Poster #165

Mechanistic and Predictive Understanding of Needle Litter Decay in Semi-Arid Mountain Ecosystems Experiencing Unprecedented Vegetation Mortality

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The Rocky Mountains of North America are experiencing a prolonged period of ecological stress resulting from coupled human and natural disturbances including logging, wildfire mitigation and incidence, climate change, and large scale insect infestation. The latter have decimated tree populations across millions of acres of forest in the region with repercussions for biogeochemical processes that can influence water resources, ecosystem function, and human well-being. The current exploratory project focuses on the decay of needle litter as a function of beetle impacted vs. unimpacted spruce (*Picea pungens*) in complement to lodgepole pine given their relevance to this form of large-scale disruption in the region. Needles were harvested from geographically similar sites and then deployed within the East River watershed at different elevations in fall 2016 to understand the effect of temperature, moisture, accelerated snowmelt and differing needle chemistry on decay processes and carbon and nitrogen export into the atmosphere (i.e. CO_2 and N_2O) and hydrosphere (i.e. nitrate, ammonia, DOC). In isolating the needles from the hydrodynamic and biogeochemical variables of the tree system, our goal is to better understand the relative biogeochemical contributions of needle decay versus rhizospheric processes in distressed ecosystems. Ultimately this necessitates contrasting these processes with those under trees, where we propose to investigate plots of spruce trees in a nearby watershed that contains both beetle-killed and non-impacted spruce. In addition to enabling an understanding of these intertwined processes on biogeochemical cycling, this will enable us to query how localized treescale hydrologic and biogeochemical responses scale to watershed processes and the potential compensatory effects of healthy surrounding trees. Collectively, our research has implications for forest recovery and nitrogen export in this nitrogen-limited montane ecosystem and could aid in the prediction of and preparation for biogeochemical shifts that could impact water quality or greenhouse gas release.