

## Drivers and Mechanisms of Long-Term Soil Response to Chronic Warming

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**Project Goals: The goal of this research is to quantify the effect of long-term warming on the temperature sensitivity of CUE and extracellular enzyme activity.**

The predictions of how soil carbon stocks will change with chronic warming are sensitive to the assumptions made about microbial parameters such as carbon use efficiency (CUE). CUE is the fraction of carbon (C) taken up by the microbial cells and retained in biomass in relation to the fraction lost via respiration. Microbial CUE partitions the flow of C to the atmosphere, decomposer communities and potential soil C stocks. Because there are still uncertainties about what drives long- and short-term responses of CUE, more research is needed to better predict soil carbon stocks in a warming world. In this ongoing work, we sampled soils from two long-term experimental sites that have been heated for 28 or 13 years in a mid-latitude hardwood forest at the Harvard Forest LTER. We collected organic and mineral soils in summer and fall and measured the response of carbon use efficiency and extracellular enzyme activity to increasing temperature from 4°C to 30°C. Respiration, a CUE component, and extracellular enzyme activity both showed a smaller response to increasing temperature in heated than control soils. In the next steps of this work we will measure carbon quality. Our working hypothesis is that substrate quality plays a role in the adaptation of CUE to long-term warming. We expect to find depletion in the more labile soil carbon pool in heated compare to control soils which could account for the smaller CUE observed in these soils. This work will elucidate the effect of long-term warming to soil carbon pools and to microbial CUE response to temperature helping us better predict possible feedback mechanisms between soil and the atmosphere.

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