Detecting nutrient limitation from the sky

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Introduction

Although airborne remote can capture every tree crown in a research plot, it is difficult to correctly match individual trees to corresponding crowns. Here we examine the spectral profiles of individual trees from three mature northern hardwood stands and assess our ability to predict tree species from hyperspectral imagery.

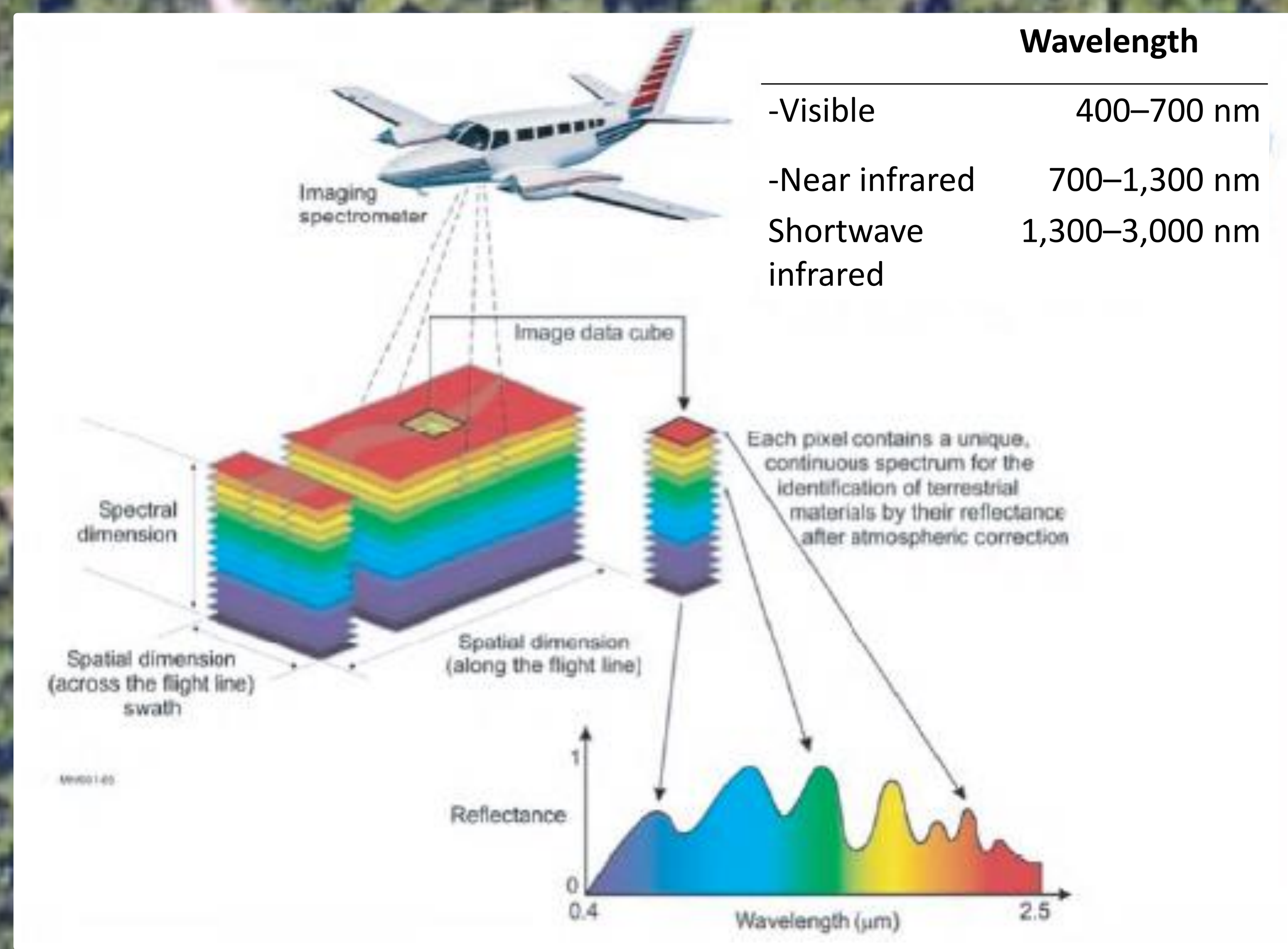
We also leverage a longterm nutrient manipulation study to ask if we experimental additions of N and P impact canopy reflectance.

Hypothesis: Canopy reflectance will differ between nutrient addition treatments

N*P factorial treatments

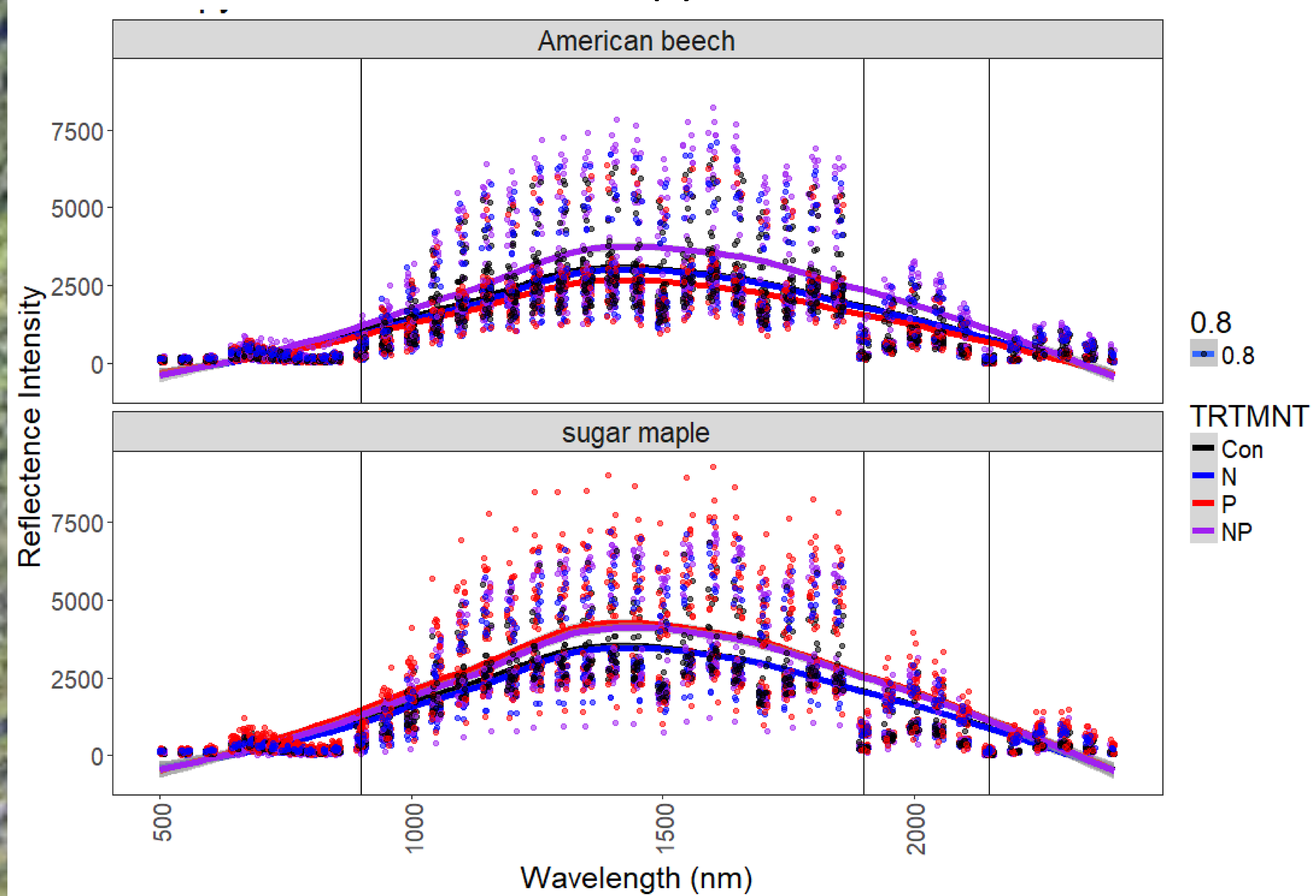
	N -	N +
P -	Control	N
P +	P	NP

NEON's airborne observatory platform captures 400 to 2500 nm reflectance at 426 wavelengths with a resolution of one meter.



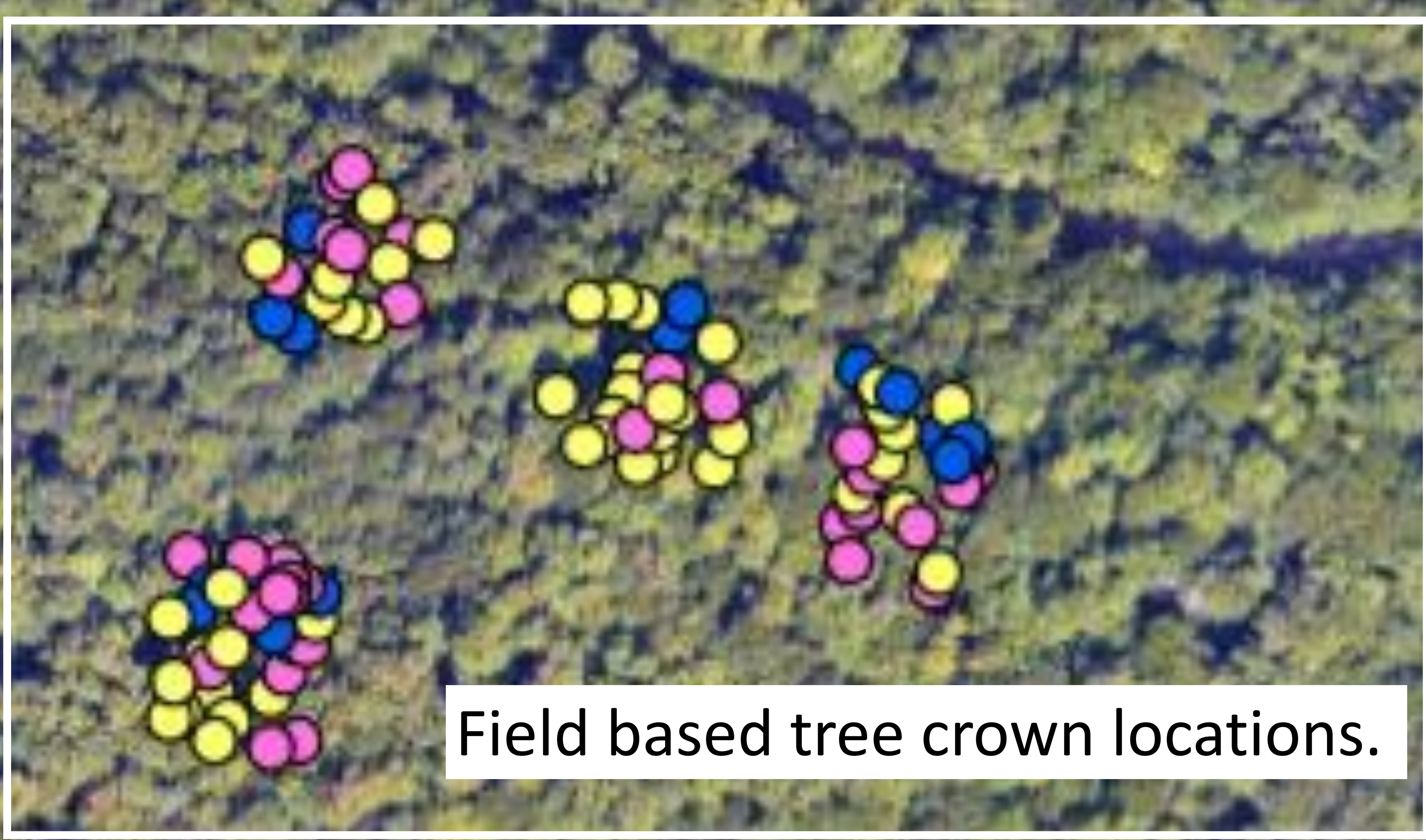
Canopy access improves crown identification

Nutrient treatments alter canopy reflectance



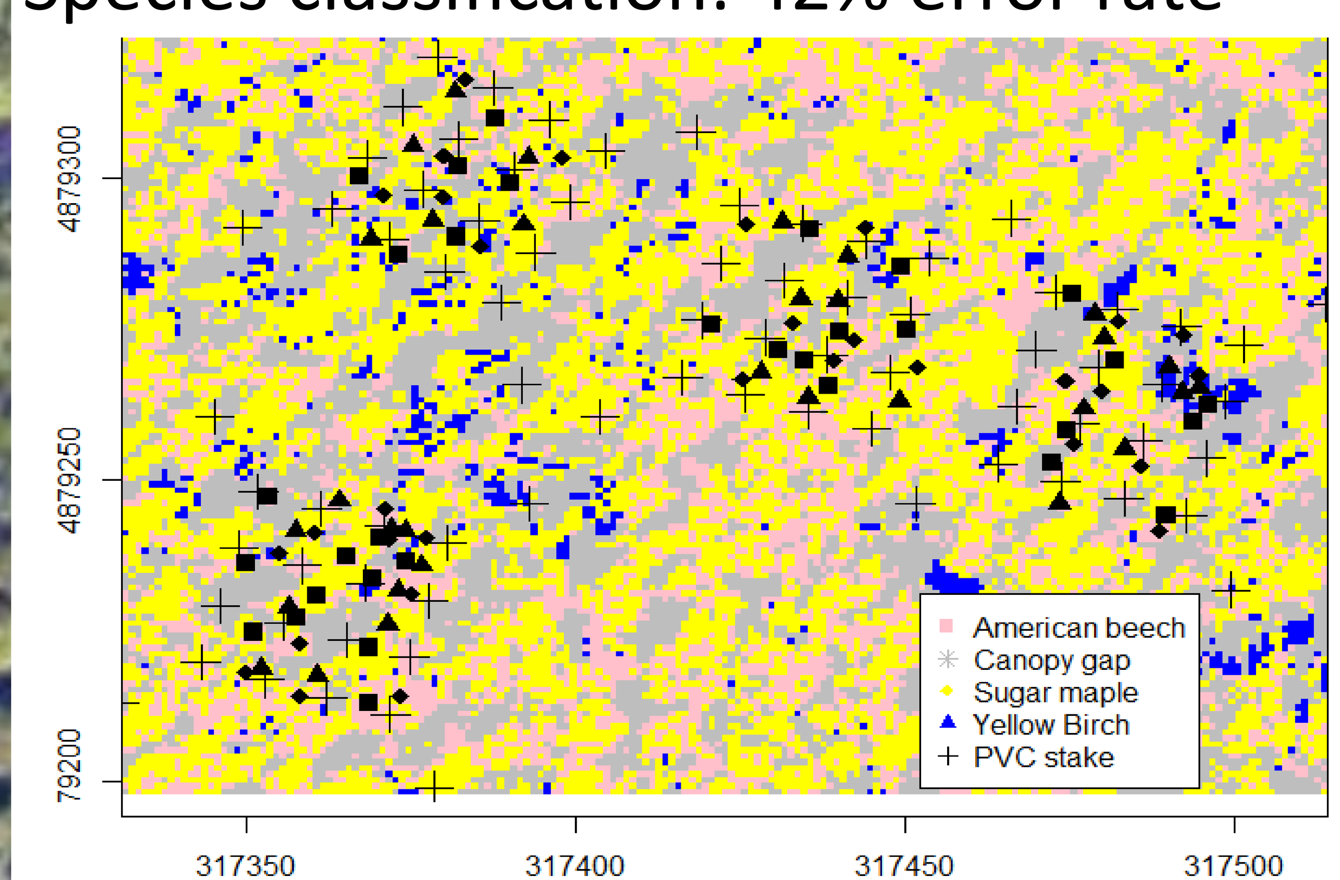
Methods

Since 2011, the multiple element limitation in northern hardwood ecosystems study (MELNHE) has added 30 kg/ha/yr of nitrogen (NH_4NO_3) and 10 kg/ha/yr phosphorus (NaH_2PO_4). In 2017, the NEON airborne observation platform (AOP) flew over Bartlett Experimental Forest and collected ortho-rectified imagery and lidar. We matched tree crown locations to individual trees in the field. These points were then used as a training dataset for tree species classification using a random forest approach.



Field based tree crown locations.

Species classification: 42% error rate



Conclusions

- Hyperspectral profiles may inform forest health monitoring
- It is difficult to match trees to crowns

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