Variation in Bird Communities Among Three Silvicultural Treatments in Northern Hardwood Forests

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Introduction

- Silviculture defined… (Helms 1998)

Clear cut: 40-60 year old stands following a clear cut and having received no additional harvests

Introduction

Selective cut: Group-selection harvested stands, typified by several age classes present at once

Introduction

Shelterwood cut:
Harvest reduced the BA to 50-70, resulting in thick sapling layer under scattered remaining overstory shelter trees

Introduction

- Silvicultural treatments = changes in structure and composition of vegetation.
- Changes in vegetation can result in changes in the bird community.
- Positive & negative relationships can exist between forest harvest practices and bird communities.
- Relevance of findings to western Great Lakes region continues to be investigated.

Introduction

- Partial harvest silviculture has become more prevalent in northern hardwood forests.

- Implementation of this at a broad scale (e.g., National Forests) can affect landscape variation in vegetation features.

- This has been shown to directly impact forest breeding bird community composition (Doyon et al. 2005, Jobes et al. 2004).

Goal

Assist Upper Great Lakes resource managers, specifically those at the Ottawa National Forest, with merging timber harvest goals and promoting bird biodiversity

Objectives

1. Test for differences in vegetation features among three silvicultural treatments.

H_o = Silvicultural treatment has no effect on vegetation features of northern hardwood forest stands.

Objectives

2. Test for differences in bird communities among three silvicultural treatments.

H_o = Silvicultural treatment has no effect on bird community composition.

Objectives

3. Test for significant differences between bird communities and vegetation features among three silvicultural systems in northern hardwood forest stands.

   H_o = There is no effect of silvicultural treatment on the relationship between bird communities and vegetation features in northern hardwood stands.

Study Area

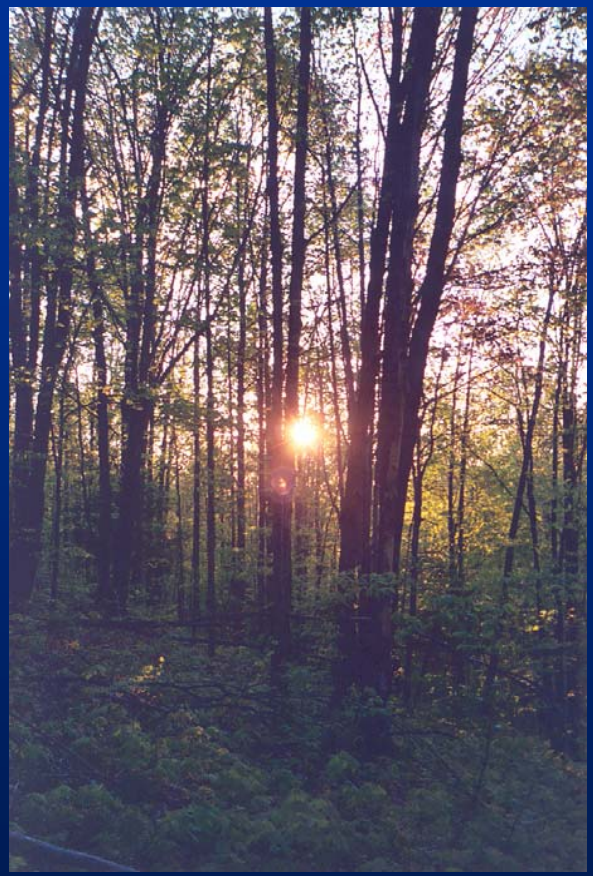

Lake Superior
Houghton County
Ontonagon
26
38
L'Anse
McCormick Wilderness
64
Ontonagon County
Bergland
Baraga County
Bruce Crossing
28
Marquette County
Ironwood
Bessemer
Gogebic County
Kenton
2
45
16
141
95
64
Michigan
Watersmeet
Iron County
OTTAWA
2
Iron County
Wisconsin
Crystal Falls
Iron River
Vilas County
N
0 5 10 Miles
Forest County
Dickinson County
Florence County

Study Area

- Northern hardwood stands in Watersmeet & Bessemer Ranger Districts (<25% conifer component) (9-15 years post harvest)

- Timber harvest has replaced fire as major disturbance regime (Frelich 2002)

Study Area



- Forests dominated by:

  -*Acer saccharum*,
  Betula alleghaniensis,
  Tilia americana,
  Tsuga canadensis,
  Ostrya virginiana
  (Crow 2002)

- Mean temp = 4.4°C
- Mean precip = 85.37 cm
- Mean snowfall = 288.64 cm

Methods

Bird Communities

-Fixed radius point counts June 1– July 15 2004 & 2005 (Ralph et al. 1993)

-Sample 36 stands evenly (12 CC, 13 SW, & 11 SC)

-Three visits per point to minimize environmental variability

Methods

- Four 0.04 ha circular plots per point count location in summer 2004
  - -0°, 120 °, 240 °, & point count (Machtans & Latour 2003)

  - -Measured 9 vegetation features
    - -% Canopy Cover
    - -Basal Area
    - -Snag Abundance
    - -% Ground Cover
    - -Avg. Sapling Layer Height
    - -Avg. Maximum Canopy Ht.
    - -% Vertical Cover
    - -Stand Avg. DBH
    - -% Conifer Cover

Results

Objective 1: Test for significant differences in habitat structure among three silvicultural treatments.

-- Basal Area ($p = 0.02$), % Vertical Cover ($p = 0.05$), & Stand Avg. DBH ($p < 0.0001$) significantly different among treatment types in SAS Univariate ANOVA

--SAS MANOVA revealed an overall effect of treatment on vegetation features ($p < 0.0001$)

Results

Objective 1:

-- 87.36% of the variation explained by first five components in PCA Analysis

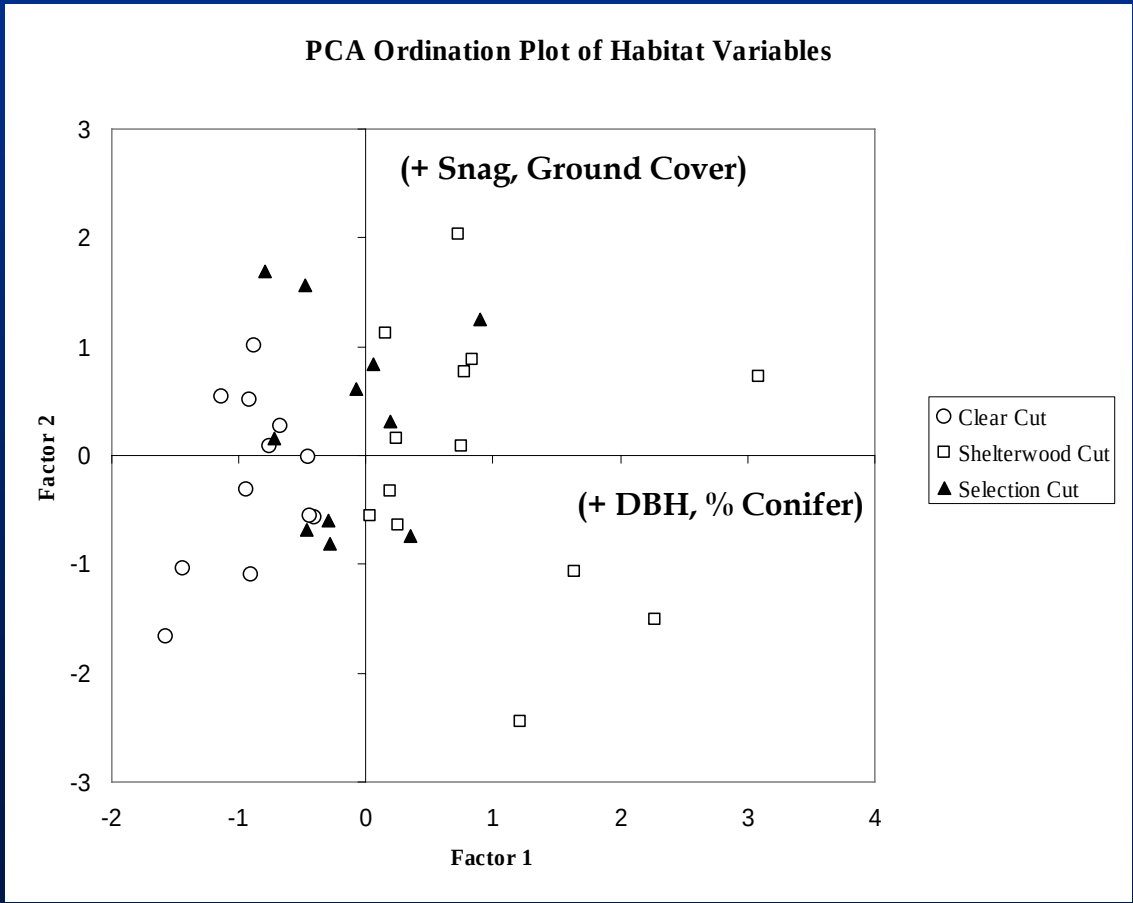
-- Stand average DBH & % Conifer had strong POSITIVE loadings on 1st factor

-- Snag abundance & % Ground Cover had strong POSITIVE loadings on 2nd factor

-- Vertical Structure had strong NEGATIVE loading on 3rd factor

Results

Objective 1:



Results

Objective 2: Test for significant differences in bird communities among three silvicultural systems.

--In 2004, six species' abundances differed among treatment types ($p<0.05$)

AMRE, BHVI, BRCR, LEFL, VEER, WIWR

--In 2005, seven species' abundances differed among treatment types ($p<0.05$)

AMGO, AMRE, BLJA, EAWP, LEFL, WBNU, WIWR

Results

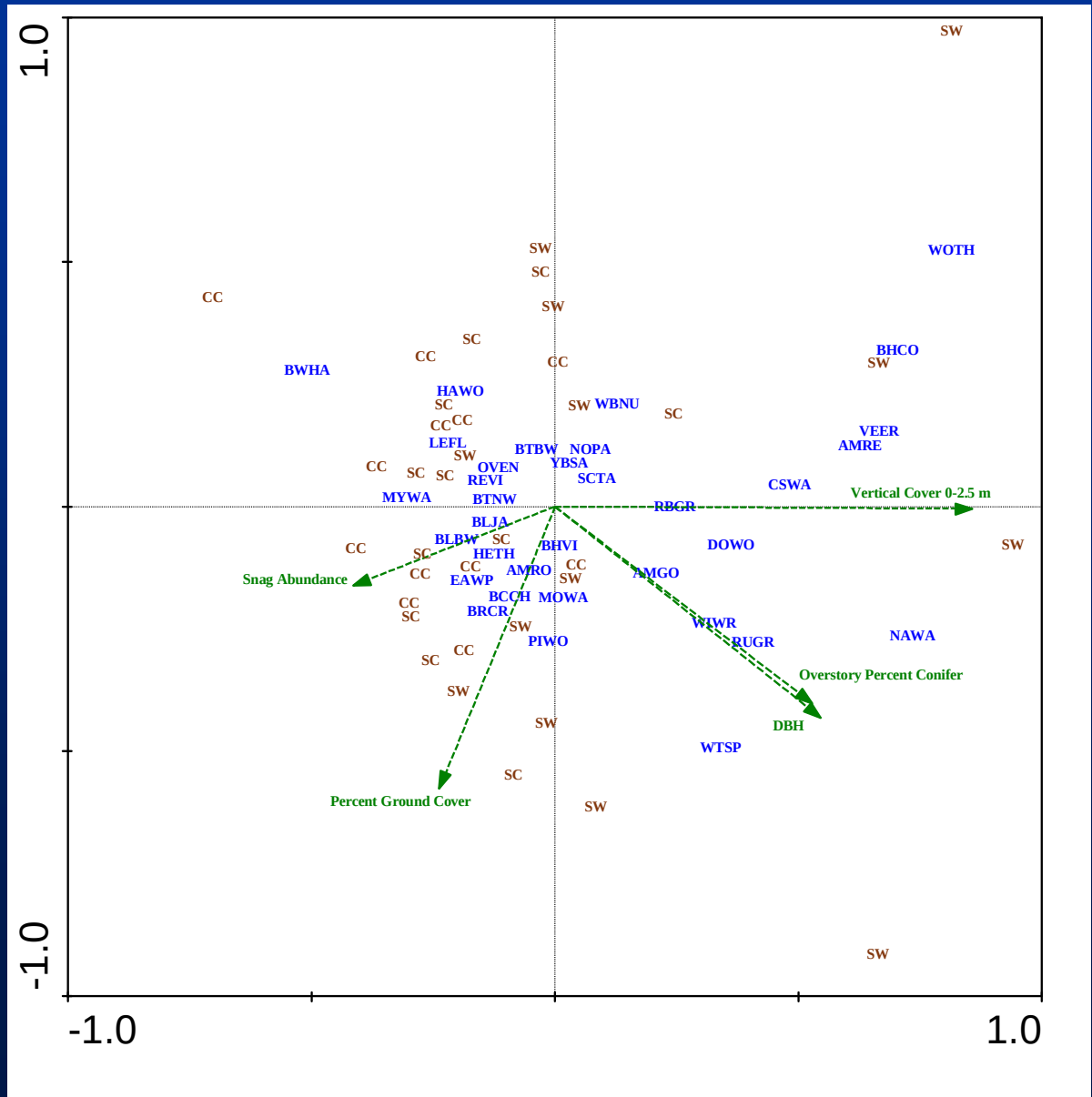
Objective 3: Test for significant differences between bird assemblages and vegetation features among three silvicultural systems in northern hardwood forest stands.

-Canoco triplots revealed species groupings in relation to habitat features and treatment type.

Results

Objective 3:

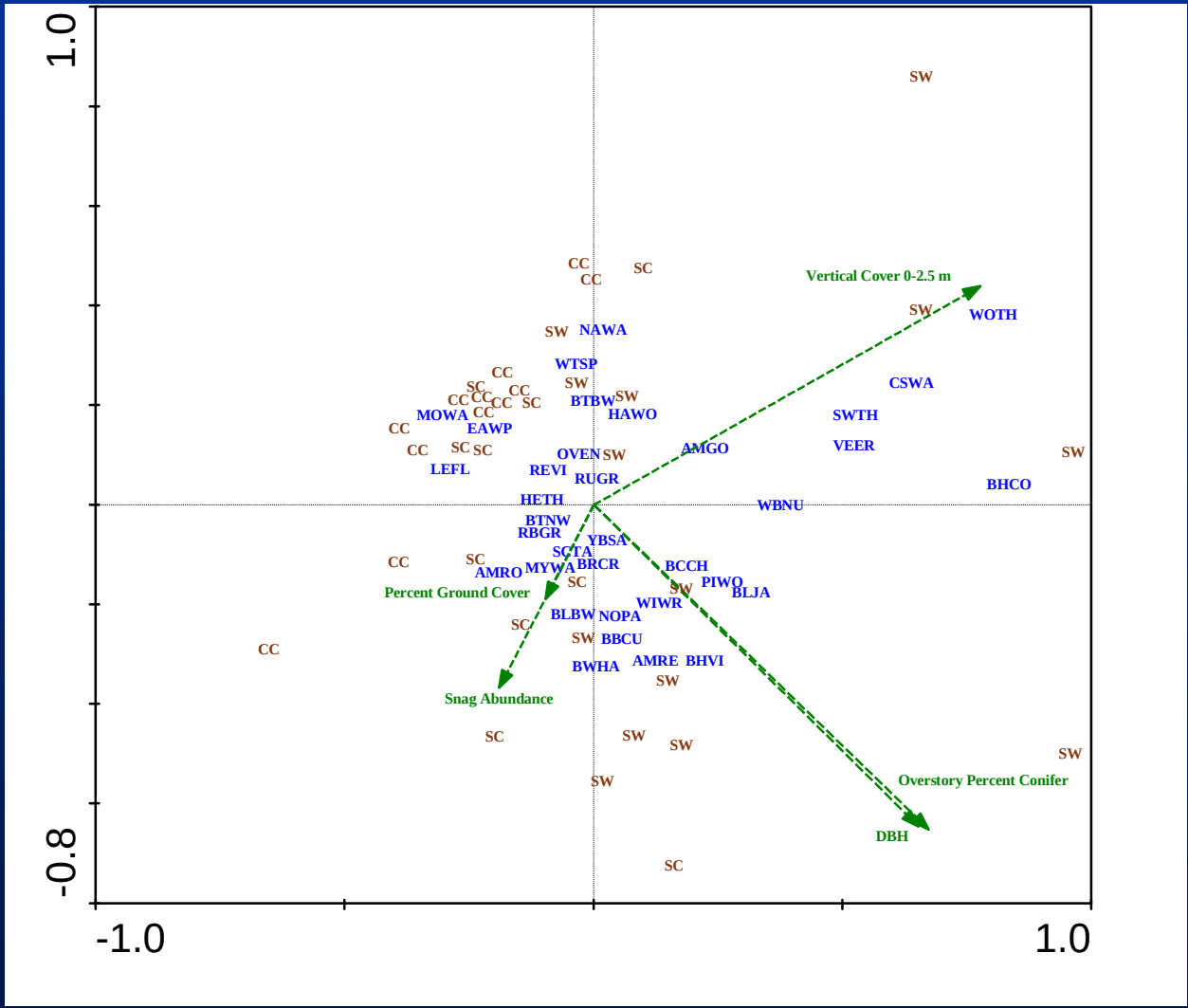
2004



Results

Objective 3:

2005



Management Implications

- Treatment type had an effect on both vegetation features and bird communities on individual northern hardwood stands

- However, variation occurred within a treatment type, resulting in a "gradient" of management effect (i.e. selection cuts not distinct from either clear cut or shelterwood stands based on vegetation features)

- Concerns about future direction of northern hardwood stand succession (e.g., Sugar Maple monoculture w/ open, sedge-like understory)

Management Implications

- Several bird species showed strong relationships with dense vertical cover most associated with shelterwood cuts (CSWA, VEER, SWTH, AMRE)

- SC stands dominated by later seral stage conditions provided for more WIWR and BRCR (both declining throughout other Great Lakes forests)

- CC stands did provide refugia for LEFL, OVEN, HETH, and BTNW (ubiquitous species)

Management Implications

- Assist forest managers with using silviculture to manage for rare and common breeding birds

- I recommend a mixture of treatment types for overall bird biodiversity

- Shelterwood harvests result in a unique bird assemblage not found in more widespread, selection cuts (potential refugia for species declining elsewhere)

- Provide a reference for Ottawa National Forest Resource Managers as they implement their new forest plan

Black-throated Blue Warbler

Dendroica caerulescens

- Listed as species of conservation concern in Boreal Hardwood Transition Zone (PIF 2002)

- Breeds in relatively undisturbed forest interiors (Holmes 1994)
  - -females select dense shrub layer to meet nesting requirements over foraging needs (Steele 1993)

- Nests at 1-1.5 m height in shrub-sapling layer (Brewer 1991)

Black-throated Blue Warbler

Dendroica caerulescens

- Nest searches revealed 4 BTBW nests
  - All of these were in conifer sapling "clumps", mostly mixed in with deciduous sapling layer
  - The terrain was more often sloping than flat
  - 1 nest was along forest road

Acknowledgments

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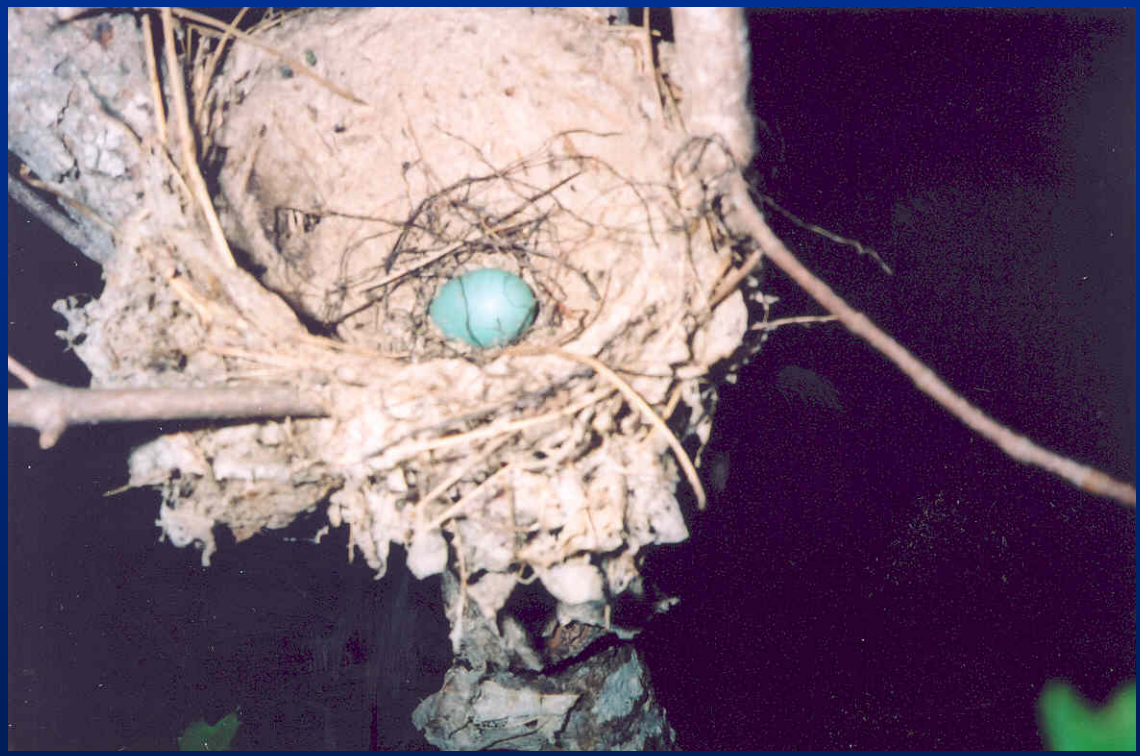
My Loving Family & Friends!

Questions?



(First documented breeding of WOTH in Gogebic County, MI 15 July 2005)