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BREEDING BIRD CENSUS IN A RED PINE FOREST

Marlys Reuvers

University of Minnesota

Biological and Forestry station

Itasca State Park

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Dr. David Blockstein

ABSTRACT

This study involved a long-term comprehensive study of breeding bird populations within Itasca State Park, Clearwater Co., Minnesota. The Red Pine forest I studied involved a 10 ha grid. A quantitative vegetation survey was conducted to help profile avifaunal distribution and characterize vegetation on the plot. The breeding bird census recorded singing males and visible males or females on the grid. These birds were mapped and territories were determined based on profiles done over 8 census periods. A total of 105 territories, representing 17 species were mapped. There was a total of 13 visiting species on or over the plot. Results were examined by comparing 1991, 1990, and 1980 with 1992 results.

INTRODUCTION

Bird habitat is affected by human activity in many ways. We do not fully understand how populations change and the impact of technology and disturbance on breeding bird populations. Human populations have direct impact on bird habitat through logging, building of homes, power and sewer lines, and manipulation of the habitat for a wide variety of uses. There are side effects of human interaction in the form of global warming, pollution, acid

rain, introduction of pesticides, herbicides and other toxic substances that reach far into the natural habitats of birds on breeding areas and wintering grounds. Ecosystems are also affected by preventing natural phenomena such as fire. The conflict between the preservation of the ecosystem and the fulfillment of human needs will always be with us.

Birds are excellent indicators of temporal environmental change. They rely on vegetation for food, shelter and nesting habitat. Successful breeding requires specific habitats and ecological conditions. Therefore, locating breeding birds in a specific habitat as defined by the vegetation present will help make assumptions of population size and distribution for breeders in similar habitats. Breeding bird censuses help monitor change in bird populations over time and help to alert scientists to changes which are occurring.

This paper reports results from the Breeding Bird Census of the mature red pine forest for 1992. The red pine plot is located on the Wilderness Drive in Itasca State park. It is a mature forest of red pines and scattered white pines, with a fairly dense understory of maple and quaking aspen. To appreciate the ebb and flow of birds as their distribution constantly shift in response to long-term climatic changes, habitat alteration and human intervention is an important reason to document the distribution of birds and compare our results

with those obtained by Mills (1980) and with a population described by Rakstad and Probst (1983). I will also compare studies done in 1990 and 1991 by the ornithology classes at Itasca State park. Dr. Blockstein has established 4 permanent grids for on-going breeding bird censuses in Itasca State Park, Clearwater Co., Minnesota. The red pine plot was chosen in an effort to re-establish a census by Mills (1980).

The purpose of this paper will be to compare and contrast the current population of breeding birds in the red pine forest with populations found by previous researchers.

The pine forest is fairly heterogeneous with open forest on the south edge near the road, several clearings, and a 1-ha sedge meadow near the center. There has been no fire in the area since the early 20th century and it is succeeding into a maple-aspen forest. Quantitative analysis will be presented using the breeding bird census methods and vegetation studies using standard methods. These data will allow us to look at the impact of habitat on bird species composition and population change. This study could be useful in documenting changes in populations of songbirds which is an important tool for determining the effects of habitat destruction and fragmentation on the breeding areas and wintering grounds (Askins et.al. 1990).

METHODS

Itasca State Park (128 km2) is located at the convergence of Clearwater, Becker and Hubbard counties in northwest Minnesota. It includes a transition zone from deciduous forest to northern coniferous forest. Itasca is a very diverse and interesting area to study because of the varied habitat types and therefore the variety of birds that breed in the park. During the past century, it has been the site of many ornithological studies (see Blockstein 1991). However, there have been few quantitative studies of bird populations in the park.

The red pine plot is approximately 4.5 km from the beginning of the one-way section of the Wilderness Drive. The plot is located on the north side of the road. Permanent markers were placed at each corner of the grid. The 10 ha plot was divided into grid squares each 2500 m2.

A quantitative vegetation survey was done in 10 random 0.4 ha plots as described in James and Shugart (1970). For a compilation of survey data and interpretation see Tables 1 and 2.

Trees were determined to species and categorized according to dbh. It was determined that there were 597.5 trees per ha or

5975 trees within the entire study plot. In general there is a strong influence by Red Pine (Pinus resinosa) with a relative density of 16.7% and relative dominance of 37.3%.

The vegetation study indicated a large relative dominance of large red pine trees dominating the landscape. The high frequency of Sugar Maple, Quaking Aspen, Balsam Fir and Red Oak in the understory indicate the transition from a dominant coniferous forest area to a deciduous forest area.

Shrubs (defined as stems less than 3 inches in diameter and height greater than one meter) were determined to be 6445 per ha. or 64,450 shrubs within the study plot. Some frequently occurring shrubs included Beaked Hazelnut (Corylus cornuta), Red-berried Elder (Sambucus pubens), and young deciduous trees.

Ground cover was estimated to exist on approximately 55% of the total study area. Major components of round cover were Bunchberry (Cornus canadensis), Large-leaf Aster (Aster macrophyllus), Wild Lily-of-the-valley (Maianthemum candense), Blueberry (vaccinium angustifolium), and strawberry (Fragaria sp.).

Canopy cover was identified as approximately 77% in the study plot. The dominant canopy tree was Red Pine at approximately 75 feet in height. Deciduous species formed a sub-

canopy that had an estimate range of height from 4 feet to 30 feet.

BREEDING BIRD CENSUS

The breeding bird census was performed according to the Cornell Laboratory of Ornithology instructions. A map had been designed for the study plot (see figure 2) and was used to locate each bird species identified on the plot. Censuses were performed on 8 different days. Three observers were typically present, myself, Philip Johns and Matthew Coller. David Blockstein, Don Graves, Bethany Woodworth and Gloria Peterson each came once. See table 3 for census times and information on weather etc.

During each census, alternate grid lines were walked, and we started at a different end each time. The researchers stopped at intervals on the grid lines to listen and look for birds. When a bird was heard or seen, it was identified and recorded on the map. 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 used to determine individual breeding males territories. Centers of activity and simultaneous singing by

males were used to establish individual breeding territories. Territories completely inside the grid were considered residents, birds with territories only partially in were considered "half residents". Birds seen or heard near the plot or having large territories or known to breed earlier were considered "visitors".

RESULTS

During the 8 census periods a total of 30 species were identified and mapped. Maps are included by species in Appendix 2. Of these, 17 species were residents and 13 visitors. A total of 105 territories were identified on the plot. A complete list of breeding birds by species is shown in Table 4, with the numbers per plot and estimated values per km2.

The most numerous species were the Ovenbirds with a total of 23.5 territories on the plot. The second most numerous species was the Black-throated Green Warblers with 14 territories and then Red-eyed Vireos with 13 territories. The Pine Warbler had 11 territories. (See figure 2 for a graphic representation of numbers of territories).

DISCUSSION

We began our breeding bird survey on June 23 and ended on July 11, 1992. This would be considered toward the end of the breeding season for some species and possible breakdown of territory boundaries after the young have fledged or when territories are no longer maintained as strictly. Over the censuses dates it is likely that territories were moved slightly due to the breeding season of individual birds. Some of the visitors such as the Red-breasted Nuthatch were past their breeding season. Also, Gray Jays and Blue Jays were visitors to the plot with juveniles in a family group. It is impossible to determine if the nesting occurred on the plot or if the birds were moving through the plot.

A comparison of the 4 years of data (see table 5) shows the Ovenbird is consistently the most numerous bird on the plot. There is not a great deviation in the numbers seen in the last three years. These numbers are up from the 1980 census done by Mills. The number of Pine Warblers on the plot were down by 56% from the last two years. But, is 36% higher than in 1980. This could be due to the later census or depleted habitat, they are most frequently found in large stands of White Pine (Janssen 1988). The results of the Red-eyed Vireo are inconsistent through years. With 13 territories in 1992 this indicates a 46% drop in numbers from 1991, but it indicates a 27% increase from 1990 and

a 78% increase from 1980. It is difficult to determine if the population is increasing or decreasing or if there is an error on behalf of the researchers. Stokes describes the behavior of the Red-eyed Vireo to consist of continual movement about the periphery of the territory, singing their song phrases loudly. As more males arrive, the areas patrolled by the earliest birds become smaller and better defined. Stokes also says it is hard to follow some of the activities of the Red-Eyed Vireo, because it tends to live and move about in the dense cover of open, broad-leaved forests. The territory size for the Red-Eyed Vireo is 1-2 acres (Stokes). This would indicate the maximum number of Red-Eyed Vireos' on the plot (24.69 acres, 10ha) would be 24. It would seem reasonable to assume the number would be between 12 and 24 and not at the maximum number due to mapping errors, movement and inconsistences in data collection.

The Black-throated Green Warbler has been consistent in numbers and has shown an increase of 1 territory per year. It is a widespread but local resident in the northeast and north-central regions, with observations as far south as northern Pine County (Janssen 1988). The Canada Warbler showed a 50% decrease from 1991 and a 25% decrease from 1990. It is a local resident in the north-central, northern portions of the central and east-central regions and is most frequently found in large stands of White Pine (Janssen 1988). If a decrease continues this would reflect the change in habitat from a climax pine forest to a

deciduous forest. The Chestnut-sided Warbler has shown an increase in the last 3 years. It is a resident primarily in northern regions from Cook County in the east to eastern Marshall and Kittson Counties in the west (Janssen 1988). In the early twentieth century this species was fairly well represented in the southeastern region and in the area around the Twin Cities, but as the area was urbanized and the heavy forests cut, the species began to disappear (Janssen 1988). The increase could reflect the cutting of wooded areas around the park and the population moving into a heavily wooded plot from these cut areas.

The Hermit Thrush has decreased by 25% from 1990 to 1991 and 30% from 1991 to 1992. It is a shy bird and the preferred habitat is coniferous, mixed or deciduous forest and forest edge for breeding habitat (Ehrlich 1988). The red pine plot should be ideal for these birds. The Northern Parula showed a 50% decrease from 1991 but a 60% increase from 1990. This again indicates inconsistent data. The Eastern Wood Pewee population has consistently increased over 3 years. The Common Yellowthroat has shown a decrease over 3 years.

The Nashville Warbler was not observed in any of the other censuses. But, had 6.5 territories on the plot in 1992. The Nashville Warbler breeds in deciduous, coniferous, and riparian woodlands, bogs, and thickets(Ehrlich 1988). This is the habitat area where they were mapped on the pine plot. It seems to be a

perfect habitat for the Nashville Warbler which has apparently just moved into the area this year.

The Yellow-bellied Sapsucker was also a resident for the first time in 1992. Two nests were observed on the plot and fledglings were observed and heard on several occasions on the plot. In the past the Yellow-bellied Sapsucker had only been a visitor. They apparently moved onto the plot this year to nest for the first time. The Brown Creeper increased by 70% from 1991. Several were observed feeding by ascending the trunk of a dead tree in a spiral course and then dropping and moving to another tree to repeat the procedure.

In conclusion, it appears that some populations are increasing, others are decreasing and there are new populations moving onto the red pine plot. There are also some inconsistency in the data that has been collected. A statistical analysis would be appropriate in the future to determine if there are significant increases or decreases in any of the songbird populations on this plot.

We need to considerer succession as we monitor this plot for vegetation and bird populations. Succession is the process whereby one plant community changes into another. It involves the immigration and extinction of species, coupled with changes in the relative abundance of different plants. Succession

represents community dynamics occurring on a time scale of the order of the life-spans of the dominant plants (in contrast to much slower, evolutionary changes, occurring over hundreds or thousands of generations, or the much more rapid seasonal or annual fluctuations in species' abundances). Succession occurs because, for each species, the probability of establishment changes through time, as both the abiotic environment (e.g. soil conditions, light intensity) and the biotic environment (e.g. the abundance of natural enemies, the nature and competitive ability of neighboring plants) are altered (Crawley 1986). The movement of this plot from a mature pine forest to a deciduous forest can be regarded as succession which is not a single process but the influence of a great many factors. The increase in snags, decrease in large and medium sized pines and increase in shrubs, deciduous trees and herbaceous plants contribute to the increase in some species and the decrease in other species. This is a dynamic plot in the sense that it is changing over the years and will eventually succeed into a new type of habitat possibly that of a deciduous forest. This process will influence bird and mammal species and other species that are able to live and breed in the plot.

For further information you may contact the author at:

5071 Eagle Lake Road

Duluth, MN 55803

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LITERATURE CITED

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

Crawley, M.J.,1986. Plant Ecology.Blackwell Scientific Publications, Oxford london edinburgh, Boston Palo alto Melbourne.

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

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

Janssen, R.B.,1988. Birds in Minnesota. University of Minnesota Press, Minneapolis.

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

Podeszwa, C., 1991. A Breeding Bird Census in itasca State Park: Red Pine Forest With Deciduous Understory. Class paper, University of Minnesota Forestry and Biological Station.

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

Stokes, D.W., L.Q. Stokes. 1983. A Guide to Bird Behavior, Volume I and II. Little, Brown and Company, Boston, Toronto.

Whittaker, J., 1990. An examination of Breeding Bird Populations in a red pine forest. Class paper, University of Minnesota Forestry and Biological Station

Tablel

Table one

Summary Sheet A

Summary Sheet for Tenth-acre (0.04 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		Trees/ha	
1 Acer Saccharum	11	18	7	1	1				38	95	15.9 %
2 Tilia americana	3	ø	2						5	12.5	2.1
3 Quercus rubrum	10	3	1	ø	1				15	37.5	6.3
4 Populus tremuloides	6	4	8	5	3				26	65	10.9
5 Abies balsamea	8	13	4						25	62.5	10.5
6 Ostrya virginiana	13								13	32.5	5.4
7 Betula papyrifera	1	1	1						3	7.5	1.3
8 Pinus Strobus	ø	6	8	4	8	2			28	70	11.7
9 Pinus resinosa	ø	3	6	8	18	5			40	100	16.7
10 Ulmus americana	1								1	2.5	0.4
Dead	8	15	11	6	2	3			45	112.5	18.8
TOTAL	61	63	48	24	33	10			239	597.5	100%
Trees/acre by size class (trees/ha)	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 < 3" d.b.h. Eg. total pluses (+) in 20 readings x 5. (1289 x 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 or 55%

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

Table 2 0.04 Summary Sheet B Table Two:

Summary Sheet for Tenth-acre (0.4 hectare) circles.

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.) in m^2								Total Basal Area ~~sq. feet~~ m^2	Relative Dominance[7] (by species)	No. of circles in which the species occurred	Frequency[8]
	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 Acer saccharum	0.0099	0.486	0.378	0.09	0.162				1.13 m^2	7.7%	6	60
2 Tilia americana	0.0027	∅	0.108						0.111	0.8	2	20
3 Quercus rubrum	0.009	0.081	0.054	∅	0.162				0.306	2.1	3	30
4 Populus tremuloides	0.0054	0.108	0.432	0.45	0.486				1.48	10.1	3	30
5 Abies balsamea	0.0072	0.351	0.216						0.574	3.9	6	60
6 Ostrya virginiana	0.0117								0.0117	0.1	1	10
7 Betula papyrifera	0.0009	0.027	0.054						0.054	0.4	3	30
8 Pinus Strobus	∅	0.162	0.432	0.36	1.296	0.558			2.81	19.2	4	40
9 Pinus resinosa	∅	0.081	0.324	0.72	2.916	1.395			5.44	37.3	8	80
10 Ulmus americana	0.0009								0.0009	0.006	1	10
Dead	0.0072	0.405	0.594	0.54	0.324	0.837			2.71	18.6	6	60
TOTAL	0.0549	1.701	2.592	2.16	5.346	2.79			14.6 m^2	100%		~~100%~~
Trees/acre by size class m^2/ha	0.137	4.25	6.48	5.4	13.4	7.8						
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. (1289 x 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 or 55%

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

TABLE 3: TIMES, WEATHER AND DATES OF CENSUS IN 1992

Visit	Time Start-end	Temp(oC)	Wind	Sky
June 23*	0515-1200	11	0	overcast
June 26	0500-1100	10	0	overcast
June 29	0500-1100	18	1-3	overcast
June 30	0510-1200	7	1-3	overcast
July 3	0515-0930	10	1-3	overcast
July 5**	0500-0830	10	1-3	clear
July 7	0500-1000	18	1-3	overcast
July 11	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.

TABLE 4

BIRD TERRITORIES IN THE RED PINE PLOT-1992

BREEDING MALES:	#/PLOT	#/KM2	#/100 ACRES
Ovenbird	23.5	235	94.8
Black-throated Green Warbler	14.0	140	56.5
Red-eyed Vireo	13.0	130	52.4
Pine Warbler	11.0	110	44.4
Chestnut-sided Warbler	7.5	75	30.2
Nashville Warbler	6.5	65	26.2
Eastern Wood-Pewee	5.5	55	22.2
Brown Creeper	5.0	50	20.2
Yellow-bellied Sapsucker	3.5	35	14.1
Hermit Thrush	3.0	30	12.0
Common Yellowthroat	3.0	30	12.0
Canada Warbler	3.0	30	12.0
Northern Parula	2.5	25	10.0
Scarlet Tanager	1.5	15	6.0
Ruffed Grouse	1.0	10	4.4
Winter Wren	1.0	10	4.0
American Robin	0.5	5	2.0

VISITORS:

Pine Warbler
Broad-winged Hawk
Evening Grosbeak
Hairy Woodpecker
Gray Jay
Blue Jay
Great Crested Flycatcher
Mourning Warbler
Red Breasted Nuthatch
Black-backed Woodpecker
Purple Finch
Common Raven
Black-capped Chickadee

TABLE 5

#/KM2 OF BIRD TERRITORIES IN THE RED PINE PLOT FOR 4 YEARS

Breeding males	1992 #/km2	1991 #/km2	1990 #/km2	1980 #/km2
Ovenbird	235	250	265	196
Pine Warbler	110	245	215	71
Red-eyed Vireo	130	240	95	102
Black-throated Green Warbler	140	130	120	78
Canada Warbler	30	60	40	0
Chestnut-sided Warbler	75	55	50	16
Hermit Thrush	30	50	75	47
Northern Parula	25	50	10	16
Eastern Wood Pewee	55	45	30	39
Great-crested Flycatcher	–	40	30	0
Common Yellowthroat	30	35	50	8
Mourning Warbler	–	20	15	0
Brown Creeper	50	15	10	31
Scarlet Tanager	15	15	25	16
Black-capped Chickadee	–	10	10	63
Pileated Woodpecker	–	10	10	0
Ruffed Grouse	10	10	20	8
Winter Wren	10	5	5	8
Nashville Warbler	65	–	–	–
Yellow-bellied Sapsucker	35	–	–	–
American Robin	5	–	–	–

VISITORS

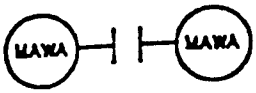
Broad-winged Hawk
Screech Owl
Hairy Woodpecker
Black-backed Woodpecker
Gray Jay
Blue Jay
Common Raven
Red-breasted Nuthatch
American Redstart
Pine Siskin
Song Sparrow
Purple Finch
Black-capped Chickadee
Evening Grosbeak

Figure one -1992

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

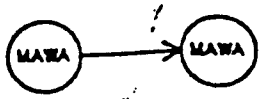
– calling, sex unknown

MAWA – observed, sex unknown

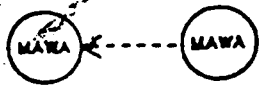
– pair together, assumed mated

– 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 postion

MAWA ✳ – nest

Number of Territorial Males

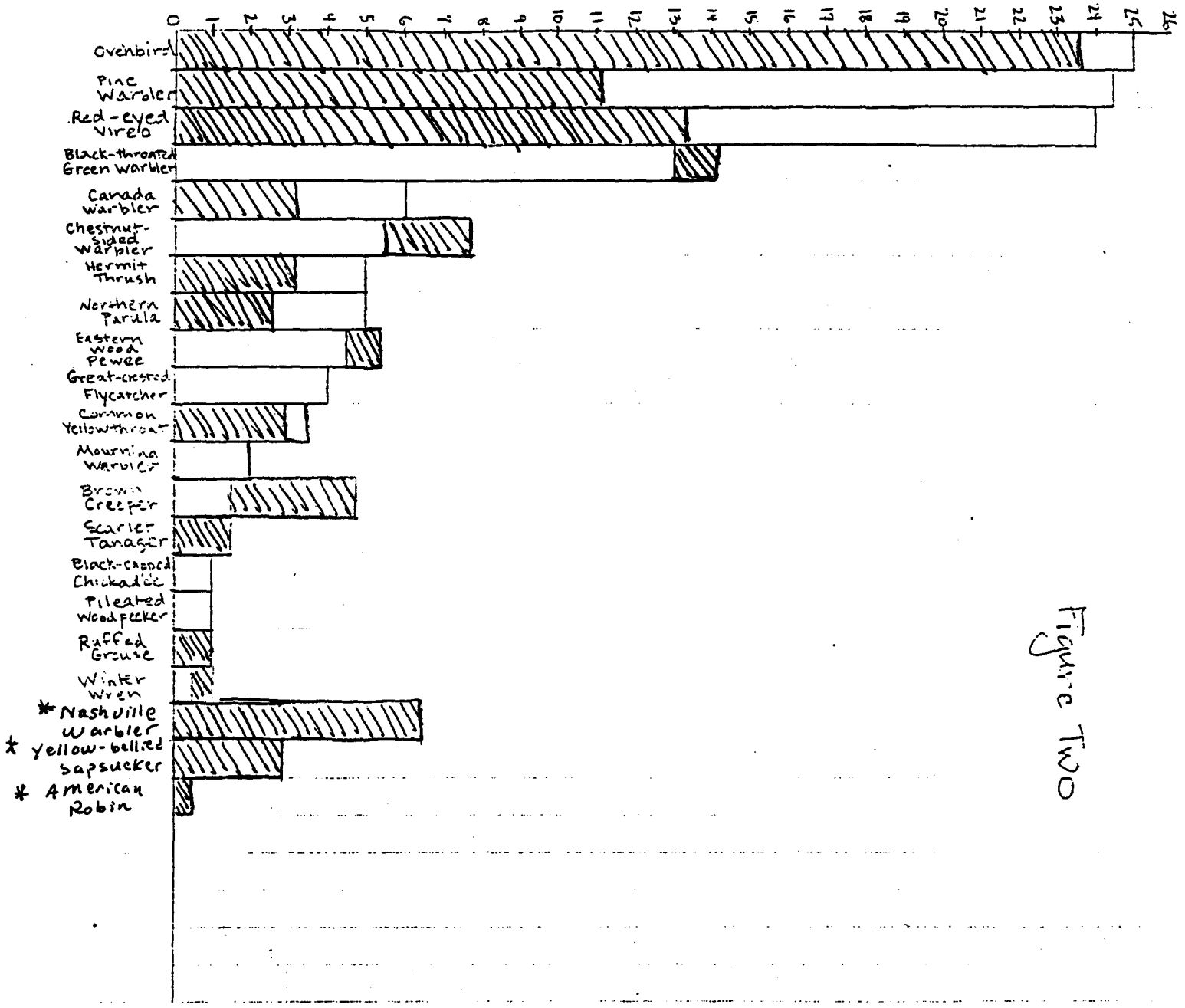


Figure Two

1991 = □

1992 = ▨

* = absent in 1991

MAP Figure three

MAP Sample points 1992.