

Grant Write-Up: Indian Peaks Wilderness Research Grant

Receiving the Indian Peaks Wilderness Research Grant has been pivotal for advancing my research as a Ph.D. student in the Department of Ecology and Evolutionary Biology at the University of Colorado Boulder. The grant supported my ongoing work investigating plant-microbe interactions and vegetation shifts in high alpine ecosystems, specifically within the Green Lakes Valley area of the Niwot Ridge Long Term Ecological Research site. This research aims to explore how climate change is reshaping plant and microbial communities, with a focus on plant colonization and succession in previously unvegetated alpine regions.

Research Objectives and Accomplishments

The project, titled *Tracing Alpine Frontiers: Plant-Microbe Interactions and Vegetation Shifts*, builds on previous studies conducted in 2007/08 and 2015/16. My primary objectives were to assess how plant and soil microbial communities respond to climate-induced changes over time. Specifically, I aimed to:

- Resample historically unvegetated plots to measure rates of plant colonization.
- Investigate the role of microbial diversity in influencing plant establishment.
- Examine how microtopographic variations mediate these dynamics.

Thanks to the grant, I conducted extensive fieldwork in Green Lakes Valley, where I resampled 98 plots across a 2-kilometer elevational gradient. Data collection included detailed surveys of plant diversity and cover, as well as soil sampling for microbial and fungal analyses using amplicon sequencing techniques. Preliminary findings suggest that warming trends are facilitating plant colonization in unvegetated areas, with microbial symbionts playing a key role in enabling plant survival under harsh conditions.

Impact on Students and Collaborators

The grant not only supported my research but also provided invaluable opportunities for undergraduate and graduate students to gain hands-on experience in ecological fieldwork and laboratory techniques. Below are testimonials from some of the students who contributed to this project:

- Kat Barr: *"Working with Annie and the Suding Lab this past year has been such a rewarding experience! This was my first research opportunity, and it provided me with valuable hands-on learning both in the field and in the lab. Working on this project has deepened my interest in plant and community ecology, and given me real, practical experiences that enhance what I'm learning in the classroom."*
- Annie Gilbert: *"My experience working in this lab has shaped my enthusiasm for pursuing a research career focused on understanding human-plant relationships in the face of climate change. This experience has fueled my excitement for a future in plant ecology."*

- Kayleigh Vanderwerf: *"My time researching in the Suding Lab under Annie Meeder's guidance has been transformative. This journey has solidified my aspirations and built the confidence needed to pursue a Ph.D. It has prepared me to contribute meaningfully to my chosen field and to continue growing as a researcher committed to impactful scientific discovery."*

Budget Utilization

The grant allowed me to enhance the safety and effectiveness of my research team. Funds were used to:

- Complete an advanced Wilderness First Responder Training to ensure field safety in remote and rugged terrains.
- Purchase soil sampling and DNA extraction materials, such as sterile conical tubes and DNeasy PowerSoil Kits, enabling high-quality microbial analyses.

Broader Impacts

This research contributes to understanding how climate change drives ecological transformations in high alpine ecosystems. The findings have implications for predicting future shifts in biodiversity and ecosystem function under warming scenarios. Furthermore, the project has fostered collaboration, mentorship, and training for emerging ecologists, thereby enriching the scientific community.

I am deeply grateful to the Indian Peaks Wilderness Alliance for supporting this work and look forward to sharing the full results through publications and presentations. This grant has not only advanced my academic journey but also inspired the next generation of ecologists to tackle critical challenges in alpine and climate-change research.









