Evaluating the Efficacy of Audubon Vermont's Bird-friendly Maple

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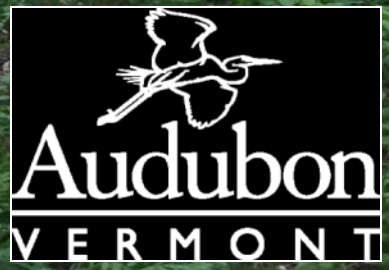
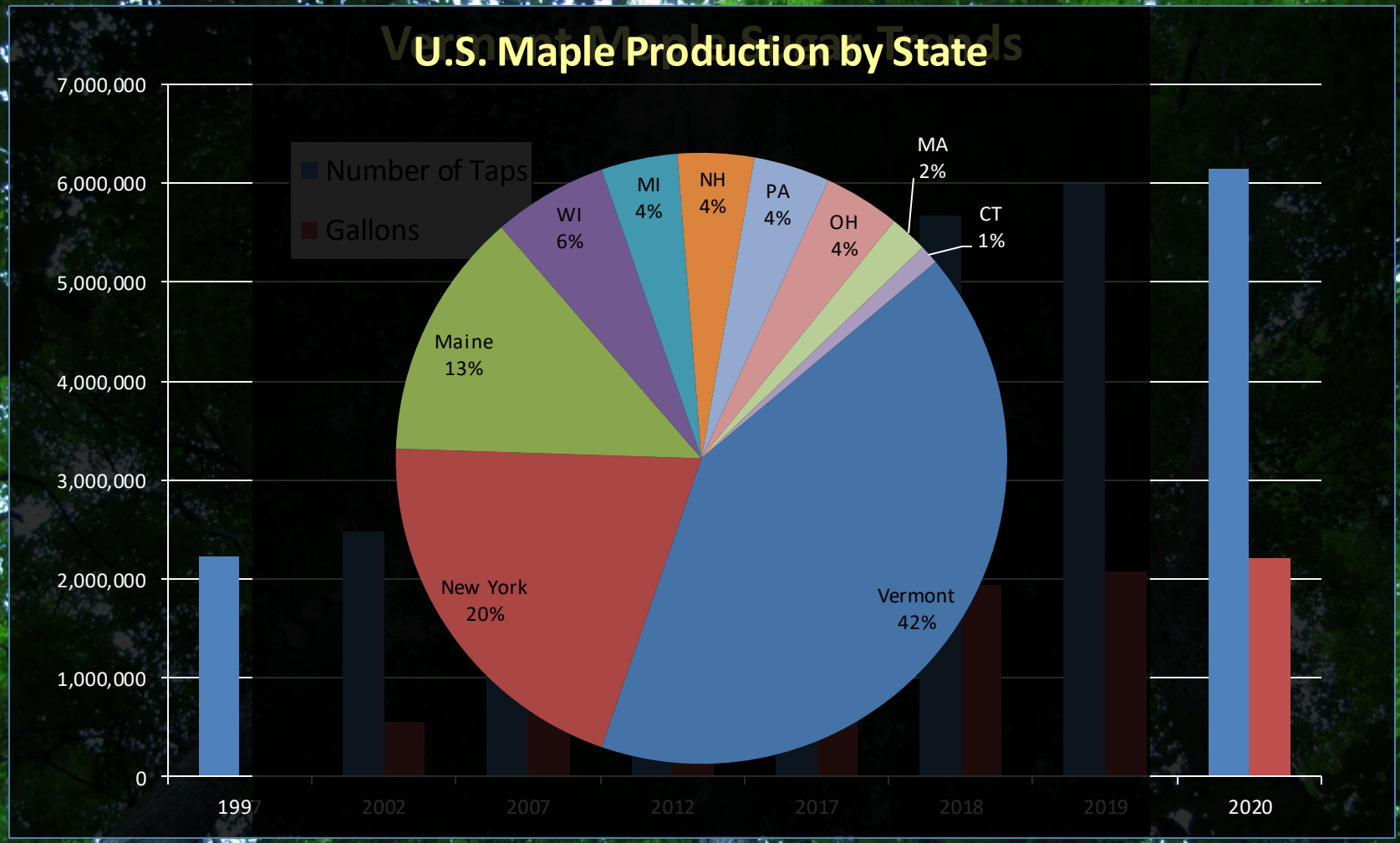
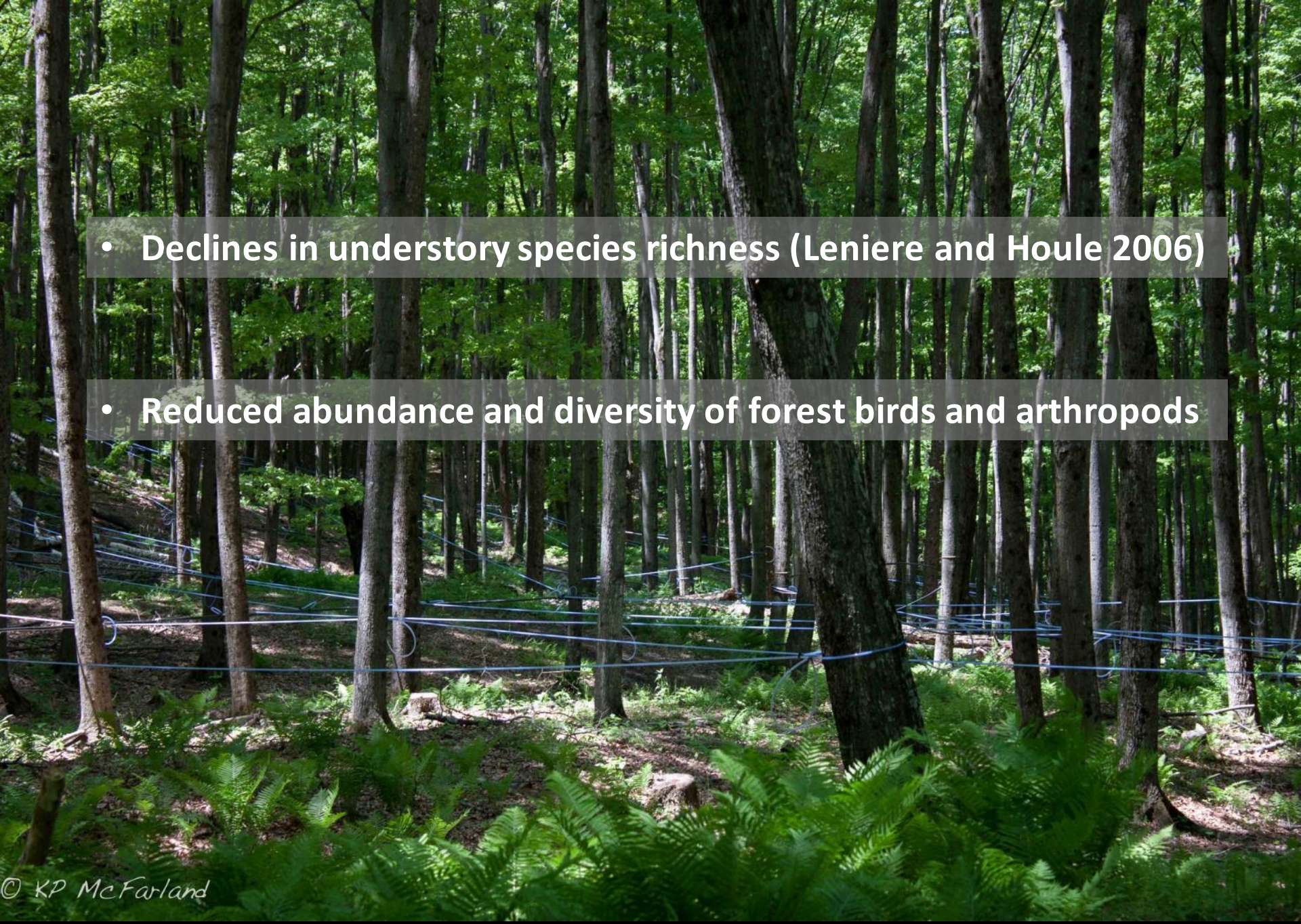




Source: USDA National Agricultural Statistics Service


• Declines in understory species richness (Leniere and Houle 2006)
• Reduced abundance and diversity of forest birds and arthropods
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- Improve forest habitat value
- Native plant diversity
- Long-term forest productivity

- Tree species diversity (≤ 75% sugar maple)
- Forest structural diversity (range of size classes)
- Snags/cavity trees and CWM

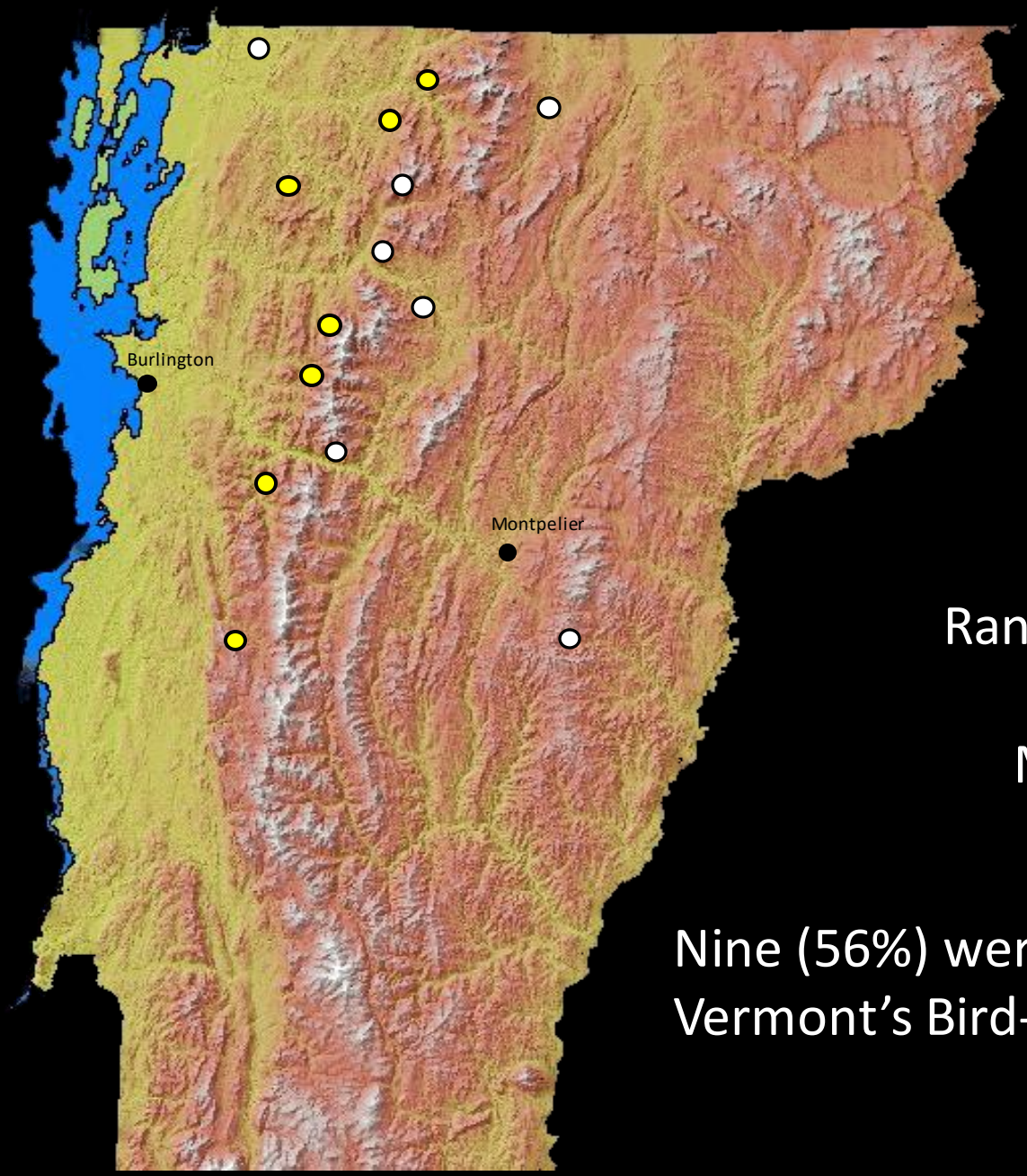

PROSHADE
USDA ORGANIC
VERMONT CERTIFIED ORGANIC
Cream
Maple Syrup
mont Maple Farm
evermontmaplefarm.com
Produced in Bird-friendly Habitats
MAPLE CANDIED NUTS
VERMONT MAPLE FARM
MAPLE CUBE
SAMPLE CUBE:
- MAPLE CREAM
- MAPLE SUGAR
- MAPLE SYRUP
MAPLE CANDIED NUTS

Project Objectives:

1. Quantify forest breeding bird communities across a gradient of sugarbush production and management intensities;

2. Examine how differences in vegetation structure and arthropod biomass influence breeding bird communities;

3. Use results to update Audubon Vermont's Bird-friendly Maple Project recommendations and provide guidance in developing sustainable sugarbush management policies that will be relevant across the Northern Forest region.



2020 Study Sites

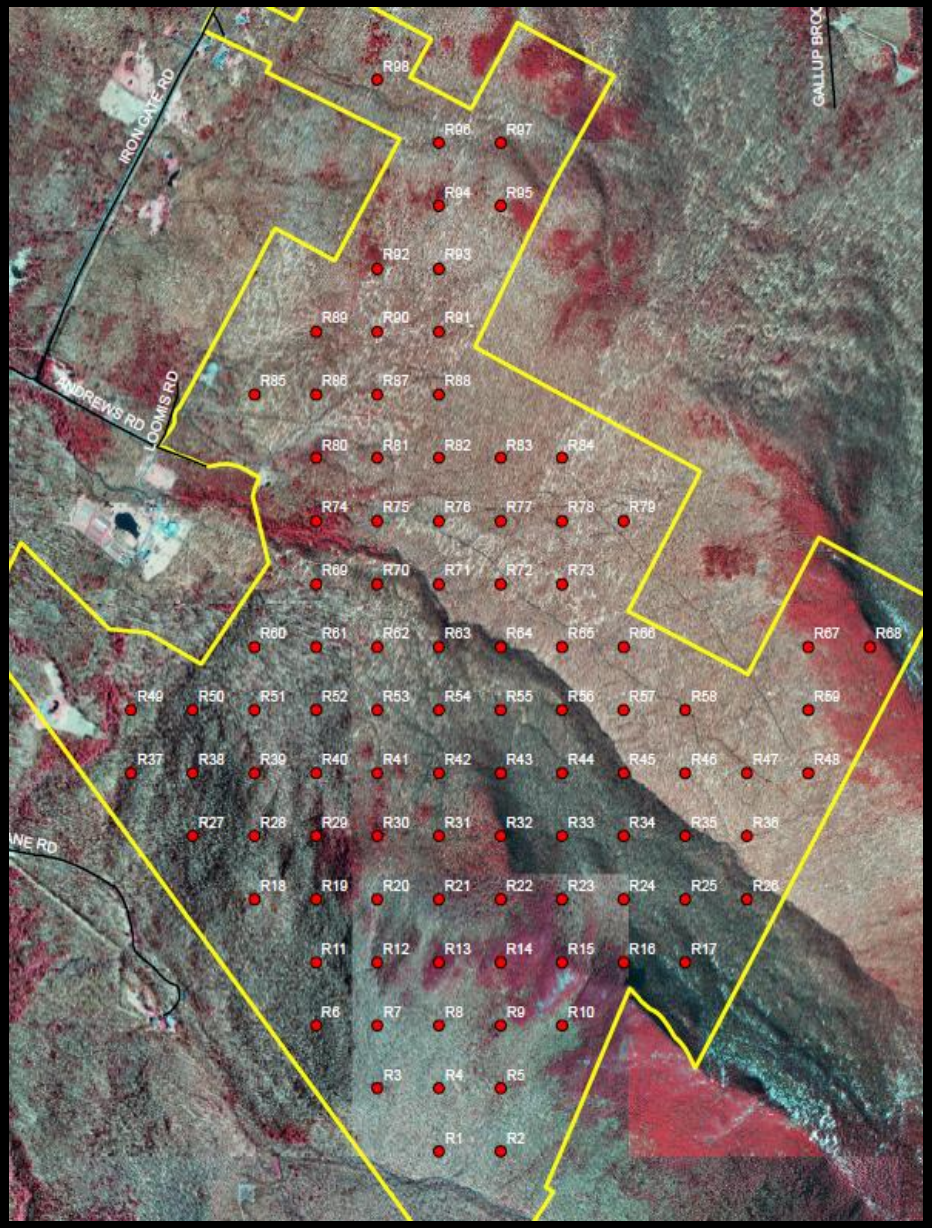
2021 Study Sites

Range = 37 to 1,400 acres

Mean = 336.5 acres

Nine (56%) were enrolled in Audubon Vermont's Bird-friendly Maple Project.

Field Surveys



Survey points
established on 200m grid

353 points

(range = 3 – 80/site);

161 points in 2020

192 in 2021

Breeding Bird Surveys

Point Counts (50-m radius)

Three independent, 4-minute point counts (12-minutes total/point) during June

Arthropod Biomass – 1,059 Survey Plots

Litter-dwelling arthropods
(Rankin and Perlut 2015)

Foliage-dwelling arthropods
(Duren et al. 2017)

Vegetation Surveys – 1,412 Plots

Detailed Protocol

Center plot (353):

- Overstory Trees & Snags
- Canopy Cover
- Large Sapling
- Small Saplings & Shrubs
- Litter Depth
- Ground Cover
- Regeneration (Woody spp)
- Course Woody Material

Rapid Assessment Protocol

Subplots (1,059):

- Overstory Trees & Snags
- Canopy Cover
- Herbaceous, woody vegetation, & CWM cover

Analytical Modeling

Community occupancy models

Community N-mixture (abundance) models

(Dorazio and Royle 2005; Gelfand et al. 2005)

Modeling Covariate
Ground Cover
Fern/club moss cover (%)
Woody vegetation (<5m) cover (%)
Bare soil cover (%)
Herbaceous cover (%)
Grass/sedge cover (%)
Bryophyte cover (%)
Litter depth
Canopy Cover
Basal area of sugar maple (%)
High canopy cover (%)
Non-sugar maple overstory richness
Understory Diversity
Large sapling richness
Small sapling/shrub richness
Seedling richness
Dead Wood
Snag density (number/acre)
Coarse Woody Material (m^3/ha)
Arthropods
Litter-dwelling arthropod biomass
Foliage arthropod biomass

Results

10,332 observations of 72 species

SGCN detected

"High Priority" species

Wood Thrush

Canada Warbler

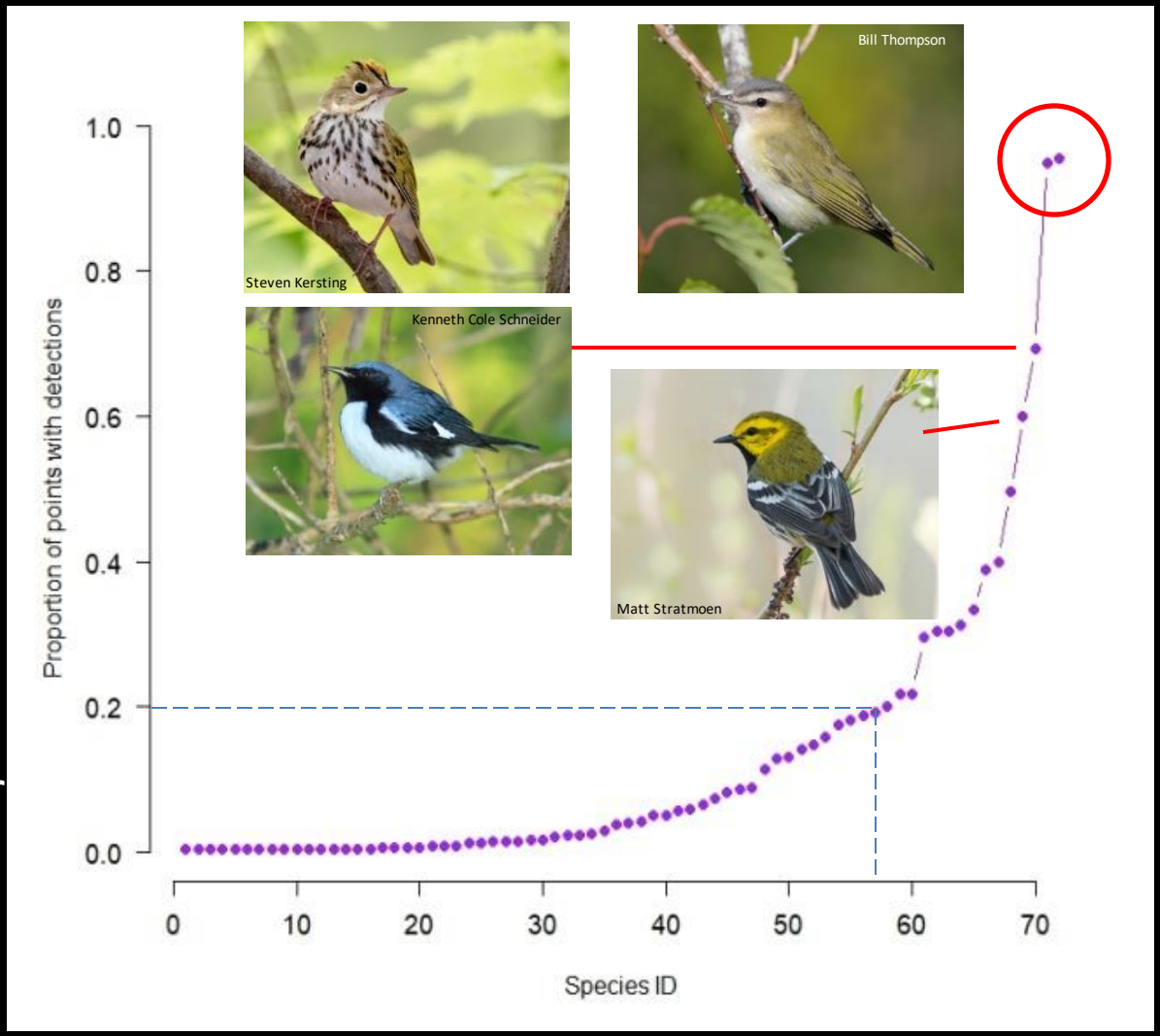
"Medium Priority"

Black-throated Blue Warbler

Chestnut-sided Warbler

Ruffed Grouse

Black-billed Cuckoo

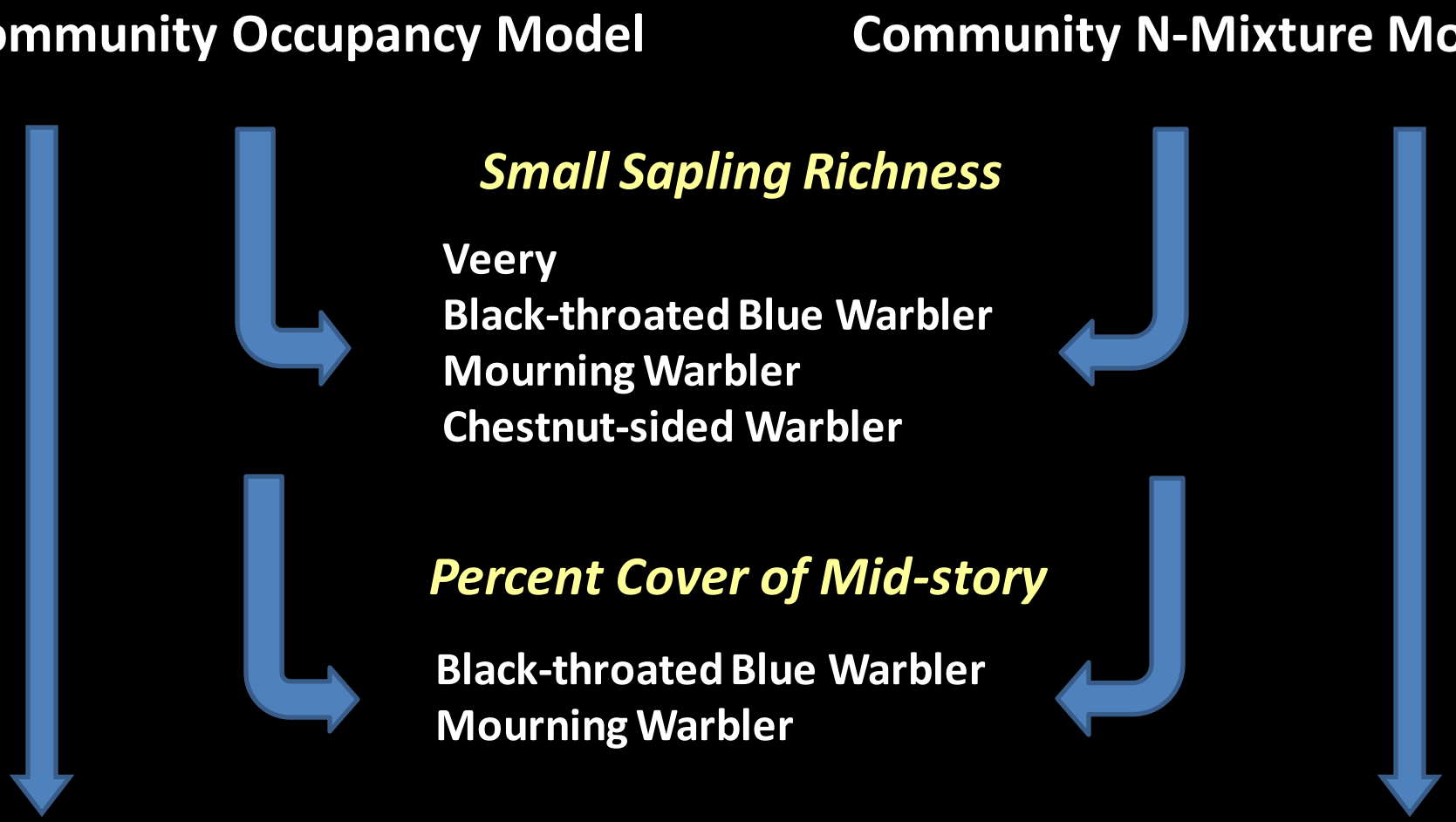


Community Results

Significant Positive Relationships

Community Occupancy Model	Community N-Mixture Model
• Coarse woody material volume	• Percent high canopy cover
• Percent herbaceous cover	• Percent herbaceous cover
• Litter depth	• Litter depth

Individual Species Results



Take-homes

Four habitat covariates were important to the forest bird community:

1) Herbaceous cover
2) Litter depth
3) Coarse woody material
4) High canopy cover

Steve Faccio

Management Recommendations

- Increase/maintain a high percentage of native, shade-tolerant herbaceous cover. Identify invasive species and apply best practices to control.
- Invasive earthworms can deplete leaf litter. Pay attention to litter depth and earthworm presence/distribution to detect potential changes.
- Leave downed logs and tree tops whenever possible to increase woody material.

Take-homes

Early-successional species

Ground/shrub species

Management Recommendations

- Consider intensive group selection harvests, which create small canopy gaps while leaving areas between gaps untouched. Tozer et al. (2010) found this technique retained forest interior species while attracting gap specialists better than typical group selection harvests.
- When possible emulate natural disturbance regimes in both scale and frequency, to which our forest birds are well adapted.
- When creating canopy gaps, strive to increase the species richness of the sapling/shrub layer.

Future Directions

UVM Co-PIs – Brendan Fisher, Tony D'Amato, Rachelle Gould

Liza Morse, PhD candidate

How the intensity of maple sugar production

- affects the bird community and the sustainability of working maple landscapes
- impacts on ecosystem services (such as carbon sequestration and storage)
- resilience to increasing disturbances under climate change

Daniel Pratson, PhD candidate

Human dimensions side of maple sugar production

- Does incentivizing forest management for multiple ecosystem services align with landowner values?

Future Directions

Update Audubon Vermont's Bird-friendly Maple guidelines to promote

- Understory and mid-story vegetation diversity
- Best practices to reduce the introduction of invasive earthworms

Acknowledgements

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