The New England Botanical Club
Graduate Student Research Awards
2014 AWARD WINNER

Eva Dannenberg
Conservation Biology Program
Antioch University New England

Boreal calciphiles in Vermont, USA: Predictive modeling and examination of rare plant habitat distribution

For many years, boreal calcareous cliff communities, home to many rare alpine plant species surviving at the southern edge of their range, have fascinated botanists and ecologists. Recent efforts to document and model some rare plant ranges have determined that the full extent of their distribution may be incompletely known. Concern over climate change and its effects on rare species, especially those occurring at higher elevations and near the southern limit of their ranges, increases the importance of efforts to both identify potential rare plant populations and monitor those already known. For the rare plants native to the boreal calcareous cliff community, study of historical herbarium records and subsequent field research in Vermont have revealed that some occurrences of this plant community in the state were not known until recently, and it is possible, given Vermont's landscape and geology, that more such sites exist. Predictive computer models are now used worldwide to assist in finding new populations of rare plants, and this study will use predictive modeling and field verification of these models to investigate whether this rare plant community is more widespread in the state than currently believed. Research questions include: Are there undiscovered or forgotten examples of the boreal calcareous cliff community in Vermont? Where are they located? And how accurately can the geographic information systems (GIS) models and ecological niche models designed for this study predict their locations?

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Caitlin McDonough MacKenzie
Department of Biology
Boston University

Spring phenology and climate change in Acadia National Park

Phenology — the timing of biological events such as leaf out and flowering — is perhaps the most accessible, most visible, and most iconic measure of the effect of climate change on plant ecology. In Acadia National Park, Maine, a program monitoring flowering phenology and the relationship between spring temperatures and flowering date across wild plant communities has just begun. While there is a general trend in advancing spring phenology in the literature, the responses of individual plant taxa and populations to warming vary. This study explores the relative effects of environment and genetic differences among populations on the spring phenology of three common and iconic plant species. I established three common gardens filled with transplants of ninety native individuals of lowbush blueberry (*Vaccinium angustifolium*), sheep laurel (*Kalmia angustifolia*), and three-toothed cinquefoil (*Sibbaldiopsis tridentata*) sourced from three elevations on Cadillac Mountain in Acadia National Park. The transplant gardens provide a kind of natural warming experiment: transplants from the summit will experience a milder climate in the mid- and low-elevation gardens. Representatives from each elevation and species combination were planted in each garden; these plants will be monitored for spring phenology, as well as growth and reproductive success. This project will provide an in-depth look at population-level responses to the effects of climate change along an elevation gradient, complementing the broader phenology monitoring effort across the entire park.

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Katherine Putney
Department of Plant Biology
University of Georgia

Evaluating the natural arbuscular mycorrhizal fungal communities associated with sexually dimorphic *Geranium maculatum*

The interaction between plants and their root-associated fungi is a fascinating example of how organisms can interact to change each other's evolution and ecology. This interaction is one of the oldest of symbioses and has been implicated in the establishment of plants on land. It is generally considered a symbiosis in which both the plant and the fungi receive some benefit for growth and proliferation. Understanding which fungal partners colonize a plant's roots and in what context is important in light of climate change. Climate change can cause an organism's range to shift due to changing temperatures and other effects. However, if these environmental changes affect one partner in this symbiosis differently than another, understanding how current ranges of both partners relate to one another can help us understand how this relationship may change. I am evaluating what fungal partners are found in the roots of *Geranium maculatum* across the plant's natural range and in different environmental contexts. Some populations of this plant include both hermaphroditic individuals (pollen and seed production), and pistillate individuals (no pollen production). Therefore, I am also investigating whether differences in plant sex are correlated with differences in fungal partners in the roots of a given plant.

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