Detecting nutrient limitation from the sky
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Introduction

Although airborne remote sensing can collect information on every tree crown in a research plot, it is difficult to correctly match individual trees to their corresponding crown locations. Here we examine the spectral profiles of individual trees from three mature northern hardwood stands (C7, C8, C9) and assess our ability to predict tree species from hyperspectral imagery.

We also leverage a long-term nutrient manipulation study to ask if experimental additions of N and P impact canopy reflectance.

Hypothesis: Canopy reflectance will differ between nutrient addition treatments.

Methods

Since 2011, the multiple element limitation in northern hardwood ecosystems study (MELNHE) has added 30 kg/ha/yr of N as NH₄NO₃ and 10 kg/ha/yr P as NaH₂PO₄ to the forest floor. In 2017, the NEON airborne observation platform flew over Bartlett Experimental Forest and collected ortho-rectified imagery and lidar. We matched tree crown locations to individual trees in the field and extracted reflectance values from 50 wavelengths per pixel. These points were then used as a training dataset for random forest tree species classification.

Results

Hyperspectral profiles may inform forest health monitoring.
- It is difficult to match trees to crowns.
- Drones may offer similar results with higher spatial and temporal resolution.
- Link reflectance to foliar chemistry and the leaf economic spectrum.

Species classification and prediction: 42% error rate (4 species)