

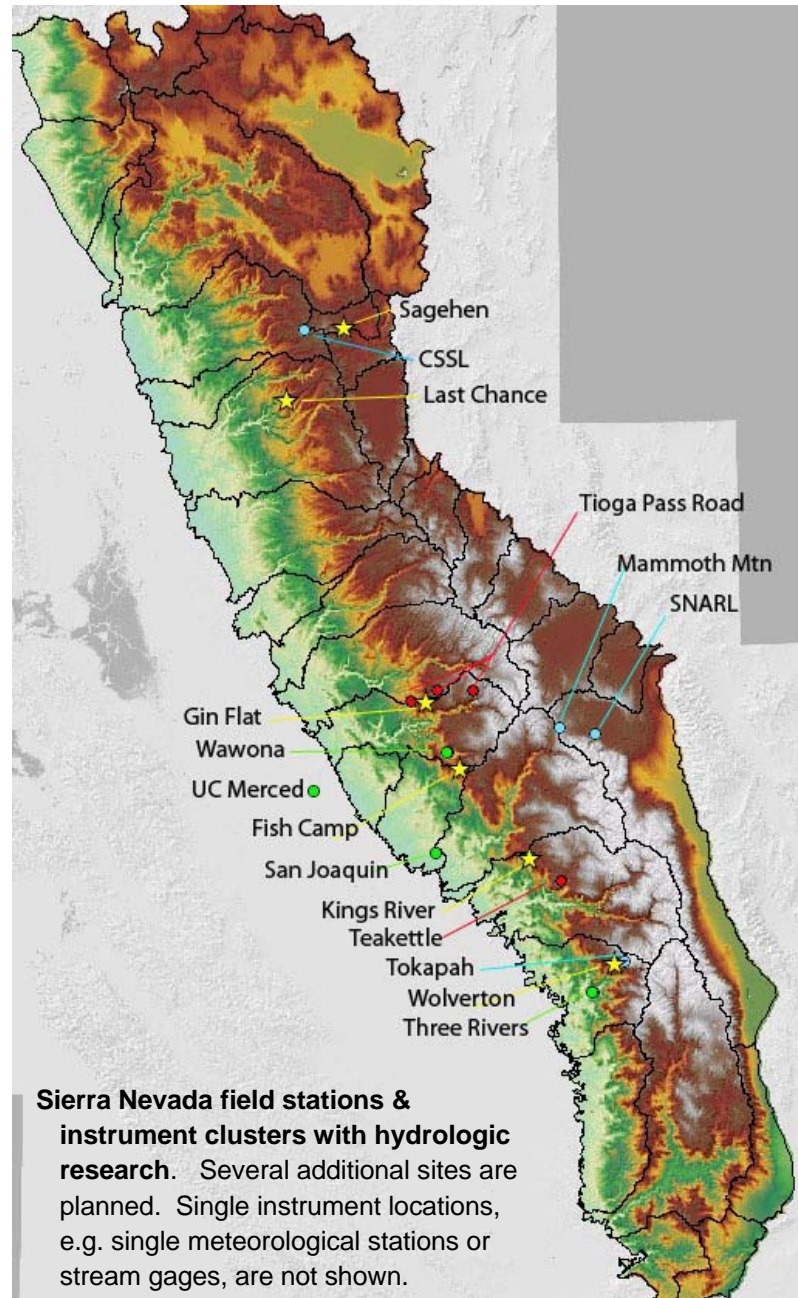
Proposed multi-campus research unit

Context & need

Importance. Climate change is introducing unprecedented stresses into the Sierra Nevada water cycle, with billion-dollar implications for flood control, water supplies & ecosystem management. Water managers, land stewards & other stakeholders are facing large knowledge gaps, as precipitation, snowmelt, temperature regimes & seasonal transitions move outside the historical range. The changing mountain water cycle has implications for maintaining critical habitats, sustaining hydropower production, managing fire risk, operating dams & delivering water to end users across the state. UC has a central role in meeting knowledge gaps through research & development of technology.

Missing elements & enabling technology. The UC research presence in the Sierra Nevada, outside of the Tahoe basin, is limited but growing. Historical facilities in the Lake Tahoe region continue to play important roles as important infrastructure for local research & instruction needs; but the large latitudinal & elevational gradients in climate & ecosystems across the Sierra Nevada & surrounding valleys demand a more representative & extensive system of measurement & research infrastructure. Scaling process understanding requires representative measurements, distributed platforms for research, enabling cyberinfrastructure & means of coordinating & integrating research across multiple investigators & campuses. Three technical elements have recently come together that make a research platform at the scale of the Sierra Nevada feasible: i) accurate, sustained satellite estimates of landcover properties ii) reliable, low-cost sensors & telemetry systems for environmental variables, & iii) cyberinfrastructure advances to integrate data & make it readily available to the science community.

Conceptual design. A multi-campus research unit will provide an intellectual focus, essential cyberinfrastructure to enable research, & a hub for communications both among researchers & between researchers & Sierra Nevada stakeholders. Intellectually the proposed MRU will provide the scaffolding for planning, exchanging ideas & collaborating on research. Cyberinfrastructure for data management & distribution is the essence & core of the MRU. It links people, measurements & analyses; & it links distributed research activities into a single network. The communications role for the MRU provides value added for the research of the individual & groups of affiliated scientists; & it enables both individual & collective education & outreach activities.



Expected outcomes. The proposed MRU will link the efforts of ad hoc groups working to build a Sierra Nevada Hydrologic Observatory (SNHO), efforts that began nearly 5 years ago. It will signal a multi-campus commitment to a major issue for the state, both addressing critical knowledge gaps & building good will. It will provide a means to effectively leverage state, private & federal resources around water & related Earth science, ecological & resource management questions. Finally, it will result in science & policy advances on questions that are at the forefront of those fields.

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Core locations^a & participants

Instrument clusters. Existing distributed clusters involving multiple instruments

- Wolverton basin, Sequoia NP (UCM, UCD, UCLA)
- Tokapah, Sequoia NP (UCSB, UCR)
- Kings River Experimental Watershed (USFS) & Sierra Nevada Critical Zone Observatory (UCM, UCB, UCD, UCI, UCSB, UCLA), Sierra NF
- Fish Camp, Sierra NF (UCM, UCB)
- Gin Flat & Tioga Pass Road, Yosemite NP (UCM, UCSD)
- Last Chance, Tahoe NF (UCM, UCB)
- Central Sierra Snow Laboratory (UCB)
- Sagehen Creek (UCB, UCLA) UC Natural Reserve & USFS-PSW experimental forest
- Mammoth Mountain (UCSB, UCLA, UCM)

Other sites. Existing & planned field stations & planned instrument clusters

- Three Rivers (possible SNRI field station)
- Teakettle (USFS-PSW experimental forest)
- San Joaquin Experimental Range (USFS-PSW), proposed NEON core site
- UC Merced campus reserve (planned UC-NRS site)
- Wawona, SNRI field station, Yosemite NP
- Sierra Nevada Aquatic Research Laboratory, UC natural reserve & field station

^asee figure on p. 1

Other plans. Significant basin-wide instrument deployments are planned for the American River basin, under cooperative projects involving UC, CA-DWR, American R. stakeholders, the Sierra Nevada Conservancy & NGO's.



SNRI Wawona field station.



Kings River

Participants. Faculty & research scientists from across the UC are engaged in hydrologic research in the Sierra Nevada. Expected core participants in the proposed MRU who are doing hydrologic science research at the sites illustrated on page 1 include:

- UC Merced: Roger Bales, Martha Conklin, Qinghua Guo, Tom Harmon, Robert Rice
- UC Davis: Jan Hopmans, Graham Fogg
- UC Berkeley: James Kirchner, Elizabeth Boyer, Norman Miller
- UC Santa Barbara: Jeff Dozier, Christina Tague
- UC Los Angeles: Terri Hogue, Noah Molotch
- UC San Diego: Mike Dettinger, Dan Cayan
- UC Riverside: James Sickman
- UC Irvine: Michael Goulden, Jay Famigletti
- Lawrence Livermore Lab: Reed Maxwell, Greg Nimz

Many other UC faculty & research scientists in related fields will support formation of the MRU & participate in the activities of the unit. These include colleagues in the fields of ecosystem science, ecology, (bio)geochemistry, soil science, geomorphology, climatology, meteorology.



Installing soil moisture probes, Kings River



Snow acoustic depth sensor & radio



UC Natural Reserve sites. Note lack of sites on the west slope of the Sierra Nevada & Central Valley.



Wolverton meadow & historic buildings, Sequoia NP

Cyberinfrastructure. A distributed digital library was set up through an NSF “virtual observatory” planning grant & is being expanded under other projects. See <https://eng.ucmerced.edu/snsjho/>