The East River Watershed: Hydrobiogeochemical Studies Spanning Scales and Disciplines

KENNETH H. WILLIAMS[1,2] AND THE EAST RIVER COMMUNITY WATERSHED TEAM

[1]Lawrence Berkeley National Laboratory, Berkeley, CA, USA. khwilliams@lbl.gov

[2] Rocky Mountain Biological Laboratory, Gothic, CO, USA.

Berkeley Lab and its collaborating institutions have established a "Community Watershed" in the headwaters of the East River near Crested Butte, Colorado (USA) designed to quantify processes impacting the ability of mountainous systems to retain and release water, nutrients, carbon, and metals. The watershed spans a range of scales from hillslope to catena to catchment to basin, with surface water and groundwater linking multiple geomorphic compartments. Research is multi-disciplinary involving hydrologists, plant and microbial ecologists, geochemists, geophysicists, and snow and climate scientists. Research is focused on both mechanistic and empirical studies designed to assess the impact of climate perturbation (e.g. early snowmelt) on coupled ecohydrological and biogeochemical processes as they relate to water quantity and quality. Stakeholder participation provides feedback and support on environmental monitoring and by extension a direct link to management planning decisions conducted under the Colorado Water Plan. Data collection and monitoring infrastructure are emplaced within the domain so as to assess the aggregate impact of fine scale processes on watershed scale behavior, with a particular emphasis on airborne-based characterization methods to examine hydrogeochemical processes spanning the vertical continuum from vegetation canopy to deep bedrock aquifer. Such data require extensive use of proxy measurements to assess spatial and temporal variations in properties of interest be these geologic, geochemical, microbial, or hydrologic. Data gathering occurs over a diversity of time scales from minutes to months to years, with observational data being used to define new areas of investigation and to populate and constrain reactive transport models describing water and nutrient flows emanating from the watershed. Critical infrastructure includes installation of site-specific concentration-discharge monitoring stations, meteorological station networks, elevation dependent fluxes of carbon and water, plant and microbial phenological behavior, and remote sensing datasets designed to establish spatially extensive baseline datasets required to assess the impacts of both natural and simulated climate perturbation.