

**New England Botanical Society
Graduate Student Research Award
2022 AWARD WINNER**

Amelia A. Fitch

Ecology, Evolution, Environment and Society
Dartmouth College
Hanover, NH

**Investigating the role of mycorrhizal fungi in
New England forest management**

Symbiotic mycorrhizal fungi are essential not only to tree growth, providing nutrients and water in exchange for photosynthate, but also for a whole host of other ecosystem services including soil carbon storage and pathogen resistance. New England forests are dominated by two types of mycorrhizal fungi—arbuscular mycorrhizae (AM) and ectomycorrhizae (EcM) depending on the tree species present. Forests dominated by EcM or AM fungi differ in seedling survival, nutrient availability, and how soil carbon is stored. As climate change and invasive pests shift the species composition of New England forests, the composition of mycorrhizal fungi will also change. With the impending loss of ash trees due to the emerald ash borer, northern forests lose one of the few overstory trees that associate with AM fungi. Along with the long-term decline in sugar maple, another AM-associated canopy tree, northern forests may become more dominated by EcM trees, which will have cascading effects on the ecosystem services New England forests provide. **We seek to understand how the legacy of dominant mycorrhizal associations affects how forests regenerate, cycle nutrients, and sequester carbon following forest disturbance.** In this field experiment, we will investigate how changes in soil fungal communities and nutrient availability affect planted and naturally-regenerated seedling survival and growth in AM- and EcM-dominated forest stands after timber harvesting. Because EcM fungi are hypothesized to protect roots from pathogens, decreases in these fungi may lead to increases in soil pathogens that negatively affect seedling survival. We will also investigate how timber harvesting differently affects long-term soil carbon storage in EcM vs AM-dominated forest stands. Because EcM forests have less mineral-associated soil carbon that is protected from microbes, more soil carbon might be lost from EcM forests following logging. The proposed research will establish a site for long-term monitoring of forest regeneration and carbon storage in the face of global change. We will make all our data publicly available through the Northeastern Forest Regeneration Network, and we will collaborate with foresters and land managers to develop forest management recommendations based on our research. The expected outcome of these outreach efforts to foresters and land managers is that they will consider how tree mycorrhizal associations could facilitate forest regeneration, nutrient retention, and long-term carbon storage in their management planning.

The New England Botanical Society offers awards of up to \$3,000 to graduate students to support botanical research. The awards encourage and support botanical research on the New England flora (plants, algae, and fungi), including support for field, lab, and herbarium work, as well as travel to New England by those who would not otherwise be able to work in the region. The awards are made to the graduate student(s) submitting the best research proposal dealing with systematic botany, plant ecology, genetics, plant conservation biology, or related fields pertaining to the New England flora.