Ecohydrological Controls on Root and Microbial Respiration in the East River Watershed of Colorado

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Belowground in the soil, microbes breakdown organic matter, releasing CO_2. Plant roots produce CO_2 also, via their metabolism. Our research seeks to understand how moisture inputs, such as snow and rain, influence the amount of CO_2 produced belowground in the East River watershed, near Crested Butte, Colorado. In June, 2021 we instrumented four sites along Snodgrass Mountain in the two main forest types, aspen and spruce/fir. At each of these sites, we will quantify the flux of CO_2 from the soil to the atmosphere, and how plant and microbial sources of CO_2 respond to the environment, across different elevations. To do this, continuous measurements of soil CO_2 concentrations, at multiple depths, will be combined with novel radiocarbon (14C) methods that will enable the separation of plant and microbial sources of CO_2. These measurements will be linked to measurements of forest and snow phenology (with PhenoCams), microbial activity, and environmental factors such as air and soil temperature, soil moisture, and groundwater flow. Our work is motivated by our overarching hypothesis that quantifying belowground plant and microbial processes separately, and how they are influenced by snow and rain inputs, is necessary for understanding and predicting how the belowground East River watershed ecosystems will respond to changes in the environment.