

New Hampshire Space Grant Consortium Summer 2023 Fellowship

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My Master's thesis research at UNH centers around how microbial communities in permafrost soils in Northern Alaska respond to the environmental gradients of soil depth and time since deglaciation. This research will provide insight into how carbon is processed by microbial communities in permafrost ecosystems, and help broaden our understanding of which microbes are present and active in these permafrost ecosystems. Specifically, my research investigates how the species diversity and function of permafrost microbial communities responds to two environmental gradients: soil depth, and time since deglaciation. To answer questions about how these gradients impact microbial communities, I am examining soil cores from three different sites in Northern Alaska, which were deglaciated approximately 10,000, 50,000, and 200,000 years ago.

This summer, with the support of the NHSGC Summer 2023 Fellowship, I completed the majority of the lab work for my Master's thesis, and began some of my data analysis. Additionally, I was able to present a talk at the Climatebase Fellowship about my work as a graduate student researcher at the University of New Hampshire.

Lab work

This summer, I completed enzyme assays for all 160 of my samples for three different enzymes: beta-xylosidase, cellobiohydrolase, and phenol oxidase. Microbial communities use these three enzymes to break down three different types of carbon. I worked with a current undergraduate student at UNH to do this process and trained several students in the Ernakovich lab on the enzyme assay protocol. Early results show that the enzyme activity at these sites are responding to depth gradients, and this fall, I will be continuing to analyze this data and tease out any differences in the soil cores at different sites.

Additionally, I collaborated with Paula Mouser's lab to develop a method for extracting microbial DNA from my samples using the KingFisher Flex. This was a new DNA extraction method for the Ernakovich lab, that automates the DNA extraction process for 96 samples at a time, instead of requiring that each sample is individually processed by hand. With the help of a lab technician who was a 2023 UNH graduate, I began troubleshooting the best way to amplify the extracted DNA with polymerase chain reaction (PCR). Unlike other soils from more temperate climates, permafrost soil can be more difficult to amplify with PCR because there are smaller amounts of DNA. In the first two weeks of September, I was able to confirm which of the samples had successfully amplified and send these samples to the Hubbard Center for Genome Studies to be sequenced.

Presentation at the Climatebase Fellowship

This summer, I also participated in Cohort 3 of the Climatebase Fellowship. This Fellowship is a 12-week professional development program for people from all backgrounds

who want to work in climate solutions in some way. It brings together professionals at all career stages from diverse fields, with a concentration in business and tech. After a few weeks of participation in the Fellowship, I was invited to give a virtual talk to the Fellowship audience as part of the Fellowship programming. I gave a presentation that introduced the audience to the importance of permafrost to the global climate, and then shared my work at UNH studying permafrost microbial communities and my support from organizations including the NHSGC. This 60-minute talk was given live to a virtual audience, and the recording of my talk was shared with the Climatebase Fellowship community of over 500 Fellows.