Title: Bacterial Community Response to Environmental Change Varies With Depth in the Surface Soil.

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Project Goals: We sought to assess whether bacterial response to above-ground environmental changes is uniform throughout three layers of the surface soil: the leaf litter layer, 0-2 cm of bulk soil, and 0-10 cm of bulk soil. We aimed to characterize how bacterial community composition responded to drought, wildfire, and temporal variation using the ongoing Loma Ridge Global Change Experiment. We did this in two adjacent ecosystems, a grassland and coastal sage scrubland, to further investigate how ecosystem type may influence bacterial response to environmental change throughout the surface soil.

Abstract Text: Bacterial communities in the organic leaf litter layer and bulk (mineral) soil are sensitive to environmental change. However, despite close interactions between these communities, the leaf litter layer has historically been studied in isolation from the bulk soil. Whether bacterial response to environmental changes is uniform throughout the surface soil remains unclear. Here, we simultaneously characterized how bacterial community composition in three surface soil layers (the leaf litter layer, 0-2 cm of bulk soil, and 0-10 cm of bulk soil) responded to a wildfire burning through a decade-long drought simulation in two adjacent ecosystems, a grassland and coastal sage scrubland. We found that bacterial communities in all three surface soil layers were distinct in composition and responded to drought, ecosystem type, and temporal variation. Moreover, the impact of these environmental changes on bacterial community composition decreased with depth in the surface soil. For instance, bacterial response to drought simulation was three-fold higher in the leaf litter layer than in the top 10 cm of bulk soil, with drought treatment explaining 5% and less than 2% of the compositional variation respectively (PERMANOVA: $P < 0.01$ in all cases). Wildfire altered bacterial composition in the leaf litter layer (PERMANOVA: $P < 0.05$) while there was no significant change in composition with 0-10 cm of the bulk soil (PERMANOVA: $P > 0.05$). Further, previous exposure to drought did not influence bacterial response to the wildfire. These data suggest that considering soil depth when assessing the impact of environmental conditions on the surface soil microbiome may improve predictions about the degree to which microbial communities, and therefore C flux, will respond to future environmental change.

Funding Statement: This research was supported by the U.S. Department of Energy, Office of Science, Office of Biological and Environmental Research grants DE-SC0016410 and DE-SC0020382 and the Ridge to Reef NSF Research Traineeship, award DGE-1735040.