

Breeding Birds of the Cornish Hardwood Management Area

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Date: October 1, 2018

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OVERVIEW

The Cornish Hardwood Management Area (CHMA), located in northeast Aitkin County is managed by Aitkin County Forestry Department and Minnesota Department of Natural Resources. The CHMA has been managed using uneven-aged methods over the past 20 years with the goal of retaining the mature northern hardwoods forest type throughout each rotation while providing wood resources for local industry and promoting regeneration and growth of high value hardwood trees. Because northern hardwood forests provide habitat for a variety of breeding bird species, surveys of breeding birds in CHMA were initiated in the late 1990s. Since the 1990s the majority of stands have been harvested using group selection, providing an important opportunity for a before-and-after study. In 2018, we resampled the breeding bird communities in CHMA to assess bird community composition and assess changes in bird communities that may be associated with uneven-aged management practices. This is important because although the response of breeding birds to successional forest stages from clearcut to mature stand ages are relatively well known and predictable for northern Minnesota forests, breeding bird response to uneven-aged management, specifically group selection, in northern hardwoods has not been thoroughly studied in Minnesota. Our objectives were to: 1) conduct breeding bird surveys in CMHA 2) determine whether bird community composition and species abundances are affected by uneven-aged management, and 3) assess differences between breeding bird communities in the 1990s and current bird communities.

INTRODUCTION

The breeding bird communities of the western Great Lakes region have among the richest diversity of breeding bird species in North America (Green 1995; Howe et al. 1997; Rich et al. 2004; Niemi et al. 2016). The importance of this diversity and past concerns about potential declines of some species has led to a strong interest in studying forest bird populations in relation to forest management in the region. Further, there has been a growing focus on function(s) birds play in society. Sekercioglu et al. (2017) in *Why Birds Matter* has succinctly answered these questions by emphasizing the services birds provide. 1) Birds provide provision services such as for food, clothing (down), and fertilizer (guano). 2) They regulate services such as controlling populations of invertebrate and vertebrate pests, pollinating plants, dispersing seeds, and scavenging carcasses and waste. 3) Birds support services such as cycling nutrients and even soil formation. 4) Finally, they provide cultural services such as the enjoyment and monetary value of bird watching, nature photography, and in art and religion.

Northern hardwood forests provide habitat for a variety of breeding bird species, including several long-distance migrants (Niemi et al. 2016). In Minnesota, northern hardwood communities are found throughout the Laurentian Mixed Forest province and occur on relatively rich, moist sites. Dominant tree species include sugar maple (*Acer saccharum*), paper birch (*Betula papyrifera*) yellow birch (*Betula alleghaniensis*), northern red oak (*Quercus rubra*), basswood (*Tilia americana*), trembling aspen (*Populus tremuloides*), white spruce (*Picea glauca*), and white pine (*Pinus strobus*). Northern hardwoods comprised approximately 20% of Minnesota's forest (5.3 million acres) pre-European settlement (Frelich 1998). Over the past century, almost 4 million acres of northern hardwood stands in Minnesota have been converted to other forest types (primarily shade intolerant species like aspen) and today, less than half (9% or 1.5 million acres) of this forest type exists in the state. There has been a recent interest in limiting future loss of this forest type in northern Minnesota by managing this type on an uneven-aged basis.

The Cornish Hardwood Management Area (CHMA), located in northeast Aitkin County, contains approximately 15,000 acres of northern hardwood forest. The CHMA is managed by Aitkin County forestry department and Minnesota Department of Natural Resources (MNDNR). The forestry goals for this area are to provide wood resources for local industry and to promote regeneration and growth of high value hardwood trees by maintaining this forest type throughout each rotation while maintaining large blocks of mature, closed-canopy hardwood forest. In the 1990s uneven-aged management in the CHMA focused on removing individual trees that were selected for harvest to promote hardwood growth and regeneration

(crop tree release). However, this traditional approach to uneven-aged management tends to favor shade tolerant sugar maple at the expense of shade intolerant species such as oak, basswood, or birch. To address this issue, Aitkin County started focusing management using group selection gaps (~0.5 acres each) that are spread evenly throughout the stand (Figure 1). The goal of this approach is to promote tree species diversity and wildlife benefits.

Response of breeding birds to successional forest stages from clearcut to mature stand ages are relatively well known and predictable for northern Minnesota forests (Niemi et al. 2016). However, breeding bird response to uneven-aged management in northern hardwoods has not been as well-studied in Minnesota. Because bird species composition changes in response to modification in habitat structure, it is important to understand effects of uneven-aged management on bird species composition and abundance in this area. Our objectives were to: 1) conduct breeding bird surveys in CMHA 2) determine whether bird community composition and species abundances are affected by uneven-aged management, and 3) assess differences between breeding bird communities in the 1990s and current bird communities.



Figure 1. Example stand in Cornish Hardwood Management Area managed using uneven-aged management, note 0.5 acre canopy gaps.

DESIGN AND METHODS

Study Area and Sample Design

The original study design from the 1990s included conducting two point count surveys in total of 26 stands; 16 stands in the CHMA eight of these stands had been managed in the past 10 years and eight had not been recently managed, there were an additional 10 stands that were located in Savannah Portage State Park that had not been managed since the 1950's that were used as reference stands. All stands were greater than 40 acres, and point count locations were 250 m apart, and 100 m from the edge of the stand. In 2018, we resurveyed the 16 stands that are located in CHMA, however the majority of stands have been managed to some extent since the original bird surveys, thus the original study design no longer holds.

Breeding Bird Counts

One breeding bird survey was conducted at each point count location on June 2, 2018 and June 3, 2018. We used an unlimited radius 10 minute count point count that was conducted between one half hour before and four hours after sunrise. Counts were only done on days with good weather (no precipitation and wind < 20 kph) conditions. Training is an important aspect of quality data collection, NRRI observers are trained and tested on their ability to identify species by sound. Observers are also required to attend field training that was conducted over a four day period to standardize distance estimates and point count protocol. In addition to field training and testing, all observers were required to have a hearing test to ensure their hearing was within the normal range, as established by audiologists, for frequencies 125 to 8,000 hertz.

Analysis

We totaled number of species and numbers of individuals from the two points in each stand. We compared relative abundance and calculated changes in relative abundance from the 1990s and 2018 to assess differences in species composition. Further we used a two-way cluster analysis to determine whether community composition was similar among stands that have been recently harvested, this procedure identifies individual stands that have the most similar bird communities.

FUTURE DIRECTIONS

We would like to conduct breeding bird surveys again in June 2019, additional data will allow us to complete more rigorous analyses. Specifically, we would like to include stand and landscape characteristics in the analysis and focus on the spatial distribution of birds found in relation to the 0.5 acre gaps and intact mature canopy forests. Ultimately, these types of analysis will provide the details needed to fully assess the dynamics and impacts of uneven-aged management on breeding bird communities.

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Tables

Table 1. Comparison of breeding bird observations, relative abundance, and change in relative abundance for each species from the 1990s to 2018.

| Common Name | 1990s | 2018 | 1990s | 2018 | Change in relative abundance |
|------------------------------|-------|------|-------|-------|------------------------------|
| American Crow | 3 | 3 | 0.007 | 0.007 | 0.001 |
| American Redstart | 1 | 5 | 0.001 | 0.012 | 0.011 |
| American Robin | 1 | 9 | 0.001 | 0.022 | 0.021 |
| Black-and-white Warbler | 0 | 4 | 0.000 | 0.010 | 0.010 |
| Black-billed Cuckoo | 0 | 3 | 0.000 | 0.007 | 0.007 |
| Black-capped Chickadee | 1 | 0 | 0.001 | 0.000 | -0.001 |
| Black-throated Blue Warbler | 2 | 0 | 0.004 | 0.000 | -0.004 |
| Black-throated Green Warbler | 31 | 12 | 0.077 | 0.029 | -0.048 |
| Blue Jay | 2 | 4 | 0.005 | 0.010 | 0.005 |
| Brown Creeper | 2 | 3 | 0.005 | 0.007 | 0.002 |
| Cedar Waxwing | 0 | 2 | 0.000 | 0.005 | 0.005 |
| Chestnut-sided Warbler | 4 | 21 | 0.009 | 0.051 | 0.042 |
| Common Loon | 0 | 1 | 0.000 | 0.002 | 0.002 |
| Common Raven | 0 | 1 | 0.000 | 0.002 | 0.002 |
| Common Yellowthroat | 0 | 1 | 0.000 | 0.002 | 0.002 |
| Downy Woodpecker | 1 | 0 | 0.003 | 0.000 | -0.003 |
| Eastern Wood-Pewee | 12 | 11 | 0.030 | 0.027 | -0.003 |
| Golden-winged Warbler | 0 | 6 | 0.000 | 0.015 | 0.015 |
| Gray Catbird | 0 | 2 | 0.000 | 0.005 | 0.005 |
| Great Crested Flycatcher | 1 | 0 | 0.001 | 0.000 | -0.001 |
| Hairy Woodpecker | 2 | 0 | 0.004 | 0.000 | -0.004 |
| Hermit Thrush | 12 | 2 | 0.030 | 0.005 | -0.025 |
| Indigo Bunting | 0 | 1 | 0.000 | 0.002 | 0.002 |
| Least Flycatcher | 66 | 34 | 0.161 | 0.083 | -0.077 |
| Mourning Warbler | 0 | 14 | 0.000 | 0.034 | 0.034 |
| Nashville Warbler | 1 | 7 | 0.001 | 0.017 | 0.016 |
| Northern Flicker | 1 | 0 | 0.001 | 0.000 | -0.001 |
| Northern Parula | 4 | 1 | 0.009 | 0.002 | -0.007 |
| Northern Waterthrush | 2 | 3 | 0.004 | 0.007 | 0.003 |
| Ovenbird | 119 | 119 | 0.292 | 0.292 | 0.000 |
| Pileated Woodpecker | 0 | 1 | 0.000 | 0.002 | 0.002 |
| Red-eyed Vireo | 90 | 62 | 0.221 | 0.152 | -0.069 |
| Rose-breasted Grosbeak | 7 | 12 | 0.017 | 0.029 | 0.012 |

| | | | | | |
|--------------------------|----|----|-------|-------|--------|
| Ruffed Grouse | 0 | 3 | 0.000 | 0.007 | 0.007 |
| Scarlet Tanager | 6 | 9 | 0.016 | 0.022 | 0.006 |
| Song Sparrow | 0 | 2 | 0.000 | 0.005 | 0.005 |
| Veery | 10 | 13 | 0.024 | 0.032 | 0.008 |
| White-breasted Nuthatch | 1 | 4 | 0.001 | 0.010 | 0.008 |
| White-throated Sparrow | 0 | 5 | 0.000 | 0.012 | 0.012 |
| Wild Turkey | 0 | 1 | 0.000 | 0.002 | 0.002 |
| Winter Wren | 8 | 2 | 0.020 | 0.005 | -0.015 |
| Wood Thrush | 0 | 5 | 0.000 | 0.012 | 0.012 |
| Yellow-bellied Sapsucker | 17 | 3 | 0.041 | 0.007 | -0.033 |
| Yellow-throated Vireo | 0 | 1 | 0.000 | 0.002 | 0.002 |
| Unidentified species | 6 | 22 | 0.015 | 0.054 | |

Appendices

Appendix A. List of species, scientific name, 4-letter abbreviation, and guild information for species observed at Cornish Hardwood Management Area in the 1990s and 2018.

| Common Name | Scientific Name | Abbr. | Migration Strategy | Nest Site | Vegetation Type |
|------------------------------|----------------------------------|-------|--------------------|--------------------|-------------------------------|
| American Crow | <i>Corvus brachyrhynchos</i> | AMCR | Short-distance | Canopy | Deciduous forest |
| American Redstart | <i>Setophaga ruticilla</i> | AMRE | Long-distance | Subcanopy or Shrub | Early successional |
| American Robin | <i>Turdus migratorius</i> | AMRO | Short-distance | Subcanopy or Shrub | Fields and meadows |
| Black-and-white Warbler | <i>Mniotilta varia</i> | BAWW | Long-distance | Ground | Mixed forest |
| Black-billed Cuckoo | <i>Coccyzus erythrophthalmus</i> | BBCU | Long-distance | Subcanopy or Shrub | Deciduous forest |
| Black-capped Chickadee | <i>Poecile atricapillus</i> | BCCH | Permanent Resident | Cavity | Deciduous forest |
| Black-throated Blue Warbler | <i>Setophaga caeruleascens</i> | BTBW | Long-distance | Subcanopy or Shrub | Deciduous forest |
| Black-throated Green Warbler | <i>Setophaga virens</i> | BTNW | Long-distance | Subcanopy or Shrub | Mixed forest |
| Blue Jay | <i>Cyanocitta cristata</i> | BLJA | Permanent Resident | Canopy | Deciduous forest |
| Brown Creeper | <i>Certhia americana</i> | BRCR | Short-distance | Cavity | Deciduous forest |
| Cedar Waxwing | <i>Bombycilla cedrorum</i> | CEDW | Short-distance | Subcanopy or Shrub | Ponds, lakes, rivers, streams |
| Chestnut-sided Warbler | <i>Setophaga pensylvanica</i> | CSWA | Long-distance | Subcanopy or Shrub | Early successional |
| Common Loon | <i>Gavia immer</i> | COLO | Short-distance | Ground | Ponds, lakes, rivers, streams |
| Common Raven | <i>Corvus corax</i> | CORA | Permanent Resident | Canopy | Coniferous forest |
| Common Yellowthroat | <i>Geothlypis trichas</i> | COYE | Long-distance | Ground | Shrub swamp |
| Downy Woodpecker | <i>Picoides pubescens</i> | DOWO | Permanent Resident | Cavity | Deciduous forest |
| Eastern Wood-Pewee | <i>Contopus virens</i> | EAWP | Long-distance | Canopy | Mixed forest |
| Golden-winged Warbler | <i>Vermivora chrysoptera</i> | GWWA | Long-distance | Ground | Early successional |
| Gray Catbird | <i>Dumetella carolinensis</i> | GRCA | Long-distance | Subcanopy or Shrub | Early successional |
| Great Crested Flycatcher | <i>Myiarchus crinitus</i> | GCFL | Long-distance | Cavity | Deciduous forest |
| Hairy Woodpecker | <i>Picoides villosus</i> | HAWO | Permanent Resident | Cavity | Deciduous forest |

| | | | | | |
|--------------------------|--------------------------------|------|--------------------|--------------------|---------------------------|
| Hermit Thrush | <i>Catharus guttatus</i> | HETH | Short-distance | Ground | Mixed forest |
| Indigo Bunting | <i>Passerina cyanea</i> | INBU | Long-distance | Subcanopy or Shrub | Fields and meadows |
| Least Flycatcher | <i>Empidonax minimus</i> | LEFL | Long-distance | Subcanopy or Shrub | Deciduous forest |
| Mourning Warbler | <i>Geothlypis philadelphia</i> | MOWA | Long-distance | Ground | Early successional |
| Nashville Warbler | <i>Oreothlypis ruficapilla</i> | NAWA | Long-distance | Ground | Lowland coniferous forest |
| Northern Flicker | <i>Colaptes auratus</i> | NOFL | Short-distance | Cavity | Deciduous forest |
| Northern Parula | <i>Setophaga americana</i> | NOPA | Long-distance | Canopy | Lowland coniferous forest |
| Northern Waterthrush | <i>Parkesia noveboracensis</i> | NOWA | Long-distance | Ground | Lowland coniferous forest |
| Ovenbird | <i>Seiurus aurocapilla</i> | OVEN | Long-distance | Ground | Deciduous forest |
| Pileated Woodpecker | <i>Dryocopus pileatus</i> | PIWO | Permanent Resident | Cavity | Deciduous forest |
| Red-eyed Vireo | <i>Vireo olivaceus</i> | REVI | Long-distance | Subcanopy or Shrub | Deciduous forest |
| Rose-breasted Grosbeak | <i>Pheucticus ludovicianus</i> | RBGR | Long-distance | Subcanopy or Shrub | Deciduous forest |
| Ruffed Grouse | <i>Bonasa umbellus</i> | RUGR | Permanent Resident | Ground | Deciduous forest |
| Scarlet Tanager | <i>Piranga olivacea</i> | SCTA | Long-distance | Canopy | Deciduous forest |
| Song Sparrow | <i>Melospiza melodia</i> | SOSP | Short-distance | Ground | Fields and meadows |
| Veery | <i>Catharus fuscescens</i> | VEER | Long-distance | Ground | Deciduous forest |
| White-breasted Nuthatch | <i>Sitta carolinensis</i> | WBNU | Permanent Resident | Cavity | Deciduous forest |
| White-throated Sparrow | <i>Zonotrichia albicollis</i> | WTSP | Short-distance | Ground | Early successional |
| Wild Turkey | <i>Meleagris gallopavo</i> | WITU | Permanent Resident | Ground | Deciduous forest |
| Winter Wren | <i>Troglodytes hiemalis</i> | WIWR | Short-distance | Ground | Lowland coniferous forest |
| Wood Thrush | <i>Hylocichla mustelina</i> | WOTH | Long-distance | Subcanopy or Shrub | Deciduous forest |
| Yellow-bellied Sapsucker | <i>Sphyrapicus varius</i> | YBSA | Short-distance | Cavity | Deciduous forest |
| Yellow-throated Vireo | <i>Vireo flavifrons</i> | YTVI | Long-distance | Canopy | Deciduous forest |