "Achieving California's water security given growing demands, diminishing snow, and increasing wildfire". UC Berkeley, Department of Civil and Environmental Engineering.

August-September 2018. R. Bales presented 10 invited talks on 3 different topics while on sabbatical in China. Seminar hosts:

– Institute of Soil Science, Chinese Academy of Sciences,

- Nanjing.
- International Institute for Earth System Science, Nanjing University.
 - The Institute of the Earth Environment, Ecology & Environment Division, Chinese Academy of Sciences, Xi'an .
 - Northwest University, College of Urban and Environmental Sciences, Xi'an.
 - Northwest Institute of Eco-Environment & Resources, Chinese Academy of Sciences, Lanzhou.
 - Lanzhou University, School of Earth and Environmental Sciences.
 - Institute of Botany, Chinese Academy of Sciences, Beijing.
 - Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing.
 - Institute of Geographic Sciences and Natural Resources Research, Key Lab of Ecosystem Network Observation and Modeling, Chinese Academy of Sciences, Beijing.
 - College of Urban & Environmental Sciences, Dept. of Ecology, Beijing (Peking) University.
- December 2017. "Making up for lost snow: lessons from a warming Sierra Nevada: A water-resources & climate-solutions perspective". Nye Lecture, Cryosphere Section, American Geophysical Union Meeting, New Orleans.
- November 2017. "Strategic communications to achieve carbon neutrality within the University of California", UC President's Global Climate Leadership Council Meeting, San Diego.
- April 2017. "Drought Resilience & Water Security: Observations from the Sierra Nevada". NSF U.S. Critical Zone Observatory Network, Critical Zone and Society Webinar Series.
- February 2017, "Water Security in a Changing Climate: Observations from Drought in the Sierra Nevada", University of California Irvine, Water-UCI Colloquium Series.
- February 2017. "Observations from drought in the Sierra Nevada: evapotranspiration, climate & regolith weathering". UC Berkeley, Environmental Engineering Seminar.

Scientific meetings

R. Bales and co-authors have made over 300 presentations at national and international scientific meetings, including the annual fall meeting of the American Geophysical Union, the annual spring meeting of the European Geophysical Union, and various specialty meetings and workshops.

MAJOR FIELD PROGRAMS

- 2013-present. American River Hydrologic Observatory, PI. Built and operated basin-scale, spatially distributed continuous measurements using 140-node wireless-sensor network (plus over 100 repeater nodes), making it the largest off-grid wireless-sensor network. Some nodes continue, and some are being upgraded for long-term operational use. Handed off responsibility to others in 2020.
- 2007-2021. Southern Sierra Critical Zone Observatory, Principal Investigator and Director. Community platform for critical-zone research. Served dozens of

- investigators & was core program used by many UC Merced faculty in leveraging other grants. Provided data and field support for many dissertations and high-impact journal papers. Partially replaced by NSF's NEON program, and part transferred to Pacific Southwest Research Station, US Forest Service.
- 2016-2020. Feather River Hydrologic Observatory, Co-PI. Built and operated sub-basin-scale, spatially distributed continuous measurements using 50-node wireless-sensor network, aimed at improving hydrologic predictions for hydropower operations. Currently being upgraded by DWR for long-term operational use.
- 2005-2015. Sierra Nevada Adaptive Management Project, Co-PI. Role: Built and operated spatially distributed continuous hydrologic measurement program in 2 sets of paired catchments in the Sierra Nevada, as part of a larger, multi-disciplinary assessment of forest-thinning effects on forest health.
- 2003-2014. Summit Greenland Baseline Measurement program, PI. NSF-supported measurement program at GEOSummit, for community data.
- 1999-2011. Greenland Environmental Observatory, Summit (GEOSummit), Founding Director. NSF-supported research facility and one of NOAA's global atmospheric observatories. Continues in operation as Summit Station.
- 2008-2009. West Antarctic Ice Sheet (WAIS) Divide Ice Coring Program, Investigator. Role: atmospheric chemistry measurements and analysis of shallow cores to establish past atmospheric oxidation capacity.
- 1995-2007. Program on Arctic Regional Climate Assessment (PARCA), Investigator. Role: drilling, retrieving, and analyzing ice cores across Greenland Ice Sheet to establish multi-century accumulation patterns.
- 1999-2002. West Antarctic traverse, Investigator. Role: atmospheric-chemistry measurements across West Antarctica and analysis of shallow cores to establish atmospheric-snow transfer function for interpretation of deeper ice cores.
2000. South Pole Ice Coring, PI. Series of shallow ice cores to reconstruct past atmospheric oxidation capacity, and accompanying measurements of atmospheric chemistry.
- 1996-1998. Siple Dome Antarctic Ice Coring program, Investigator. Role: Sampling and analysis to establish atmosphere-snow transfer function for hydrogen peroxide and formaldehyde.
- 1996-98. Greenland Ice Sheet 2 (GISP2) Ice Coring Program (3-km core to bedrock), Investigator. Responsibility: atmospheric measurement program and analysis of multi-century cores (100 m depth) to reconstruct past atmospheric oxidation capacity.
- 1989-1996. Mammoth Mountain Snow Observatory, Investigator. Role: helped to establish long-term research site for snow science and carried out a variety of measurements and experiments at the site (Site managed by UCSB, Sierra Nevada Aquatic Research Laboratory).
- 1989-1994. Glacier Lakes Ecosystem Enhancement Program (Wyoming), Investigator. Role: helped to establish long-term research site for watershed science and carried out a variety of measurements and experiments at the site (Site managed by Rocky

- Mountain Forest and Range Experiment Station, U.S. Forest Service).
1991. Borden, Ontario Research Site, Investigator. Role: Set up and carried out field experiments on virus and bacteria transport in a sandy aquifer (managed by University of Waterloo).
1990. Toxic Substances Hydrology Research Site, Cape Cod, investigator. Role: Set up and carried out field experiments on virus and bacteria transport in a sandy aquifer (managed by U.S. Geological Survey).

RESEARCH GRANTS

Current grants

- California Wildlife Conservation Board, Advancing Flow Measurement Capabilities from Forest Restoration in Northern California (Co-PI) 6/20-4/24, \$93,744 (UC Merced portion, sub from Pepperwood Foundation).
- NSF, Facilitating Restoration of Natural Infrastructure Using Uncertainty Communication (co-PI) 8/21-8/23, (PI: Lace Padilla) \$300,000.
- California Dept. Water Resources & U.S. Bureau of Reclamation, Defining the Rain-Snow Transition Zone in the Northern Sierra Nevada (PI) 8/20-8/23, \$599,697.
- USDA, Sustaining California's Food Production Through Integrated Water and Energy Management (Co-PI) 1/18-12/22 (PI: Martha Conklin), \$1,343,262.
- California Department of Forestry and Fire Protection, Valuation of water and carbon benefits of forest restoration (PI) 4/22-3/25, \$99,939 (Graduate support for Han Guo).

Completed grants

- California Strategic Growth Council (Co-PI) 5/19-3/23 (PI: M. Goulden, UCI; 4 Co-PIs) \$4,604,000.
- NSF, Southern Sierra Critical Zone Observatory (PI) 10/13-5/22 (collaborative research, 6 Co-I's) \$6,905,084.
- California Wildlife Conservation Board, Streamflow Enhancement for the French Meadows Watershed Restoration Program (PI) 4/18-12/22 (2 Co-PIs) \$1,020,470.
- California Department of Water Resources, Assessment of Climate Change Effects and Impacts on the Hydrology of Southern Sierra Nevada Basins (PI) 11/17-6/19 (1 Co-PI) \$104,433.
- Pacific Gas and Electric, Resilient Communities Grant (PI) 9/17-9/19 (2 Co-PIs) \$100,000.
- Bureau of Reclamation, Hemlock Forest-Restoration Project (Co-PI) 8/17-9/20 (PI: M. Conklin, UCM; 2 Co-PIs) \$800,000.
- California Energy Commission, improving hydrological snowpack forecasting for hydropower generation using intelligent information systems (co-PI), \$499,060 (UC Merced portion).
- UCOP, Water security and sustainability research initiative (PI) 1/15-12/18 (collaborative research, 5 Co-I's) \$3,529,749.
- UC-ANR. Effect of forest management on water yields and other ecosystem services in Sierra Nevada forests (collaborator) 1/12-12/15, \$599,500 (Bales budget)
- NSF. Development of a Basin-scale Water-balance Instrument Cluster for Hydrologic, Atmospheric and Ecosystem Science (PI) 7/11-6/15, \$1,995,156.
- USDA. Variable thinning using historical stand structure

- data to create fire-resilient forests and enhance ecosystem services in a changing climate (Co-PI) 6/12-5/15, \$222,195
- CA-DWR and USFS. Sierra Nevada adaptive management project (Co-PI) 9/07-12/15, \$1,500,000.
- NSF, Continued core measurements at Summit, Greenland Environmental Observatory. 09/09-08/14, (Co-PI. collaborative with DRI), \$500,000 UCM budget.
- NSF. Critical Zone Observatory: Snowline processes in the southern Sierra Nevada (PI) 8/07-9/13 (collaborative research, 6 Co-I's) \$5,250,000.
- NPS. Vulnerability of sequoia groves to moisture stress under a changing climate (Co-PI) 9/11-1/13, \$37,078 (Bales budget)
- NPS. SEKI natural resources condition assessment. (PI) 4/11-7/12, \$14,375.
- NPS. An assessment of snowcover in major river basins of the Sierra Nevada Network parks and potential approaches for long-term monitoring (PI) 9/09-11/11, \$17,639.
- NSF. Atmospheric, snow & firn chemistry studies for interpretation of WAIS-divide cores (Co-I) 9/07-8/12, \$341,344.
- NSF. Sierra Nevada Research Institute Informatics and Data Visualization Center in Yosemite National Park (Co-PI) 01/10-12/11, \$411,000.
- CA-DWR. Water and climate measurement program, (PI) 1/10-12/11, \$300,000.
- CA-SNC. Sierra Nevada Watershed Ecosystem Enhancement Program (PI) 5/08-11/11, \$47,847.
- NSF. Science coordination office for Summit, Greenland Environmental Observatory (PI. collaborative project with UNH), 8/05-7/11, \$480,511 Bales budget.
- NSF, Core measurements at Summit, Greenland Environmental Observatory. 09/03-02/10, (PI. collaborative with DRI and UC Davis), \$939,126 total budget.
- NSF. Development of a multi-axis differential optical absorption spectrometer for measurements of trace gases in the polar troposphere (PI. 1 Co-PI, at UCLA), 8/04-7/09, \$484,651 total budget.
- NSF. Science planning for WATER and environmental research system network (PI) 5/08-8/09, \$56,280.
- NASA. Multi-resolution snow products for the hydrologic sciences (Co-PI. subcontract from UCSB) 03/05-12/09, \$704,195 Bales budget.
- NSF. Science and Technology Center for Sustainability of Semi-Arid Hydrology and Riparian Areas, (Co-PI and deputy director on renewal; stepped aside upon leaving Arizona), 1/05-12/09, \$17,000,000 total budget, \$300,000 UCM budget.
- NSF. Science and Technology Center for Sustainability of Semi-Arid Hydrology and Riparian Areas. (Co-PI & deputy director; stepped aside upon leaving Arizona), 1/00-12/04, \$16,000,000.
- NSF. Technician Support: Phase I: A Multi-purpose Environmental Analytical Laboratory at UC Merced (Co-PI) 12/05-05-10, \$149,986.
- NSF. Observatory Design in the Mountain West: Scaling Measurements and Modeling in the San Joaquin Valley and Sierra Nevada (PI), 8/06-7/10, \$194,727.
- NSF. Development of a Water-Balance Instrument Cluster for Mountain Hydrology, Biochemistry and Ecosystem Science (PI) 8/06-7/10, \$578,171.

- LLNL. Integrated measurements and modeling of Sierra Nevada water balance (PI), 2/06-5/08, \$99,993.
- USDA Forest Service. Sierra Nevada Adaptive Management (PI for UCM sub, 2-Co-PI's; collaborative research with UC Berkeley), 7/05-9/07, \$81,272.
- NASA. Variability of ice sheet elevation and mass balance at regional spatial scales (Co-PI, collaborative research with DRI) 1/03-12/05, \$212,976 Bales budget.
- NSF. Hydrologic investigations within the GLOBE program, (Co-PI) 8/02-7/08, \$424,000.
- NSF. Antarctic Troposphere Chemistry Investigation (ANTCI) (Co-PI; collaborative research with 16 others), 03/03-03/05, \$105,880 Bales budget.
- NSF. Record of atmospheric photochemistry at South Pole (PI. collaborative research with DRI), 01/00-12/04, \$166,233 Bales budget.
- NSF. Impact of Snow Photochemistry on Atmospheric Radical Concentrations at Summit, Greenland (Co-PI; collaborative research with 10 others), 09/02-09/05, \$220,109 Bales budget.
- NSF. Science coordination office for Summit, Greenland Environmental Observatory (PI. collaborative project with UNH), 1/00-12/05, \$292,137 Bales budget.
- NSF. Hydrogen peroxide, formaldehyde, and sub-annual snow accumulation in West Antarctica: participation in the West Antarctic traverse (PI. collaborative research with DRI), 1/99-12/04, \$295,000 total budget.
- NSF. Greenland ice sheet accumulation variability, 8/02-12/04 (PI), \$97,899.
- NOAA. Variability, social vulnerability, and public policy in the Southwestern U.S. (PI until 2003; 10 Co-PI's), 6/02-7/07, \$5,000,000 total budget, \$300,000 Bales budget.
- NASA. Applications of remotely sensed land-surface data for seasonal and long-term hydroclimate predictions (Co-PI; collaborative research with UCLA & LBL), 06/02-12/04, \$153,115 Bales budget.
- Raytheon. Synergy II Partnership to Demonstrate the Use of EOS Data and EOS-DIS in the Public Interest (one of 3 Co-PI's), 1/01-2/03, \$1,200,000.
- NASA. Southwest Regional Earth Science Applications Center (PI. 5 Co-PI's), 2/99-12/02, \$1,500,000.
- NSF. Development of a high-resolution continuous flow analysis system (PI), 6/01-12/02, \$113,685.
- NSF. Hydrologic investigations within the GLOBE program (PI. 3 Co-PI's), 6/98-8/02, \$723,017.
- NSF. Snow-atmosphere transfer function for reversibly deposited species in West Antarctica (PI) 6/98-7/03, \$345,000.
- NSF. Current Relationships between air and snow chemistry in winter at Summit, Greenland (Co-PI. collaborative research with UNH). 11/98-6/02, \$90,000 Bales budget.
- NOAA. Variability, Social Vulnerability, and Public Policy in the Southwestern U.S. (PI. 6 Co-PI's), 2/98-5/02, \$1,611,571.
- NASA. Analysis of Ice Cores for Estimating Annual Accumulation in Greenland. (PI. 1 Co-PI), 1/98-12/01, \$365,000.
- NSF. Transfer function for photochemically produced chemical species in Greenland snow, firn and ice (PI), 1/99-12/01, \$270,000.
- NASA: Hydrology, Hydrochemical Modeling and Remote Sensing in Seasonally Snow-Covered Alpine Drainage Basins (Co-PI. subcontract from UCSB), 01/91-12/00, \$900,000 Bales budget.
- NSF. Collaborative Research, Biochemical and hydrologic controls on solutes and flowpaths in alpine watersheds (PI) 9/95-8/99, \$72,000.
- NSF. General education course development for earth system science and global change (PI) 4/95-1/99, \$100,001.
- NSF. Relationships between air and snow chemistry in winter at Summit, Greenland (PI) 9/96-6/00, \$19,404.
- NSF. Snow-Atmosphere Transfer Function for Reversibly Deposited Chemical Species (PI), \$268,054. 7/93-12/96.
- NSF. Distribution of Reactive Chemical Species in Snow and Ice (PI), \$190,000 7/92-12/94.
- NSF. Modeling Snowmelt Runoff and Chemistry in Alpine Basins (PI) \$191,337. 1/93-1/96.
- NSF. Scientific Basis for Modeling Snow Distribution and Melt in Alpine Catchments of the Chilean Andes (PI) \$22,308. May 1994 to April 1996
- NSF. Modeling snowmelt runoff and chemistry in alpine basins of the Sierra Nevada (PI) 8/93-6/98, \$30,837.
- NIEHS. Effect of Cosolutes on Hydrophobic Contaminant Transport (PI) 4 / 92-3/95, \$452,800.
- NIEHS. Subsurface Transport of Biocolloids (Co-I) 3/92-3/95, \$360,000.
- NSF. Undergraduate Laboratory Improvement for Earth System Science and Global Change (PI) 6 / 93 to 12/95, \$33,215.
- NATO. Snow- Atmosphere Transfer Exchange of Chemical Species, Reversibly Deposited to Snow (PI) 10/93- 10 / 94, \$7,000.
- USDOE. Transport of Subsurface Biocolloids in Porous Media (PI) 8/91-8/94, \$292,835.
- NSF. Solute Transport in Seasonal Snowpacks. (PI) 1 / 91 - 12 / 93 , \$236,802.
- USEPA. Microscale Kinetic Effects and the Subsurface Transport of Volatile Contaminants (PI) 10/90-9/93, \$218,963.
- USEPA. Delineation of Wellhead Protection Zones: Considerations of Virus and Bacteria Transport (PI) 9 / 91 - 9 / 93 , \$199,447.
- NSF. Workshop on Processes of Snow- Atmosphere Chemical Exchange (PI) 2 / 92 - 8 / 93 , \$13,690.
- USFS. Development and Application of Snowmelt Modeling for GLEES (PI) 9/91-12/93, \$25,000.
- Arizona WRRC. Underground Fate and Transport of Microorganisms (PI), 6 / 90 - 5 / 92 , \$66,735.
- NASA. Hydrology, Hydrochemical Modeling and Remote Sensing in Seasonally Snow-Covered Alpine Drainage Basins (Co-I), 7/89-12/90, \$21,000.
- NIEHS. Subsurface Transport of Biocolloids (PI) 3/90-3/92, \$193,947.
- NIEHS. Effect of Cosolutes on Hydrophobic Contaminant Transport (PI) 3/90-3/92, \$220,205.
- USEPA. Sorption and Partitioning of Hydrophobic Ionizable Organic Compounds (PI) 6/97-6/90, \$256,803.
- USGS. Surface-Chemical Factors Affecting Transport of Bio-colloids in Subsurface Media (PI) 9/87-6/90, \$128,873.
- Calif ARB. Development of Watershed Models for Emerald Lake Watershed for Sequoia National Park

- and for Other Lakes of the Sierra Nevada (PI) 6/87-5/89, \$150,000.
- USFS. The Transport of Tracer Pollutants through a Layer of Natural Snow Melting in a Controlled Environment (PI) 5/88-5/89, \$18,000.
- USFS. SO₂ Fumigation of Natural Snow in a Controlled Environment (PI) 3/88-5/88, \$5,000.
- Salt River Project, Subsurface Removal of Volatile Organic Compounds Using Forced Ventilation (PI) 8/87-9/88, \$45,330.
- ACS PRF. Effect of Binding Mechanisms on Sorption Kinetics (PI) 9/85-8/87, \$15,000.
- NSF. Kinetics of Sorption Reactions in Groundwater, (PI) 6/85-12/87, \$64,880.
- USEPA. Coagulation and Nucleation of Submicron Particles (PI) 6/85-12/87, \$94,305.
- Motorola, Inc. Physicochemical and Biological Factors Affecting the Feasibility of Cleanup Measures in Contaminated Sediments (PI) 6/85-9/86, \$48,204. 6/85-6/86.
- Federal Water Resources Research Program, Biodegradation of Organic Contaminants in Groundwater (PI) 5/85-6/87, \$21,316.
- USFS, Fumigation of Snow with SO₂ and NO₂ (PI) 4/85-6/86, \$60,000.

PROFESSIONAL SERVICE (*selected*)

Note: In 2011 I made the transition away from serving on national advisory committees, especially those requiring significant travel, to working locally with state agencies and regional partnerships on within-California priorities. This included providing leadership from my UC position, rather than from advisory-committee membership, on addressing the state's climate and water-resources challenges. For me this as much more impactful service, and accommodated my family obligations.

Note on Critical Zone Observatory (CZO) Network, 2007-2021. As Director of the Southern Sierra CZO, I was heavily involved in CZO network activities, serving the professional community, including significant travel to other CZO sites, to NSF, and to other meetings. One goal, which has seen considerable success, was to engage the research community in better integrating disciplinary research, using the framework of the Earth's Critical Zone. In 2020 NSF launched the Critical Zone Collaborative Network.

- 2006-2012. Member, Board of Directors, Great Valley Center, Modesto, CA. This non-profit focused on capacity building and other programs to improve institutions and the quality of life in the Central Valley.
- 2007-2010. Member, science leadership team, WATERS Network (NSF).
- 2003-2012 Greenland Summit Environmental Observatory, Scientific Director (NSF).
- 2004-2007. Member, Committee on Integrated Hydrologic Observations, Water Science and Technology Board, National Research Council.
- 2003-2010. Member, National Advisory Board, Long Term Ecological Research (LTER) Network.
- 2003-2007: Member, Committee on Metrics for Global Change Research, National Research Council.
- 2002-2006: Member, Committee on Geophysical and Environmental Data, National Research Council.

- 2001-2008: Member Representative, Consortium of Universities for the Advancement of Hydrologic Science, Inc. 2006-2008: Chair Hydrologic Measurement Facility Oversight Committee. 2005-2006: Member, Science Agenda Team. 2001-2004: Member, Board of Directors. 2001-2003: Member, Executive Committee. 2000-2001: Chair, steering committee that planned and formed the consortium, and PI on grant that funded the consortium.
- 2000-2011: Steering Committee Chair and Science Coordination Office Director, Summit Greenland Environmental Observatory.
- 1999-2000, Chair, Steering Committee, Southwest Regional Assessment, U.S. Global Change Research Program; Member, Regional Assessment Team.
- 2000-2002: Member, Advisory Committee, Geosciences Directorate, National Science Foundation.
- 2000-2002, Steering Committee, Eos, Transactions, American Geophysical Union. Hydrology Editor, 1997-2001.
- 1999-2002: Member, Committee on Hydrologic Sciences, National Research Council.
- 1999-2001: Chair, Ice Core Working Group. Member, 1997-1999.
- 1999-2000: Member, Water Cycle Study Group, U.S. Global Change Research Program.
- 1994-1996: Hydrology section secretary, American Geophysical Union.
- 1992-1996: Associate editor, Water Resources Research.
- 1992-1996: Member, Committee on Glaciology, National Research Council.
- 1991-1996: U.S. representative, International Commission on Water Quality, International Association of Hydrologic Sciences.
- 1991-1995: Chair, Snow-Atmosphere Chemical Exchange Working Group, International Commission for Snow and Ice.
- 1990-1993: Fall meeting program chair, Hydrology Section, American Geophysical Union.
- 1987-1990: Steering Committee, Snow Chemistry Working Group, International Commission for Snow and Ice.
- 1985-1990: Water Quality Committee, Hydrology Section, American Geophysical Union.
- 1989-1991: Coagulation Research Committee, American Water Works Association.

RECENT CONSULTING

- 2017-present. Blue Forest Conservation, Science Advisor; and development of water-resources data and tools to help increase the pace and scale of forest restoration.
- 2018-2022, The Nature Conservancy, Tahoe-Central Sierra Initiative (forest restoration and water resources).
- 2014, Kennedy-Jenks Consultants, Mariposa Integrated Water Management Plan. Climate change impacts on regional hydrology.
- 2014, Provost & Prichard Consulting Group, Madera Integrated Water Management Plan. Climate change impacts on regional hydrology
- 2013-2014, Scott River Watershed Cooperative Planning Group, forest management and water resources.
- 2009 - 2010, Tetratex, Inc. Climate change study for L.A. Department of Water and Power.
- 2009 - 2010, Department of Justice, Consultant to legal team defending Yosemite National Park.

COURSES TAUGHT**UC Merced**

Lower Division: Service Learning; Freshman Seminar (global change)

Upper Division: Hydrology and Climate, Engineering Economics.

Upper Division/Graduate Level: Field Methods in Snow Hydrology, Mountain Hydrology.

Graduate Level: Environmental systems, Water Resources, Environmental Systems Seminar (AY 20-21 focus on Environmental Justice).

UC Berkeley

Graduate Level: Water Resources.

U. Arizona

Lower Division: Introduction to Global Change; Water and the Environment.

Upper Division: Principles of Water Quality; Environmental Hydrology.

Graduate Level: Topics in Semi-Arid Hydrology; Global Biogeochemical Cycles; Water Quality Dynamics; Pollutants in the Hydrologic Environment; Sorption Phenomena; Aquatic Chemistry of Surfaces; Water Quality Planning and Policy; Physical Oceanology and Limnology for Hydrologists; Computational Methods in Hydrology.

Short Course: Chemical Behavior of Organic Contaminants. 40-hr course for professional hydrologists.

RESEARCH SUPERVISION

Current Ph.D.: Han Guo.

Current Postdoctoral: Min Gon Chung, Guotao Cui, Weichao Guo (co-supervise).

Completed, Postdoctoral Researchers: J. Acker (co-supervise), M. Anklin, F. Avanzi (co-supervise), R. Banta (co-supervise), C. Brown-Mitic, J. Burkhart, D.W. Cline (co-supervise), M. Erickson (co-supervise), S.R. Fassnacht, R. Ghanbari (co-supervise), M. Glueck, M. Hutterli, H. W. Jacobi, Z. Klos, M. Kniffen (co-supervise), Q. Ma (co-supervise), F. Liu, J. Morrill (co-supervise), R. Ray (co-supervise), D. Rheinheimer, R. Rice, A. Seth (co-supervise), D. Shen, B. Tobin (co-supervise).

Completed Ph.D.

T. Maurer. Development of novel data applications for improving precipitation-runoff modeling in headwater catchments (co-supervise), 2020.

S. Malek. Alpine sensor network system for high-resolution spatial snow and runoff estimation (co-supervise), 2019.

J. Rungee. Estimating plant-accessible water storage through evaluating evapotranspiration in the semi-arid western United States using eddy-covariance, remote sensing, and spatially distributed data. 2019.

Q. Ma. Quantifying forest structure parameters and their changes from LiDAR data and satellite imagery in the Sierra Nevada (co-supervise), 2018.

Z. Zheng. Multi-spatial-scale observational studies of the Sierra Nevada snowpack using wireless-sensor networks and multi-platform remote-sensing data, 2018.

- Y. Su. The Use of LiDAR in multi-scale forestry applications (co-supervise), 2017.
- Z. Zhang. Basin-scale hydrologic experiment by means of a wireless-sensor network system (co-supervise), 2016.
- J. Roche. Evaluating water balance components in the Sierra Nevada: Snowpack sensitivity to climate warming and forest evapotranspiration reduction potential. 2015.
- P. Saksa. Forest management, wildfire, and climate impacts on the hydrology of Sierra Nevada mixed-conifer watersheds (co-supervise), 2015.
- B. Harrison. Skill evaluation of water supply forecasts in western Sierra Nevada and Colorado River basins, 2015.
- S. Masclin. Contribution of sources and sinks to the photochemistry of the present and past atmosphere of West Antarctica based on air, snow and ice-core records. 2014.
- P. Kirchner. Snow Distribution over an elevation gradient and forest snow hydrology of the Southern Sierra Nevada, California, 2014.
- B. Kerkez. A cyberinfrastructure for the measurement and estimation of large-scale hydrologic processes (co-supervise), 2012.
- M. Frey. Hydrogen peroxide and formaldehyde in West Antarctic atmospheres and ice, 2006.
- K. Dressler. Estimating the spatial distribution of snow water equivalent and simulated snowmelt runoff modeling in headwater basins of the semi-arid Southwest, 2005.
- J. Burkhart. Variability of nitrogen deposition and preservation over the Greenland Ice Sheet, 2005.
- N. Molotch. Estimating the spatial distribution of snow water equivalent and snowmelt in mountainous watersheds of semi-arid regions, 2003.
- A.M. Kramer-Huth. Geochemical and isotopic mixing models: two case studies in a snow-dominated and semi-arid environment, 2003.
- T. Meixner. Alpine biogeochemical modeling: case studies, improvements, and parameter estimation, 1999.
- J.R. McConnell. Investigation of the atmosphere-snow transfer process for hydrogen peroxide 1997.
- R. Harrington. The release of meltwater and ionic solute from melting snow, 1997.
- R.H. Galarraga-Sanchez. Scale effects in determining snowmelt from mountainous basins using a distributed approach for snow water equivalence and radiation, and a point snowmelt model, 1995.
- S. Li. Modeling biocolloid transport in saturated porous media, 1993.
- R.A. Matzner. Characterization of aza-arene transport in saturated porous media, 1993.
- R.A. Wolford. Integrated hydrogeochemical modeling of an alpine watershed: Sierra Nevada, California (co-supervise), 1992.
- Z.K. Chowdhury. Coagulation of submicron colloids in water treatment (co-supervise), 1988.
- D.L. Pardieck. Biodegradation of phenols in aquatic culture by soil-derived microorganisms, with reference to their fate in the subsurface (co-supervise), 1988.
- J.E. Szecsody. Sorption kinetics of hydrophobic organic compounds on organic modified surfaces, 1988.
- M.P. Valdez. The incorporation of sulfur dioxide into snow and depositing ice (co-supervise), 1988.

Completed M.S.

- M. Pickard. Influence of within-stand tree spatial arrangement on snowpack distribution and ablation in the Sierra Nevada, CA, 2015.
- S. Welch. Sensor placement strategies for SWE estimation in the American River basin (co-supervise), 2012.
- S. Martin. Erosion in Southern Sierra Nevada headwater catchments, 2009.
- C. Peters. Hydrologic resource assessment of Upper Sabino Creek Basin, Pima County, Arizona, 2000.
- J. Clemmons. A comparison of water quality methods and data: Globe Program vs. United States Geological Survey, 2000.
- J.F. Burkhart Sorption behavior of formaldehyde to ice grains, 2000.
- A.M. Kramer. GLOBE water quality data in context: A comparative study of volunteer and governmental agency databases, 1998.
- B.D. Wolaver. Comparison of snow distribution methods in the Echaurren Basin, Chilean Andes, 1999.
- J.A. Rohrbough. Spatial variability of snow chemistry in a seasonal snowpack, Southeastern Wyoming, 1998.
- J.R. Shaw. Modeling of silicate mineral weathering reactions in an alpine basin of the southern Sierra Nevada, California, 1997.
- B.J. Cadle. Application of snow distribution models within the Laguna Negra basin, Chile, 1996.
- J.R. Winterle. Sorption kinetics of H₂O₂ to snow grains, 1996.
- S.M. Carroll. Evaluation of virus removal by sandy soils during soil-aquifer treatment using indigenous bacteriophage as indicator organisms (co-supervise), 1996.
- D. McCaulou. Bacteria transport through soil columns, 1993.
- T. Kinoshita. Effects of pH and hydrophobicity on the transport of viruses and bacteria in saturated media, 1991.
- C.E. Petersen. Ion flux through a shallow snowpack: effects of initial and melt conditions, 1990.
- S. Hinkle. Modeling colloid transport in saturated porous media, 1990.
- J.G. Van de Water, Physical and chemical processes affecting forced ventilation of benzene and p-xylene in a desert soil, 1989.
- K. Stocking. Adsorption of MS-2 bacteriophage to silica. Master's thesis, 1989.
- K.G. Pill, The use of a multiparameter bacterial aquatic toxicity test (co-supervise), 1989.
- E. E. Hopkins, Characterization of the dissolution of hornblende with application to natural waters, 1989.
- D. Hunter. Influence of pH and counterion concentration on the sorption of acridine to unbonded silica, 1989.
- T. W. Kroeger. Hydrophobic partitioning of the bacteriophage MS-2, 1989.
- P.A. Noppe. Nitrogen cycling at Emerald-Lake watershed, Sequoia National Park. 1989.
- J. H. Davis, Sorption and desorption of benzene and p-xylene on an unsaturated desert soil, 1989.
- G.E. Kupillas, Development and investigation of a multiparameter microbial toxicity test using the bacterium *Salmonella Typhimurium* (co-supervise), 1988.
- D.G. Kebler. Coagulation of submicron colloids by supramicron silica particles, 1988.
- P.W. Lawson. Sorption of fulvic acid on aluminum oxide and desert soil, 1988.
- K.L. McClellan. Biodegradation of trichloroethylene by bacteria indigenous to a contaminated site (co-supervise), 1987.
- D.A. Stanley. Atmospheric and aqueous flux of sulfur in snow, 1987.
- T.W. Whitehead. Sorption and desorption of volatile alkyl halides in a desert soil, 1987.
- A. Klein. Sorption reactions of 1,d-Dichlorobenzene in low organic carbon soils, 1986.

ACADEMIC SERVICE**UC Systemwide**

- 2022-present. Member, Systemwide Task Force on Pathways to a Fossil Free UC.
- 2014-present. Member, UC President's Global Climate Leadership Council (GCLC). Current role: As a systemwide Senate appointee, R. Bales has been working with Academic Council to increase communication and engagement of faculty in addressing UCs carbon-neutrality goals, and the further path to our larger goal to help create a more sustainable, equitable, resilient and healthy world. This Council is very active.
- 2014-present. Member, GCLC Applied Research Working Group (ARWG). This working group was regularly active before the pandemic, in convening UC researchers with state officials, developing research opportunities and looking forward to research that could contribute to meeting UC and state decarbonization goals. Renewed activity planned in fall 2022.
- 2018-present. Steering Committee Member, California Collaborative for Climate Change Solutions (C4S). An outgrowth of the ARWG, C4S brought together UCs, National Labs, other universities, the private sector, and state officials to develop strategic research opportunities that would contribute to California's energy-transition goals. Discussions are underway about restarting this initiative, as it was less active during the pandemic.
- 2015-2020: Director, University of California Water Security and Sustainability Research Initiative (MRPI).
- 2016-2018. Chair, Working Group on Strategic Communication to Achieve Carbon Neutrality within the University of California (TomKat Foundation support).
- 2012-2016. Researcher and water-initiative co-leader, Center for Information Technology Research in the Interest of Society (CITRIS), UC Berkeley
- 2009-2013. Member, UC Natural Reserve System Advisory Committee.
- 2009-2010. Member, .Advisory Panel, Water Resources Center Archives and Berkeley Water Center, Water Data Management Project.
- 2007-2008. Member, Planning Group for California Climate Solutions Institute (proposal to California Public Utilities Commission and State Legislature.
- 2006-2008. Member, Academic Senate Committee on Planning & Budget.
- 2004-2006. Member, Academic Senate Board of Admissions and Relations with Schools (BOARS).
- 2003-2007. Convener, Multi-campus ad hoc planning

group for Sierra Nevada Hydrologic Observatory.

UC Merced

Director, Sierra Nevada Research Institute, 2007-2020.

Note that this ORU appointment provided teaching release and precluded senate service at campus level. SNRI Director still has a very high service load.

Director, UC Merced Natural Reserve System, 2008-2013.

Director, Yosemite Field Station, Sierra Nevada Research Station, 2008-2013.

Director, Environmental Analytical Laboratory, 2008- 2013.

National Parks Institute, Steering Committee, Member, 2009-2013.

Academic Surge Building Advisory Committee, Member, 2010.

School of Management planning committee, Member, 2008-2016.

Search Committee, Dean of Engineering, 2009-2010.

Great Valley Center Director Search Committee, 2007-2008.

Senate Committee on Academic Planning and Resource Allocation, 2004-2008. Chair. 2005-2007.

UCM Division Council (2004-2008). Vice-Chair, 2005; 2007-2008.

UC Merced budget committee, Member 2006 - 2007.

Sierra Nevada Research Institute Advisory Committee, Member 2003-2007.

UCM Ad hoc space planning committee, Member 2005-2006.

UCM Instructional Technology Advisory Committee, Member 2004-2005.

Undergraduate Council 2003 - 2005. Chair 2004-2005.

UC Merced School of Engineering

Search Committee, Ecological Engineering, Chair. February – June 2014.

Search Committee, Management, Chair. July 2010 - June 2011.

School of Engineering Faculty, Chair, August 2006 - August 2008.

Air pollution faculty search committee, Member 2005 - 2007.

Environmental economics faculty search committee, Member 2005 - 2006.

Environmental policy faculty search committee, Chair 2005 - 2006.

Renewable energy faculty search committee, Member 2005 - 2006.

Spatial analysis faculty search committee, Chair 2004 - 2005.

U. Arizona (selected)

2000-2003: Deputy Director (co-leader), NSF Science and Technology Center for the Sustainability of Semi-Arid Hydrology and Riparian Areas, University of Arizona

1998-2003: Lead Investigator, Climate Assessment for the Southwest Project, University of Arizona (stepped down upon leaving to join UC Merced).

2000-2003: Member, Committee on Remote Sensing and Spatial Analysis.

1999-2003: Director, NASA Regional Earth Science Applications Center.

1994-2003: Member, Interdisciplinary Committee for Global Change, Chair 1994-1997.

2002-2003. Advisory committee on focused excellence initiatives for the university, University of Arizona, Provost.

2000-2003. Advisory Committee, Vice President for Research.

1999-2003. Department of Hydrology and Water Resources, Graduate Policy Committee

2000-2003. Faculty Senate, Member.

2000-2002. Faculty status committee, College of Engineering and Mines, Promotion and Tenure.

1997-1999: Acting Director, Institute for the Study of Planet Earth, (organized research unit)

1997-1999. Flandreau Science Center, Science and Technology Working Group (planning for new science museum).