BREEDING BIRD CENSUS
IN A
RED PINE FOREST

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Breeding Bird Census in a Red Pine Forest

Abstract: A Breeding Bird Census was conducted by three members of an Ornithology class held at the University of Minnesota Forestry and Biological Station in order to establish a baseline for future studies. Dominant bird species making up 66% of the territorial males include the Ovenbird, Pine Warbler, Black-throated Green Warbler, Red-eyed Vireo and Hermit Thrush. The dominant tree species was Red Pine followed by unspeciated dead trees, Maple and Ironwood in terms of relative density.

INTRODUCTION:

Songbird populations have been declining since the end of WWII over much of the eastern United States. Reasons include deforestation of both tropical and eastern North American forests, nest predation, cowbird parasitism and fragmentation of habitat. These declines, however, are not uniform among bird species nor among forest types. Consistant, long-term studies need to be conducted in order to assess changes in population dynamics.

The purpose of the Breeding Bird Census, initiated by the National Audubon Society in 1937, is to monitor population changes. The first step in this process is to determine the species and density of breeding birds found in each habitat type throughout North America. This study attempts to do so in a Red Pine forest located within Itasca State Park in Minnesota. A permanant study plot has been established which will be available to assess changes in bird populations within a particular area over time. It is also part of a larger study to be conducted by Dr. David Blockstein

comparing bird populations found within five different Itasca Park habitats over time.

METHODS:

The location site for this Breeding Bird Census is positioned in the Wilderness Sanctuary of Itasca State Park in Minnesota. It is 2.9 miles from the beginning of the one-way portion of the Wilderness Drive; a 20 mile-per-hour road sign is located near the beginning of the plot. (See Appendix 1 for a more detailed description of plot location). The plot size is 10 ha (24.69 acres) and consists of 40 squares, each 2500m^2 (50 m X 50 m). The area was established according to the guidelines set by the National Audubon Society's Breeding Bird Census (Cornell Laboratory of Ornithology, 1989). A compass and measuring tape were used to lay the grid. At 50 m intervals plastic flagging was used for marking purposes. Permanent markers will be installed at a later date. Grid lines running west to east are numbered 0-9; grid lines running south to north are lettered A-F. The basic shape is rectangular, although the southern-most side is irregular due to the presence of the Wilderness Drive road. The west, north and east sides are borderd by a similar forest; on the southern side, three of five columns are buffered by a 50 m zone of similar forest while the remaining two columns begin at roadside. (See Appendix 1).

Census dates were June 22, July 1,3,6,8,9 and 10. Six-and-a-half of eight censuses were conducted in the morning hours between 0500 and 1000; the remaining one-and-a-half censuses occured between 1930 and 2144. Total observer hours was 96.5 with an average time of 12.1 hours. Main observers included the author, Karyn Noyes, and Joe Whittaker; David Blockstein attended three censuses and Anne Braunschweig participated in two. The weather varied between 45^0 - 80^0 F, wind ranged from 0 - 7 mph and the sky varied from clear to overcast. No precipitation occured.

Vegetation analysis, as described by James and Shugart (1970), was used to identify the tree, shrub, herb and canopy populations. Caluculations can be found in Tables 1 and 2. Ten sites were chosen by a random drawing of the interior plot squares. (see Appendix 1). At each site, the four categories of vegetation were analyized and recorded. Trees, defined as stems of 3 m or greater, were identified by genus for oak, maple and spruce and by species for the remaining vegetation. 6420 trees were calculated to be within the entire study plot at 260 per acre. Red Pines (Pinus resinosa) were the dominant species in terms of relative dominance (58.1%), relative density (21.5%) and total basal area (154.1 sq. ft.). Among living trees, White Pines (Pinus strobus) followed in terms of relative dominance (10.7) although they were encountered much less frequently (40% as compared to 70%) and had a low relative density (5.0). Numerous unspeciated dead trees were also present and, in fact, had the highest distribution frequency (90%) and second highest relative dominance (13.6) and relative density (18.46). Maple (Acer sp.) and Fir (Abies balsamea) were similar in terms of relative dominance (5.58 and 5.50, respectively) and relative density (15.77 and 12.31, respectively). The above mentioned trees made up 93% of the total basal area in square feet. Listed in terms of decreasing relative dominance are the remaining trees encountered during the vegetation analysis: Ironwood (Ostrya virginiana), Paper Birch (Betula papyrifera), Oak (Quercus sp.), Big-toothed Aspen (Populus grandidentata), and Spruce (Picea sp.). A comparative graph can be found in Figure 2.

Shrubs made up the remaining standing vegetation (ie. a diameter of 3 m or less) and were determined to be 1238 per acre; a total of 30,556 were calculated to be within the plot. Beaked Hazelnut (Corylus cornuta) and young deciduous trees such as Maple were frequently encountered.

Ground cover appeared on approximately 59.8% of the entire study site. Dominant species include Bunchberry (Cornus canadensis), Large-leaf

Aster (Aster macrophyllus), Wild Lily-of-the-valley (Maianthenum canadense), Blueberry (Vaccinium angustifolium), and Strawberry (Fragaria sp.).

Canopy cover was observed in approximately 73.3% of the plot.

RESULTS:

Our censusing resulted in a total of 116 territorial males representing 23 species and a total of 11 visitors representing nine species. A complete list of birds, their distribution per km^2 and per 100 acres can be found in Appendix 3 with a more readable format found in Table 3 and Figure 3. The Ovenbird, Pine Warbler, Black-throated Green Warbler, Red-eyed Vireo and Hermit Thrush made up 66% of the birds either seen or heard. Territory sizes and locations for each species, including visitors, is located in Appendix 2 and was mapped according to the symbols found in Figure 1. No nests were found and therefore reproductive success could not be calculated.

DISCUSSION:

One study, conducted by Paul J. Mills in 1980, is available for comparison purposes (Mills, 1980). He monitored a 12.75 ha (31.49 acres) portion of the Wilderness Sanctuary which primarily contained Red Pine (53%), Balsam Fir (12.9%) and Paper Birch (7.6%) in terms of trees per acre. Our study plot contains primarily Red Pine (22%), Ironwood (15%) and Fir (12%). Both plots had a substantial amount of dead trees - 20% in the previous study; 18% in the present study. Canopy differed slightly (64.5% for old; 73% for new) while ground cover differed more (79.3% for old; 59% for new).

An additional study conducted in 1983 by Don Rakstad and John R.

Probst in a Red Pine forest located in Chippewa National Forest is also available for comparison (Rakstad and Probst, 1983). The plot was 8.54 ha (21.1 acres) and was mainly Red Pine with an open understory due to management.

Many bird species remained relatively constant within the Itasca plots including the Ovenbird, Eastern Wood Peewee, Red-breasted Nuthatch, Northern Parula, Black-throated Green Warbler, Hermit Thrush, Hairy Woodpecker, Scarlet Tanager, Ruffed Grouse, Black-backed Woodpecker, Winter Wren and the Pileated Woodpecker. (See Figures 3 and 4 for comparison purposes).

There were many instances in which the Itasca plots had a similar number of species but the Chippewa plot differed considerably. One seemingly unexplainable discrepancy is in the number of Black-throated Green Warblers. The Black-throated Green Warbler prefers open coniferous forests and coniferous/deciduous forests for breeding. They were observed, however, 10 times by Mills, 12 times by the present census group and were not observed at all by Rakstad and Probst.

Another discrepancy is in the number of Ovenbirds. Both Mills' plot and the present plot contained a high number of Ovenbirds (25.0 and 26.5 respectively) while the Chippewa plot contained only two. This can be explained by the breeding preference of this species which rarely nests in pine forests and prefers a leaf-covered deciduous wood floor. The dense understory of the Itasca plots and the presence of fir and maple can therefore account for the large number of Ovenbirds. The same reasoning can be applied to the Red-eyed Vireo which had an average population of 11.25 within the Itasca plots but was observed only once in the Chippewa plot.

Other variations occured between the two major plot sites but on a smaller scale. The Hermit Thrush was observed less than .5 times in the Chippewa plot and an average of 6.75 times in the Itasca plots. The Hermit

Thrush tends to select nest sites where conditions are relatively moist. Perhaps the dry conditions indicated by Rakstad and Probst is one reason for this difference. Brown Creepers, which prefer to breed in pine forests, were observed four times in Mills' plot compared to once in the present plot. The larger number of pines in the older plot could be a partial explanation. This does not, however, account for the zero observations within the Chippewa plot. The Red-breasted Nuthatch was observed in the Mills plot 5 times, the present plot 3 times and the Chippewa plot .5 times. The Nuthatch prefers coniforous trees for breeding but also nests in mixed deciduous/coniferous forests and prefers mature stands with decaying large trees.

There was an increase of 228% in the numbers of Pine Warblers within the Itasca plots, increasing from 9 to 21.5. The Pine Warbler nests and forages only in pines, so it is interesting to note that the Chippewa plot had a total of only 2.5. There seems to be an increase in Pine Warbler population within Itasca as similar studies on two sites, one predominately aspen and the other heterogeneous (Sewage Lagoon), also had high populations.

It is possible that many of the lower numbers of species found within the Chippewa plot is partially due to the fewer number of observer hours spent; 14 hours compared to 26 in Mills' plot and 96.5 in the present plot.

Another difference between Itasca plots was with the Black-capped Chickadee which was observed once in both the Chippewa plot and in the present plot but 8 times in the Mills plot. Chickadees nest in deciduous trees which explains the low number found in the Chippewa plot but not the difference between Itasca plots.

There were slight declines between Itasca plots among the Red-eyed Vereo, Eastern Wood Peewee, Swainson's Thrush, Veery and the Northern Parula, all of which appear on a list compiled in The Birder's Handbook giving those North American birds most at risk by the destruction of

tropical forests. Four other speices on that list, however, have increased: Ovenbird, Canada Warbler, Chesnut-sided Warbler and Black-throated Green Warbler.

The only bird in the Chippewa plot to have significantly more territories than in the Itasca plots was the Least Flycatcher; 10 were observed in the Chippewa plot while none were observed in the other two plots. The Least Flycatcher was on the Blue List in 1980, was a Special Concern in 1981-82, was of Local Concern in 1986 and is in continuing decline in some portions of it's range (Ehrlich, Dobkin and Wheye, 1988).

Other birds occuring in the Chippewa plot and not in the Itasca plots were the Chipping Sparrow (4), Brown-headed Cowbird (2.5), Yellow-rumped Warbler (2), Common Flicker (1), Rufus-sided Towhee (.1), Common Nighthawk (.5) and Nashville Warbler (+). It is interesting to note that the Brown-headed Cowbird was not observed in either Itasca plots despite the population explosion it has undergone in recent years.

It is unfortunate that direct comparisons could not be made between the two Itasca plots as the areas differed in location and size. Hopefully, this permanent census plot as well as the data obtained from it will be used in future studies.

I would like to thank Karyn Noyes and Joe Whittaker for helping with the censusing activities and with the compiliation of this paper, Anne Braunschwieg for helping with the censusing as well as with plant identification and David Blockstein for help with censusing as well as sharing his knowledge of birds with the Ornithology class of 1990.

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RED PINE CENSUS 1990

TABLE 1

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				
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

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

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

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

Number of Circles = 10

TABLE 2

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 (10 Sq. Ft.)	I	Total Basal Area (sq. feet)	Relative Dominance[7] (by species)	No. of circles in which the species occurred	Frequency[8]
1 Birch	0.6	0.9	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	6.94	4	40
5 Dead	0.8	5.7	6.0	4.0	7.2	3.1	9.8	+		36.6	13.86	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	0.6	—	—	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%		~~100%~~
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	4.9	6.6	99.98%			

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

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

Canopy Cover: Percent of plus (+) readings. Eg. total pluses in 20 sightings x 5. 7325

mean canopy height - 70 ft

TABLE 3

BIRD TERRITORIES OF THE RED PINE CENSUS PLOT

BREEDING MALES:	#/PLOT	#/KM^2	#/100 ACRES
Ovenbird	26.5	265	107
Pine Warbler	20.5	205	83
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

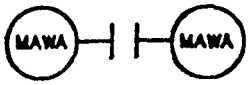
FIGURE 1

STANDARD SYMBOLS USED FOR MAPPING – May be helpful
(Magnolia Warbler in this example)

- each species is given a four letter code (VINS)

– 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 –

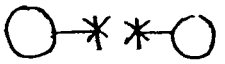
– male observed

– female observed

– calling, sex unknown

MAWA – observed, sex unknown

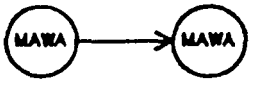
– pair together, assumed mated



Territorial ~~display~~ interaction btw two males.

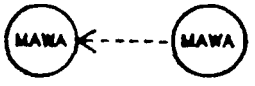
– observed conflict between males dispute over boundary

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



– known change in position

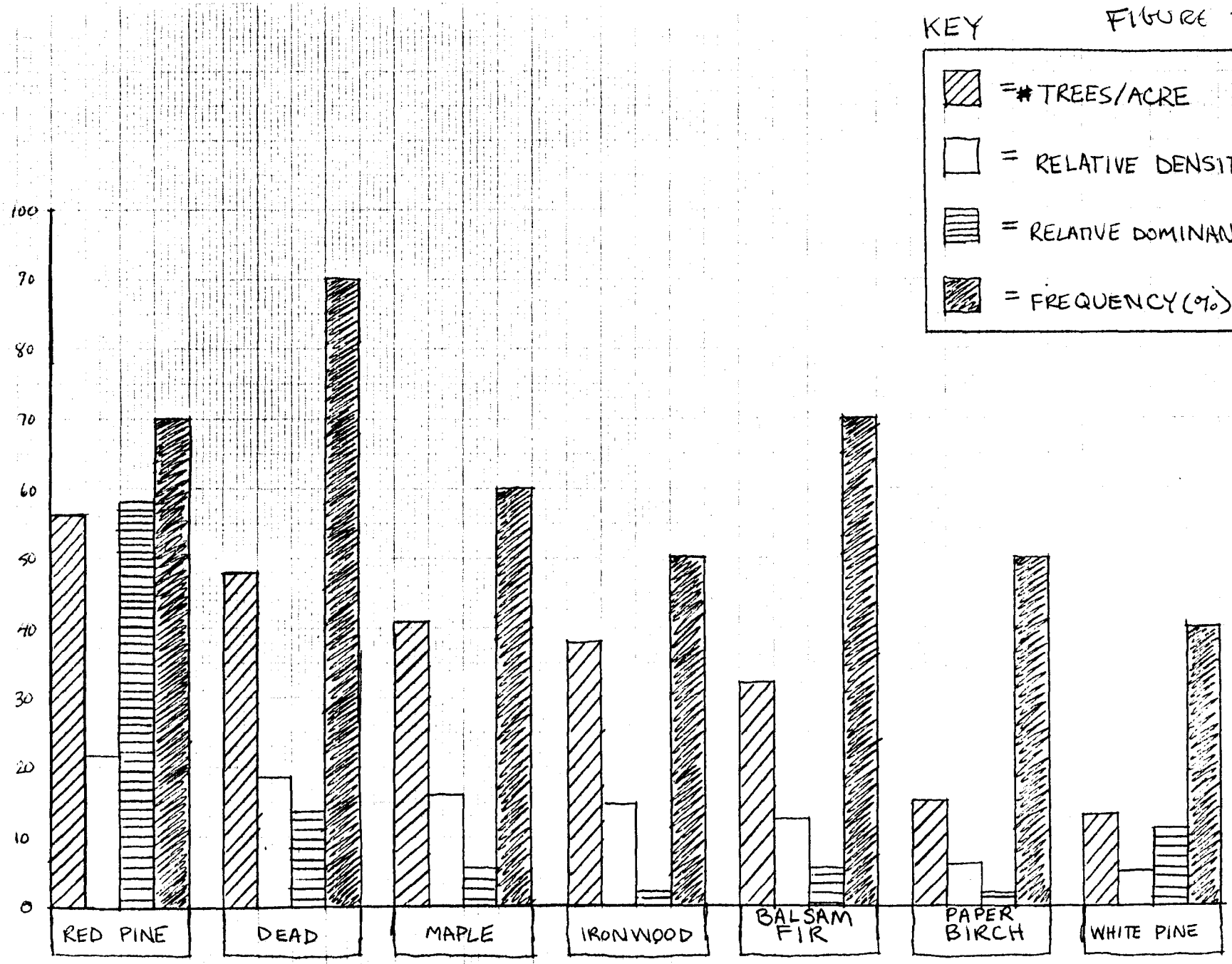
- females ~~don't~~ do not sing.



– assumed change in postion

MAWA ✳ – nest

FIGURE 2


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

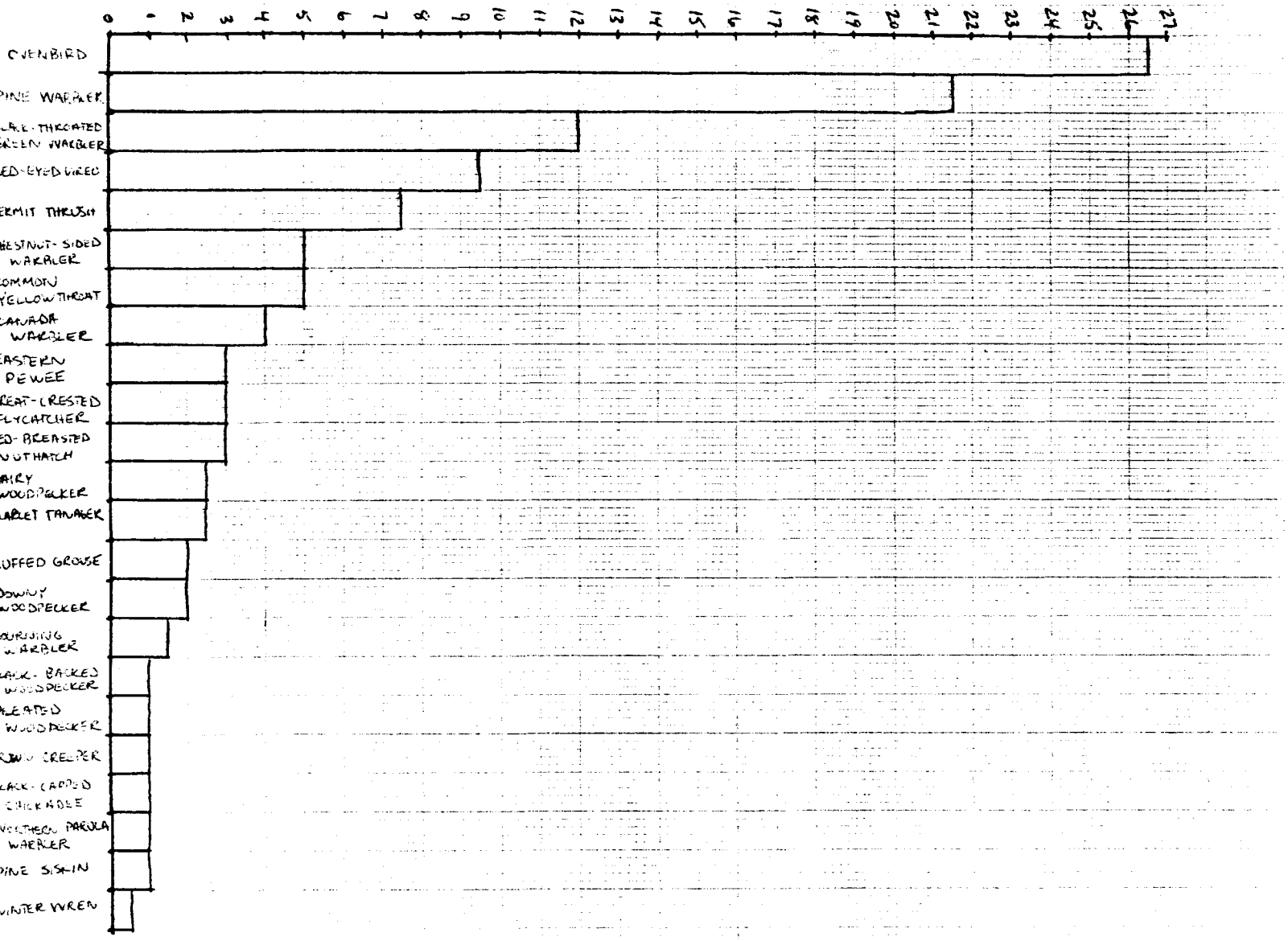

NUMBER OF TERRITORIAL MALES
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
OVENBIRD
PINE WARBLER
BLACK-THROATED GREEN WARBLER
RED-EYED VIREO
HERMIT THRUSH
CHESTNUT-SIDED WARBLER
COMMON YELLOWTHROAT
CANADA WARBLER
EASTERN PEWEE
GREAT-CRESTED FLYCATCHER
RED-BREASTED NUTHATCH
HAIRY WOODPECKER
SCARLET TANAGER
RUFFED GROUSE
DOWNY WOODPECKER
BLACK-BACKED WOODPECKER
BLEATED WOODPECKER
BROWN CREEPER
BLACK-CAPPED CHICKADEE
NORTHERN PARULA WARBLER
PINE SISKIN
WINTER WREN

FIGURE 3

Figure:

Adapted from Mills, 1980.

Red Pine Census Plot