



AVIAN COMMUNITY AND SPECIES RESPONSE TO HARDWOOD FOREST MANAGEMENT FOR CERULEAN WARBLERS.



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AFO/COS/WOS
2011 Kearney, NE

Intermediate Harvest, WV:

1. Tale of 2 blue birds: CERW Forest Interior, INBU Edge/Early Successional Spp – Both tied to gaps
2. Number of Collaborators/Field Researchers
3. Mention intermediate shelterwood harvest

Breeding Bird Survey Cerulean Warbler – Appalachian BCR



1. Why we studied CERW – long-term decline
2. Appalachian BCR – much of the population, extensive hardwood forest

Early Successional / Scrub Breeding Birds Eastern BBS Region

36 species, 1966 – 2007

significant 17 spp

negative trend (47%)

significant 5 spp

positive trend (14%)

Field Sparrow



Prairie Warbler



Indigo Bunting



Field Sparrow	-3.0 % / Year
Prairie Warbler	-1.8
Eastern Towhee	-1.6
Mourning Warbler (PA)	-1.5
Blue-winged Warbler	-1.2
Chestnut-sided Warbler	-0.7
Indigo Bunting	-0.6
Song Sparrow	-0.6
Common Yellowthroat	-0.5

1. Negative trend for early successional species – 36 species with BBS data, more declining than increasing
2. Habitat change?
3. We have PRAW, INBU – not really FISP

Cerulean Warbler Silviculture Study

7 study sites:

1 KY

1 OH

2 TN

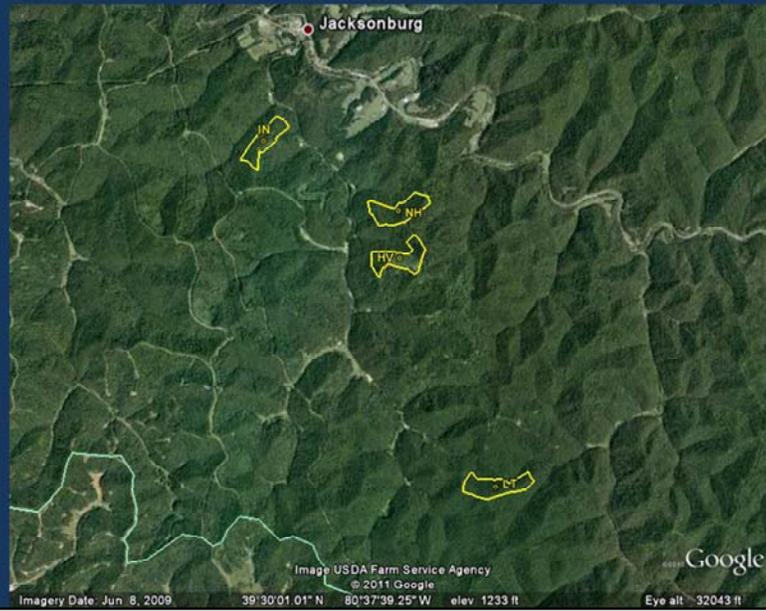
3 WV



1. Overview of Cerulean Warbler Silviculture Study Areas.

Cerulean Warbler Silviculture Study

WV
Context:
Forest



1. Spatial context may be important – Forest around Forest

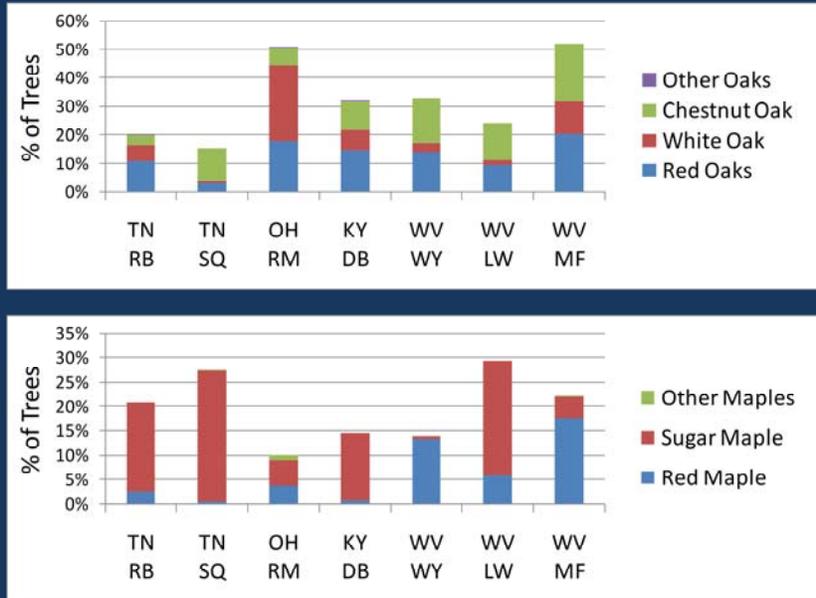
Cerulean Warbler Silviculture Study

OH
Context:
Forest /
Ag



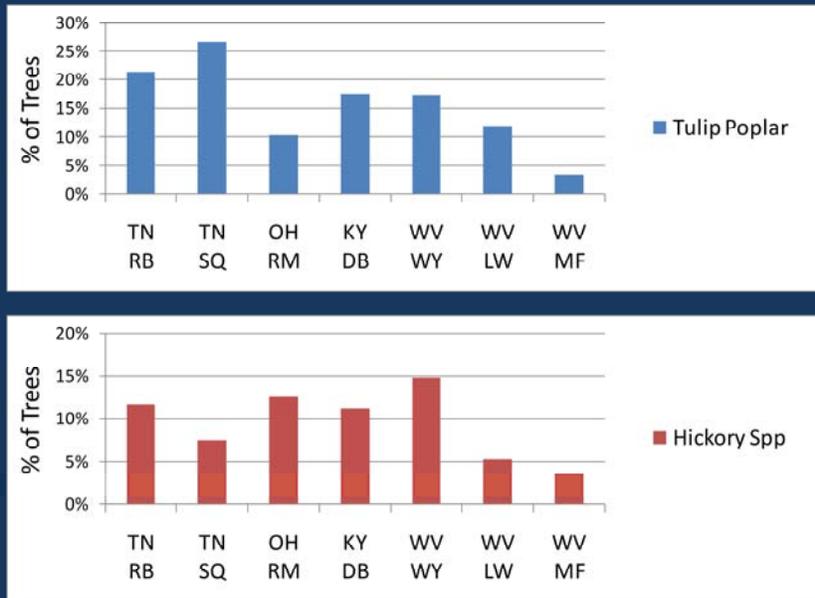
1. Spatial context may be important – Forestry and Agriculture around Forest
2. Likely a different species pool (BHCO?)

Initial Forest Composition on the Plots



1. Major tree species – Oaks and Maples ~50% of trees
2. Site to site variability

Initial Forest Composition on the Plots



1. Major tree species – Tulip Poplar and Hickory Spp ~20-30% of trees
2. Site to site variability

Study Design

Four 20 ha plots replicated on ridges at each study area:

- LT -light single-tree selection harvest (~70% residual basal area)
- IN -intermediate shelterwood harvest (~50% residual basal area)
- HV -heavy even-age harvest (~10% residual basal area)
- NH -no harvest control

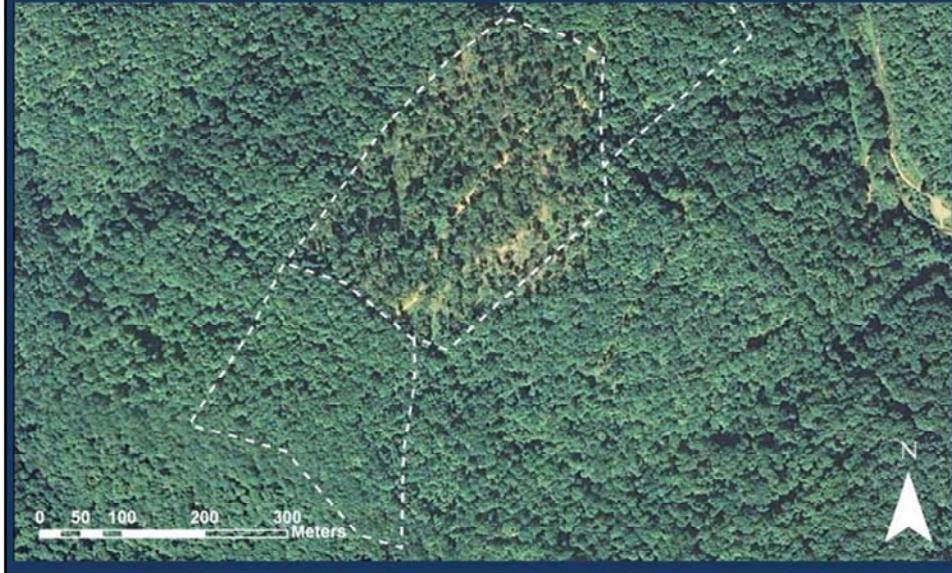
1. Study area – replication of harvests at each

Light Single-Tree Selection Harvest
~80 ft²/acre (17.2-18.3 m²/ha) RBA (~70%)



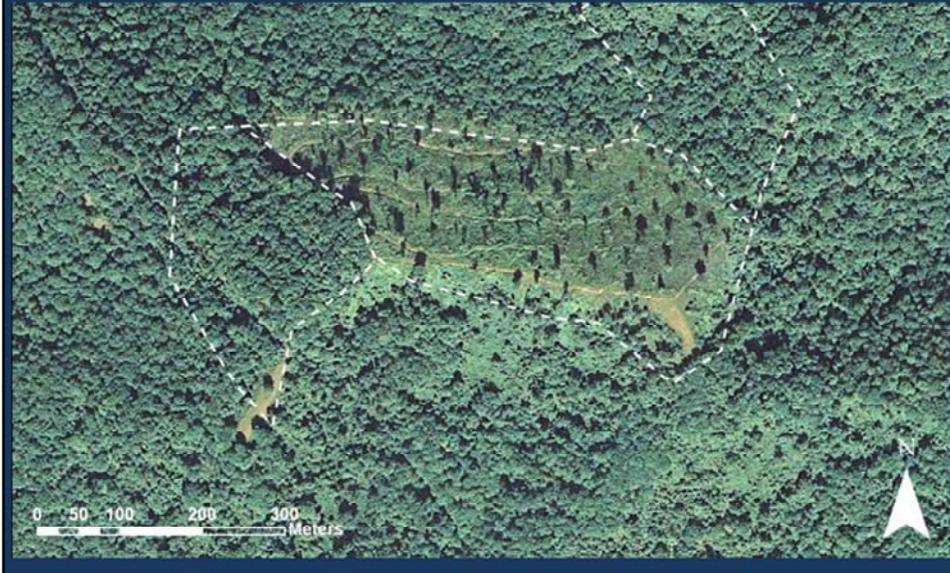
1. Buffer and Treatment Portions
2. Ridge Tops!
3. Differences in degree of canopy removal from light to heavy treatment.

**Intermediate Shelterwood Harvest
~55 ft²/acre (12.6 m²/ha) RBA (~50%)**



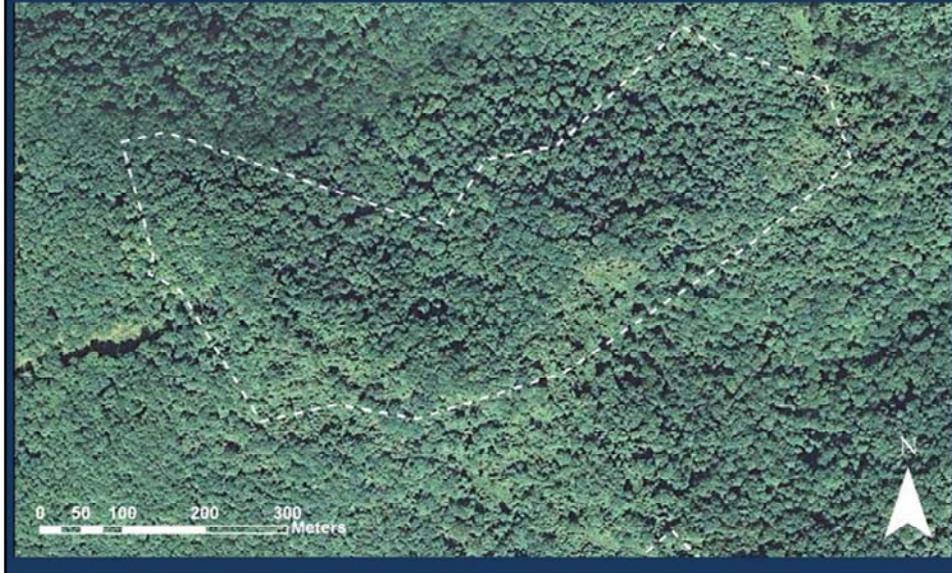
1. Buffer and Treatment Portions
2. Ridge Tops!
3. Differences in degree of canopy removal from light to heavy treatment.

Heavy Even-Age Harvest
~20 ft²/acre (4.6 m²/ha) RBA (~10%)



1. Buffer and Treatment Portions
2. Ridge Tops!
3. Differences in degree of canopy removal from light to heavy treatment.

No Harvest Control



1. Also a “No Harvest” treatment

Methods

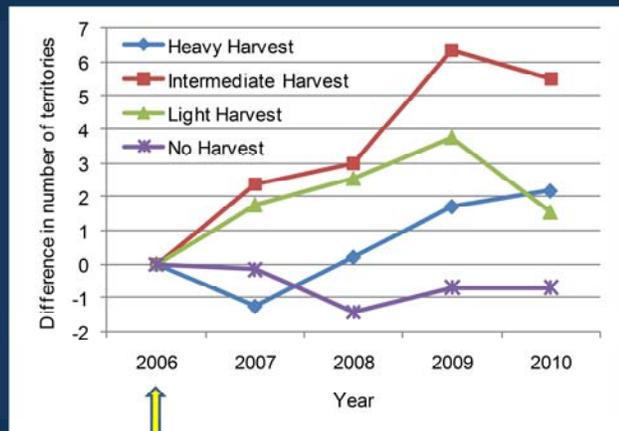
Pre- (2006) to 4 years post-treatment (2007-10) data

- Cerulean Warbler nesting success
- Territory-mapping of target species
Cerulean Warbler, Hooded Warbler,
Ovenbird, Worm-eating Warbler, Kentucky
Warbler, Wood Thrush, Scarlet Tanager
- Vegetation surveys
- Point count surveys of the avian community

1. Methods – short-term response
2. Numeric and Reproductive Response
3. Addition of early successional species due to heavier treatments
4. Point Count data is the focus today – species and community

Cerulean Warbler Response

- start with closed, mature hardwood canopy



Density ≠
Quality?

(Nesting
Success)

Pre-treatment → Basal area reduced 2007 → Understory change

1. Key is CERW positive numeric response possible in all harvests
2. But what about potential negative effects on population

Light to heavy basal area reduction can increase Cerulean Warbler abundance

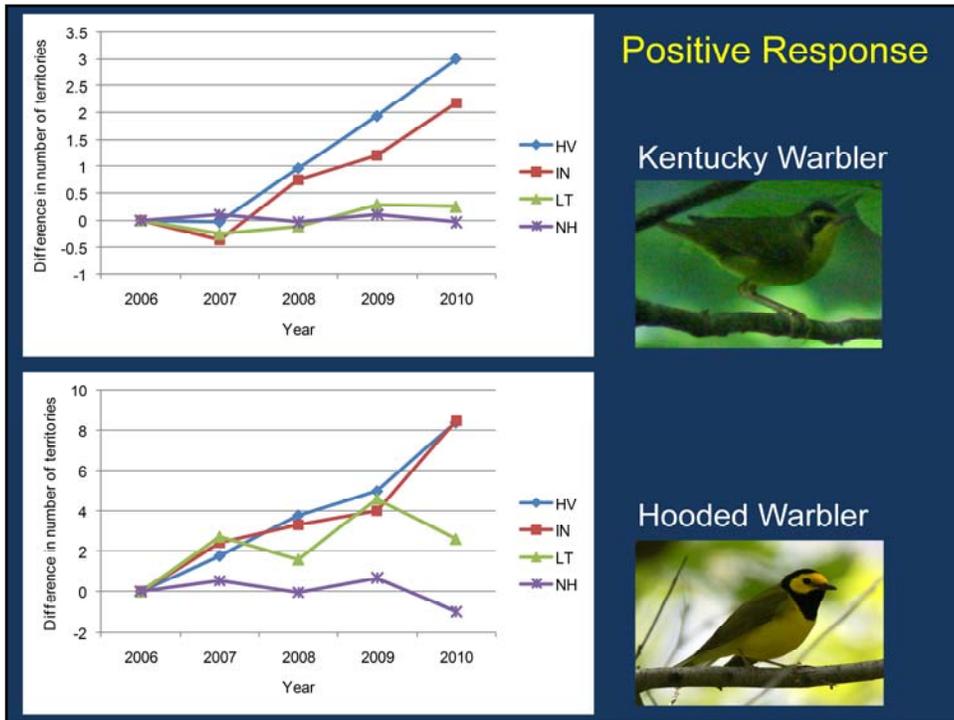
- ❖ Habitat, particularly the understory, changes in predictable ways when the canopy is opened
- ❖ Thus, other bird species/the avian community changes in predictable ways

1.Count birds

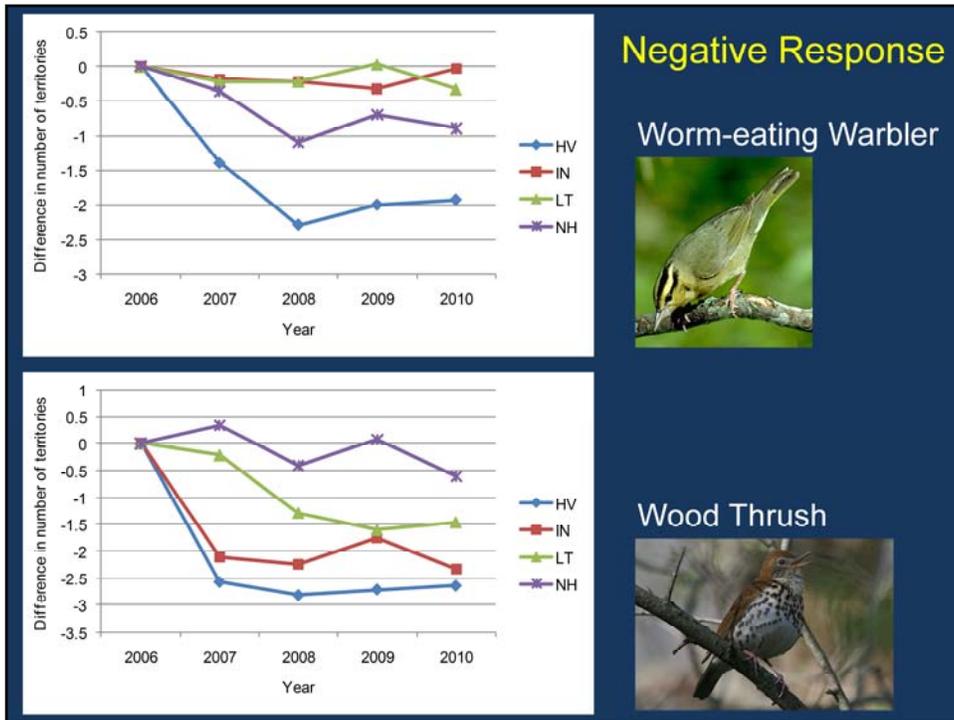
2.Quantify habitat change

- implications for other species of interest (e.g., early successional birds)
- what are the tradeoffs?

1. This may be an opportunity – flexible response so may have greater consideration of other species/community, but could be a tradeoff –other forest interior species that don't like gaps
2. Again, the final results of CERW nesting success important

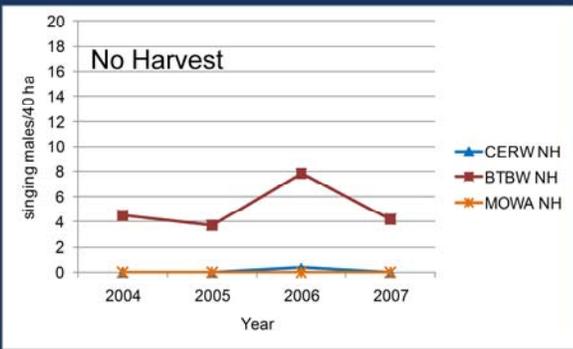
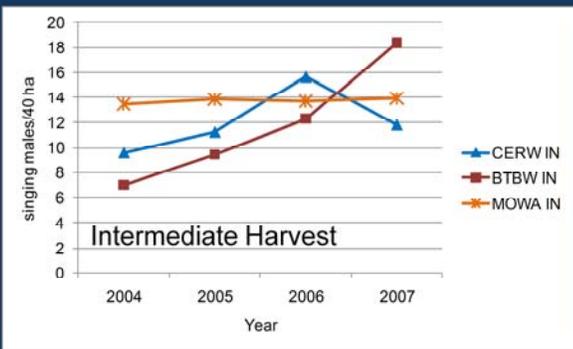


1. Key is CERW positive numeric response possible in all harvests
2. But what about potential negative effects on population

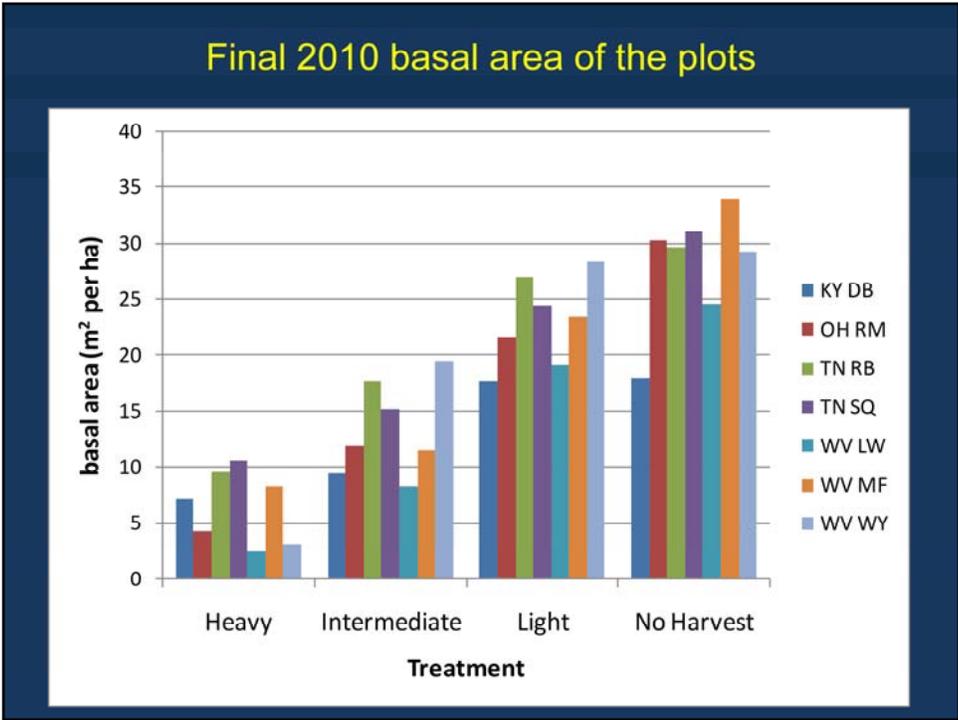


1. Key is CERW positive numeric response possible in all harvests
2. But what about potential negative effects on population

Positive Response (Allegheny Plateau, PA)

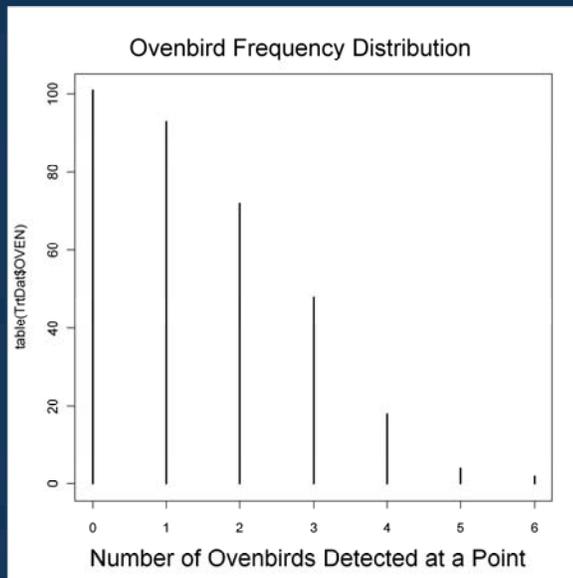


1. Key is CERW positive numeric response possible in all harvests
2. But what about potential negative effects on population



1. General grouping of plots by their treatment type works, although overlap

Point count data



- Count data (non-normal)
- Repeated data (non-independent points)
- Variation:
7 study areas
4 treatments
5 years

1. Data analysis considerations

Point count data



- Generalized mixed model repeated measures analysis

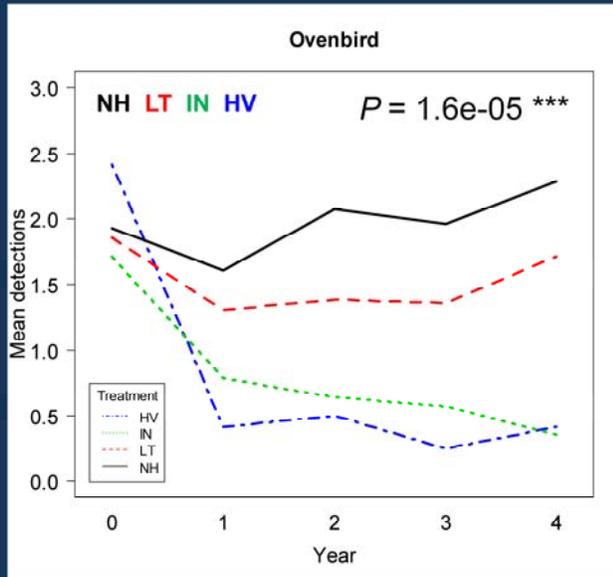
Ovenbird Example:

Number detected = Treatment + Year + Treatment*Year,
(random = Study Area/Plot/Survey Point)

- Use Poisson distribution, not Gaussian (“Normal”)
- Include Treatment*Year Interaction

1. Generalized –to deal with count data
2. Repeated measures to deal with correlation between non-independent points
3. Inclusion of Treatment by Year interaction, Individual effects of Year, Treatment

Point count data: Species Change



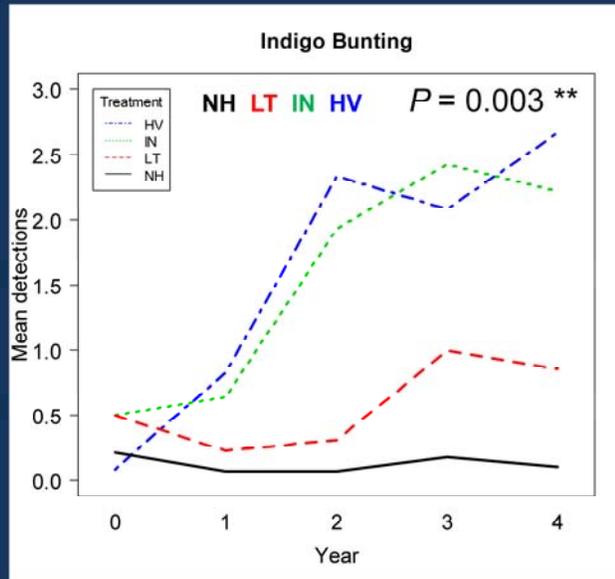
“Forest Interior”
Habitat Guild

Common:
7 study areas

Decrease
Heavy /
Intermediate
Over Time

1. Forest Interior species, same as CERW but requires a different type of structure
2. Interaction significant – difference in slope of the response according the treatment
3. Heavy/Intermediate

Point count data: Species Change



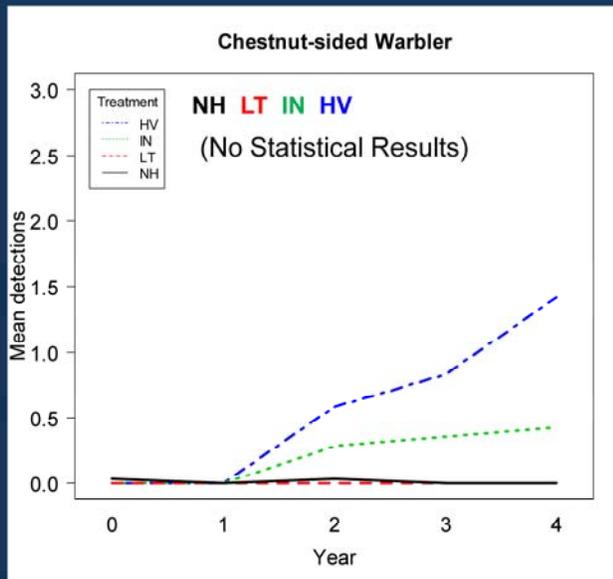
“Edge”
Habitat Guild

Common:
7 study areas

Increase
Heavy /
Intermediate
Over Time

1. Early successional species, shares some similarity with CERW structure
2. Interaction significant – difference in slope of the response according the treatment
3. Heavy/Intermediate

Point count data: Species Change



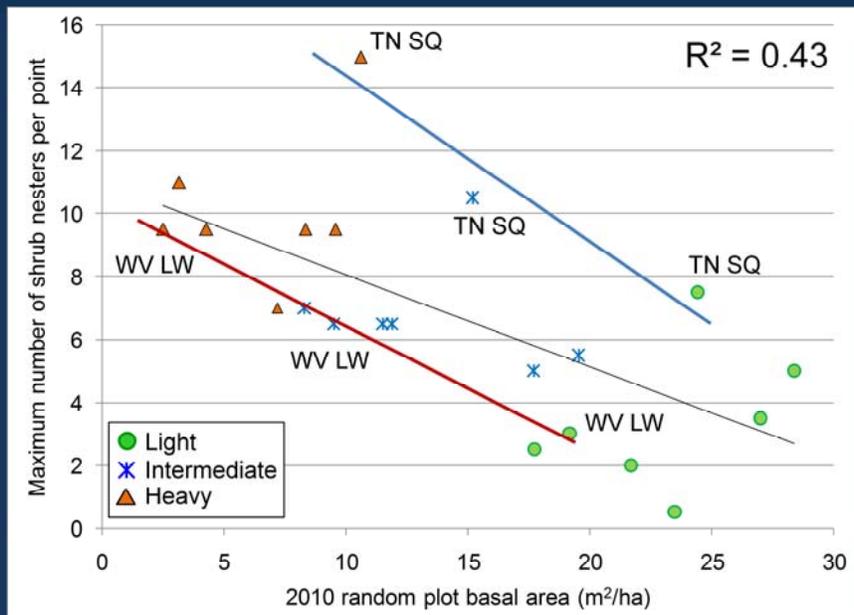
“Edge”
Habitat Guild

Uncommon:
2 study areas

❖ Different
Regional
Communities

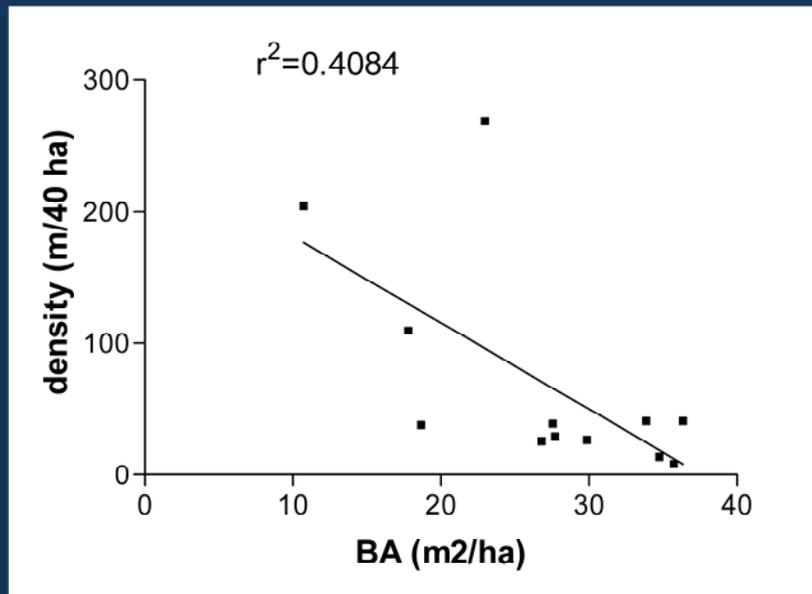
1. Early successional species, but not widespread enough for statistics
2. Probably Interaction significant – difference in slope of the response according the treatment
3. Heavy/Intermediate
4. Implication for different avian communities in, around the study areas

Shrub nesting guild -final year (2010) post-harvest

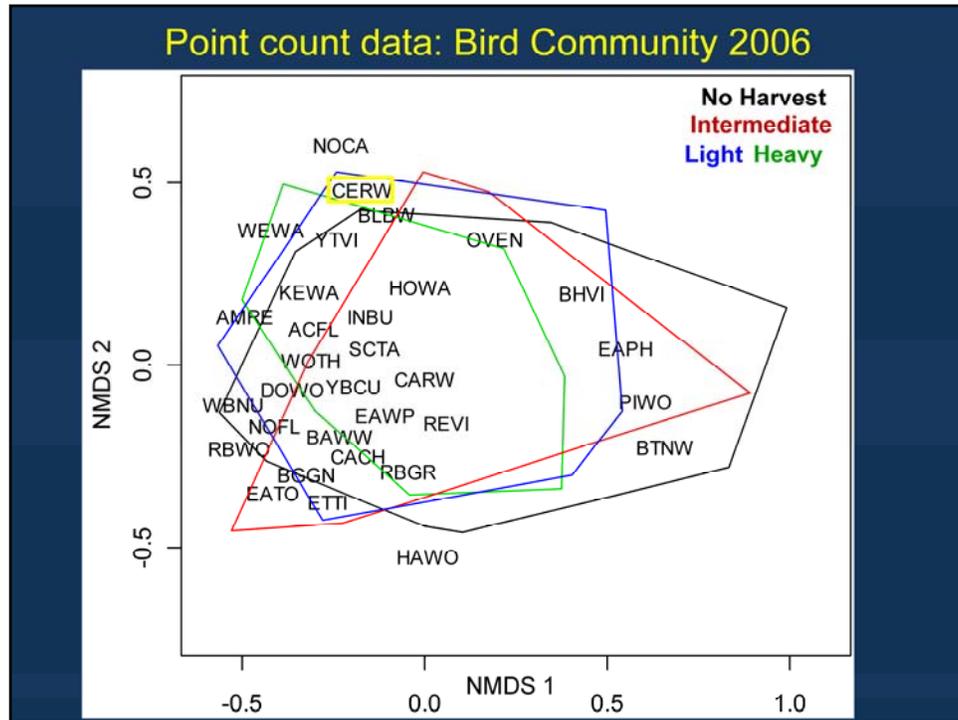


1. Gradient of Plot Basal Area, general grouping by treatment type with some overlap
2. Gradient in early successional bird response – predictable
3. Individual study areas also follow the pattern

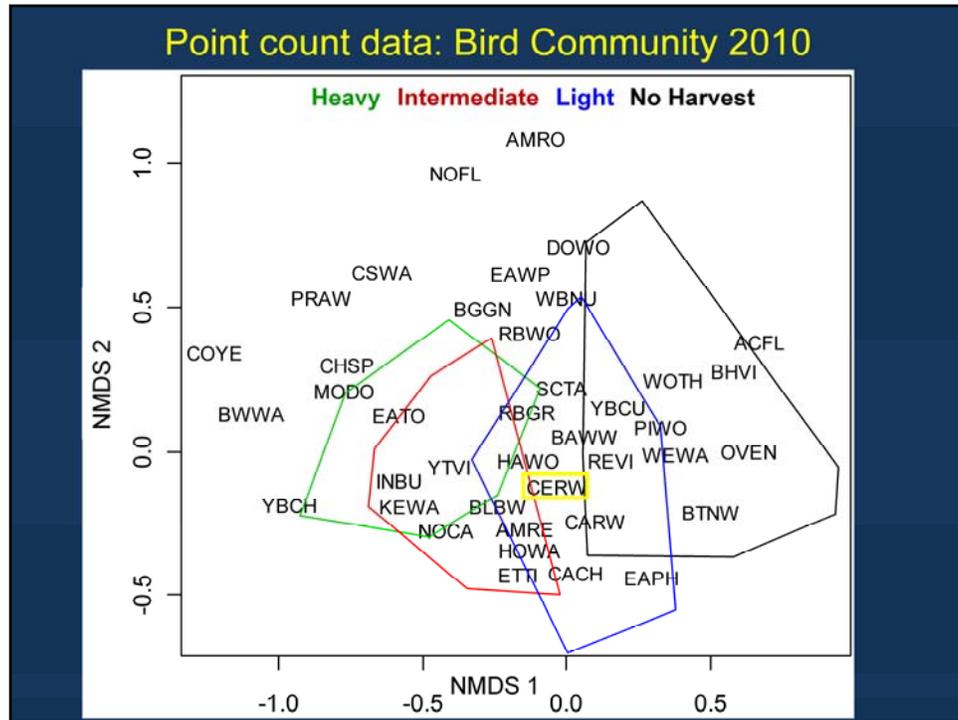
Shrub nesting guild
(Allegheny Plateau, PA)



1. Gradient of Plot Basal Area, general grouping by treatment type with some overlap
2. Gradient in early successional bird response – predictable
3. Individual study areas also follow the pattern



1. Multivariate data analysis
2. Survey points (not seen) and the treatment type polygons drawn around them due to simultaneous consideration of all data
3. Lack of differentiation, as expected
4. How the species are distributed



1. Multivariate data analysis
2. Survey points (not seen) and the treatment type polygons drawn around them due to simultaneous consideration of all data
3. Differentiation, as expected, by 2010, by treatment as might be predicted
4. How the species are distributed, CERW central position, gradient of habitat tendencies at least on the horizontal

Conclusions

❖ Species/Community Response

- Heavier BA reduction = Positive for edge/successional birds
- Regional differences due to different bird species pool
 - e.g., Chestnut-sided Warbler
- Spatial context important? Forest vs. Agriculture
 - Brown-headed Cowbird – nest parasite
- Some Forest Interior species may decline (Ovenbird)
- How long will response persist?

❖ Habitat Implication

- Early successional habitat = Post-fledging Habitat
 - even for Forest Interior Species

Conclusions

- ❖ Cerulean Warbler as a management target
 - Flexible strategy since (some) increase in all harvests?
 - consider associated species/community response
 - Birds & (economic) Forestry compatible?
 - Harvest effects on CERW nest success may be a concern
 - Restrict inference to ridge tops, ~10 ha (25 acre) cuts
 - Again, how long will response persist?

- ❖ Need to develop regional guidelines
 - Best Management Practices in the works

Management Recommendations

- ❖ Cerulean Warblers may favor east/south aspects
 - Leave some large trees
 - Preferably not red oak – poor for foraging
 - White oak may be a favorite nest tree
 - Spatial considerations – Knolls
 - Obtain information on Cerulean Warbler abundance
 - Vary harvest intensity
 - Avoid too much impact to known cluster

Acknowledgements:

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- ❖ Kentucky Department of Fish and Wildlife Resources
- ❖ West Virginia Division of Natural Resources
- ❖ Ohio Department of Natural Resources
- ❖ The Nature Conservancy

