THE BIRD POPULATION OF AN ASPEN ASSOCIATION IN CHEBOYGAN COUNTY, MICHIGAN

by

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An original investigation conducted in conjunction with Advanced Zoological Studies (Zoology 279) at the University of Michigan Biological Station

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INTRODUCTION

This study of the breeding bird population in an aspen association is the beginning of a long ranged program aimed to determine those changes in the avifauna that accompany vegetational succession. The data for this paper was gathered on a 48.7 acres aspen plot during the summer of 1947 in the vacinity of the University of Michigan Biological Station.

My preexisting interest in an aspen population problem accompanied by the coincidence of Dr Olin Sewall Pettingill's desire to lay out such a successional investigation that could also be used in class work gave birth to the study.

This paper is the pioneer amongst many to follow that will describe the study area in years to come. It is hoped that the data here will be of use to my predecessors toward interpreting their data.

For their aid toward the success of this study acknowledgements are in order to Dr. Olin Sewall Pettingill for helpful suggestions during the progress of the investigation, to Dr. S. Charles Kendeigh for developing my interest in population studies as well as aquainting me with the methods used in such problems, to Dr. Frank C. Gates for historical data, weather data, and aid in vegetational interpretation, to Robert B. Iea for helping in laying out the census plot, to the Advanced Ornithology class (Zoology 119) for aid in census taking, and to the University of Michigan Biological Station for the use of its facilities and equipment especially in regards to making perminent markers for the census plot.

LOCATION

As mentioned in the Introduction the study area is located near the University of Michigan Biological Station. The Biological Station in turn is situated on the south shore of Douglas Lake, western Cheboygan County, Michigan.

More specifically the census plot's location is in the aspen forest one mile south of the Biological Station in the northeast section defined by the junction of the Hog Back and Topinabee Roads immediately north of Reese's Bog (See Map 1 at the conclusion of the text).

Concerning the ecological location the climax association in this part of Michigan could be classed as a transition zone between the Central Eastern Deciduous Forest and the Northeastern Coniferous Forest. This means that the better soils in the vacinity of the Biological Station will support a Maple-beech climax association and on the poorer soils will be found a Red-white pine climax community.

Geologically speaking the study area is situated on the nothern rim of the saucer-like basin that characterizes the state of Michigan. On the shores of the Great Lakes a few miles noth, east, and west of the census plot the bedrock that constitutes the structure for the "saucer" juts above the grounds surface to form outcropings. These outcropings are the highest points of the "saucer" and are found all around Michigan on the shores of the Great Lakes.

In the vacinity of the aspen area studied the bedrock formations are covered by a layer of glacial till.

HISTORY

Of course the more ancient history of the study area as well as all temperate America involves that of glaciation and its implications of retreating ice and water, sculptured topography, deposition of till, reinvasion of succeeding vegetation associations, and conversion of the glacial till into soil.

The more resent history of any importance has been due to anthropeic factors. First came the lumbering industry which contributed to the cutting over of northern Michigan by 1870. Following the cut over many man made fires swept through the region.

The known history of the census plot itself consists of early cutting as demonstrated by large stumps in the area. Part of it was once a farm which is mow abandoned (the field and oak-aspen on Map 1). In 1916 the engineers that were then at what is now called the Biological Station burned the area which was then maple-beech with some pine so that surveying would be facilitated. It was a severe burn that killed all the trees. In 1919 when the aspens had gotten started there was another fire. This was not as devestating and was more like a brush fire due to the small aspens. This 1919 fire was the last.

CLIMATE

The climate of Michigan is such that a growth of trees can be maintained. Dr. Frank C. Gates sums up the weather around the Biological Station as follows; "---- the temperature is moderate, the rainfall likewise is moderate but amply distributed throughout the year. Snow is usually abundant and remains on the ground for a long time" (Gates 1926:171). The data in Table 1 below gives a more accurate picture.

Table 1.

METEOROLOGICAL SUMMARY CHEBOYGAN, MICHIGAN
(U. S. Weather Bureau Figures)

TEMPERATURE 'F	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Absolute Maximum	59	51	72	86	89	95	101	95	95	89	73	59
Mean	19	16	25	39	50	61	66	65	60	48	35	23
Absolute Minimum	-20	-38	-22	-2	17	28	33	35	25	15	-6	-18
Growing Season					May 20	Jun. 15	----------		Sep. 10	Sep. 25		
Wind	NW	NW	NW	NW	NW	NW	NW	NW	SW	SW	NW	SW
Precipitation (inches)	1.70	1.38	1.90	1.79	3.10	1.85	3.10	2.97	2.92	2.50	2.49	1.93
										Total		28.57
Number of days with precipitation	9	7	6	7	8	7	8	9	8	8	9	9
Snowfall (inches)	15.6	13.6	9.6	2.3	0.7	-	-	-	T	0.7	6.6	12.5
										Total		62.0

(6/27/34)

SPECIAL FACTORS

The elevation of Douglas Lake itself is 712 feet above sea level. The study area does not vary too much from this.

The topography of the census plot consists of a hill on the northeast section which is the highest point, a strip representing the lowest elevation running from the northewest corner to the southeast corner, and another higher portion in the soutwest section.

The soil of the study area, typical of the upland aspen association, is composed of sand with some gravel but very little loam and clay. Thus the fertility and moisture holding qualities are nil.

The burns that were mentioned in regards to the history of the region are important special factors accountable for the large aspen froests today. First it takes a fire severe enough to kill the conifers or prevent the hardwoods from resprouting depending upon which climax association the fire has devestated. This gives the weed tree aspens a chance to take control. Since the seedling aspens will not grow in the shade of the larger trees it is necessary to have the area claered periodically so that new aspens may get started from seeding and sprouting and the dominence will be maintained. Of course this periodic clearing will have of be accomplinshed at intervals less than the age of the aspen, in this case Populus grandidentata, which lives to 25 to 30 years, so that a succeeding association does not take over. Here is where repeated fires are necessary.

The census plot was last burned in 1919 which makes it an old aspen area. It is hoped that no more fires will rage over the area so that the succeeding associations destined to follow the aspens can develope unmolested.

Another special factor in the region is man. It was man who cleared part of the area for agricultural and lumbering purposes. Man also was responsible for the many forest fires.

PLANT ASSOCIATION

Because this population study is linked with plant succession it is important that a accurate picture of the changing vegetation be obtained. Since the amount of vegetational change per year is too slight to be effective upon the bird population, quantitative and qualitative measurements are not necessary each summer but they should be taken at regular intervals of more significant lengths. It, however, is important that the floral association be recorded this first year of the investigation.

Methods of Gathering Data

Tree counts and list quadrats were taken this summer. The tree counts proceeded in a northerly direction along quadrat lines 1, 4, and 7 (quadrat lines are explained

later in the text) which total a distance of 4,368 feet. All the trees in a two meter strip along these lines that equaled one meter or more in height were counted and their diameters measured at the counter's breast height. If a tree was over one meter tall but not as high as breast height their diameters were measured at the one meter level. The data received from this method were grouped into catagories of diameter for each species.

Sixty four list quadrats were recorded. Dr.Gates has told me that 25 would be sufficiesnt to get a significant statistical representation of the vegetation. List quadrats consist of squares one meter on a side (this an area of one square meter) laid on the ground at regular intervals and the presence of the species of plants falling within these squares noted. Observe that only the presence of the species are recorded not the numbers. Frequency indices for each species may be computed from the data collected.

The special technique in determining the positions of the quadrats in this area consisted of taking a quadrat six feet to the east of each quadrat marker (quadrat markers are explained later in the text).

All the data collected in the manner described above was recorded in reference to position on the study plot. This pertains to tree conts as will as list quadrats. Thus the exact place where each peculiarity of the association occurs has been preserved. The purpose for this and the results are dealt with in the section below.

Tree Count and Quadrat Data

The floral data can be found in Tables 6 and 7 at the end of the text in the section containing maps, tables, and figures.

Description of the Vegetation

Ideally a problem such as this should be conducted in a homogenous habitat which in this case would be an aspen (Populus grandidentata) association. The fulfillment of this requirement is not as easy as it would at first seem even amongst the vast aspen forest that surrounds the Biological Station. After much unsuccessful searching, an area that seemed to satisfy the prerequisites was discovered. After a perminent plot was established, however, it was found that part of it included an abandoned field. This presented an edge effect in the aspen association that appeared in the population results.

Barring the obstacle in finding a homogenous habitat that is described above, it is also diffacult to find a an aspen association that is pure aspen. This is tracable to the fact that an aspen association in this part of the country is a seral stage that will eventually be invaded and taken over by another association. This the area selected for this study has an aspen dominence but varies from section to section in regards to invaders and density of vegetation. These variations are indicated on Map 1 at the end of the text.

Tables 6 and 7 show that the study area is an old aspen association on the verge of changing to another association. The high frequency of larger diametered Populus grandidentata and the considerably lower than 100% frequency index for Pteris aquilina are two examples supporting this phenomonon. Historically this aspen area should be an old one. Its final burning in 1919 would give the oldest aspens on the plot an age of approximately 28 years which is approaching the maximum life for Populu grandidentata.

In Table 7 all the elements of the vegetation with a frequency index above 13 are typically of the aspens. They are Gaultheria procumbens, Pteris aquilina, Melampyrum lineare, Vaccinium pennsyvanicum, Solidago hispida, Acer rubrum, Oryzopsis pungens, Aster laevis, Diervilla lonicera, Rubus allegheniensis, and Populus grandidentata. Other floral elements such as Betula papyrifera, Populus tremuloides, and Oryzopsis pungens are also more or less exclusive to aspen associations but often occur in lower percentages.

An attempt was made to quantitatively measure the differences in the vegetation designated on Map 1. The results were not conclusive and showed little if nor difference between the zones within the aspens. This at first confused me because an untrained observer could tell immediately that part of the northeast higher section of the study plot is aspen and oak in nearly equal amounts, that there is a low moist central band running from the northwest to the southeast which is composed of an aspen dominence with a thick Acer rubrum subdominence coming in below

the aspen canopy, and that the southwest again higher portion is aspen with many tall pines mixed in (the pines, although the same age as the aspens, have surpassed them in height). After rechecking the compass directions of the base lines from which the area was laid out it was found that through some error the east and west line was not true. This was the answer to my dilemma because the vegetational areas had been taken from an ariel photograph under the assumption that the base line in question was east and west. Therefore, a distortion was produced between the actual existance of the vegetational zones and where they are shown on the map. Since the quadrats were taken by using the boundries on the map an error large enough to make the zones appear the same was produced. Thus, only after carefully surveying the study plot can the differences in vegetation be demonstrated statistically.

Fate of the Area

As mentioned earlier the study area is on the verge of changing to another association. Already there are some species of birds existing there that are not typical of a pure aspen association. But before we delve into the future let us examine the remains of the past.

It has already been said that this area was a hardwood maple-beech association with a generous sprinkling of pines. Today the beech (Fagus grandifolia) and sugar maple

(Acer saccharum) that have resprouted after the burn are very scarce and only occur in the low moist section where the Red Maple (Acer rubrum) is so common. Also in this portion of the study area there exists many relic ground plants of the maple-beech association. Some of these are Pyrola secunda, Aralia nudicaulis, Clintonia borealis, Mianthemum canadensis, Trientalis americanas, Aster macrophyllus, Smilacina racemosa, Mitchella repens, and Lonicera canadensis. It is probable that these relics that require more moisture than is common in normal aspen associations struggled greatly for survival immediately after the fire. This supposition is based on the fact that the Large-toothed Aspen (Populus grandidentata), which is characteristic of the dry uplands, is the oldest tree, and the moisture loving American Aspen (Populus tremuloides) has come up since the initial growth after the fire.

It is this moister area of the census plot that has the best chance of returning directly to a maple-beech association.

The upland areas on each side of the moist valley are very dry and sandy (the fires have burned out most of the organic material in the soil) and have long since lost the maple-beech relics. Here is were the pines (Pinus resinosus and Pinus stobis) of the original maple-beech association have made a startling comeback. The pine invasion is most prominent in the southwestern zone. This pine association will develope unhindered by the the maple-beech climax because the soil is too dry and sterile to support the latter. After many years the

pines will build up the soil to a point where the hardwood climax can again inherit the region.

In summary it can be said that the low moist zone of the study area will probably go directly to maple-beech and the dry zones surrounding it will go first to pine and then to maple-beech. These prophesies of course bar any eventuality of another fire.

BIRD POPULATION

Census Methods

In determining the bird population on the study area, plot census methods were utilized. This involves establishing a grid on the desired area and recording the position of singing males is respect to the reference points of the grid. Singing males are assumed to indicate a breeding pair. After several censuses have been taken the different species' territories can be determined. These territories are counted and the number of breeding pairs is immediately obvious (I omitted those territories that existed only in part on the census area. Thus, although Figure 7 of the Oven-bird involves 11 territories only eight are counted in arriving at the population). The more times the area is censused the more accurate will be the resulting population because not all the males will be singing during any one census and also there are changes in the population throughout the summer.

The grid set up on the particular study area described here includes eight quadrat lines running north and south. A distance of 208 feet separate the quadrat lines from eachother. This automatically produces 49 quadrats of an area of 208 square feet or 487 acres in all. The lines running east and west are designated by letters from A to H, those to the north and south are indicated by numbers from one to eight. Therefore, at each point where quadrat lines intersect there is a position that is recognized by a letter and number. There are 64 such positions all of which have been marked with perminent posts that are called quadrat markers. These quadrat markers are approximately four feet tall and are painted white at the top with the number of the position in black on two sides.

It is important to population work that conditions are highly favorable during the census work so that the chances are greatest that all the males will be singing. This means of course that the census should be conducted in the early morning and on sunny days. I found that shortly after sunrise the singing had reached its zenith. This period of maximum song, however, did not last long enough for me to cover the whole area and the birds had begun to become quiet in accompaniment with the morning feeding by the time I had reached the last half of the area. To counteract this phenomonon I divided one census into two days, doing one half one day and the other half the next. To eliminate errors due to time that might still exist I did not always go over the area in the same pattern.

One time I would begin at one end of the area and the other time at the other end. This meant that the time at which any one part of the census plot was covered was varied instead of kept constant.

If carefully carried out, a census once a week is sufficient. Intervals of less time will do no harm but greater intervals will miss some of the fine points of the ever changing bird population.

Table 2 below gives the weather data on the days of censusing as accumulated by Dr. Gates at the Biological Station.

Table 2.

METEOROLOGICAL DATA ON DAYS OF CENSUSING

Date (1947)	Temperature 'F Nite. Max.	Nite. Min.	Day Max.	Day Min.	Solar Max.	Barometer (in.) 7 am.	2 pm.
June 26	67	59	82	59	149	29.28	29.27
June 30	72	54	80	59	142	29.42	29.32
July 3	69	53	79	58	148	29.52	29.49
July 9	77	59	85	61	147	29.69	29.58
* July 10	80	58	81	61	151	29.56	29.47
July 16	74	65	83	66	142	29.36	29.23
July 23	64	48	70	49	139	29.62	29.58
July 26	79	60	86	65	154	29.60	29.41
July 31	76	50	65	51	127	29.46	29.54

* 0.03 inches of precipitation.

Census Data

The study area had a breeding population of 28 pairs distributed among 12 species (these figures exclude the cowbird which was breeding in the area). For the sake of conveanience in comparing these data with those derived from other studies the figures are usually converted to breeding pairs per 100 acres. My aspen area has 56 breeding pairs per 100 acres.

Table 3 shows the population density by species on the basis of 48.7 acres and 100 acres.

Table 3.

BREEDING POPULATION

Species	Prs./48.7 acres	Prs./100 acres
1. Ruffed Grouse (*Bonasa umbellus*)	1	2
2. Black-billed Cuckoo (*Coccyzus erythrophthalmus*)	1	2
3. Nighthawk (*Chordeiles minor*)	1	2
4. Wood Pewee (*Contopus virens*)	1	2
5. Blue Jay (*Cyanocitta cristata*)	2	4
6. Robin (*Turdus migratorius*)	2	4
7. Hermit Thrush (*Hylocichla guttata*)	~~3~~ 2	~~6~~ 4
8. Red-eyed Vireo (*Vireo olivaceus*)	~~6~~ 5	~~12~~ 10
9. Oven-bird (*Seiurus aurocapillus*)	~~8~~ 5.33	~~16~~ 10.67
10. Scarlet Tanager (*Piranga alivacea*)	1	2
11. Vesper Sparrow (*Pooecetes gramineus*)	1	2
12. Chipping Sparrow (*Spizella passerina*)	1	2
Total	~~28~~ [illegible]	~~56~~ [illegible]

13 breeding species (Including the Cowbird, *Molothrus ater*)

Figures revised after re-evaluation [illegible] / [illegible] 17 June 1975

Table 4 is a list of all the birds seen in the area including the non-breeding species and those that were only flying over

Table 4.

CHECK LIST OF SPECIES OBSERVED

1. Goshawk (Accipiter gentilis)
2. Ruffed Grouse (Bonasa umbellus)
3. Ring-billed Gull (Larus delawarensis)
4. Mourning Dove (Zenaidura macroura)
5. Black-billed Cuckoo (Coccyzus erythrophthalmus)
6. Nighthawk (Chordeiles minor)
7. Yellow-shafted Flicker (Colaptes auratus)
8. Yellow-bellied Sapsucker (Sphyrapicus varius)
9. Crested Flycatcher (Myiarchus crinitus)
10. Wood Pewee (Contopus virens)
11. Purple Martin (Progne subis)
12. Blue Jay (Cyanocitta cristata)
13. Crow (Corvus brachyrhynchos)
14. Black-capped Chickadee (Parus atricapillus)
15. Catbird (Dumetella carolinensis)
16. Robin (Turdus migratorius)
17. Hermit Thrush (Hyocichla guttata)
18. Bluebird (Sialia sialis)
19. Cedar Waxwing (Bombycilla cedrorum)
20. Red-eyed Vireo (Vireo olivacea)
21. Black and White Warbler (Mniotilta varia)
22. Black-throated Green Warbler (Dendroica virens)
23. Pine Warbler (Dendroica striata)
24. Oven-bird (Seiurus aurocapillus)
25. Cowbird (Molothrus ater)
26. Scarlet Tanager (Piranga olivacea)
27. Indigo bunting (Passerina cyanea)
28. Vesper Sparrow (Pooecetes gramineus)
29. Chipping Sparrow (Spizella passerina)
30. Song Sparrow (Melospiza melodia)

The position of each species' territories in the study area may be found at the end of the text (Figures 1 to 8).

Comparison with other Studies

In resent years many population studies have been conducted in this country representing different localities and habitats. Last year (1946) several were carried out in the vacinity of the Biological Station under the direction of S. Charles Kendeigh.

Of those results from other studies available to myself only four showed a smaller population than the 56 pairs per 100 acres that I found. These were all part of a problem investigated by Aretas A. Saunders in the Allegany State Park, New York. He found 8.8 pairs per 100 acres in a field habitat, 46.9 pairs per 100 acres in a meadow association, 40.1 pairs per 100 acres in a maple-beech forest, and 37.2 pairs per 100 acres in an aspen-red maple enviroment. He also found 13 other habitats which had a higher population than my area (Saunders 1936:124).

Kendeigh, who has done much population work, found an extrordinarily high density of birds in the vast spruce-fir coniferous forest of Canada during a spruce budworm outbreak in the summer of 1945. He found 319 breeding pairs per 100 acres (Kendeigh 1947:29). In a hemlock-beech-maple forest in New York State he discovered 165 pairs per 100 acres (Kendeigh 1946).

Joseph Cadbury and Allen D. Cruickshank obtained a high breeding population of 242 pairs per 100 acres in a red-white spruce association on Hog Island, Maine (Cadbury and Cruickshank 1942).

Even those studies conducted around the Biological

Station demonstrate the rule of a higher population than in my area. In 1944 Virginia L. Garst studied the population in an aspen association using strip count census methods (Garst 1944), Her area included the aspen area west of the Biological Station almost to Bryant's Bog. She computed a population of 59 pairs per 100 acres including 30 breeding species.

In 1946 E. Vandegrift and L. Ritsema censused the aspen area west of the Biological Station's baseball diamond and determined a breeding population of 55 plus pairs per 100 acres distributed among 20 species (Vandegrift and Ritsema 1946).

The higher population in these two aspen areas as compared with mine is probably contributable to a larger edge effect. The results showed more species characteristic of the edge nesting there than I found.

Some other populations studied in areas near mine were (1) 87 plus pairs and 25 species per 100 acres in a pine association near Pellston, Michigan, (Prescott 1946) (2) 156 pairs and 33 species in a beech-maple climax forest on Colonial Point in Burt Lake (Hofslund 1946), (3) 148 pairs and 26 species in the cedar-balsam section of Reese's Bog (Riggs 1946), and (4) 139 pairs and 28 species in the cut over aspen-cedar-balsam section of Reese's Bog (Riggs 1946). The two latter relatively highly populated areas are just across the road from my area.

Table 5 at the end of the text summarizes the data given above.

COACTIONS BETWEEN THE BIRDS AND THE VEGETATION

This section of the text shall be more of less an annotated list of the species observed in the area with brief statements as to relationships to the habitat.

1. Goshawk. Accipiter gentilis. Two of this species, apparently immatures, were seen flying over the study area June 26. Although not nesting in my area (it has nested in Reese's Bog nearby many times) it may feed over it especially relishing the Ruffed Grouse.

2. Ruffed Grouse. Bonosa Umbellus. One pair nested on the area. This species was first noted June 26 when the male began to drum at 11:00 am. It was later flushed from the thick foliaged aspen-red maple zone where there are many fallen logs. These fallen logs are important to the Ruffed Grouse. The male habitually uses them when drumming. It is doubtful whether any mating would take place in the absence of logs. Thus the study area would contain no Ruffed Grouse (or at least only stragglers) were it not for the logs in this one vegetation zone.

At a later date two grouse were flushed from this same locality which were presumably mates. Still later a female and five young were regularily encountered on the highest portion of the area where the blue berries grew in abundance. Evidentally this was a good place to feed the junveniles.

3. Ring-billed Gull. Larus delawarensis. This species was only seen flying over the area. It had no relationship with the study plot but just happened to pass over it on its way between Douglas and Burt Lakes.

4. Mourning Dove. Zenaidura macroura. On July 23 three Mourning Doves were seen in the vacinity of the field in the northeast section of the study area. This species would not be expected in the aspen forest because of the lack of nest sites and because of their preference for an edge association. Where they were found is the only possible place on the area where they might be nesting. Here there are burnt stumps for nest sites and here too is a nice edge effect. Since they were seen only once it is assumed no breeding took place on the study plot.

5. Black-billed Cuckoo. Coccyzus erythrophthalamus. One pair nested on the area. These birds require considerable support for their nests. The pines in certain sections of the study area would serve as ideal nest sites. One abandoned nest, however, was placed in a large birch fork which served as a platform.

This bird frequents both the forest edge and the forest itself.

6. Nighthawk. Chordeiles minor. One nest was found with the usual two eggs. There may have been more than one breeding pair in my area but unless the nest is found there is no way of determining their territories. These birds require a comparatively open place on the ground

for a nest site. They would not be found nesting in a dense forest but could be found in fields. The nest found on my area was in the scrubby part of the aspens that had many open places between the trees.

7. Yellow-shafted Flicker. Coloptes auratus. Because of the lack of large trees and especially large dead trees there are almost no nesting sites for the flicker. This species can then be classed as a wanderer on my area.where only one was seen in its favorite edge habitat near the southwest field.

8. Yellow-bellied Sapsucker. Sphyrapicus varius. The same pertains to this species as to the flicker in regards to nest sites. It was, however, seen in a place where nest sites might be found (extreme southern corner of the forested area bordering the southeast field). Since it occured there only once it is not thought to have nested there. This species is another bird of the edge association.

9. Crested Flycatcher. Myairchus crinitus. Since this species is dependent upon ready made cavities usually of the abandoned flicker vintage for nest sites it is doubtful that this flycatcher nested on the study area. It was seen once in the same locality that the sapsucker was observed.

10. Wood Pewee. Contopus virens. One pair nested on the census plot. Since this species places its nest on the fork of a horizontal limb usually some distance from the trunk of the tree it needs a nesting tree that characteristically has secure horizontal forks. The aspen, birch, or red

maple of the main part of the study area do not satisfy this prerequisite. The scrub oak of the zone on the hill in the northeast section of the area, however, serve as ideal nesting trees. The strong wood of the oak supports secure horizontal forks. This is the place where the one pair of Wood Pewees were found.

It appears that the pewee commonly can find only oak trees for nest sites because Thaomas S. Roberts states in regards to the species "-----a preferance for oak woodlands -----" (Roberts II 1936:25).

11. Purple Martin. Progne subis. The martins were only observed flying over the area in search of food during the post nesting season. They were not recorded until after I noticed that they had begun to abandon the nesting houses around the Biological Station in late July.

12. Blue Jay. Cyanocitta cristata. Blue Jays are not confined to one habitat. This is true because of the adaptability of their nests. I have seen them in both deciduous and coniferous trees as well as on man made structures. Two pairs were breeding in my area.

13. Crow. Corvus brachyrhynchos. Crows were seen only once flying over the northern part of the study area. Although few nesting sites are offered in the census plot there are many in surrounding areas.

14. Black-capped Chickadee. Parus atricapillus. This species was first observed in the study area during the post breeding season in wandering family groups. Soft

rotting stumps were too scarce in my area so none nested there.

15. Catbird. Dumetella carolinensis. One was heard in its favorite edge habitat near the north end of the south-eastern field. It shall be classed as a wanderer since it was not recorded more than once.

16. Robin. Turdus migratorius. Here is a bird that seems to thrive in almost any habitat. Like the Blue Jay its nest is very adaptable to many types of situations (in fact even more so than the Blue Jay's). Two pair plus nested on the census plot.

17. Hermit Thrush. Hyocichla guttata. Some people believe that the Hermit Thrush is a bird of the coniferous forest, and in some localities it may be true. Roberts says, "It is necessary to go to the northern evergreen forests in the month of June to know the Hermit Thrush in its full glory."(Roberts II 1936:125).

My area, however, is not a coniferous forest yet three pairs of Hermit Thrushes bred there. The nest of one pair was found on the ground in a shaded area. It will be noted, though, on Figure 5 that the territories fall in those parts of the census plot that had some pines mixed in with the aspen. Thus it is my belief that the Hermit Thrush will nest where only a few conifers exist. It is doubtful that it will nest where no conifers exist. Perhaps the use of the pine needles in its nest is such a deep rooted instinct that it determins this selection.

18. Bluebird. Sialia sialis. This species did not nest in the study area. Few if any nesting sites were available to them. Two were seen flying over the southern part of the area on July 10.

19. Cedar Waxwing. Bombycilla cedrorum. This bird of the edge association did not breed in the area. It usually nests in large oaks, maples, or pines if available in an edge association. This was not true in my area. Several were seen flying over the northeastern field.

It is even doubtful whether my area served as feeding grounds for the waxwings since the serviceberry crop was very poor.

20. Red-eyed Vireo. Vireo olivacea. Here is one of the most common birds breeding in my aspen area yet it really does not owe its occurance to the aspens. On Figure 6 it will be noted that the vireo territories correspond more or less to the zone that includes the red maples. None are to be found in the aspen-pine section to the southeast. This is the key to the situation. The Red-eyed Vireo almost exclusively uses the maples for its the site of their suspended nest possibly because it offers small and flexible at the same time secure forks at the periphery of the tree. Red-eyed Vireos nest in a number of habitats that fulfill the maple requirement (oak forks are too stiff, aspen forks are too brittle). Six pairs bred in the study area this summer.

It will be interesting to note the Red-eyed Vireo's invasion into the southwest portion of the area if and

when the maples start growing there.

21. Black and White Warbler. Mniotilta virens. This warbler was seen on two occations. Once early in the summer feeding in the pines of the extreme southwest section but not singing. The next time it was observed it was near the same place during the post-breeding season. This time it was singing. Since it was observed at two widely separated intervals it is interpreted to be two different individuals that had wandered over from nearby Reese's Bog where they are common nesters. One was wandering in the pre-breeding season, the other in the post-breeding season.

22. Black-throated Green Warbler. Dendroica virens. Here is another common breeder of Reese's Bog. One family (male and several young) were observed in my area late in the summer. They did not breed in my area but wandered there in search of food.

23. Pine Warbler. Dendroica striata. This species is another of the post-breeding wanderers. It was a fairly common nester in the pines along the road near Reese's Bog.

24. Over-bird. Seuirus aurocapillus. This bird was the most common in the area. Eight pairs bred there. It is not exclusive to the aspen association, however. It will be found in numbers in any forest habitat that has a dense liter of deciduous leaves on the ground. My area satisfies these requirements practically throughout its

extent. Thus the Ovem-birds are distributed fairly evenly over it.

When the young leave the nest there seems to be considerable wandering. The previously rather small territories were greatly enlargened by recording the adults and young late in the breeding seasom (see Figure 7).

25. Cowbird. Melothrus ater. Although this bird was breeding in the area (a Red-eyed Vireo was observed feeding a young Cowbird) and was observed many times it was impossible to determine the breeding pairs for obvious reasons. They seemed to be more common in the northern half of the area where the Red-eyed Vireo nested more commonly. The Redeyed Vireo and Ovenbird were probably the most frequently parasitized.

26. Scarlet Tanager. Piranga olivacea. One pair with a large territory nested on the area in the central belt of dense aspen-red maple. The aspens would not support its bulky nest but the pines and, most likely in this case, the red maples could. Roberts also names the oak as a possible nest site (Roberts II 1936:330).

The first tanager seen on the area was what turned out to be a wanderer on the southern boundry of thearea.

27. Indigo Bunting. Passerina cyanea. A pair of this finch which is characteristic of the edge association was observed near the northeast field with its family of young then out of the nest. It did not nest on the study area but wandered there after the young learned to fly.

28. Vesper Sparrow. Pooecetes gramineus. Here is a bird that nested on the census plat that is the result of the edge effect established by the field to the east. One pair nested there. It is a ground nester that prefers open areas but requires a few shrubs or trees to be used as singing posts.

29. Chipping Sparrow. Spizella passerina. This bird is another product of the edge effect described above. One pair bred on the area. Two other territories were near or partially on the area. This species nests off the ground therefore requiring an environment a little less open than the Vesper Sparrow so that nest sites may be found. Low conifers are often used. The Chipping Sparrow also needs a song post.

30. Song Sparrow. Melospiza melodia. This sparrow is still another result of the edge association. It did not, however, nest on my area. It was recorded as a wanderer during the post-breeding season in the northeastern field.

DISCUSSION AND CONCLUSIONS

From the foregoing data it is evident that an aspen association supports one of the lowest bird populations. There are few habitats that have fewer birds per acre.

I think the most important factor contributing to this small population is the scarcity of nest sites. Very few birds can use the aspens as nesting trees. This may be primarily because of the aspen's small brittle and unsecure limbs, secondarily because of the poor cover supplied by its sparce constantly moving foliage. It is interesting to note that the most abundent bird in the study area, the Oven-bird, shuns the aspens and uses the ground for a nesting site. Furthermore it and, the Nighthawk, and Cowbird are the only three species that were breeding in the area that would use a pure aspen habitat as a breeding environment. The Oven-bird only needs a forest with a leaf covered ground from which it can gather nesting material. The Nighthawk, also a ground nester, would be found in a younger more open aspen area, where incidentally it is too open for the Oven-bird. Here it ouly requires a plane on the ground where it can lay two eggs. The Cowbird would be there because it commonly parasitizes the Over-bird. A fourth species, the robin, might possibly nest there too if an aspen fork large enough to support it easily adapted nest could be found. All the other species that have been named as breeding in the study area are there because of certain invading.

relic, and secondary species in the aspen association. As examples, the Red-eyed Vireo is there because it can nest in the red maples a secondary species, the Hermit Thrush is there because the invading pines' needles can be used in nest construction, the Ruffed Grouse is there because the logs in the central zone which are relics of the 1916 fire are suitable for drumming, and so forth (see the section on coactions).

Let us examine the cases of the Oven-bird, Nighthawk, and Cowbird more closely. It is true that they are the only species found in my area that would occupy a pure aspen environment, but it is also true that not even these species are endemic forms to the aspen association. In fact all three are found in greater numbers in some more favorable habitat. Take for examples the numbers of Oven-birds in a beech-maple climax forest, or the Nighthawks that nest on building roofs, or the Cowbirds of the open field and edge associations. This all amounts to the curious conclusion that of the very few species that would select an aspen habitat for breeding purposes none are dependent upon the aspens for nest sites, and all are more characteristic of some other environment.

But no pure aspen association will ever exist. Since it is not a stationary stage in the line of succession as is the climax community it is forever changing its vegetational formula. One can never accurately describe the factors of the envirnment in an aspen association because they are never free from those influences of

relic or invading types. When it is young it is still part field, when it is old it has the added influence of the succeeding community. A young aspen area is then very much different from an old one as demonstrated by the fact that an Oven-bird will not nest in a young phase while a Nighthawk will and vise versa. The secondary species of the aspen dominence also produce their own effect as seen in the case of the red maple and the Red-eyed Vireo, or the red oak and the Wood Pewee. Because of this complex of factors the aspen association will always have a hodgepodge of species nesting that are either left over from the preceeding seral stage or foreshadowing the next one.

For some reason unknown to myself the aspen area is used during the post-breeding season as a feeding ground for birds not commonly expected in the habitat. The Black-throated Green Warbler, Pine Warbler, Black and White Warbler, Black-capped Chickadee among others used the area in this way. Of course it may have just been the coincidence of random wandering from nearby Reese's Bog where most of these species nested.

The case of the Song Sparrow, Indigo Bunting, and other recorded wanders that characteristically inhabit the edge association.. They were also seen in the edge on my area, They had not wandered out or their environment but had only followed it around.

SUMMARY

1. A study of the bird population in an aspen association was carried out at the University of Michigan Biological Station during the summer of 1947.

2. The purpose of the investigation was to begin a study whereby the changes in the bird population that accompanied plant succession could be noted,

3. The study plot lies in that part of northern Michigan where the transition between the northeastern coniferous forest and the central eastern deciduous forest exists.

4. The history of the area involves glaciation, lumbering, fire, agriculture, and now protection.

5. The climate of the region is such that it will support a growth of trees.

6. Special factors in the census plot include the rolling topography, sandy soil, and devestating fires.

7. List quadrat and tree counts were taken to gather floral data.

8. The Populus grandidentata dominated vegetation is divided into three subregions; (1) aspen-oak, (2) aspen- maple, (3) and aspen pine. Fields and an edge effect exist on the eastern side of the area.

9. The ground flora is typically aspen consisting mostly of Pteris aquilina, Gaultheria procumbens, and Diervilla

10. The higher drier parts of the area will go to pine and then to maple-beech. The lower wetter part will go directly to maple-beech.

11. The plot census method was used to determine the bird population.

12. Thirteen breeding species accounted for 56 birds per 100 acres in the area. The Oven-bird and Red-eyed Vireo where the most common.

13. A comparison with other studies shows that my area had a relatively low population.

14. The different species were observed on the census plot because of certain coastions with the vegetation.

15. The aspen habitat has a small population because of the lack of nest sites.

16. The Oven-bird, Nighthawk, and Cowbird are the only species on my area that would choose a pure aspen area as a breeding habitat but would not use the aspens for nesting, and would be more numerous in some other habitat.

17. An ever changing aspen association has the influence of other invading or relic communities within it.

18. Some species were found wandering about the spen area studied that are not characteristic to the habitat.

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MAPS, TABLES, AND FIGURES

LOCATIONAL AND VEGETATIONAL MAP

OF THE STUDY AREA

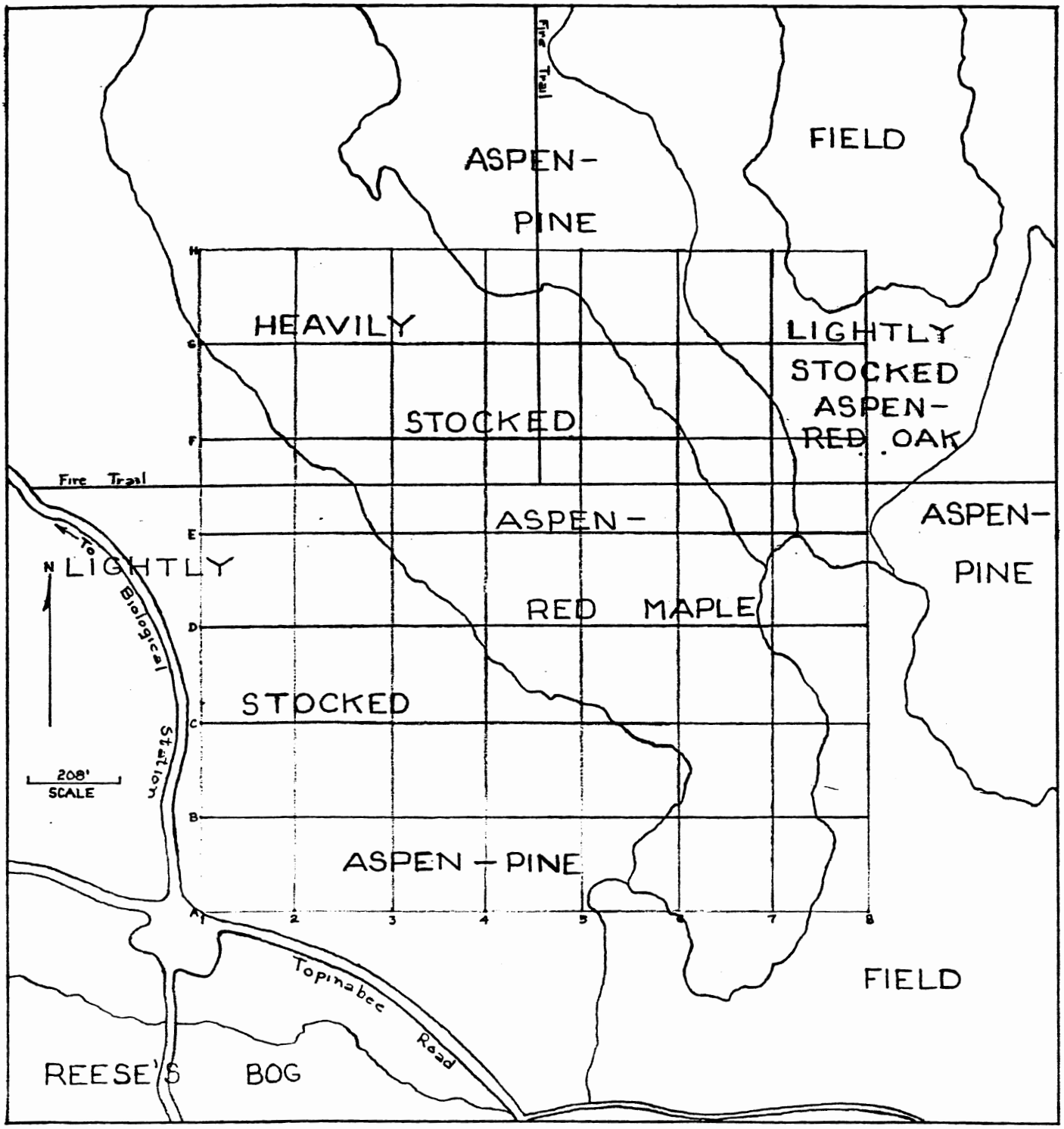


Table 5.

BIRD POPULATIONS FROM VARIOUS LOCATIONS AND HABITATS

Investigator	Habitat	Locality	No. of Species	Prs./100 Acres
Saunders	Meadow	Allegany State Park, New York	6	46.9
"	Field	" " " " "	1	8.8
"	Maple-Beech	" " " " "	14	40.1
"	Aspen-Red Maple	" " " " "	14	37.2
Kendeigh	Spruce-Fir	Black Sturgeon Lake, Canada	42	319+
"	Hemlock-Maple-Beech	New York State	-	165
Cadbury and Cruickshank	Red- White Spruce	Hog Island, Maine	21	242
Garst	Aspen	Cheboygan Co., Mich.	30	59
Vandegrift and Ritsema	Aspen	" " "	20	65+
Prescott	Pine	Emmet " "	25	87
Hofslund	Beech-Maple	Cheböygan " "	33	156
Riggs	Cedar-Balsam	" " "	26	148
"	Aspen-Cedar-Balsam	" " "	28	139
James	Aspen	" " "	13	56

Table 6

TREE COUNT DATA

Species	Diameters in Cetimeters						
	0-2.5	2.5-5	5-10	10-20	20-30	30-40	% of total
Acer pennsylvanicum	3	1	-	-	-	-	*
Acer rubrum	44	60	22	-	-	-	13
Acer saccharum	3	1	-	-	-	-	*
Amalanchier canadensis	2	3	-	-	-	-	1
Betula papyrifera	46	58	16	1	-	-	12
Fagus grandifolia	-	1	-	-	-	-	*
Pinus resinosa	4	1	1	2	1	3	1
Pinus strobus	2	-	-	-	-	-	*
Populus grandidentata	58	153	236	76	3	-	53
Populus tremuloides	9	24	12	2	-	-	5
Prunus pennsyvanicum	6	1	-	-	-	-	1
Quercus borealis	17	18	36	6	-	-	8
Rhus glabra	26	-	-	-	-	-	3
Rubus allegheniensis	3	-	-	-	-	-	*
Salix discolor	36	-	-	-	-	-	4
Viburnum acerifolium	4	-	-	-	-	-	*

1001 is the total number of trees counted.

Table 7

LIST QUADRAT DATA

Species	F.I.
Abies balsamea	*
Acer pennsyvanicum	*
Acer rubrum	16
Acer saccharum	*
Agrostis hyemalis	*
Amelanchier canadensis	*
Amelanchier spicata	3
Antennaria canadensis	3
Apocynum androsaemifolium	2
Arabis glabra	*
Aralia nudicaulis	6
Arctostaphylos uvaursi	*
Asclepias syriaca	*
Aster laevis	15
Aster macrophyllus	3
Betula papyrifera	8
Carex sp.	*
Chimaphila umbellata	6
Clintonia borealis	2
Comandra umbellata	3
Convolvulus spithamaeus	2
Cypripedium acaule	*
Danthonia spicata	2
Diervilla lonicera	43
Epigea repens	2
Epilobium angustifolium	*
Erigeron philidelphicus	*
Fagus grandifolia	*
Fragaria virginiana	*
Gaultheria procumbens	47
Gaylussacia baccata	2
Hieracium aurantiacum	2
Hieracium venosum	*
Hypericum pefforatum	2
Lonicera canadensis	*
Mianthemum canadense	3
Melampyrum lineare	14
Mitchella repens	*
Moss and Lichen cover	15
Oenothera sp.	*
Oryzopsis asperifolia	8
Oryzopsis pungens	30
Panicum meridionale	3
Pedicularis canadensis	*
Pinus banksiana	*
Pinus resinosa	9
Pinus strobus	*
Poa compressa	8
Polygala pauciflora	6
Populus grandidentata	21
Populus tremuloides	5

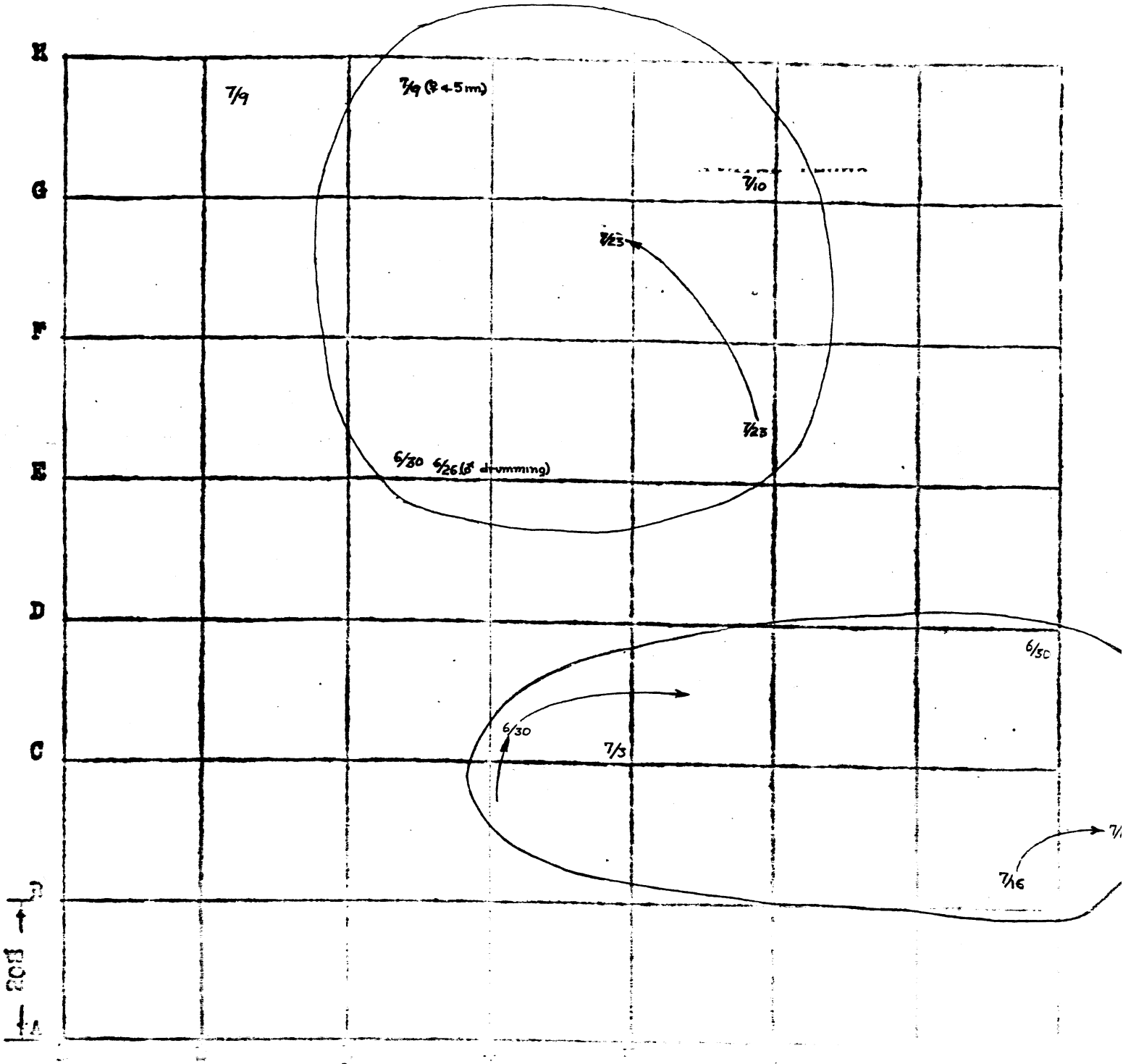
Species	F.I.
Prenanthes racemosa	*
Prunus pennsylvanica	*
Pteris aquilina	84
Pyrola asarifolia	5
Pyrola secunda	2
Quercus borealis	11
Ranunculus acris	*
[illegible]	
Rhus glabra	13
Rubus allegheniensis	16
Rumex acetosella	*
Salix discolor	2
Solidago canadensis	*
Solidago hispida	22
Trientalis americana	2
Tragopogom pratensis	*
Vaccinium pennsylvanicum	25
Vaccinium canadense	3
Viburnum acerifolium	3
Vicia sp.	*

F.I.-**--Frequency Index

* The species that did not occur in the quadrats but were seen in the area.

Figure 1

RUFFED GROUSE AND BLACK-BILLED CUCKOO



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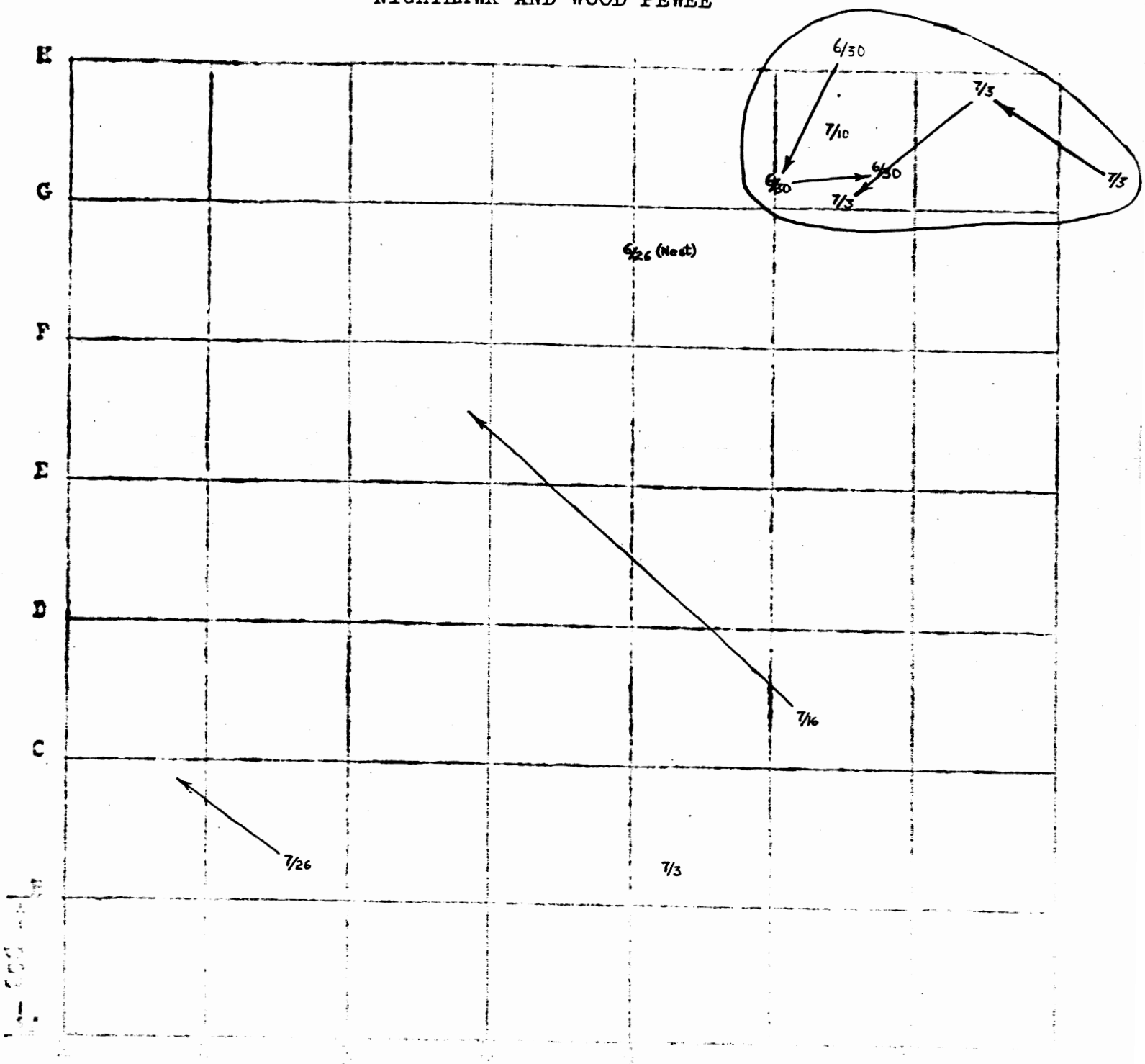
June 30, 1947 - - - - 6/30
July 3, 1947 - - - - 7/3
July 9, 1947 - - - - 7/9
July 10, 1947 - - - - 7/10
July 16, 1947 - - - - 7/16
July 23, 1947 - - - - 7/23

Ruffed Grouse - - - - ▬

Black-billed Cuckoo - ▬

Figure 2

NIGHTHAWK AND WOOD PEWEE



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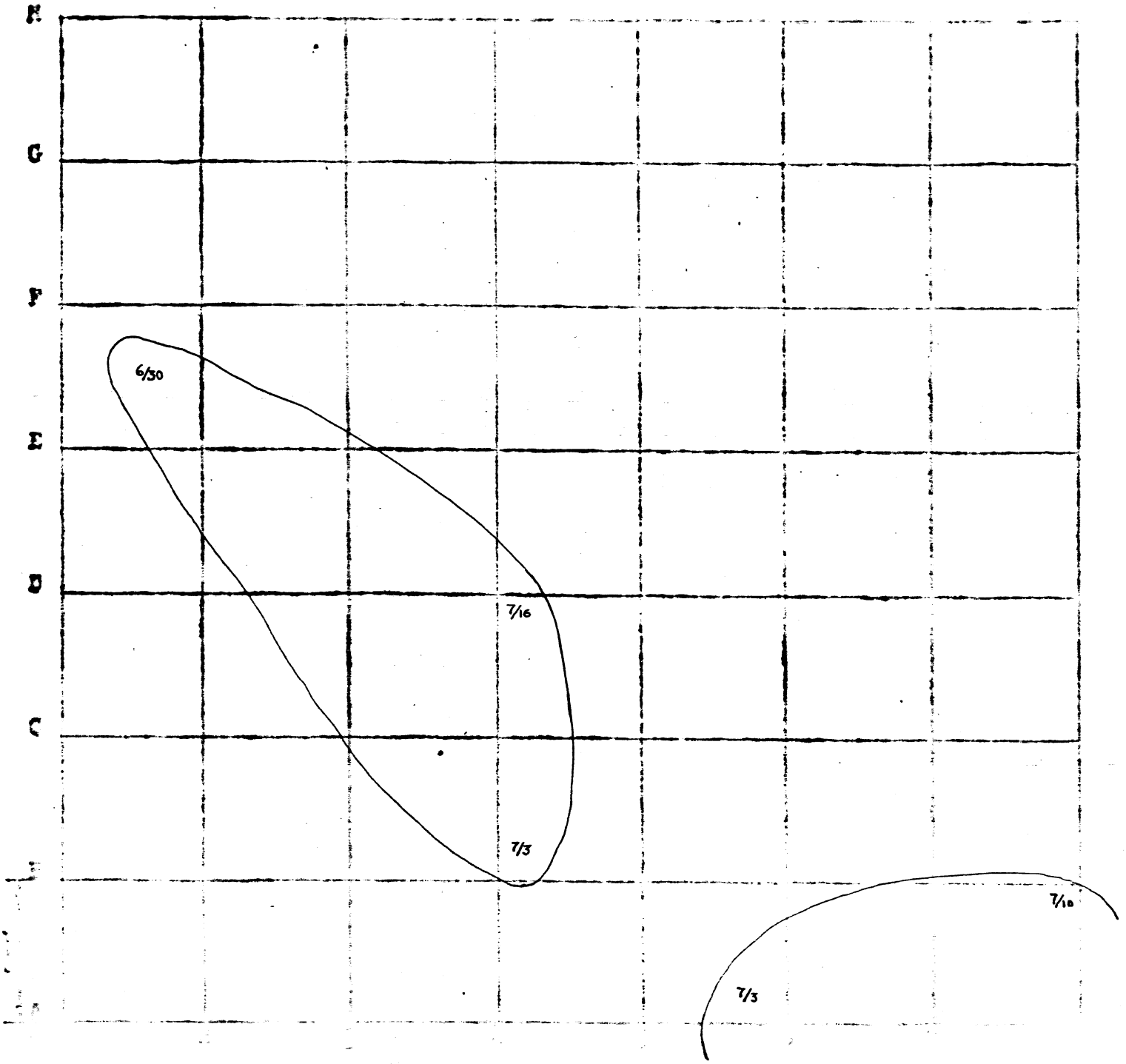
July 10, 1947 - - - - 7/10
July 16, 1947 - - - - 7/16
July 26, 1947 - - - - 7/26

Nighthawk - - - - - - -

Wood Pewee - - - - - -

Figure 3

BLUE JAY

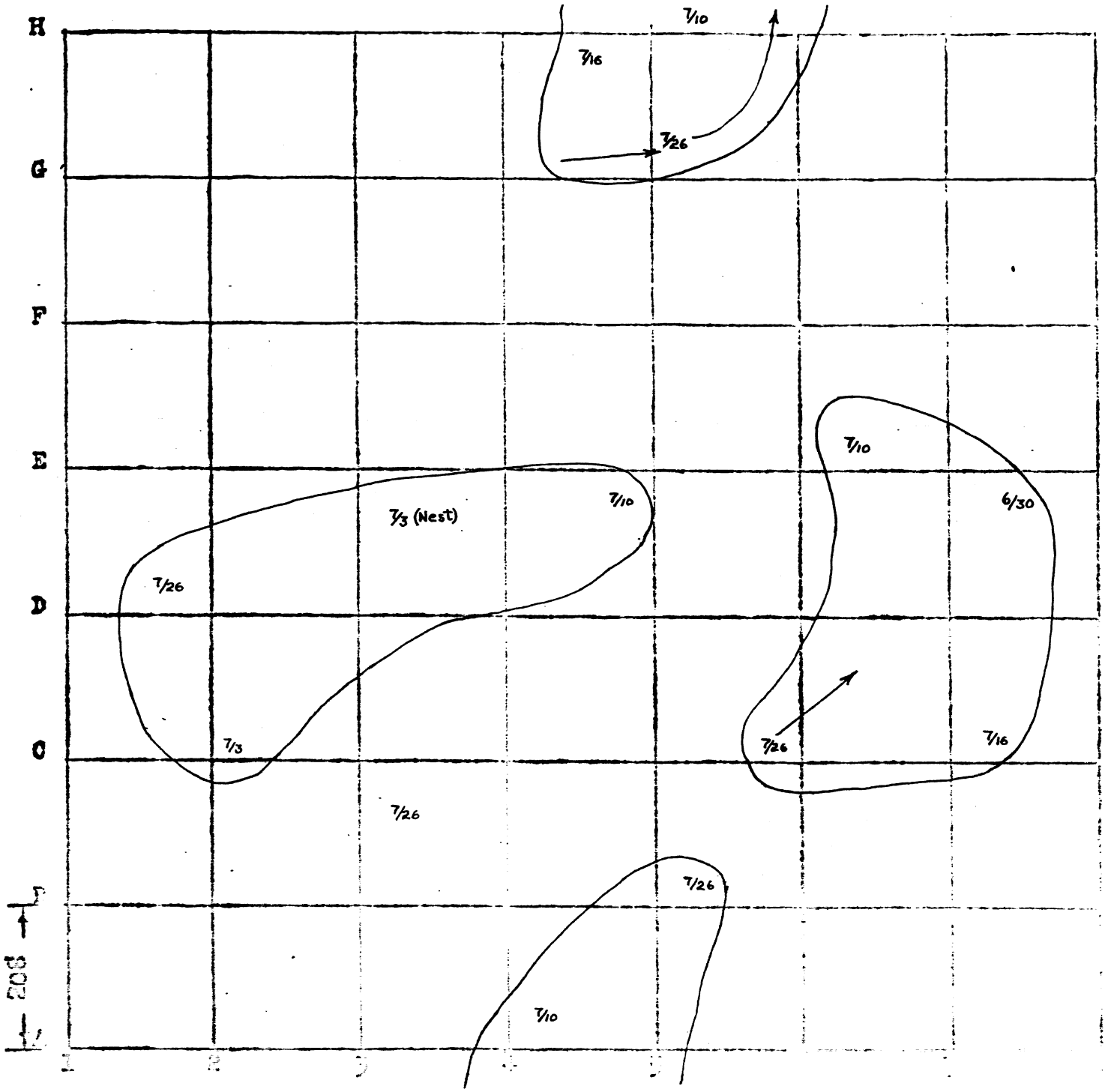


June 30, 1947 - - - - 6/30
July 3, 1947 - - - - 7/3
July 10, 1947 - - - - 7/10
July 16, 1947 - - - - 7/16

Blue Jay - - - - - ▬

Figure 4

ROBIN



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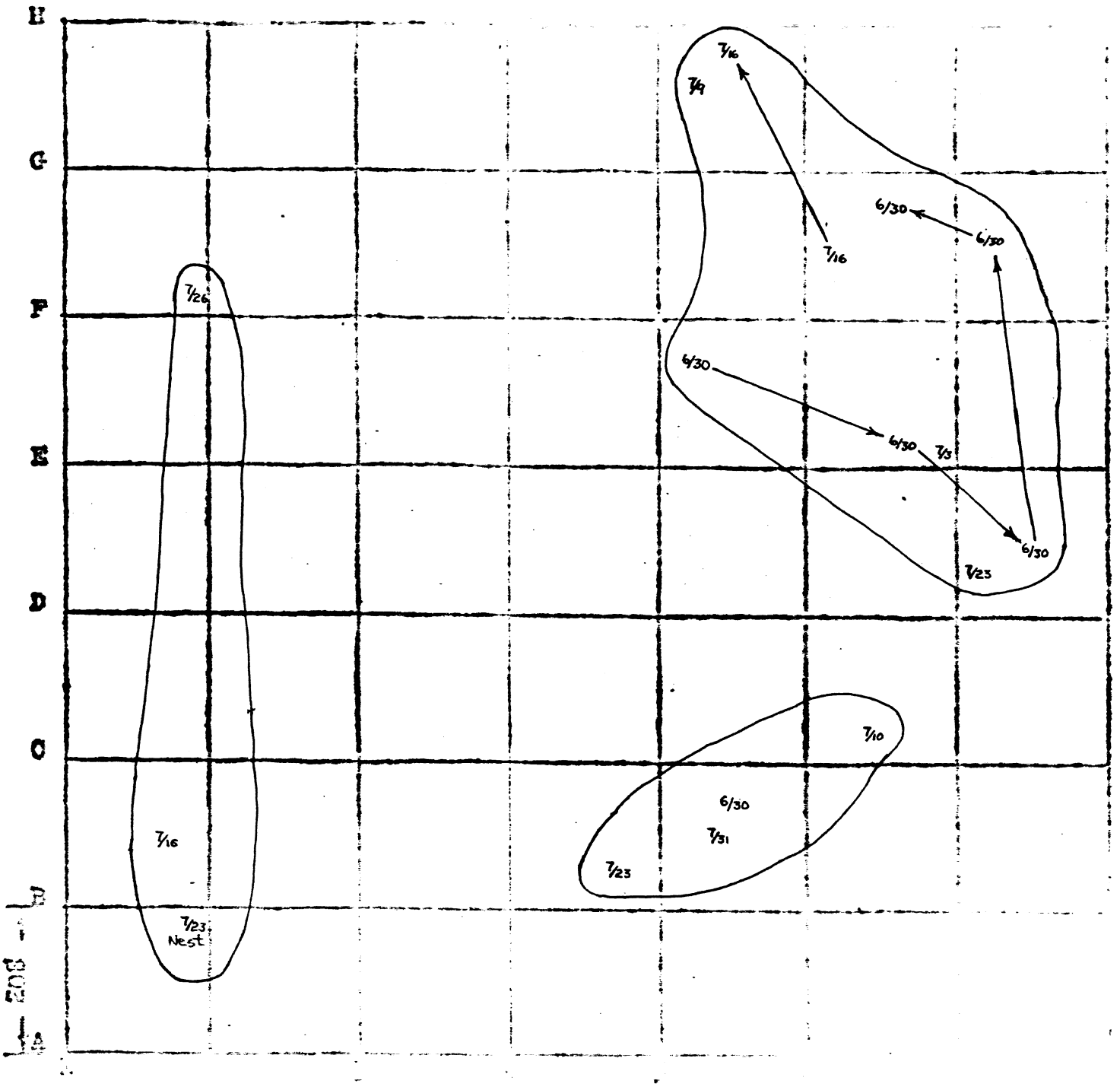
July 3, 1947 - - - - 7/3
July 10, 1947 - - - - 7/10
July 16, 1947 - - - - 7/16
July 26, 1947 - - - - 7/26

Robin - - - - - - -

Figure 5

HERMIT THRUSH



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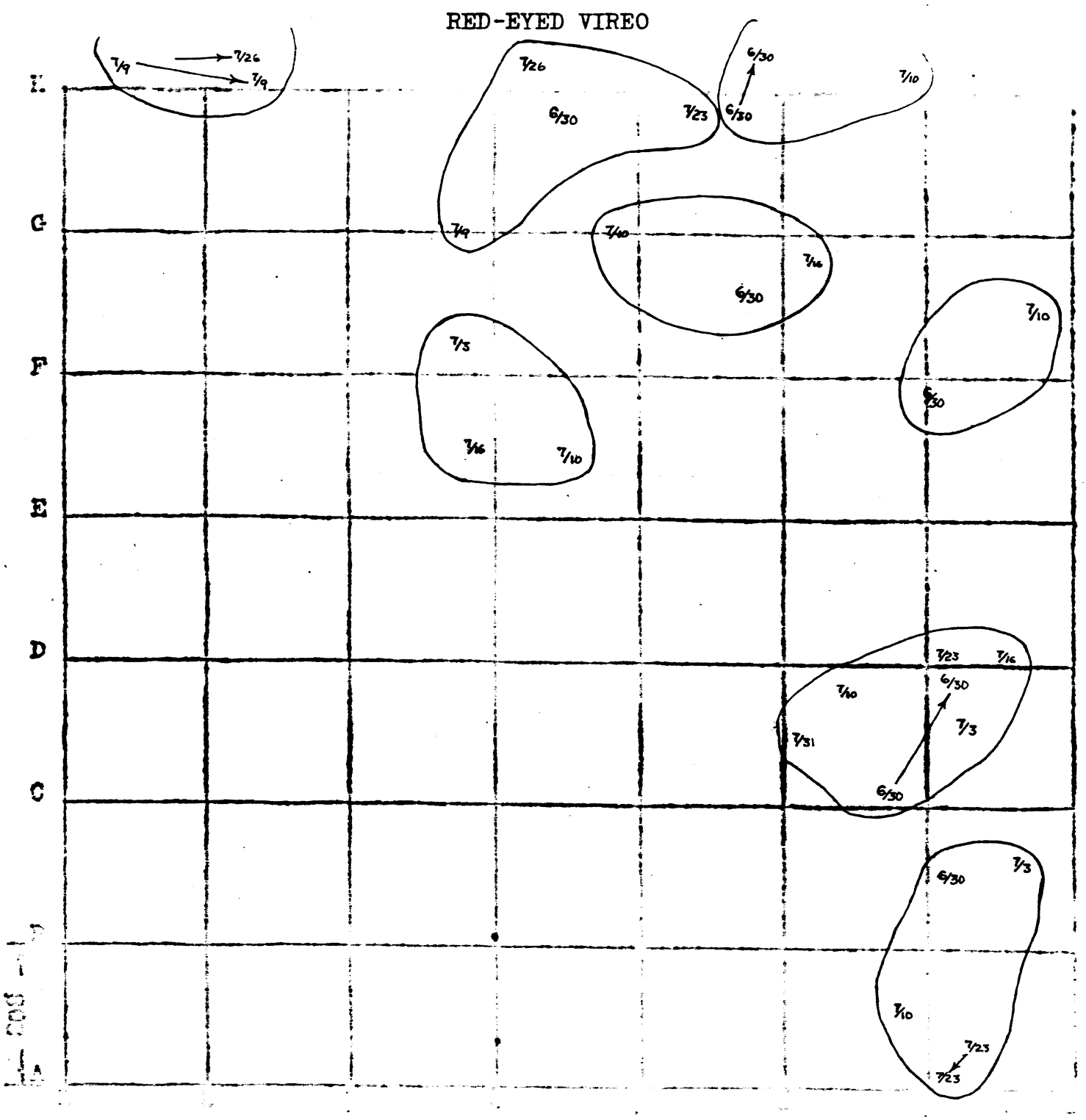
July 9, 1947 - - - - 7/9
July 10, 1947 - - - - 7/10
July 16, 1947 - - - - 7/16
July 23, 1947 - - - - 7/23
July 26, 1947 - - - - 7/26
July 31, 1947 - - - - 7/31

Hermit Thrush - - - - ■

Figure 6



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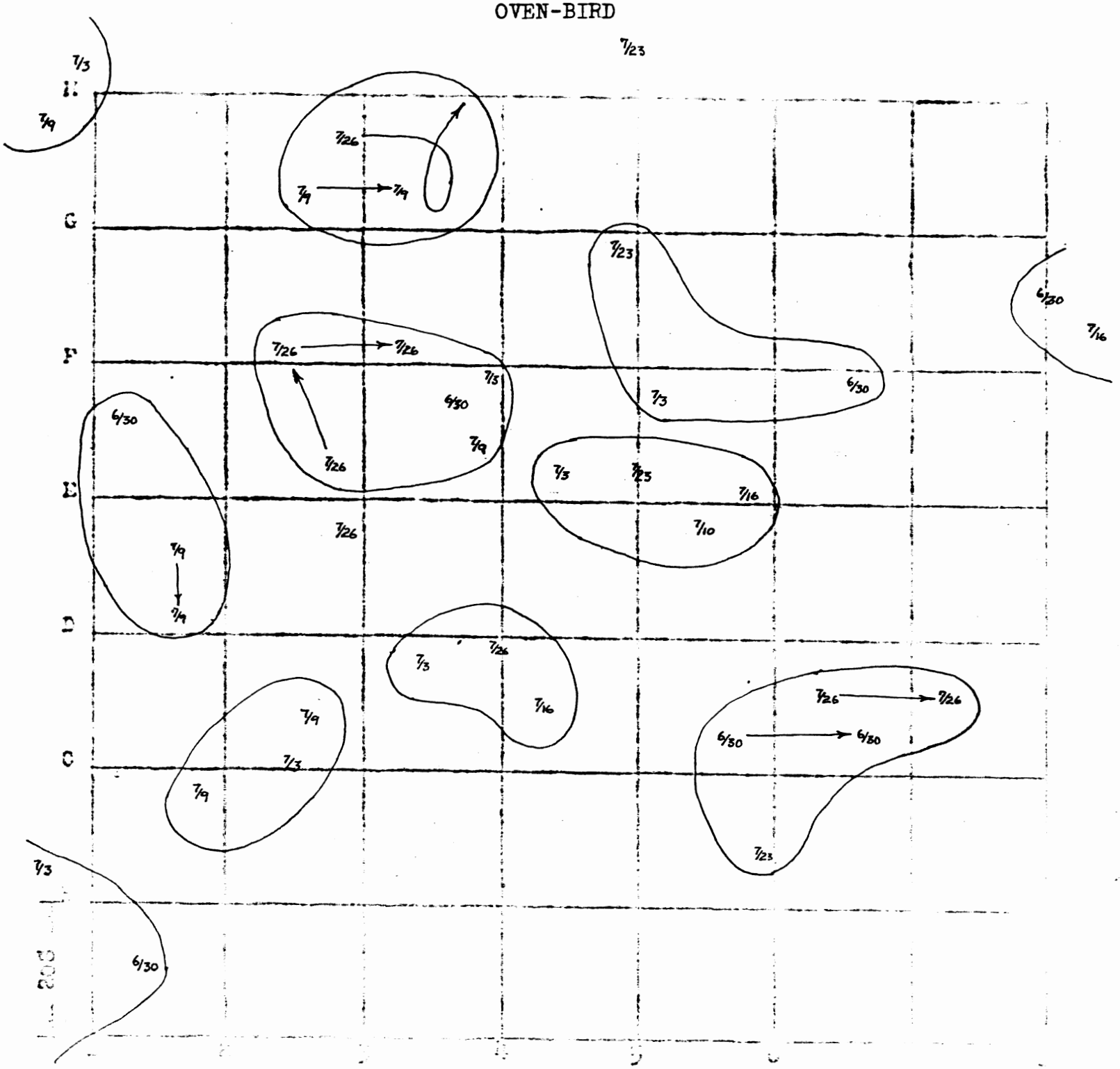
July 10, 1947 - - - - 7/10
July 16, 1947 - - - - 7/16
July 23, 1947 - - - - 7/23
July 26, 1947 - - - - 7/26
July 31, 1947 - - - - 7/31

Red-eyed Vireo - - - - ▬

Figure 7

OVEN-BIRD



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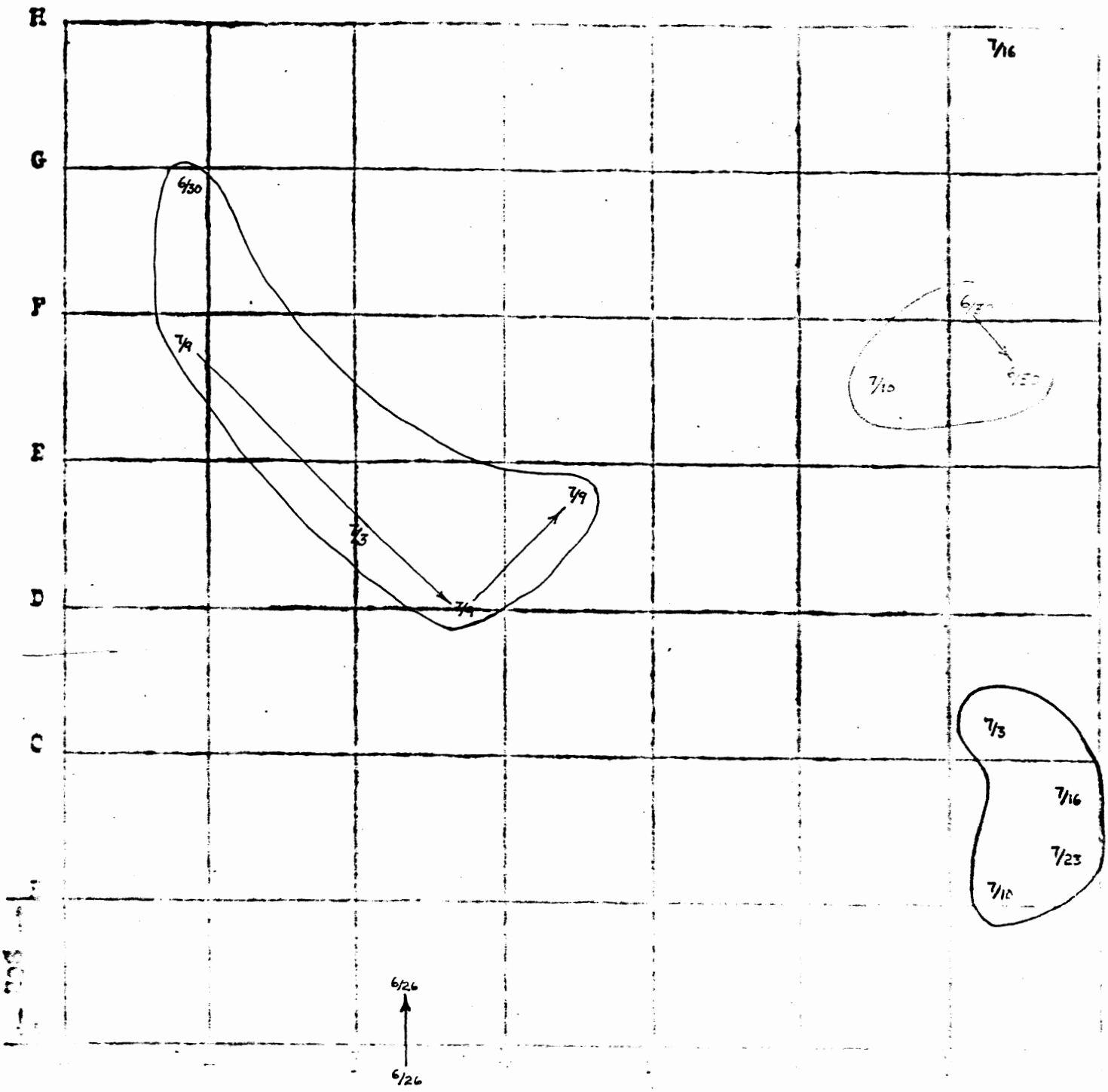
July 3, 1947 - - - - 7/3
July 9, 1947 - - - - 7/9
July 10, 1947 - - - - 7/10
July 16, 1947 - - - - 7/16
July 23, 1947 - - - - 7/23
July 26, 1947 - - - - 7/26

Oven-bird - - - - - ▬

Figure 8

SCARIET TANAGER, VESPER SPARROW, AND CHIPPING SPARROW



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June 30, 1947 - - - - 6/30
July 3, 1947 - - - - 7/3
July 9, 1947 - - - - 7/9
July 10, 1947 - - - - 7/10
July 16, 1947 - - - - 7/16
July 23, 1947 - - - - 7/23
July 26, 1947 - - - - 7/26

Scarlet Tanager - - - -
Vesper Sparrow- - - - -
Chipping Sparrow- - - -