Internship Project: Exploring vascular plant and carabid beetle diversity across three different ecoclimatic domains using NEON provisional data

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National Ecological Observatory Network

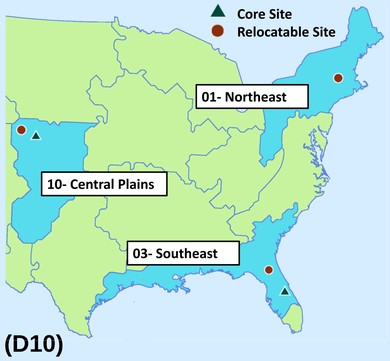
Motivation

Biodiversity is an important measure for understanding population and ecosystem dynamics. The National Ecological Observatory Network (NEON) is a nationwide, 30-year project aimed at collecting data on long-term ecological change. We explored patterns of beetle and plant composition and diversity using 2013 NEON provisional data. Data were collected across multiple plots occurring in five sites that represent three eco-climatic domains. Results demonstrate the applicability of NEON collected data to studies of biodiversity and species richness.

Sampling Locations and Vegetation Types

Domain 01 (D01)

- Deciduous Forest
- Evergreen Forest
- Mixed Forest



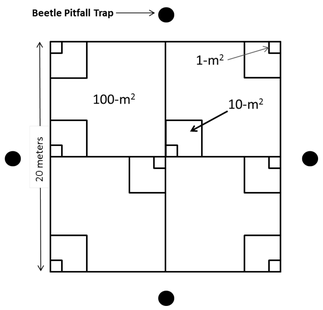
Domain 03 (D03)

- Evergreen Forest
- Emergent Wetland
- Woody Wetland

Domain 10 (D10)

- Grassland
- Cultivated Crops

NEON Sampling Methods



Beetle Sampling

- Collected every 2 wks: April to September
- ID'd to species

Plant Surveying

- Surveyed once a year
- ID'd to species

Figure 1. Multi-scale plot used for plant and beetle survey. Each 400-m² plot contains four 100-m² sub-plots, eight 10-m², and eight 1-m² nested subplots. Circles represent locations of beetle traps.

Beetle Composition and Plant Diversity Across Domains

Results: Plant Diversity

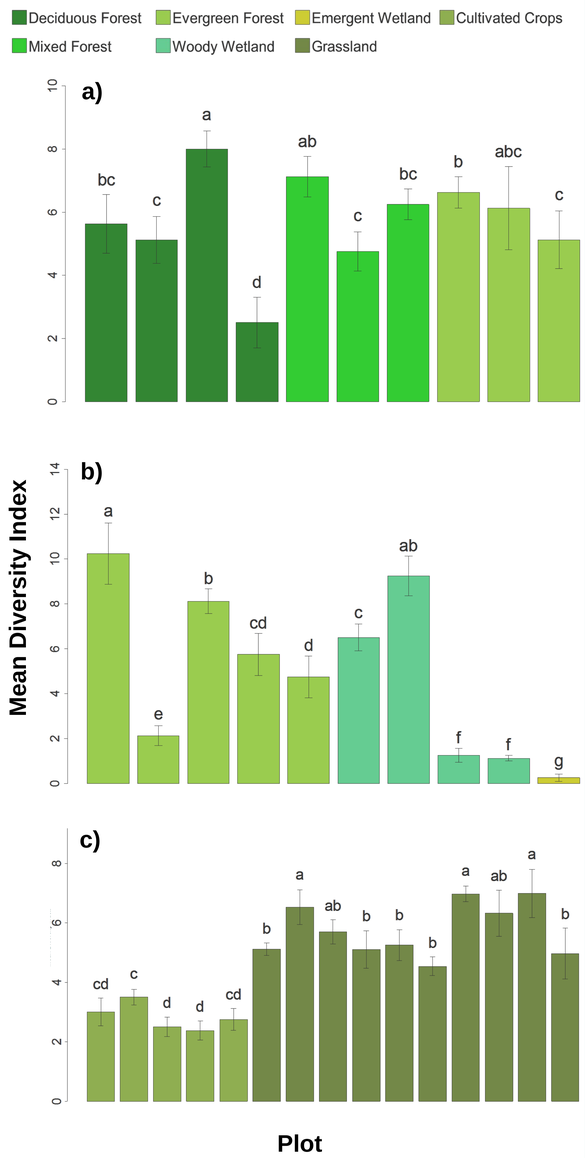


Figure 2. Mean plant diversity in 2013, as measured by an inverse Simpson's index. Plant diversity is plotted by vegetation type (colored bars) for D01 (a), D03 (b), and D10 (c). Error bars represent ±1 standard error of the mean, letters represent significant differences.

Results: Beetle Community Composition

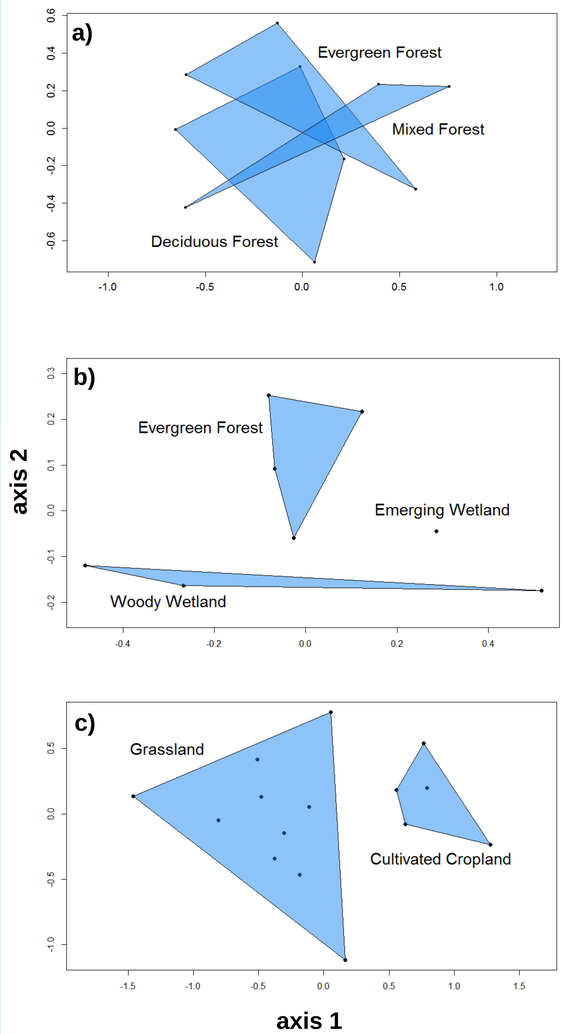


Figure 3. Ordination (through non-metric multidimensional scaling) plots of 2013 carabid beetle species richness. Points represent plots within D01 (a), D03 (b), and D10 (c). Polygons represent different vegetation types and the area of each polygon represents the strength of the similarities; smaller polygons represent greater beetle composition similarity among plots.

Results: Beetle and Plant Diversity

Beetle and plant diversity were not significantly correlated at the plot, site, or domain levels. This may reflect that additional years of sampling are needed.

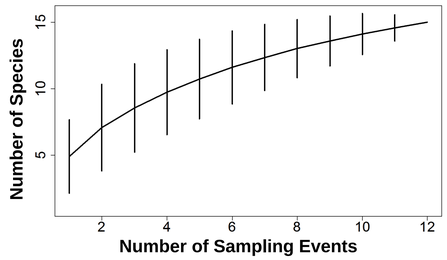


Figure 4. Beetle species accumulation for one plot. Curve represents actual data and vertical bars represent confidence intervals calculated during estimation of sampling events required to detect all species (not shown).

Conclusions

Patterns of diversity differ by domain:

- Plant diversity varies by vegetation type in two domains
- Beetle communities cluster by vegetation type in two domains
- Beetle species present may depend on available vegetation types

Future Exploration:

- Continued sampling is necessary to further explore beetle diversity and plant identity relationships as well as spatial relationships between vegetation type and beetle communities across the continental U.S..

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