Continued Expansion of the Vermont Monitoring Cooperative's Forest Health Monitoring Network

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Kirsti Carr[1,2], John Truong[1,2], Diana Gurvich[1,2], James Duncan[1,2] and Rebecca Rossell[1,2]

[1]University of Vermont Rubenstein School of Environment and Natural Resources, [2]Vermont Monitoring Cooperative

By establishing a diverse and robust network of long-term forest health monitoring plots with detailed, yearly measurements, the VMC aims to provide to provide a baseline of forest health conditions across the state of Vermont. Such field measurements are critical for detecting subtle changes in forest health and exploring potential drivers of decline.

Introduction

In 1991, the Vermont Monitoring Cooperative and the Vermont Department of Forests, Parks and Recreation created a statewide forest health monitoring network, designed to uncover important relationships, changes, and stressors impacting Vermont's forested landscape. The plots were initially located in intensive study sites on Mt. Mansfield and in the Lye Brook Wilderness and were surveyed annually. In the last three years, the network was expanded from 14 to 48 plots by co-locating with other forest health monitoring efforts such as the USFS Forest Inventory and Analysis, the North American Maple Project, and others. The result of this expanded network is a more complete set of data sampling a wider range of biophysical regions. The expansion better represents a cross-section of Vermont's forests and long-term trends in forest health.

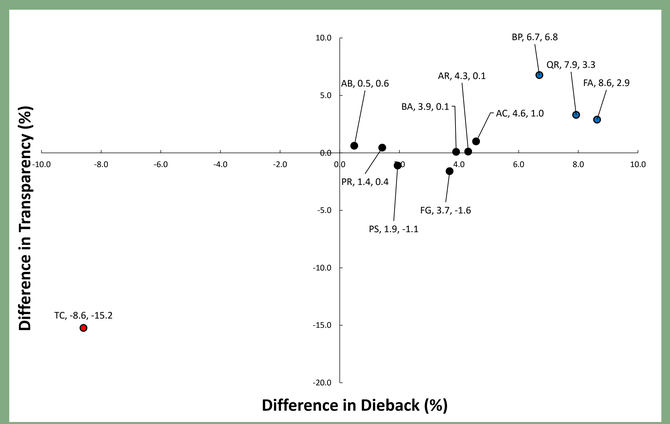
Methods

Plot design:

- Based on National Forest Health Monitoring protocol
- Four 7.32m radius subplots established based on FIA protocol
- Each subplot contains a 2.0m radius microplot located at 3.66m east of the subplot center

Forest Health Metrics:

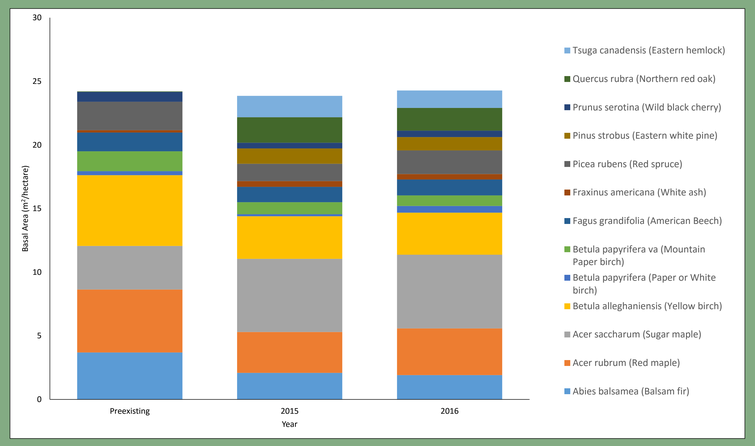
- Tree health metrics (vigor, dieback, transparency, discoloration, other damages)
- Hemispherical photos
- Canopy photography to quantify transparency
- Abundance of seedling and physiology of saplings recorded
- Presence/Absence of animal browse
- Abundance/Type of invasive plants



Indicator of tree conditions for selected dominant and codominant stems within all FHM plots. The magnitude of difference between dieback (%) and transparency(%) of the 2016 means by species from the long-term means. Points with color indicate when the change was greater than or equal to one standard deviation above (blue) or below (red) the mean.

Expansion

As of 2016, 29 plots have been added to the project since 2014, bringing the full network to 48. This covers 8 bioregions and 11 forest types.



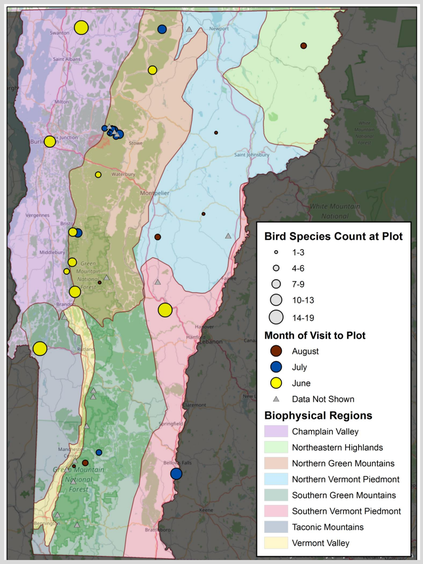
Basal area per hectare of each species in the overstory, showing the representation of species in the 2016 plot network in comparison to 2015 expansion data and preexisting data before 2014.

Additional Data Collection in 2016

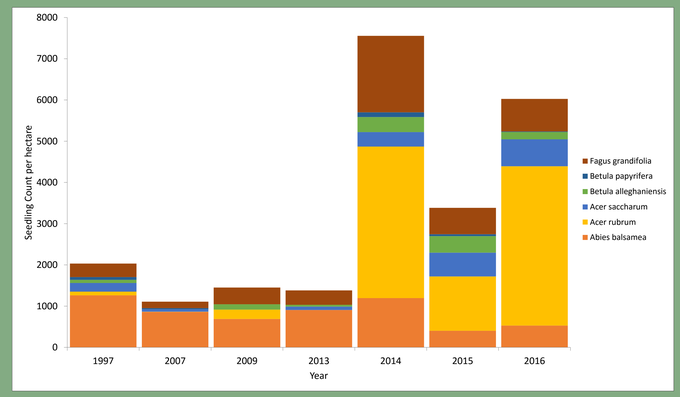
During the 2016 field season, bird habitat data based on VT Audubon's Foresters for the Birds methodology was collected at each established plot, and bird species observed were recorded at each subplot.

The purpose of this project is to provide an additional resource for analysis of FHM plots using birds and bird habitat as indicators of forest health, and to note overarching patterns between bird species observed, quality of bird habitat, and forest health.

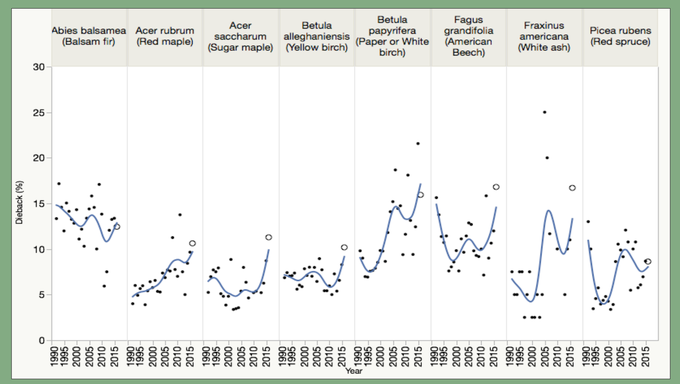
In the future, this data can be used to predict the probability that factors such as tree vigor affect the occupancy of bird species at surveyed sites.



Map of the Forest Health Monitoring program plot network showing bird species count per plot. Triangles indicate plots that were measured in the evening. Circles and their size represent the location of the plot and the count of bird species at the specific plot.



Mean seedling count per species by year in a subset of plots on Mt. Mansfield and Lye Brook with long-term seedling records. In 2014, the definition of a seedling was expanded to include all seedlings with true leaves, which causes the apparent jump in that year.



Mean percent dieback in the canopy of overstory species by year.

Results and Conclusions

- Expansion leads to better representation of Vermont's biophysical regions, forest types, and tree species.
- The 2015 and 2016 tree data more accurately matches species abundance patterns seen in the USDA's Forest Inventory Analysis program within the state.
- Efforts continue to standardize the forest health data throughout the state, giving new insight into broader forest health trends.
- Combining long-term records with increased spatial breadth allows for better understanding of how plot-level forest health patterns fit into the broader picture of forest ecosystem condition in the region.