

**BREEDING BIRDS OF THE CORNISH HARDWOOD MANAGEMENT AREA:  
AITKIN COUNTY, MINNESOTA**

Report To:  
Minnesota Department of Natural Resources, Non-game Division  
Grand Rapids, MN  
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Submitted By:  
JoAnn Hanowski  
Natural Resources Research Institute, Duluth, MN

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**SUMMARY**

The Cornish Hardwood management area (CHMA), located in northeast Aitkin County is managed by Aitkin County forestry department and Minnesota Department of Natural Resources in an uneven-aged format. 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. Northern hardwood forests provide habitat for a variety of breeding bird species, including several long-distant migrants. Although, 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 in northern hardwoods has not been studied in Minnesota. Our objectives were to: 1) establish a long-term breeding bird monitoring program in the CHMA to detect annual changes in species abundances, 2) determine whether bird community composition and species abundances are affected by uneven-aged management, and 3) compare bird community in the CHMA with other northern hardwood stands in northern Minnesota.

Twenty-six individual stands that were greater than 40 acres were selected for monitoring. Eight stands were harvested within the past 10 years (managed), eight stands are in the management area, but have not been recently managed (unmanaged), and ten sites were located in Savannah Portage State Park. One breeding bird survey was conducted at each point with an unlimited radius 10 minute count point. A total of 25 bird species were observed in 26 stands (52 points). On average, we observed about 22 individuals and 7 to 8 species in each stand (total of two point counts). No differences were detected in bird communities among management types. Two of the 15 species tested with analysis of variance indicated a significant difference ( $P \leq 0.05$ ) in abundance among management types. The Chestnut-sided Warbler and Winter Wren were more abundant in the managed than in the unmanaged or reference sites. Both of these species are associated with habitat features that occur shortly after forest management activities (shrubs or slash piles).

A cluster analysis with bird species showed that bird community composition was not different among management types. Overall bird communities in all stands sampled regardless of management history were similar. This result indicates that uneven-aged management such as the type that has been done at CHMA does not result in a forest structure that is different than what currently exists in other

northern hardwood stands in this region. This result is similar to what we have found previously for other “old-growth” northern hardwood stands in the State.

A species that was absent in northern hardwood stands in this region was the Black-throated Blue Warbler. This species is rarely found in northern hardwoods in north central Minnesota but occurs in selected northern hardwood stands in northeast Minnesota, primarily in the Lake Superior highlands. A study on the Black-throated Blue Warbler in northeast Minnesota in 1998 found that the species prefers northern hardwood stands with a shrub understory. In areas where there are few shrubs, the species was primarily associated with small gaps (in the range of 0.05 to 0.10 ha) in the canopy that have resulted from blowdowns. The natural disturbance regime for northern hardwoods in this region was windstorms which occur every few decades and create small forest gaps by blowing down senescent or weak and hollow trees. It is possible that the Black-throated Blue Warbler historically responded to habitat that was created by these gaps and moved across the landscape as new patches were created and old patches became unsuitable.

It may be possible maintain the objectives for forest management in the CHMA by completing harvests that would result in the creation of small gaps. Another recommendation would be to choose harvest equipment that would have less impact on the understory vegetation (e.g., result in less skidding of trees). These management suggestions will not only provide more suitable habitat for avian species that require shrubs and saplings, but also a population of seedlings and saplings for future recruitment into the canopy.

## **BACKGROUND**

At presettlement, about 20% of Minnesota’s forest or 5.3 million acres were northern hardwoods (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 of the original acres (9% or 1.5 millions acres) of this 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 is managed by Aitkin County forestry department and Minnesota Department of Natural Resources in an uneven-aged format. 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. Stands are harvested on an approximate fifteen year rotation and individual trees are selected for harvest to promote hardwood growth and regeneration. After each harvest, approximately 80-85 ft<sup>2</sup> basal area is left in the stand.

Northern hardwood forests provide habitat for a variety of breeding bird species, including several long-distant migrants (NRRI data, 1997). Response of breeding birds to successional forest stages from clearcut to mature stand ages are relatively well known and predictable for northern Minnesota forests (NRRI data, 1997). However, breeding bird response to uneven-aged management in northern hardwoods has not been studied in Minnesota. Because bird species composition changes in response to modification in habitat structure, it will be important to understand effects of uneven-aged management on bird species composition and abundance in this area. Our objectives were to: 1) establish a long-term breeding bird monitoring program in the CHMA to detect annual changes in species abundances, 2) determine whether bird community composition and species abundances are affected by uneven-aged management, and 3) compare bird community in the CHMA with other northern hardwood stands in northern Minnesota.

## STUDY AREA

Twenty-six individual stands that were greater than 40 acres were selected for monitoring in spring of 1998 following protocol by Hanowski and Niemi (1995). Eight stands were harvested within the past 10 years (managed), eight stands are in the management area, but have not been recently managed (unmanaged), and ten sites were located in Savannah Portage State Park. Sites within Savannah Portage State Park are used as reference sites here, but did receive some harvest treatments in the early 1950's (personal communication with Park personnel). Because these sites have been disturbed since stand origination they do not meet the old-growth criteria (e.g., >120 years and no significant human disturbance see Hale et al. submitted). These sites will not receive harvest treatments in the near future. Two points were established in each stand and were permanently marked with a metal fence post. The points are 250 m apart from each other and 100 m from the stand edge. Point locations were recorded with a GPS and coordinates are available from the Aitkin County Forestry office.

## METHODS

One breeding bird survey was conducted at each point between 8 and 16 June 1998. 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 by one observer who has had over 20 years experience in collecting point count data.

We totaled number of species, individuals and numbers of individual species from the two points in each stand. Data were examined for normality and appropriate transformations were done for those variables that did not have normal distributions or homogeneous variances. Analysis of variance (ANOVA) was used to determine whether total number of species, total number of individuals, or numbers of individual species were different between three management groups. Species that occurred on sites within two of the three management groups were tested.

Tests on individual species (e.g., ANOVA) do not always reveal differences or similarities in bird community composition. Therefore, a cluster analysis was done to determine whether community composition was similar among stands within the same management type. A hierarchical clustering technique was used and included all bird species. This procedure identifies individual stands that have the most similar bird communities.

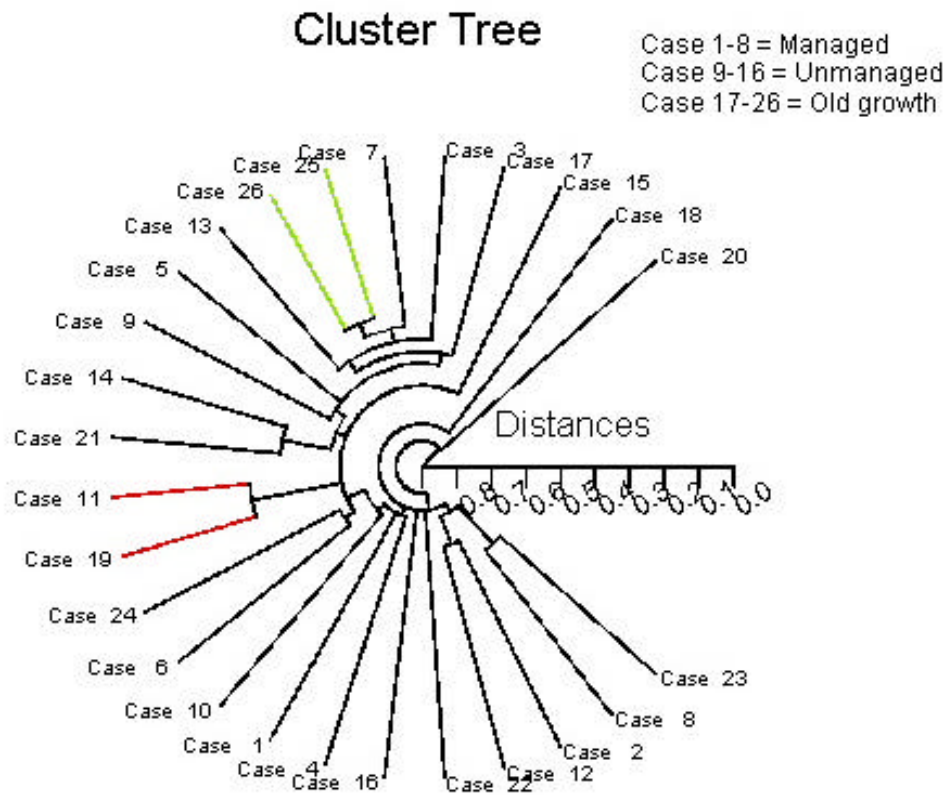
## RESULTS

A total of 25 bird species were observed in 26 stands (52 points) (Table 1). Of the 25 species observed, four were only observed in the reference stands including Ruby-throated Hummingbird, Black-capped Chickadee, Nashville Warbler, and Pine Warbler. Three species, Northern Flicker, Great Crested Flycatcher, and Northern Parula, were only observed on the managed sites. The Black-and-white Warbler and Blackburnian Warbler were counted only on the unmanaged sites.

On average, we observed about 22 individuals and 7 to 8 species in each stand (total of two point counts). No differences were detected in bird communities among management types (Table 1). The Ovenbird, Red-eyed Vireo and Least Flycatcher were the most abundant bird species and no differences were detected among treatment types (Table 1). Two of the 15 species tested with ANOVA indicated a significant difference ( $P \leq 0.05$ ) in abundance among management types. The Chestnut-sided Warbler and

Winter Wren were more abundant in the managed than in the unmanaged or reference sites (Table 1).

Results of the cluster analysis showed that bird community composition in sites within a management type were relatively homogeneous. Sites within one type of management were not more similar to each other than they were to sites within the other management types (Figure 1). For example, sites 11 and 19 are most similar to each other which is reflected by both their position adjacent to each other and their connection with the shortest line (see Figure 1). The next two most similar sites were both reference sites (sites 25 and 26). If community composition was unique to a management type we would expect that sites within a management type would be clustered together in this analysis. This clustering of sites within a management type was not observed; only two reference sites (25 and 26) were grouped at the lowest level. Clusters at all levels included sites from all management groups.



**Figure 1.** Diagram of cluster analysis depicting similarity of bird community composition on managed (cases 1-8), unmanaged (cases 9-16) and reference (cases 17-26) sites in the CHMA. Sites that are closest together and linked on the wheel are most similar to each other.

## DISCUSSION

Bird community composition of stands in the CHMA and Savannah Portage State Forest are similar to other northern hardwood stands in northern Minnesota and Wisconsin. Total numbers of species and individuals in the CHMA were similar to what was found in 5 maple stands in the Tofte District of the Superior National Forest and in 6 maple/basswood stands in the Chippewa National Forest over the past 9 years. Bird community composition from pole (24 stands) and saw (11 stands) sized stands in the Chequamegon National Forest (northern Wisconsin) over the past 8 years was also similar to what was found in the CHMA. In general, bird species richness and total number of individuals observed in northern hardwood stands rank this habitat in the lower third of nine other forest habitats (e.g., pine, aspen, spruce/fir, black spruce, tamarack) surveyed in this region (Hanowski personal data).

Types of species observed and abundance of these species in the CHMA was also similar to what was found in hardwood stands in this region. The Ovenbird was the most abundant species in the CHMA and also most abundant in hardwood stands in northern Minnesota and Wisconsin (Hanowski personal data). This species typically reaches its highest abundance (or second highest) in this forest type compared to other forest types in the region. Similarly, the Red-eyed Vireo, Least Flycatcher, and Black-throated Green Warbler, which were the next most abundant individual species in the CHMA, are also abundant in other hardwood stands in the region. They also have higher abundances in this forest type than in most other forest types where they occur (Hanowski personal data).

Both species that were more abundant in managed stands, the Chestnut-sided Warbler and Winter Wren, are associated with habitat features that occur shortly after forest management activities. For example, the Chestnut-sided Warbler is a shrub-associated species and responds to shrubs growing in small gaps after trees are removed. The Winter Wren nests in upturned roots, old cavities, or brush piles and often occurs in association with slash piles left after harvest activities. The higher abundance of these two species in managed stands is predictable based on their specific habitat needs. Both of these species occur in hardwood stands throughout the region. However, the Chestnut-sided Warbler is most abundant in early-regenerating stands and the Winter Wren in lowland conifer or mixed conifer-deciduous forest types (Hanowski personal data).

Overall bird communities in all stands sampled regardless of management history were similar. Site groupings in the cluster analysis did not reflect management history groups. This result indicates that uneven-aged management such as the type that has been done at CHMA does not result in a forest structure that is different than what currently exists in other northern hardwood stands in this region. The lack of difference between managed and unmanaged stands and stands in Savannah State Forest is likely due to the age and management history of the stands. In general, the species composition and age of trees between the three areas does not appear to be different. This result is similar to what we have found previously for other "old-growth" northern hardwood stands in the State. For example, bird surveys in representative old-growth stands in Minnesota have not identified any old growth dependent species (personal data). This result may be an indication of the relatively young age of Minnesota's old-growth forest and suggests that these stands are structurally similar to mature stands. This presumption is supported by Hale et al. (submitted) who reported that tree, sapling, large and small seedling densities were similar in the old-growth and mature stands that they sampled. The major structural difference that they found was in the volume and types of coarse woody debris. This structural difference would not likely affect bird species composition in these forests.

A species that was absent in northern hardwood stands in this region was the Black-throated Blue Warbler. This species is rarely found in northern hardwoods in north central Minnesota but occurs in selected northern hardwood stands in northeast Minnesota, primarily in the Lake Superior highlands. This species has a high priority ranking in the Great Lakes region, primarily because a large percentage (29%) of its range occurs here (Niemi et al. 1998). A study on the Black-throated Blue Warbler in northeast Minnesota in 1998 found that the species prefers northern hardwood stands with a shrub understory (Jim Lind personal communication). In areas where there are few shrubs, the species was primarily associated with small gaps (in the range of 0.05 to 0.10 ha) in the canopy that have resulted from blowdowns (Jim Lind personal communication).

The natural disturbance regime for northern hardwoods in this region was windstorms which occur every few decades and create small forest gaps by blowing down senescent or weak and hollow trees (Frelich 1998). Disturbance by fire or other major wind disturbance to create young, even-aged stands was infrequent (1000-2000 years), and thus a typical acre of northern hardwood forest had trees of many sizes and ages with many gaps in different stages of recovery (Frelich 1998). It is possible that the Black-throated Blue Warbler historically responded to habitat that was created by these gaps and moved across the landscape as new patches were created and old patches became unsuitable.

It may be possible maintain the objectives for forest management in the CHMA by completing harvests that would result in the creation of small gaps. Another recommendation would be to choose harvest equipment that would have less impact on the understory vegetation (e.g., result in less skidding of trees). These management suggestions will not only provide more suitable habitat for avian species that require shrubs and saplings, but also a population of seedlings and saplings for future recruitment into the canopy.

## REFERENCES

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Table 1. Mean and standard deviations of breeding birds observed in managed, unmanaged, and reference hardwood sites in northern Aitkin County. F and P-values from analysis of variance tests are also included for those species that were abundant enough to test.

	Managed (n=8)		Unmanaged (n=8)		Reference (n=10)		F-value	P-value
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD		
<b>Community Parameters</b>								
Individuals	22.6	4.6	22.6	1.6	21.9	3.3	0.14	0.87
Species	8.4	2.9	7.3	1.2	7.0	1.8	1.10	0.35
<b>Individual Species</b>								
Ruby-throated Hummingbird	–	–	–	–	0.1	0.3	–	–
Northern Flicker	0.1	0.3	–	–	–	–	–	–
Yellow-bellied Sapsucker	0.8	0.9	1.3	0.7	1.1	1.0	0.68	0.52
Downy Woodpecker	–	–	0.1	0.4	0.2	0.4	0.83	0.45
Unidentified Woodpecker	0.3	0.5	0.1	0.4	–	–		
Great Crested Flycatcher	0.1	0.3	–	–	–	–	–	–
Least Flycatcher	3.8	3.2	3.3	1.9	2.5	2.8	0.49	0.62
Eastern Wood Pewee	0.5	0.5	0.3	0.5	0.7	0.7	1.36	0.28
Blue Jay	0.2	0.5	0.1	0.4	–	–	1.35	0.28
Black-capped Chickadee	–	–	–	–	0.2	0.4	–	–
Brown Creeper	0.1	0.3	–	–	0.1	0.3	0.46	0.64
<b>Winter Wren</b>	0.6	0.7	–	–	0.2	0.4	3.45	<b>0.05</b>
Hermit Thrush	1.5	0.7	0.8	0.7	0.4	0.7	0.85	0.44
Veery	0.4	0.7	0.3	0.7	–	–	1.04	0.37
Red-eyed Vireo	5.6	1.3	6.1	1.4	5.5	1.4	0.49	0.62
Black-and-white Warbler	–	–	0.3	0.5	–	–	–	–
Nashville Warbler	–	–	–	–	0.3	0.7	–	–
Northern Parula	0.3	0.5	–	–	–	–	–	–
Black-throated Green Warbler	1.6	0.5	1.8	1.3	2.1	1.1	0.53	0.59
Blackburnian Warbler	–	–	0.1	0.4	–	–	–	–
<b>Chestnut-sided Warbler</b>	0.5	0.5	0.1	0.4	–	–	4.65	<b>0.02</b>
Pine Warbler	–	–	–	–	0.1	0.3	–	–

Table 1. Continued.

	Managed (n=8)		Unmanaged (n=8)		Reference (n=10)		F-value	P-value
	$\bar{x}$	SD	$\bar{x}$		$\bar{x}$	SD		
Ovenbird	6.8	1.7	7.0	1.6	7.9	1.9	1.09	0.35
Northern Waterthrush	0.1	0.3	-	-	-	-	-	-
Scarlet Tanager	0.3	0.5	0.5	0.8	0.5	0.5	0.49	0.61
Rose-breasted Grosbeak	0.3	0.5	0.4	0.5	0.1	0.4	0.92	0.41