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ForestGEO at Yale-Myers Forest: Establishing a new long-term forest census plot

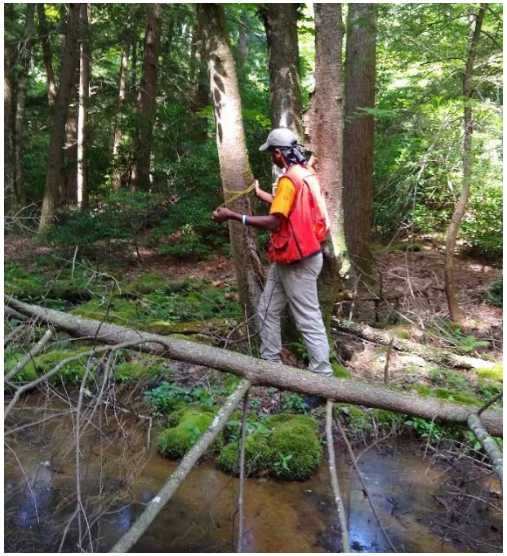
Research Highlights

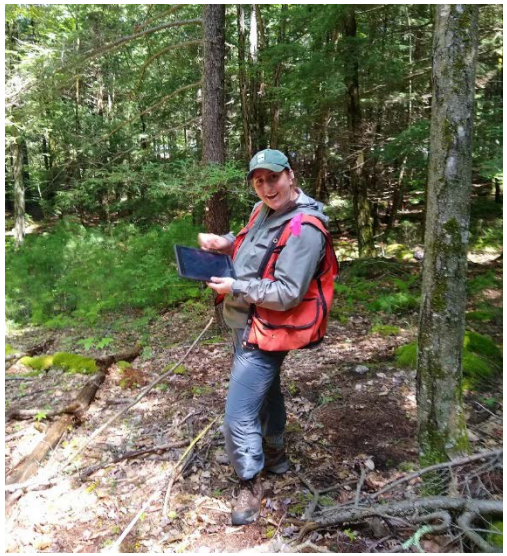
- Established three hectares of a planned six-hectare plot at in the “Tree Heaven” area of Yale-Myers forest, where every woody vegetation stem >1 cm in diameter was identified, tagged, measured, and spatially mapped.
- Educated undergraduate interns in data collection, management, and visualization, plant identification, research logistics, field skills, and developing research questions.

Research Summary

Projections of climate change predict a major increase in temperature, shifts in precipitation patterns, and alteration of forest disturbance regimes in northeastern forests of the United States. Forests are the source of many critical products and ecosystem services upon which humans depend, including carbon storage, biodiversity, clean water, and timber production. Understanding how change in climate will alter forest composition and function is critical for managing and restoring these forest resources.

The Smithsonian’s Forest Global Earth Observatory (ForestGEO) project was started at Barro Colorado Island (BCI) in Panama starting in 1980 to elucidate trends in forest development and structure. High impact studies from BCI inspired a network of forest census plots which has grown from one site at BCI to 67 sites across both tropical and temperate forest ecosystems. Sites in the network use standardized protocols with high resolution data (all woody vegetation >1cm in diameter are censused) which allow for cross-site comparisons and have resulted in multiple, high-impact scientific publications that have greatly advanced both theoretical and applied forest ecology. Currently research themes specific to temperate forests include forest demography, canopy and vegetative structure, biogeochemistry, forest response to climate change, invasion biology, and the role of human and natural disturbances in forest development and dynamics.





Undergraduate student interns measure trees and record data at the ForestGEO plot

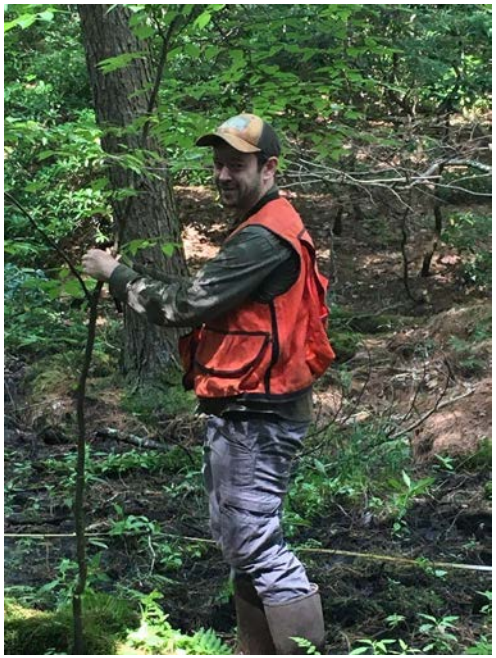
Research Summary, cont.

The objective of this project was to conduct the initial census of the six-hectare Yale-Myers forest ForestGEO site. The Yale-Myers forest is an approximately 8,000-acre production and research forest, located in Northeastern Connecticut. It differs from many other research forests because it is both a site of abundant research but also management for forest products. Long-term data at this unique site on tree growth and survival is essential for predicting and mitigating effects of global change on forest ecosystems, as well as for answering theoretical questions in ecology. Four principal investigators have shown interest in using the ForestGEO plot for their own research interests, all of whom work for the Yale School of Forestry and Environmental Studies. Research interests for using the ForestGEO data include forest stand dynamics, forest methane fluxes, understory plant community dynamics, and negative density dependence at temperate latitudes.

Yale-Myers forest is managed differently than other forests in the ForestGEO network which may lead to novel findings in relation to this management, however, this management also led to some hurdles that made following the ForestGEO protocol difficult. Yale-Myers is managed as a production forest, as a result one corner of the plot goes into a recent timber harvest where there is dense regeneration of both black birch and white pine seedlings that are mostly between 1 - 2 centimeters in diameter. In one, 10 x 10-meter plot we found as many as 220 individuals that needed to be mapped and measured. This significantly slowed our progress and was a little frustrating because we know that through natural self-thinning many of the saplings, we tagged will be dead by the next census. Another challenge was measuring Mountain Laurel which is a clonal propagating species that is woody and grows in dense thickets that are extremely difficult to move through. Defining where one Mountain Laurel began and ended relative to the next was difficult because of their clonal growth form and measuring stems was difficult because each “individual” had many stems >1cm in diameter. Therefore, tagging, measuring, and mapping these plants according to the ForestGEO protocol was extremely difficult. However, Mountain Laurel is an abundant feature of Connecticut forests which is beautiful when it blooms in early summer and this plot may help to capture how it varies across the landscape.

An important aspect of this project was the education of the Yale-Myers undergraduate interns who helped to implement the project. Up to six interns worked on this project per day. Their tasks included measuring, mapping, and identifying all woody plants located within the site along with assistance in planning and managing workflow, data management, and field logistics. The interns were an integral part of the implementation of this project.

In summation, with the implementation of the six-hectare ForestGEO plot at Yale-Myers we are creating a resource of long-term data for future researchers at Yale-Myers who need access to extensive long-term datasets to address their research questions. This resource will be available to students, faculty, and visiting researchers. And will be used in the advancement of our understanding in both theoretical and applied forest ecology as well as a teaching tool for future interns and students who come to learn about forest ecology at the Yale-Myers forest. To date, we have completed the initial census for about four of six hectares, with the final two hectares to be added in the coming years.



Scenes from the ForestGEO plot