

IBS # 1941-A

A Breeding Bird Census in a Red Pine Forest
With Deciduous Undergrowth:

The Effects of a Changing Habitat
On Avian Populations

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ABSTRACT

A breeding bird census was performed in an undisturbed red pine forest with deciduous understory between 23 June and 11 July 1992. 105 male territories were deduced among 17 species. 13 visiting species were also observed. The population size of several species has changed: some have increased while others have declined. It is hypothesized that forest succession is the main reason for the changing population sizes. Brown-headed Cowbird parasitism is also considered.

INTRODUCTION

As natural habitats continue to be manipulated by human enterprise and pollution, many avian populations are declining. Political decisions can and should be made on how to reduce this inclination, but research must be conducted to convince lawmakers of such trends. The Breeding Bird Census (BBC) is a standardized method for analyzing songbird population size and territory outlined by the Cornell Laboratory of Ornithology (Cornell 1991). Long term studies of these characteristics are now underway in protected areas and can be used as a control in comparing potential avifauna declinations in soon-to-be-developed regions.

David Blockstein has set up four permanent study plots in Itasca State Park, Minnesota to be continually monitored over the years (Blockstein 1991). We performed a BBC on a plot in a red pine forest between 23 June and 11 July 1992. The plot was used during the last two summers, and a similar nearby plot was employed in 1980. The 10 ha area in the park's scientific and natural area is protected from public use. However, the habitat is obviously changing due to succession. One may argue that this transformation diminishes the validity of the analysis, but the study is a control with respect to this kind of natural phenomenon. Other members of the class are performing censuses in three other locations of the park, some of which are climax communities. Therefore, the study areas represent some of the collective natural environments of this region.

METHODS

STUDY PLOT AND BREEDING BIRD CENSUS

The study area is a 10 ha rectangular plot located in the protected wilderness area of Itasca State Park, Clearwater County, MN. (fig 1). A grid was set up such that squares of 50 meters to a side were marked. We walked along the lines of the grid such that every point in the area was covered within 50

meters or less. Each member of the team was responsible for recording a number of birds whether seen, heard, or both, and notations for the respective observations were made (see appendix 1 for symbols). Each species was then recopied onto its own map with different colored pencils used for separate days, and territories were determined from aggregates of overlapping sightings.

VEGETATION SURVEY

The vegetation was surveyed at 10 randomly chosen intersections (see fig 1) following the methods of James and Shugart (1970), corrected by James (1980). The methods consist of measuring the diameters of all the trees (defined to be greater than 3 inches diameter at breast height, DBH) in an area of 22.7 m in diameter. The number of shrubs (less than 3 inches DBH) were deduced by counting how many were touched when two transects across the survey site were walked. Ground cover (of herbs) and canopy cover was estimated by noting the percentage of green seen in the crosshairs of a sighting tube when a transect was performed. The dominant species (basal area) in the plot were red pines (Pinus resinosa) at 37.5% and white pines (Pinus strobus) at 19.2%. These were followed by 18.6% standing dead trees, 10.1% quaking aspens (Populus tremuloides), and 7.7% sugar maples (Acer saccharum).

P. resinosa was also the tree of highest relative density at 16.7%. All of the dead trees combined held a higher relative density of 18.8%. Following these were A. saccharum at 15.9% and P. tremuloides at 10.9%. The canopy cover was determined to be 77%.

Shrub cover was resolved to be 6445 shrubs per hectare while the ground cover was 55% herbs. Beaked Hazel (Corylus cornuda) and maple saplings (A. saccharum and A. rubra) were among the densest species of shrubs. Plants common on the forest floor included Aster macrophyllus, Pteridium aquilinum, Thalictrum dioicum, Polygonatum grandifolia, Streptopus roseus, Cornus

canadensis, Hepatica americana, Maianthemum canadense, and Clintonia borealis.

The plot consists of several distinct areas (fig 1). There is an open pine stand near the southwest corner where no under foliage occurs. In the northwest corner there is a deciduous forest with moderate amounts of shrubs and herbs. The northeast corner is thick in shrubs (A. rubrum, A. saccharum, and red-berried elder, Sambucus racemosa) and the canopy is opened by a fallen red pine. In the central portion of the plot there is a larger clearing caused by many more fallen pines. To the east is a 1 ha sedge meadow. Pitcher plants (Sarracenia purpurea) were very noticeable along with sundews (Drosera rotundifolia). The southeast corner was very thick in S. racemosa. In all of the uncleared areas, red and white pines were heterogeneously distributed.

RESULTS

Seventeen breeding species and ¹³fourteen visiting species occurred on the plot. A total of 105 territories were derived from singing males. Ovenbirds were the most common (23.5), followed by Black-throated Green Warblers (14), Red-eyed Vireos (13), and Pine Warblers (11). A list of all the birds observed is tabulated in table 1. Most of the territories were less than or equal to 100 square meters with the exception of those belonging to the Hermit Thrushes, Scarlet Tanagers, and possibly the Eastern Wood Peewees and Northern Parulas. Two active Yellow-bellied Sapsucker nests were observed in aspen cavities approximately 10 m high. The nestlings were heard in both cases and a parent was seen entering on one occasion. A visiting Ruffed Grouse and her brood were also sighted.

DISCUSSION

Many of the population sizes in the plot have not changed significantly since 1990 as one would expect since the area is protected from human exploitation; however, numbers in the sizes

of a few species populations have markedly changed. Between 1650 and 1922, 32 fires occurred within the limits of the present park boundaries (Mills 1980, reporting from Frisell 1973). Without the regular occurrence of fire since then (human controlled), and with logging in the early part of the century, the fire regenerated pines are being out competed by mixed hardwoods. The change in some avian population sizes is further evidence that forest succession is taking place.

Ehrlich et al wrote that Ovenbirds nest in deciduous forests and rarely in pines (Ehrlich 542), yet they've been the most abundant species in all four years (Podeszwa 1991, Noyes 1990, Mills 1980).

Chestnut-sided Warblers have increased by 33% since 1990. They occur in abundance in the northeast corner of the plot, and the habitat matches the preferred vegetation that Ehrlich describes: bushy underbrush, borders between open canopy and woodland stands, and secondary growth (Ehrlich 516).

Black-throated Green Warblers and Eastern Wood Peewees have also increased since 1990 by 14% and 45% respectively. The plot's coniferous-deciduous blend is a prime environment for these species.

American Robins and Nashville Warblers made an appearance in the red pine plots for the first time. Both species are generalists in their decisions on where to nest, but there is something interesting about the relatively high number of Nashvilles (6.5) when none were reported before. A definite increase has also occurred in the mature aspen plot (Nyberg and Wagenius). Ehrlich states that little work has been done on the species.

Brown Creepers are pine forest breeders, yet they have also increased in number (85%). They prefer to nest underneath bark. Perhaps their increase in number is due to successful habitat denning in the loose bark of the aging pines.

The Pine Warbler population has shown a sharp decrease in size since 1990 (67%), and the drop in the number of Hermit

Thrushes (60%) is also significant. These two species are very representative of coniferous stands, and their decline reflects the state of the changing habitat.

Red-eyed Vireos are deciduous inhabitants but have shown high numbers in all four years. Brown-headed Cowbird parasitism may be responsible for the fluctuating number of Vireos since this species is one of the most common host for cowbird brood parasitism. Two of the three other groups in the class share similar patterns with the Red-eyed Vireos in their plots (Coy and Baertlein, Nyberg and Wagenius, and Peterson).

Common Yellowthroats are said to be one of the most abundant warblers and are noted to inhabit marsh, swamp, and edge habitats (Ehrlich 546). They are also one of the most susceptible hosts to cowbird parasitism. The preferred habitats on our plot have remained relatively stable in size over the last three years, but the population has been decreasing (40%). This may present further evidence that the successfulness of cowbirds is contributing to the changes in bird populations in the red pines. Indeed, all of the other groups have reported sighting cowbirds in their plots. Cowbirds prefer deciduous and grassy habitats (Ehrlich), and we did not observe any in our plot. Could this not inhibit cowbird exploitation in the pine forests?

Conclusion: Many forces may be at work when discussing rising or falling trends in certain avian populations. Although man has not directly exploited the area where our plot lies for over 70 years, indirect intervention has occurred in fire suppression. Red and white pines still dominate, but the deciduous understory is dense in greater than 50% of the plot's area; the forest is succeeding. The change in habitat reduces the size of some populations and increases or opens opportunities for other species. Brown-headed Cowbirds may be indirectly included on the list of newcomers. Cowbirds choose not to spend their adulthood lives in such an area as our plot, but the nests of other inhabitants may be very attractive.

ACKNOWLEDGEMENTS

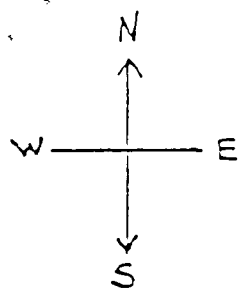
I would like to thank Don Graves and Gloria Peterson for accompanying us on the census when a substitute was needed, and Cathy Podeszwa for her assistance during the vegetative analysis. David Blockstein and Bethany Woodworth were invaluable resources in the field, and Dave's good humor when crises arose is to be commended. Finally, I acknowledge and salute my partners Marlys Reuvers and Philip Johns for a job well done, and I always appreciated the discussions on graduate school level topics.

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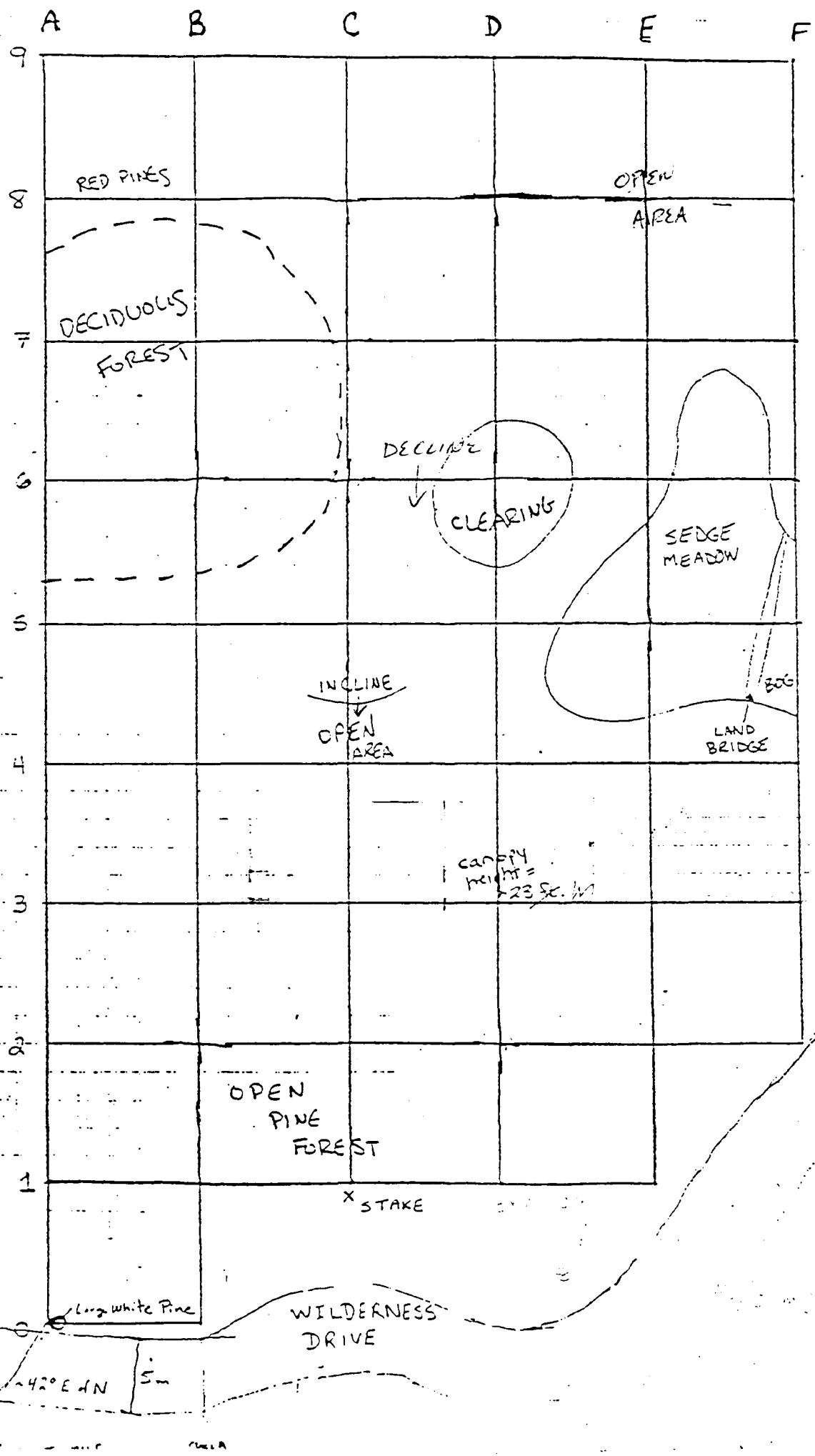
RED PINE PLOT

FIGURE 1



* = Vegetation Sampling Areas

0 50 m



2.9 mi from beginning of single plane drive

0.9 m to Record Red & Bison Site

WILDERNESS DRIVE

Long white Pine

42° E 4N

5m

X STAKE

canopy height = 23 SC. M

OPEN PINE FOREST

LAND BRIDGE

SEDGE MEADOW

CLEARING

DECIDUE

INCLINE
OPEN AREA

DECIDUOUS FOREST

RED PINES

OPEN AREA

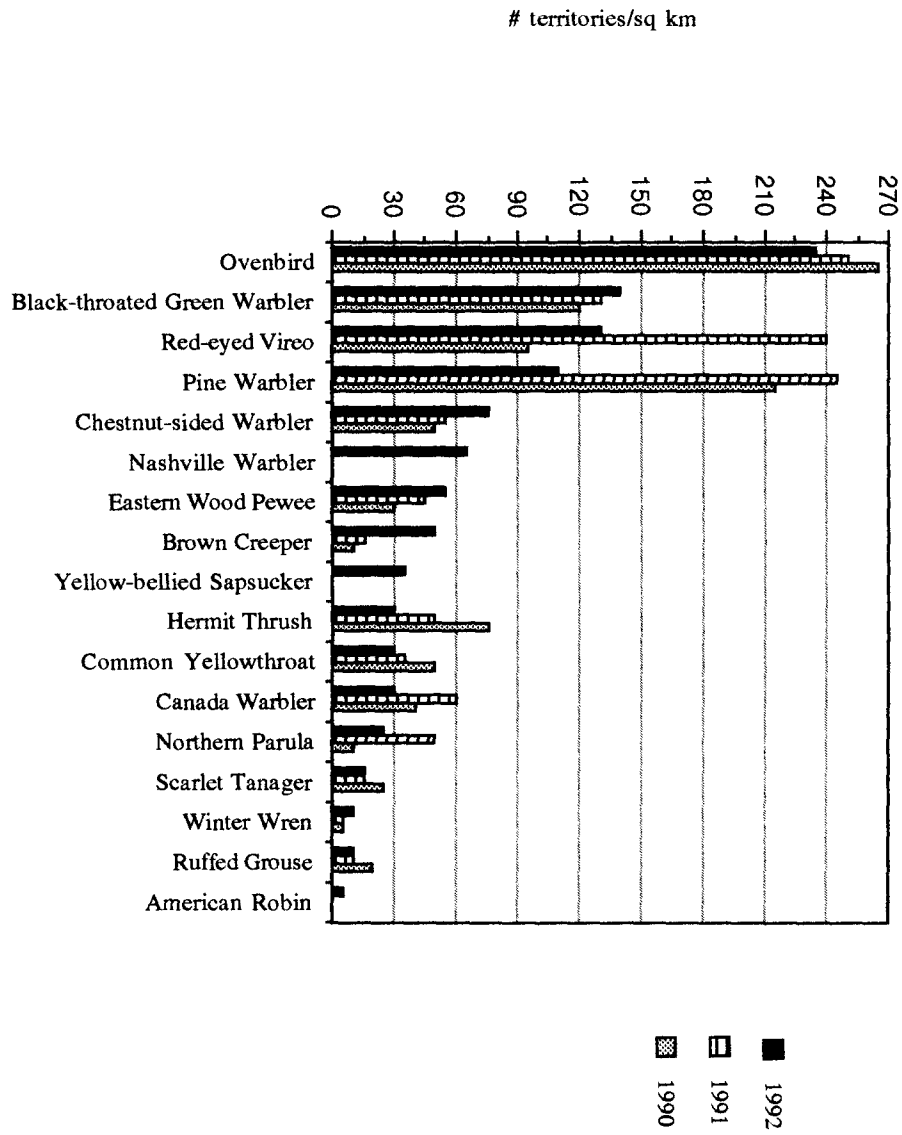


Figure 2: Number of Territories per Square Kilometer, 1990-1992. The abundance of breeding territories for three years, listed by 1992 abundance. Based on red pine plot BBC.

Summary Sheet A.

Summary Sheet for Tenth-acre (0.4 hectare) Circles

Number of Circles = 10

Trees:

Density ¹									Total	Trees/acre (by species) ²	Relative Density (by species) ³
Species	Number of trees in all circles by size class										
	A 3-6	B 6-9	C 9-12	D 12-15	E 15-21	F 21-27	G 27-33	H 33			
1 <i>Acer saccharum</i>	11	18	7	1	1				38	95	15.4 %
2 <i>Tilia americana</i>	3	0	2						5	12.5	2.1
3 <i>Quercus rubrum</i>	10	3	1	0	1				15	37.5	6.3
4 <i>Populus tremuloides</i>	6	4	8	5	3				26	65	10.9
5 <i>Alnus balsamea</i>	8	13	4						25	62.5	10.5
6 <i>Ostrya virginiana</i>	13								13	32.5	5.4
7 <i>Betula papyrifera</i>	1	1	1						3	7.5	1.3
8 <i>Pinus strobus</i>	0	6	2	0	8	2			28	70	11.7
9 <i>Pinus resinosa</i>	0	3	6	6	18	5			40	100	16.7
10 <i>Ulmus americana</i>	1								1	2.5	0.4
Dead	8	15	1	6	2	3			45	112.5	18.8
TOTAL	61	63	43	24	33	10			239	597.5	100%
Trees/acre by size class	152.5	157.5	120	60	82.5	25					
Relative Density by size class	25.5%	26.4	20.1	10.4	13.8	4.2					

Shrubs: Percent of + readings for interception of woody vegetation ² 3" d.b.h. Eg. total pluses (+) in 20 readings x 5. $(1289 \times 100) / 20 = 6445\%$

Ground Cover: Percent of plus + readings for green vegetation sighted in ocular tube. Eg. total pluses in 20 sightings x 5. $110 / 200 = 0.55 = 55\%$

Canopy Cover: Percent of plus (+) readings. Eg. total pluses in 20 sightings x 5. $154 / 200 = 0.77 = 77\%$

TABLE 1

Summary Sheet for Tenth-acre (0.4 hectare) circles

Number of Circles = 10

Trees

	Basal Area ⁵								Total Basal Area (sq. feet) m ²	Relative Dominance ⁷ (by species)	No. of circles in which the species occurred	Frequency ⁹
Species	Cross sectional area of the trunk at 4.5 feet from the ground (d.b.h.) in m ²											
	A (0.1)	B (0.3)	C (0.6)	D (1.0)	E (1.8)	F (3.1)	G (4.9)	H (005 d ²)				
1 <i>Acer saccharum</i>	0.0091	0.486	0.378	0.09	0.162				1.13m ²	7.7%	6	60
2 <i>Tilia americana</i>	0.0027	0	0.106						0.111	0.8	2	20
3 <i>Quercus rubra</i>	0.009	0.081	0.054	0	0.116				0.206	2.1	3	30
4 <i>Populus tremuloides</i>	0.0054	0.102	0.452	0.45	0.481				1.48	10.1	3	30
5 <i>Abies balsamea</i>	0.0092	0.351	0.216						0.574	3.9	6	60
6 <i>Cedrus virginiana</i>	0.0117								0.0117	0.1	1	10
7 <i>Betula papyrifera</i>	0.0109	0.027	0.054						0.054	0.4	3	30
8 <i>Pinus strobus</i>	0	0.162	0.42	0.36	1.296	0.558			2.81	19.2	4	40
9 <i>Pinus resinosa</i>	0	0.021	0.324	0.72	2.916	1.395			5.44	52.5	5	50
10 <i>Ulmus americana</i>	0.0009								0.0009	0.006	1	10
Dead	0.0072	0.405	0.594	0.54	0.324	0.857			2.71	18.6	6	60
TOTAL	0.0549	1.701	2.592	2.16	5.746	2.79			14.6m ²	100%		100%
Trees/acre by size class m ² /ha	0.134	4.25	6.45	5.4	13.4	7.2						
Relative Density by size class	0.40	11.7	17.8	14.8	36.3	19.1						
Shrubs: Percent of + readings for interception of woody vegetation < 3" d.b.h. Eg. total pluses (+) in 20 readings x 5.												
Ground Cover: Percent of plus + readings for green vegetation sighted in ocular tube. Eg. total pluses in 20 sightings x 5.												
Canopy Cover: Percent of plus (+) readings. Eg. total pluses in 20 sightings x 5.												

Table 3: Red Pine Plot

Breeding Bird Territory Densities and List of Visitors for 1992

This table consists of the number of breeding bird territories and visitors (1992) on the 10 ha red pine study plot. The densities from previous years have been averaged to the number of territories per square kilometer (this information is from Podeszwa 1991 and Noyes 1990).

Breeding Males of 1992	1992 #/10 ha	1992 #/Km ²	1991 #/Km ²	1990 #/Km ²
Ovenbird	23.5	235	250	265
Black-throated Green Warbler	14	140	130	120
Red-eyed Vireo	13	130	240	95
Pine Warbler	11	110	245	215
Chestnut-sided Warbler	7.5	75	55	50
Nashville Warbler	6.5	65	0	0
Eastern Wood Peewee	5.5	55	45	30
Brown Creeper	5	50	15	10
Yellow-bellied Sapsucker	3.5	35	0	0
Hermit Thrush	3	30	50	75
Common Yellowthroat	3	30	35	50
Canada Warbler	3	30	60	40
Northern Parula	2.5	25	50	10
Scarlet Tanager	1.5	15	15	25
Winter Wren	1	10	5	5
Ruffed Grouse	1	10	10	20
American Robin	0.5	5	0	0

Visitors

Broad-winged Hawk
Black-backed Woodpecker
Hairy Woodpecker
Blue Jay
Gray Jay
Common Raven
Black-capped Chickadee
Red-breasted Nuthatch
White-breasted Nuthatch
Mourning Warbler
Evening Grosbeak
Pine Siskin
Purple Finch

~~Figure Three~~

APPENDIX 1

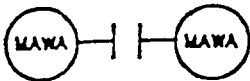
STANDARD SYMBOLS USED FOR MAPPING — May be helpful
(Robbins, 1970) (Magnolia Warbler in this example)



— position of singing male



— approximate position of singing male (can be enlarged to indicate area of uncertainty)



— simultaneous registration of song within a short time period indicates 2 interacting males



✓ — male observed



— female observed



— calling, sex unknown

MAWA

— observed, sex unknown



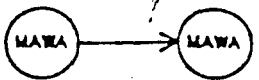
— pair together, assumed mated



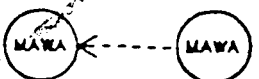
— observed conflict between males dispute over boundary



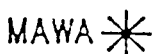
— vocal defence of territories between males this specifically implies a territory boundary



— known change in position



— assumed change in position



— nest

Appendix 2: Times, Weather, and Dates of the BBC in 1992

Visit	Time	Temp(°C)	Wind	Sky
23 June*	0515-1200	11	0	overcast
26 June	0500-1100	10	0	overcast
29 June	0500-1100	18	1-3	overcast
30 June	0510-1200	7	1-3	overcast
3 July	0515-0930	10	1-3	overcast
5 July**	0500-0830	10	1-3	clear
7 July	0500-1000	18	1-3	overcast
11 July	1910-2120	24	1-3	overcast

*There were 4 observers on this date.

**There were 2 observers on this date.

All other dates had 3 observers doing the census.