

Drought induced rapid carbon loss from high elevation meadows in the Sierra Nevada Mountains



Dr. Asmeret Asefaw Berhe
 Associate Professor, Soil Biogeochemistry
 - Life and Environmental Sciences,
 University of California, Merced.

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By the end of the 20th century, the onset of spring in the Sierra Nevada mountain range of California has been occurring on average three weeks earlier than historic records. Superimposed on this trend is an increase in the presence of highly anomalous “extreme” years, where spring arrives either significantly late or early. Depending upon the year, nonlinear responses in ecosystem processes can cause these meadow systems to shift from a sink to a source of carbon contributing to local (meadow degradation), regional (loss of ecosystem services) and global effects (feedback to atmosphere). In this talk, I will present results from a study where we assessed the impact of extreme winter precipitation variation on aboveground net primary productivity and soil respiration over three years (2011 to 2013). We found that the duration of snow cover and presence of early spring frost events contributed to an average 100% increase in soil respiration in 2012 and 2013 and an average 39% decline in aboveground net primary productivity observed over the same years. The overall growing season length increased by 57 days in 2012 and 61 days in 2013. These results demonstrate the dependency of these keystone ecosystems on a stable climate and indicate that even small changes in climate can potentially alter their resiliency.