**Research Debrief: Analyzing Soil Microbiome Composition & Diversity in Soil Ecosystems across ASCC forests in Colorado, USA**Kya Sparks, PhD student, Colorado State University   
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**The Purpose of Our Research**

Soil microbial communities play critical roles in forest ecosystem functioning, driving the cycling of key elements (e.g., carbon, nitrogen) and supporting robust tree and plant growth via the formation of obligate symbiotic relationships (e.g., ectomycorrhizal fungi). Climate change prompts shifts in the soil microbial communities over time and will likely lead to a deviation from predicted forest ecological processes and functions. As such, differences in soil microbiome composition and function should be considered when determining forest management strategies and research initiatives. I am currently examining soil microbiome (i.e., bacteria and fungi) composition and diversity across three Colorado forests (Colorado State Forest, Taylor Park, and San Juan National Forest) affiliated with the Adaptive Silviculture for Climate Change (ASCC) project. Taylor Park is unique from the other two sites since it has not been affected by bark beetle infestation. Both Taylor Park and Colorado State Forest are dominated by lodgepole pine, while San Juan is a mixed forest including species of oak, aspen, fir, and pine. The San Juan is at a lower elevation with a warmer climate and higher percentage of soil moisture, as compared to the other 2 sites. My research will investigate how the soil microbiome is influenced by these differences in overlying vegetation along with variability in climate, elevation, vegetation type, and soil nutrients across the research sites. The ASCC project is using these sites as research proxies to understand strategies for assisted migration of tree species in the future; I anticipate that my findings will offer valuable insights to enhance the success of these efforts.

**Research Questions & Goals**

Given the critical roles that the soil microbiome plays in tree establishment and growth, I broadly aim to *characterize the microbial community composition across different forest types, and link differences to other soil physicochemical measurements*. More specific research topics include:

1. Assessing the relative distribution of ectomycorrhizal fungi across soil and forest types
2. Linking microbial community diversity with organic carbon and nitrogen availability
3. Determining how forest health (e.g., extent of bark beetle mortality) influences below-ground soil microbiomes

**Preliminary Results**

This is an initial look at microbial trends after a field sampling campaign in Summer - Fall 2023:

**Clear separation between microbial community composition between sites!**

Each data point represent a microbial community from a soil sample across the three forest locations. The separation between the three colors indicates *significant* differences between the microbial communities at the three sites. Future work will determine *what* community differences are driving the separation of the samples and how these are influenced by environmental factors.