Occurrence of Breeding Neotropical Migrants Influenced by Distance to Softwood Stands

Kelsey Obernuefemann
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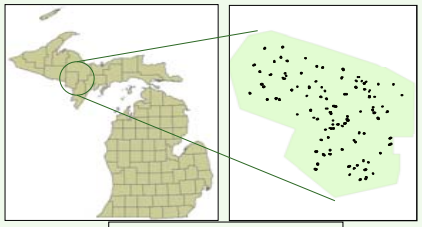
Introduction and Justification

- Neotropical migrants are particularly sensitive to changes in habitat quality, especially changes in vegetation volume and composition.
- Deer have been recognized as having significant effects on the abundance and diversity of forest birds through the role deer play in structuring forest understories.
- During the winter, deer congregate in mature softwood stands of red and white spruce, balsam fir, cedar, and hemlock in order to avoid deep winter snow.
- Little research has been done to assess if winter deer yards in softwood stands affect the distribution of breeding neotropical migrants in the surrounding deciduous forest.
- The documented decline in neotropical migrants may be ameliorated with the identification of destructive factors.

Objective

Use an inductive modeling approach to assess if bird species presence in a deciduous forest is affected by distance to softwood stands.



Study Area and Survey Sites

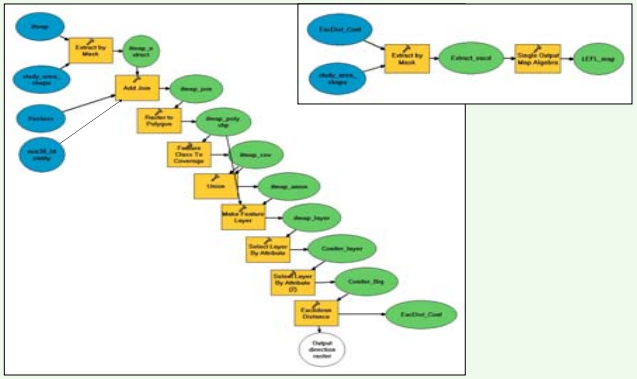
Assumptions

Ecological Assumptions:

1. Wintering deer herds congregate in softwood coniferous stands in the study area and have an impact on the understory of adjacent deciduous forests
2. Neotropical migrant species composition is affected by deer browse.

Data Assumptions:

1. Land cover types were correctly identified and mapped.
2. Bird species were correctly identified and recorded.

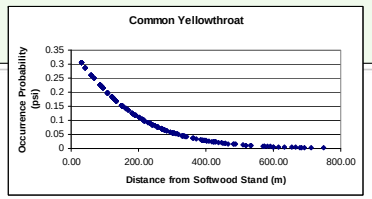


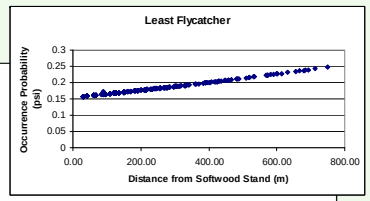
Methods

A 30 x 30m raster land cover map of the Upper Peninsula of Michigan was used as the baselayer in ArcMap.
Two classes of forest type were utilized: softwood stands (other upland conifers, mixed upland conifers, and lowland coniferous forest) and deciduous forest (northern hardwood, aspen association, mixed upland deciduous, oak association, and lowland deciduous forest).

Point count data from 294 sites in the Upper Peninsula of Michigan, collected between 2001-2003, was analyzed using Microsoft Access.
Data was filtered by presence/absence within a 30m radius for each of 10 species (Ovenbird *Seiurus aurocapillus*, Black and White Warbler *Mniotilta varia*, Black Throated Blue Warbler *Dendroica caerulescens*, Black Throated Green Warbler *Dendroica virens*, Least Flycatcher *Empidonax minimus*, Chestnut Sided Warbler *Dendroica pensylvanica*, Common Yellowthroat *Geothlypis trichas*, Red-Eyed Vireo *Vireo flavoviridis*, Veery *Catharus fuscescens*, and Scarlet Tanager *Piranga olivacea*) during 3 survey periods within a single season.

Euclidean distances to the nearest softwood stand forests for each point in a deciduous forest was calculated in ArcMap. The presence/absence data was analyzed in Program Presence, using the distance to the nearest softwood stand as the site covariate.
The resulting site specific occupancy probability for each species was further analyzed in PC-ORD using a cluster analysis. Linear regression of the occupancy probability and the distance to the nearest softwood stand was performed, providing a regression equation for the occupancy probability maps in ArcMap.





Dendrogram of Site Similarity: Sites show clustering in relation to distance to softwood stands, with increasing distance from left to right.

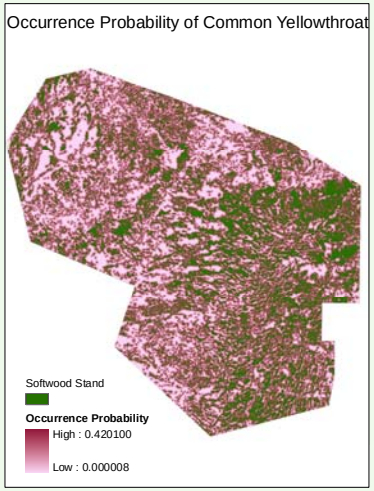
Assessment Approach to Test for Predictive Accuracy

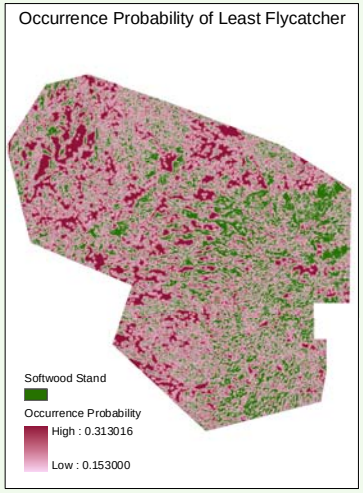
Partitioning Method: Bootstrapping -> Due to small N (few detections), I need to sample with replacement in order to maintain a better fit with my data.
Repeat 20 times, each time selecting 2/3 of presence and 2/3 of absence points to build model, and use remaining 1/3 to assess accuracy using cross-validation.

Accuracy Statistic: Kappa -> more comprehensive than other methods because it incorporates both omission and commission errors, as well as a value indicating accuracy better than could be achieved randomly.

Results

- Species composition and site similarity changes with distance to softwood stands.
- Distance to softwood stands was *strongly positively* correlated with 3 species (Ovenbird, Least Flycatcher, and Veery).
- Distance to softwood stands was *weakly positively* correlated with 2 species (Black Throated Green Warbler and Chestnut Sided Warbler).
- Distance to softwood stands was *strongly negatively* correlated with 1 species (Common Yellowthroat).





Conclusions

- There is an effect of distance to softwood stands on breeding neotropical species composition in deciduous forests.
- Unable to conclude that this is a definitive result of winter deer browse
  - Other factors possible causes: prey availability, soil characteristics, edge effects
- Further research is necessary in order to determine if deer browse is the influential factor.
  - Extensive on-site understory vegetation analysis required
  - Wintering deer population surveys must be performed
- Until then, this study provides an intriguing correlation, though not a conclusive causation.

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- **During the winter, deer congregate in mature softwood stands of red and white spruce (*Picea rebens* and *P. glauca*), balsam fir (*Abies balsamea*), cedar (*Thuja occidentalis*), and hemlock (*Tsuga Canadensis*) in order to avoid deep winter snow.**
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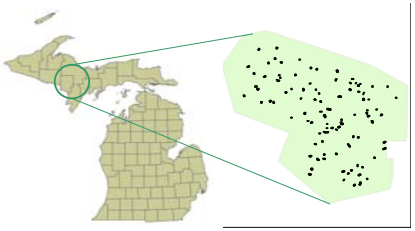

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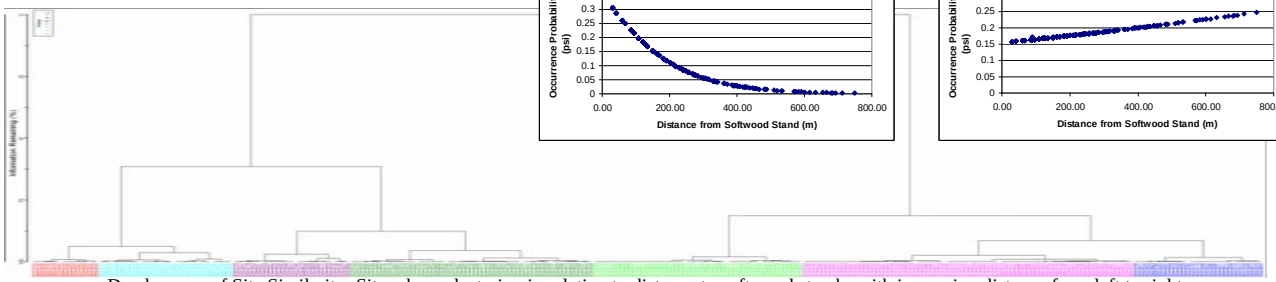

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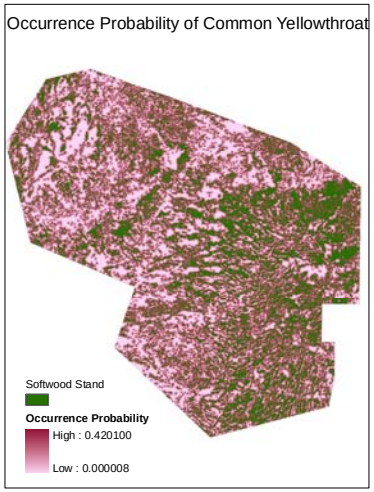

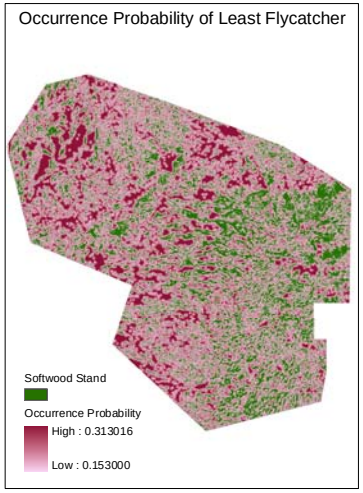

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