# Building Observational Networks for Hydrologic Characterization of the Snow-Dominated SFA East River Watershed Study Site

Rosemary W.H. Carroll[1], Lindsay Bearup[2], Roelof Versteeg[3] Greg McCurdy[1], Ben Potter[4], Lauren Foster[5], Reed Maxwell[5] and Kenneth H. Williams[2]

Quantifying the timing, intensity and duration of water inputs to snow-dominated watersheds is critical to understanding energy and water budget partitioning with direct consequences on water delivery to streams as well as on hydrologically mediated biogeochemical processes that control nonlinear riverine solute fluxes. Tremendous uncertainty in quantifying boundary condition influxes at the watershed scale is largely due to spatial and temporal heterogeneity in snow-related properties. In addition, scarcity and sampling bias in climate station infrastructure make it difficult to resolve hydrologic variability at scales relevant to biogeochemistry. As part of its Subsurface Biogeochemistry Watershed Function Scientific Focus Area (SFA), Berkeley Lab has recently established the East River (ER) in the mountains of central Colorado. The ER is representative of many high-elevation headwater systems within the Upper Colorado River Basin, with watershed complexity and hard to access terrain compounding difficulties in sampling for adequate understanding of watershed processes. To address these challenges, observation networks related to precipitation and stream fluxes are being developed in concert with a high-resolution, physically-based, integrated hydrologic model and remote sensing/airborne retrieval methods; and will support future work on hydrochemically derived streamflow age distributions. Streamflow is measured at 14 locations using pressure transducers and acoustic Doppler velocimeter (wadable) and current profiler (unwadable) to isolate sub-basin export of water and solutes. Climate monitoring relies on two SNOTEL sites, an EPA CASTNET station and six meteorological stations owned and operated by the Rocky Mountain Biological Laboratory (RMBL). RMBL station upgrades have begun with support from the SFA and the Desert Research Institute, and all climate stations are being incorporated into a sophisticated platform for data retrieval and visualization. Targeted and novel approaches to measure snow water equivalent (SWE) include a verification study of weighing-gage SWE plate technology, with potential for deployment to remote portions of the basin. In addition, comprehensive snow sampling campaigns encapsulate the largest possible range in observed physiographic parameters and will inform future LiDAR surveys being considered by the SFA. Snowmelt isotopic flux is measured at five locations, with a near-instantaneous collection device (Picarro) installed for direct comparison with stream discharge to provide the highest resolution on observed isotopic mass flux. Observation networks are focused on fundamental questions related to water cycling and provide hydrologic characterization for ongoing collaborative projects across scales within the ER watershed.

[1] Desert Research Institute, Reno, NV; rosemary.carroll@dri.edu
[2] Lawrence Berkeley National Laboratory, Berkeley, CA.
[3] Subsurface Insights, Hanover, NH
[4] Navarro Inc., Grand Junction, CO.
[5] Colorado School of Mines