AN EXAMINATION OF BREEDING BIRD POPULATIONS IN A RED PINE FOREST

Joe Whittaker
University of Minnesota
Biological and Forestry Station
Itasca State Park
15 July 1990
Field Ornithology
Dr. D. Blockstein

ABSTRACT

As part of a long-term comprehensive study of breeding bird populations within Itasca State Park, Clearwater Co., MN a 10 ha grid was set up in a Red Pine forest. A quantitative vegetation survey was performed to aid in understanding avifaunal distribution. The breeding bird census was performed over 8 days. Singing or visable males were mapped and their territories were determined. A total of 116 resident males, representing 23 species, and 11 visitors representing 9 species were mapped. Results were examined with reference to previous studies and emphesis was placed on human impacts on habitat.

INTRODUCTION

Humans have had a profound impact on all natural systems. This impact may be manifest as obvious effects, such as logging and repression of naturally caused fires, which help to reset vegetative succession. Human activity also creates subtle effects, such as global warming, pesticides and acid rain. These effects, particularly the subtle ones, may be difficult to assess in relation to impacts on habitat composition and structure.

Since vegetation responds relatively slowly to environmental changes, it is often more helpful to examine the fauna of an area. Vertebrate population changes over time may be particularly valuable. Birds, being closely tied to specific habitat components serve as excellent indicators of temporal environmental change. Successful breeding requires specific habitats and ecological conditions. Therefore, by locating breeding male

birds in a region, it is possible to make assumptions about population size and distribution of breeders in similar habitats.

Breeding bird censuses may also be used to explore the decline of eastern woodland songbirds. Blame for the decline is frequently laid upon destruction of wintering grounds in Central and South America (Erlich et al. 1988). Another possible cause exists much closer to home. The Eastern United States has undergone a great deal of change in the last hundred years. According to Erlich et al. (1988) approximately half of the eastern forest songbird breeding habitat has been destroyed. In addition, the remaining habitat is primarily forest fragments, which typically exhibit decreased nesting success as a result of increased predation and parasitism.

In an effort to create a solid database, David Blockstein has headed the establishment or re-establishment of 5 permanent grids for on-going breeding bird censuses in Itasca State Park, Clearwater Co., MN. Two were re-established on identical locations to previous breeding bird censuses, Bear Paw Point and Schoolcraft Island. A third was established in a Red Pine area along the Wilderness Drive. This site was chosen in an effort to replicate a census by Mills (1980) in the same general region. The Red Pine plot is the focus of this paper. New plots were set up in a mature Aspen stand, also along Wilderness Drive, and the forested area near the park sewage lagoon.

The purpose of this paper is to compare and contrast the current population of breeding males in the Red Pine forest with the population found by Mills (1980) and with the population described by Rakstad and Probst (1983). Additionally, pertinent species will be discussed from the mature Aspen census site. Due to the importance of habitat to the

understanding of breeding bird distribution, a quantified survey of vegetation was performed.

METHODS

STUDY SITE

The study plot is located along the Wilderness Drive in Itasca State Park, Clearwater Co., MN. The plot is approximately 2.9 mi. from the beginning of the one-way section of the Wilderness Drive. This is a short distance past the "Record White Pine", and before the "Record Red Pine". The plot is located on the north side of the road. There is a 20 mph speed limit sign directly across from the B-0 line. Permanent markers are to be placed on each corner of the grid. The plot is 10 ha (24.69 acres) divided up into 40 grid squares each 2500 m^2 (50m per side). Grid lines running from south to north are designated by the letters A-F, the lines running west to east are designated by the numbers 0-9. See study site description and map in Appendix 1.

A quantified vegetation survey was performed in 10 random 1/10 acre (0.4 ha) plots as described in James and Shugart (1970). Interpretation of this data followed James (1980). For a complete compilation of survey data and interpretation see Tables 1, 2 and Appendix 1.

Trees (defined as stems greater than 3 in. in diameter) were determined to be 260 per acre (642 trees per ha) or 6420 trees within the entire study plot. Total basal area was found to be 265 $ft.^2$ (24.6 m^2). Generally speaking, the study site was strongly influenced by Red Pine (Pinus resinosa) both in relative density (21.5%) and relative dominance (58.1%). Dead trees were grouped together at a relative density of 18.5% and a relative dominance of 13.8%. Dead trees were actually encountered more

frequently than Red Pines in the 1/10 acre plots (at frequencies of 90% and 70% respectively). The next most frequently contacted tree was the Maple (Acer sp.) with a relative density of 15.8%, a relative dominance of 5.6% and a frequency of 60%. White Pine (Pinus strobus) had a high relative dominance (10.70) despite a fairly low relative density (5.00) and frequency (40%). Other trees present in the survey included (listed in order of descending relative density): Ironwood (Ostrya virginiana), Balsam Fir (Abies balsamea), Paper Birch (Betula papyrifera), Big-toothed Aspen (Populus grandidentata), Oak (Quercus sp.) and Spruce (Picea sp.). See also Figure 2.

Shrubs (defined as stems less than 3 in. in diameter and height greater than one meter) were determined to be 1238 per acre (3056 per ha) or 30,556 shrubs within the study plot. Some frequently occuring shrubs included Beaked Hazelnut (Corylus cornuta) and young deciduous trees (such as Maple).

Ground cover was found to exist on approximately 59.8% of of the total study area. Major components of ground cover were Bunchberry (Cornus canadensis), Large-leaf Aster (Aster macrophyllus), Wild Lily-of-the-valley (Maianthemum canadense), Blueberry (Vaccinium angustifolium), and Strawberry (Fragaria sp.).

Canopy cover was identified as approximately 73.3% of the total study plot. The dominant canopy tree was Red Pine at approximately 70 ft. in height. Deciduous species formed a sub-canopy that varied in height. Plant taxonomy was determined from Mills (1980) and Morley (1974).

BREEDING BIRD CENSUS

The breeding bird census was performed according to the instructions found in the Cornell Laboratory of Ornithology mimeograph provided by D. Blockstein in Ornithology class. A map was designed of the study plot and

copies were made for each bird species identified. Censuses were performed on 8 different days. Three to four observers were typically present, the author, Rebecca Sladek, Karyn Noyes, on three occasions David Blockstein, and on two occasions Anne Braunschweig (see accompanying papers by Sladek and Noyes in prep.). Morning censuses were performed on: 26 June; 1,3,6,8,10 July. Typical morning starting time was 05:15. An evening census, beginning at 19:30 was performed on 9 July. A mixed morning/evening census was performed on 22 June (06:00 and 20:00). The total hours spent censusing was 96.5 with an average of 12.1 hours spent per census. Typically, there was little or no wind (Beaufort 0-7mph), and partly cloudy to overcast skies, no precipitation. Temperature ranged from 45-80^{0}F.

During each census, alternate grid lines were walked, in varying order. The researchers stopped at grid corners to listen and look for birds. When a bird song or call note was heard or the bird was seen, it would be identified and its location mapped. Standard symbols for mapping were used (from the Vermont Institute of Natural Science Forest Bird Monitoring Program). See Figure 1 for an example of symbols used. The maps of the 8 censuses were then used to determine individual breeding males' territories. Centers of activity and simultaneous singing by males were used to establish individual breeding males' territories. From the number of territories identified, the total number of breeding males was estimated. This also allowed for calculations to be made for breeding male distribution on a larger scale. Assumed breeding males with territories completely inside the grid were considered residents, birds with territories only partially in were considered "half residents". Males that were seen

infrequently, are known to have large territories or otherwise suspected to not be breeding within the plot are considered "visitors".

RESULTS

During the 8 censusing periods a total of 32 species were identified and mapped. Maps are included by species in Appendix 2. Of these, 23 species were classified as residents and 9 as visitors. One hundred and sixteen individual residents were identified and 11 individual visitors. A complete list of breeding males by species is shown in Table 3, along with the numbers per plot and estimated values per km^2 and 100 acres. Figure 3 shows a graphical representation of plot's breeding male population.

Ovenbirds were the most numerous species mapped. A total of 26.5 breeding male individuals were identified. On 26 June a female was observed carrying food. The second most numerous species was the Pine Warbler, 21.5 breeding males were mapped. Black-throated Green Warblers were next in abundance at 12 breeding males. Nine-and-a-half Red-eyed Vireos were mapped. There were 7.5 Hermit Thrushes identified. On two occasions, fledgling Hermit Thrushes were seen.

DISCUSSION

Two main assumptions may effect the outcome of a breeding bird census. The first is the assumption that there is no change in territory size or location. Over the period of time that the censuses were performed it is likely that some males moved their territories at least slightly. Another assumption is that no transitory males passed through attempting to set up

territories within or next to existing territories. Such sporadic data points may lead to an elevated count of "breeding" males.

The census performed by Mills (1980) resulted in a similiar but slightly lower number of Ovenbirds, 25 as oppossed to the current 26.5. See Figure 4, from Mills, 1980. Some variance is expected considering that 10 years have passed between censuses and that the sites are in presumably different locations. As suggested by Erlich et al. (1988), the number of breeding Red-eyed Vireos has fallen from 13 in 1980 to 9.5 in the current census. Again this variance may not be enough to be significant, due to the difference in study plots, but future censuses should watch for continuing decreases. In opposition to the decline of songbird numbers, Pine Warblers have increased in numbers from 9 to 21.5. This change should probably be considered important. Possible reasons for this concentration of Pine Warblers may involve habitat reduction in other regions. As old growth pine forests are clear-cut, Pine Warblers may be forced to concentrate in the few quality habitats that remain. Another option may be that the current plot is simply a high quality area capable of supporting higher populations of Pine Warblers. Other variances between the two censuses are slight and can be seen when comparing Figure 3 and Figure 4.

Unlike the Mills 1980 study, the Rakstad and Probst census (1983) in Chippewa National Forest, Itasca Co., MN shows a lot of variation. Neither the Mills (1980) nor the current census identified any Least Flycatchers but the Rakstad and Probst census found 10. The most likely reason for this is the lack of ground cover in the Chippewa National Forest Red Pine plot. Least Flycatchers tend to breed in areas of open woodland (Erlich et al., 1988), a condition that cannot be filled within the current census site. The relative abundance of Chipping Sparrows and Brown-headed Cowbirds in the 1983

census is also most likely related to their need for open areas or edges. Human forest fragmentation has increased the original range of the Brown-headed Cowbird (Erlich et al., 1988). The apparent lack of Red-eyed Vireos, Canada Warblers, Song Sparrows and some other species present in the current study plot may be related to their susceptability to Brown-headed Cowbird nest parasitism (Erlich et al., 1988). Neither of the Red Pine plots in Itasca State Park had any sightings of Brown-headed Cowbirds. Another reason for the lack of certain species, such as the Ovenbird, may be the lack of undergrowth to serve as cover. Ovenbirds' breeding success is known to be highly sensitive to forest fragmentation (Erlich et al., 1988). As with all ground-nesting and near ground nesting birds, they have had to deal with the recent invasion (in the past 50 years) of the Raccoon (Procyon lotor), which is an effective nest predator (Hazard, 1982; I had to work a mammal in somehow).

The mature Aspen stand also located along the Wilderness Drive in Itasca State Park had relatively high numbers of Red-eyed Vireos, 20.5. This may indicate a preference of the birds for deciduous forests. The population of breeding male Ovenbirds was also fairly high, 19.5 (Peterson, in prep.). This would seem to support the notion that both species require a thick layer of cover in order to be successful. Pine Warblers on the mature Aspen plot appear to be able to be successful even in a small area. There were few, scattered conifers and several had a Pine Warbler associated with them, 7 breeding males(Peterson, in prep.).

In conclusion, it would appear that populations of breeding males are specifically determined by the vegetation species present and the amount of cover necessary to support them. For this reason, it can be suggested that the decrease in songbird numbers is likely related to the influence of human

activity on North American breeding bird habitats. Unless responsible ecological management is persued, songbird populations should be expected to decrease, at least locally. Stable habitats must be established in the birds' breeding ranges before the question of wintering habitat loss can be effectively explored.

For further information you may contact the author at:

346 Whitthorne Dr.

Cincinnati, OH

45215

ACKNOWLEDGEMENTS

The following people played important roles in the preparation of this paper: David Blockstein, Rebecca Sladek, Karyn Noyes, Anne Braunschweig and the Ornithology Class at the Itasca Biological Station.

LITERATURE CITED

Cornell Laboratory of Ornithology. An introduction to the breeding bird census and Instructions for the breeding bird census form. Class mimeograph. Ithaca, NY.

Erlich, P. R., D. S. Dobkin and D. Wheye. 1988. The Birder's Handbook. Simon and Schuster, Fireside, New York, NY.

Hazard, E. B.. 1982. The Mammals of Minnesota. The University of Minnesota Press, Minneapolis, MN.

James, F. C. and H. H. Shugart, Jr.. 1970. A quantitative method of habitat description. Audubon Field Notes 24:727-736.

James, F. C.. 1980. On understanding quantitative surveys of vegetation. American Birds Vol. 34, 1:22-23.

Mills, P. J.. 1980. A comparison of breeding bird census results from a coniferous and hardwood forest. Class paper, University of Minnesota, Itasca Biological Station.

Morley, T.. 1974. Spring Flora of Minnesota. The University of Minnesota Press, Minneapolis, MN.

Rakstad, D. and J. R. Probst. 1983. Red Pine Forest. American Birds Vol. 37,1:72.

RED PINE CENSUS 1990

Summary Sheet A

Summary Sheet for Tenth-acre (0.4 hectare) Circles

Number of Circles = 10

Trees:

Species	Density[1] Number of trees in all circles by size class								Total	Trees/acre (by species)[2]	Relative Density (by species)[3]
	A 3-6	B 6-9	C 9-12	D 12-15	E 15-21	F 21-27	G 27-33	H 33	I		
1 Birch	6	3	6						15	15	5.77
2 Fir	5	11	13	3					32	32	12.31
3 Maple	10	20	8	3					41	41	15.77
4 Oak	3		2	1					6	6	2.31
5 Dead	8	19	10	4	4	1	2		48	48	18.46
6 Red Pine		4	3	5	19	12	9	2	2 56	56	21.54
7 Spruce	1			1					2	2	.77
8 White Pine			4	2	1	4	2		13	13	5.00
9 Iron wood	35	2			1				38	38	14.62
10 Big-tooth Aspen	4	4	1						9	9	3.46
TOTAL	72	63	47	19	25	17	13	2	2 260	260	100% 100.01
Trees/acre by size class	72	63	47	19	25	17	13	2	2		
Relative Density by size class	27.69	24.23	18.08	7.31	9.62	6.54	5.00	.77	.77	100.01	

Shrubs: Percent of + readings for interception of woody vegetation < 3" d.b.h. Eg. total pluses (+) in 20 readings x 5. 1237.5 per acre ← 495 x 2.5

Ground Cover: Percent of plus + readings for green vegetation sighted in ocular tube. Eg. total pluses in 20 sightings x 5. 597.5 59.8%

Canopy Cover: Percent of plus (+) readings. Eg. total pluses in 20 sightings x 5. 732.5 73.3%

TABLE 1

Summary Sheet for Tenth-acre (0.4 hectare) circles. RED PINE CENSUS 1990

Number of Circles = 10

Trees

Species	Basal Area[5] Cross sectional area of the trunk at 4.5 feet from the ground (d.b.h.) A (0.1)	B (0.3)	C (0.6)	D (1.0)	E (1.8)	F (3.1)	G (4.9)	H (0.005 d²)		Total Basal Area (sq. feet)	Relative Dominance[7] (by species)	No. of circles in which the species occurred	Frequency[8]
1 Birch	0.6	.9	3.6	—	—	—	—			5.1	1.92	5	50
2 Fir	0.5	3.3	7.8	3.0	—	—	—			14.6	5.50	7	70
3 Maple	1.0	6.0	4.8	3.0	—	—	—			14.8	5.58	6	60
4 Oak	0.3	—	1.2	1.0	—	—	—			2.5	0.94	4	40
5 Dead	0.8	5.7	6.0	4.0	7.2	3.1	9.8			36.6	13.80	9	90
6 Red Pine	—	1.2	1.8	5.0	34.2	37.2	44.1	13.0	17.6	154.1	58.09	7	70
7 Spruce	0.1	—	—	1.0	—	—	—			1.1	0.41	2	20
8 White Pine	—	—	2.4	2.0	1.8	12.4	9.8			28.4	10.70	4	40
9 Ironwood	3.5	.6	—	—	1.8	—	—			5.9	2.22	5	50
10 Big-tooth Aspen	.4	1.2	0.6	—	—	—	—			2.2	0.83	2	20
											99.99%		
TOTAL	7.2	18.9	28.2	19.0	45.0	52.7	63.7	13.0	17.6	265.3	100%		300%
Trees/acre by size class	7.2	18.9	28.2	19.0	45.0	52.7	63.7	13.0	17.6	265.3			
Relative Density by size class	2.71	7.12	10.63	7.16	16.96	19.86	24.01	4.90	6.63	99.98%			

Shrubs: Percent of + readings for interception of woody vegetation < 3" d.b.h. Eg. total pluses (+) in 20 readings x 5. 12375 495 per acre

Ground Cover: Percent of plus + readings for green vegetation sighted in ocular tube. Eg. total pluses in 20 sightings x 5. 597.5 59.8%

Canopy Cover: Percent of plus (+) readings. Eg. total pluses in 20 sightings x 5. 732.5 73.3%

TABLE 2

Table 3

T

BIRD TERRITORIES OF THE RED PINE CENSUS PLOT

BREEDING MALES:	#/PLOT	#/KM^2	#/100 ACRES
Ovenbird	26.5	265	107
Pine Warbler	21.5	215	87
Black-throated Green Warbler	12.0	120	49
Red-eyed Vireo	9.5	95	38
Hermit Thrush	7.5	75	30
Chestnut-sided Warbler	5.0	50	20
Common Yellowthroat	5.0	50	20
Canada Warbler	4.0	40	16
Eastern Wood-Pewee	3.0	30	12
Great-crested Flycatcher	3.0	30	12
Red Breasted Nuthatch	3.0	30	12
Hairy Woodpecker	2.5	25	10
Scarlet Tanager	2.5	25	10
Ruffed Grouse	2.0	20	8
Downy Woodpecker	2.0	20	8
Mourning Warbler	1.5	15	6
Black-backed Woodpecker	1.0	10	4
Pileated Woodpecker	1.0	10	4
Brown Creeper	1.0	10	4
Black-capped Chickadee	1.0	10	4
Northern Parula	1.0	10	4
Pine Siskin	1.0	10	4
Winter Wren	0.5	5	2
VISITORS:			
Blue Jay	2.0	20	8
American Robin	2.0	20	8
Broad-winged Hawk	1.0	10	4
Black-billed Cuckoo	1.0	10	4
Yellow-bellied Sapsucker	1.0	10	4
Gray Jay	1.0	10	4
Black-and-white Warbler	1.0	10	4
Song Sparrow	1.0	10	4
Purple Finch	1.0	10	4

6/18

Figure: 1

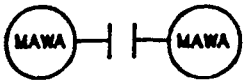
STANDARD SYMBOLS USED FOR MAPPING – May be helpful (2)

(Magnolia Warbler in this example)

Vermont Institution of Nat'l Sci
Forest Bird
Monitoring Project

– 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

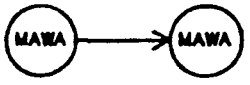
– calling, sex unknown

MAWA – observed, sex unknown

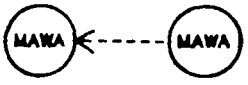
– pair together, assumed mated

– observed conflict between males dispute over boundary

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



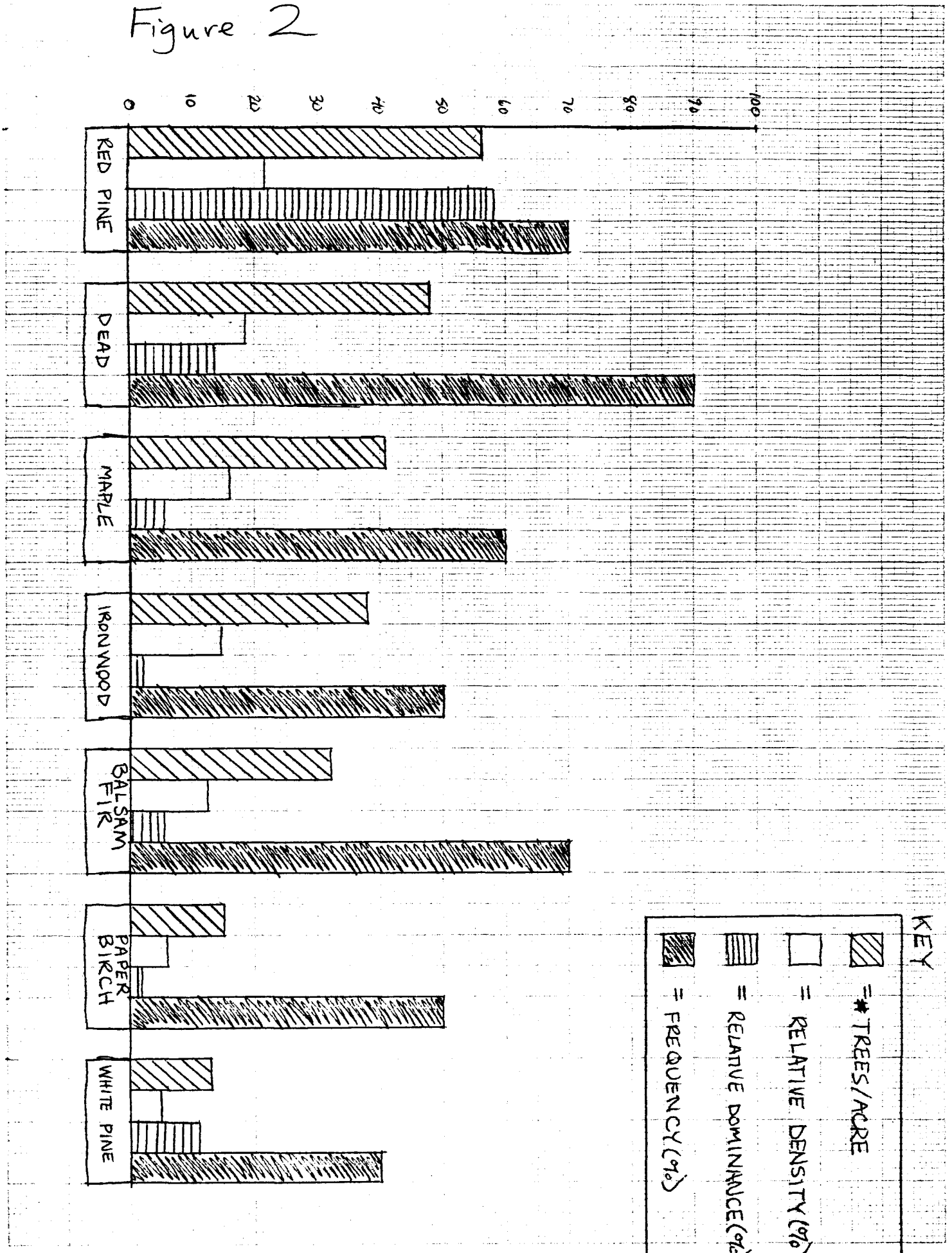
– known change in position



– assumed change in postion

MAWA ✳ – nest

Figure 2


0
10
20
30
40
50
60
70
80
90
100
RED PINE
DEAD
MAPLE
IRONWOOD
BALSAM FIR
PAPER BIRCH
WHITE PINE
KEY
= # TREES/ACRE
= RELATIVE DENSITY (%)
= RELATIVE DOMINANCE (%)
= FREQUENCY (%)

F

Figure 3

GRAPH NO. 4

UNIVERSITY OF MINNES

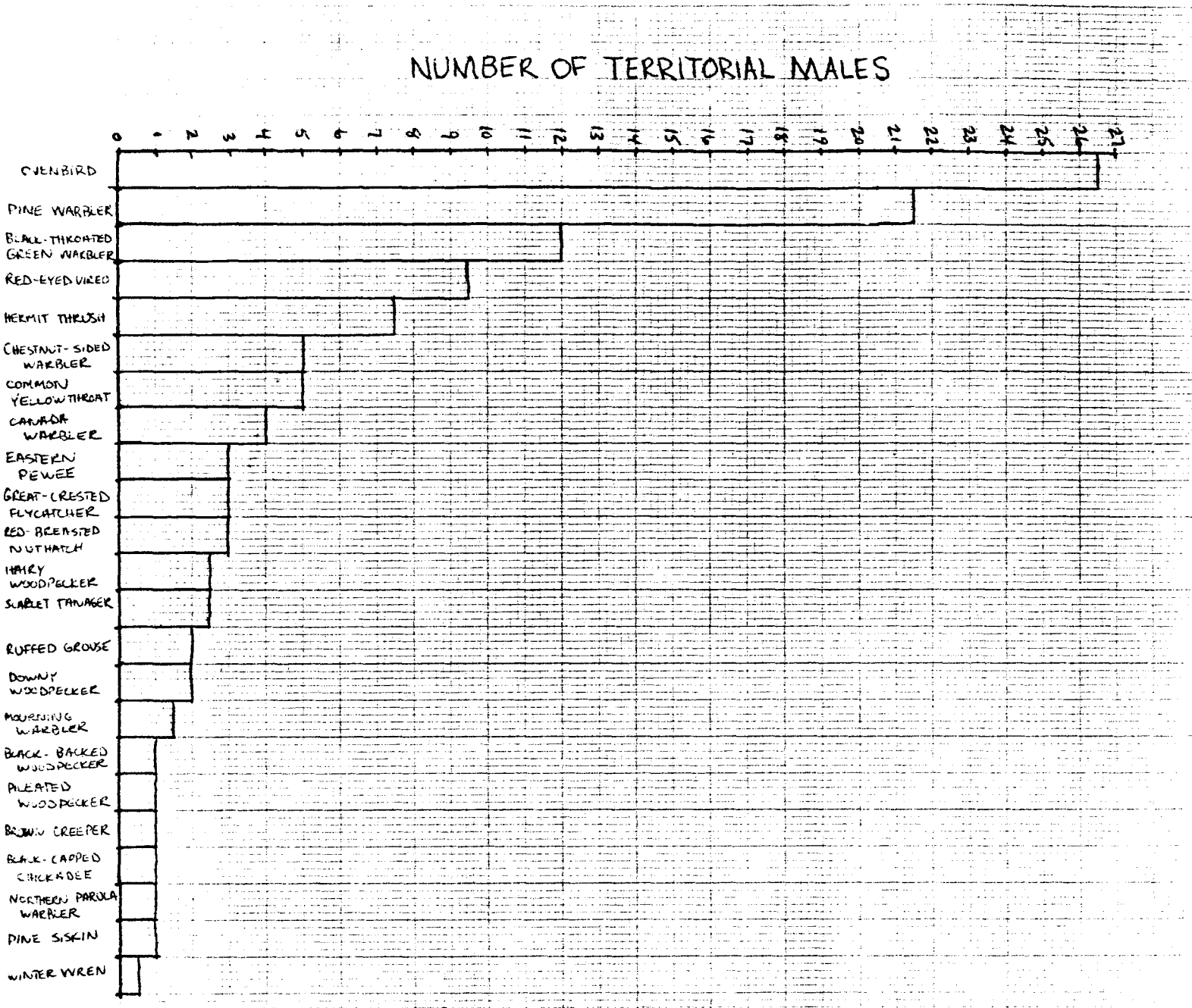


Figure: 4

Adapted from Mills, 1980.

Red Pine Census Plot