A Summer Research Experience at Hubbard Brook Experimental Forest, Woodstock, NH

The Hubbard Brook Research Foundation, with funding from the National Science Foundation (NSF), Long Term Ecological Research (LTER) program has openings for four students in the **Research Experience for Undergraduates (REU)** program during the summer of 2022. Applications are due **2/25/2022.**

Students will work with research teams involving other undergraduate and graduate students. Students also develop and conduct an independent research project. Many REU students continue their work as an independent study or senior honors thesis at their home institution. Some have even published in major scientific journals. In addition, through weekly presentations given by the mentors and other scientists, students are also exposed to a full spectrum of ecosystem research at Hubbard Brook.

We are currently recruiting for four students. Research topics include:

- **Environmental controls on soil carbon cycling**
- **Ash tree environmental condition assessment using tree-ring analysis**
- **Drought-tolerance of trees**
- **Insect biodiversity**

Details of each project, including the research mentor team and contact information, can be found on the following page.

The program runs from early June to mid-August**.** Students receive a $5000 stipend for the 10-week program, as well as free housing. Limited funding is available for research supplies and travel expenses. Food costs are paid by the participants and run approximately $42/week. Students live at Hubbard Brook Research Foundation's researcher housing adjacent to the Hubbard Brook Experimental Forest, among a community of summer field students and technicians. All residents are expected to share and cooperate with cleaning, cooking, and related chores.

Applicants should send the following to the mentor in the field they are interested in: A one page resume (including relevant coursework), contacts for three people who can provide a reference, and short answers (~1 paragraph each) to the following questions:

- There are many options for working in the environment, and research is one particular way. Why do you want to explore research?
- Why are you interested in the research project to which you are applying?
- How do you think that participating in the Hubbard Brook REU program could help you in your degree program and in your future pursuits?

For more information, or to submit application materials, contact the research mentor of your field of interest:

Summer 2022 project details:

Environmental controls on soil carbon cycling: The flux of carbon from soil microbes and plant roots is a major part of the forest carbon cycle and appears to be changing. This research project will involve measuring CO_2 and O_2 concentrations from different soil depths in the Climate Change Across Seasons Experiment (CCASE), which investigates the effects of both warmer soils and increased freeze-thaw cycles on the biogeochemistry of a northern hardwood forest. Measurements will be made multiple times per week, providing the opportunity to model soil respiration throughout the growing season. In particular, we are interested in exploring the soil respiration response to rainfall events. This research would also include testing new CO2 sensor technology to see if low-cost sensors can be deployed in soils in lieu of expensive infrared gas analyzers.

Co-mentors: Caitlin Hicks (Dartmouth: caitlin.hicks.pries@dartmouth.edu) and Alix Contosta (UNH).

Ash tree dendrochronology: Emerald ash borer has decimated populations of native ash (*Fraxinus*) species across the northeast. It was recently found for the first time at Hubbard Brook Experimental Forest and is expected to kill every mature ash there over the next several years. We are aiming to collect tree cores from mature ash trees across the full range of conditions where they occur at Hubbard Brook, in order to look at how establishment dates vary across the forest, as well as how growth has varied over time. White ash is an early-successional tree with very specific site requirements, so these cores will provide information about soil suitability, and forest-disturbance history across wide areas of the experimental forest. This project is related to a larger effort to study the ecosystem impacts of the loss of this species, and to provide information that would be useful in any future restoration efforts.

Co-mentors: Matt Vadeboncouer (UNH) and Nat Cleavitt (Cornell: nlc4@cornell.edu)

Tree drought tolerance across environmental gradients: With the observed and predicted increases in drought in the northeast due to climate change, we are interested in how different trees respond to drought conditions. We will use different physiological approaches (e.g. measuring the wilting point of leaves, quantifying their natural water stress levels) to characterize drought tolerance both between species and within species across environmental gradients (e.g. elevation, latitudinal, soil moisture availability). This work will help us understand which species are more at risk of reduced growth and mortality in the coming years.

Co-mentors: Jess Gersony (Smith), Andy Ouimette (UNH), and Nat Cleavitt (Cornell: nlc4@cornell.edu)

The Aging of a Forest in the Anthropocene: Invertebrates are an essential link in the food chain. This project aims to understand how the abundance of forest invertebrates varies as a result of forest succession and available nutrients. We aim to collect insect and gastropod samples from three locations at Hubbard Brook: 1) Watershed 1, where 45 tons of calcium silicate were added via helicopter in 1999, 2) Watershed 5, where a whole-tree harvest was carried out from 1983 to 1984, and 3) Watershed 6, the reference watershed. With these samples, we can compare invertebrate abundance and species composition in the reference forest to that of an acid rain-remediated forest of the same age, and a forest that is now at about the same age as the other forests were when studies began 50 years ago.

Co-mentors: Matt Ayres (Dartmouth: Matthew.P.Ayres@dartmouth.edu) and Miranda Zammarelli (Dartmouth)