STUDIES OF THE EASTERN RUFFED GROUSE

(Bonasa umbellus umbellus)

IN MICHIGAN

Thesis for the Degree of Ph. D.

Lee William Fisher

1937

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Thesis

Submitted to the Faculty of the Michigan State College
in Partial Fulfillment of the Requirements for the Degree of
Doctor of Philosophy

by

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Zoology Department
East Lansing, Michigan

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Picture by Jack Van Coevering of female grouse showing her reluctance in leaving the young chicks while they are being handled by the author.

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INTRODUCTION

Ruffed grouse (Bonasa umbellus umbellus) studies received its first impetus in Michigan, when in 1924, a National Cooperative Committee was formed in order to determine what diseases or parasites might be responsible for the sudden decrease in the population of these birds which occurred at this time throughout most of its range. The Michigan Department of Conservation in cooperation with other State Conservation Departments, local organizations, and sportsmen, actively participated and contributed to the investigation.

As far as discovering any particular disease or parasite to be a direct cause in the decimation of the birds, the results from these studies by the National Committee were not significant. However, it was soon apparent from the studies that very little was actually known concerning some of the diseases, parasites, foods, and many other factors that may affect the ruffed grouse in its various habitats. Therefore, in Michigan as well as in many other localities, investigators took up the challenge and directed their attention to the preservation of this native game bird, in order that it should remain a permanent member of our avifauna.

A second impetus to the study of upland game birds in Michigan, was received in 1928, when the Michigan Department of Conservation created a new Game Division. The new

division became responsible for those conservation activities having to do with the management and conservation of the state's game and non-game birds, game and fur-bearing animals. In order to carry on the various functions of the new division, several trained specialists were added to the staff, of which one or more were game bird specialists.

A definite program for ruffed grouse studies was initiated at this time. By 1932 several areas in the state had been selected as being typical of their respective regions, and carefully mapped as to the different forest cover types. Censuses were begun and taken at regular intervals. The present work is a continuance of these ruffed grouse studies, and only a part of an extensive survey and research program that the Game Division is carrying on with upland game birds in Michigan.

PURPOSE OF STUDIES: In February of 1934, it was my good fortune to receive through the Michigan Department of Conservation the opportunity to take part in the ruffed grouse studies. The purpose of the work at this time was to continue the censuses, from which data information was to be obtained on the distribution, cover type preference, relative number of birds to the total area and per unit of cover type. It would also give a check on the relative abundance of the birds during the changes in the cycle.

From September 1935 to December 1936, the writer was able, through the facilities and financial aid received from the Michigan Game Division, to remain on the grouse areas that are located in the Pigeon River State Forest. The purpose was to collect data on the general habits of the ruffed grouse; to determine some of the factors that control their abundance; to continue the censuses; and to determine the possibility of increasing the species locally through management of cover.

It was with the hope that by using the census methods, as later described, a reliable estimate of the number of birds could be determined on a known area at various periods of the year. Thus the decreasing and increasing abundance in the number of ruffed grouse, as well as the high and low point in the cycle of this bird could be closely followed. Also, it was with the hope that from the studies on the general habits and the decimating factors such as diseases, parasites, predators, and others some clue might be obtained as to what factor or combination of factors might be responsible for the periodic fluctuation in the numbers that occur in this species; and, whether or not it would be possible to increase the birds locally by the manipulation of some of the factors which are known to affect the birds.

HISTORY AND DISTRIBUTION OF THE RUFFED GROUSE IN MICHIGAN

It is difficult in our day to visualize the great abundance of certain species of animals that formerly existed throughout the State of Michigan. As with the ruffed grouse, many of the species are now reduced to a relatively small number, or like the passenger pigeon and wild turkey are totally absent from our fauna.

The following excerpts taken from "Recollection of My Fifty Years Hunting and Fishing", by Mershon (1923) gives one a general idea of the enormous number of grouse that formerly were found throughout Michigan.

"It is almost unbelievable how plentiful ruffed grouse were in this part of Michigan ..... leaving Saginaw .... out ten or twenty miles ..... towards the four points of the compass. I killed more than Archie .... we had thirty-two quail and twenty-six grouse between us for the day. These were big bags of course, but not anywhere near what the professionals or market shooters considered a good day."

Mershon quotes a letter received from C. E. Pettit, a former market hunter, in which he states:

"One season in particular I remember Thomas Bros. shipped over 4,000 birds, mostly killed by us five hunters. The season of 1891 my brother and myself started out on the morning of September 1st .... this being a trip of twenty

miles by section line. That day I killed forty birds, all partridge .... I should think we put up about 2,000 birds. We never followed them as we could find plenty on our regular course."

According to the foregoing account of the tremendous drain upon the grouse population by the market hunters, we are fortunate that market shooting was made illegal in 1894, or the ruffed grouse might have accompanied the passenger pigeon.

The following comments on ruffed grouse conditions were expressed by Mr. Boutell, at one time the President of the Saginaw Field and Stream Club. (Mich. Dept. Conservation Bien. 1925-1926).

"On the North Branch, Au Sable, partridge were plentiful in 1910. Decrease was evident in 1915. In 1917 they were scarce. In 1918 the season was closed. For the next four years they were plentiful. Our camp took about 50 birds in 1919, repeating in 1920. Despite this shooting the birds were more plentiful in 1921 than I had ever seen them before in that locality. We took upwards of 50 that year, repeating in 1922. In 1923 they showed marked decrease and in 1924 were very scarce. Last year (1925) I found few during the open season, due perhaps to unfavorable weather conditions and our camp took less than a dozen."

A review of the enactments of game laws casts a possible enlightment on the periodic fluctuations in the abundance of ruffed grouse, as well as the general interest shown in

the bird's protection and preservation.

The first game law limiting the killing of ruffed grouse in Michigan was enacted in 1894 when market shooting was made illegal. In 1910 the open season was eleven days, with a daily bag limit of ~~six~~ 12. In 1918 during a scarcity of grouse the season was closed throughout the year. In 1919 the season was opened with a daily bag limit reduced to five. Again, due to the scarcity of the birds, the season was closed throughout the years of 1927 and 1928, in the Lower Peninsula and during 1927, 1928, 1929, 1930, and 1931, in the Upper Peninsula.

At the present time the daily bag limit is five birds with an open season of eleven days in the Lower Peninsula and Upper Peninsula. Hunting may be prohibited in various localities from year to year, according to the increase or decrease in the abundance of grouse.

The distribution of the ruffed grouse in Michigan is shown in Map VI, and is based on reports received from the local conservation officers, sportsmen, and others. The Michigan Department of Conservation Biennial Report of 1929-1930 refers to these records as follows:

"These reports show that extensive areas of partridge territory are found only in the upper two-thirds of the state, but that some partridge are present in all the counties but two. Even in the northern counties, however, the quality of cover varies greatly in different localities, and large areas of wild land may have little or no cover suitable for grouse."

GENERAL DESCRIPTION OF MICHIGAN

TOPOGRAPHY: The State of Michigan lies within north latitude 41°45' to 48°20' and west longitude 82°25' to 90°34'. It is divided by a body of water into the Upper Peninsula and the Lower Peninsula. The state measures approximately 425 miles from north to south and 325 from east to west. The total area is 58,915 square miles, with a coast line of more than 1,600 miles.

The elevation in the Upper Peninsula ~~ranges~~ varies from 400 feet to 2,000 feet above sea level. The western part is rugged and hilly, while the eastern part is mostly smooth to rolling and slopes northward from its southern border to the shores of Lake Superior. This region contains many lakes, swamps, and marshes, also forests of pine intermixed with hardwood.

The elevation of the Lower Peninsula ~~ranges~~ varies from 400 feet to 1,700 feet above sea level. However, approximately eighty-five per cent of the Lower Peninsula is below 1,000 feet. The average elevation of the entire state is 840 feet above sea level, that of the Lower Peninsula 854 feet. The surface in general is level or rolling, sloping up in its northern portion to a central watershed which extends approximately northeast and southwest, the highest part of which is located in Otsego county, and is 1,100 feet above sea level.

Barrows (1912) writes of the topography of Michigan as follows: "Geographically, Michigan is one of the most in-

teresting states in the Union for bird study, stretching from the southern prairies to the great evergreen forests of the north, and touching as it does all the Great Lakes except Ontario, ----. It includes almost every variety of surface found in the eastern United States, with the exception of salt marshes and lofty mountains.----. Great marshes are found here and there; thousands of lakes are scattered among the broad savannas of the south and the wooded wildernesses of the north, and a dozen goodly rivers and innumerable smaller streams gather the abundant rainfall and carry it sooner or later to the Great Lakes."

CLIMATE: Seeley (1922) states that the average temperature for Michigan *varies* from 38°F. in the interior, elevated portions of the Upper Peninsula, to 49°F. in the most southern counties. Due partly to the lake effect on climate he found that the annual rainfall in the lake region was over thirty inches while in such non-lake states as the Dakotas it was less than twenty inches. Likewise that the snowfall was greater near the lakes than it was inland, the greatest amount falling along the southern coast of Lake Superior and the eastern coast of Lake Michigan; that the annual snowfall along the shore of Lake Michigan was from fifty to sixty inches in contrast to the thirty to fifty inches which falls in most of the areas in the interior of the state; that in the southern portion of the Upper Peninsula the snowfall was less than fifty inches, and in the Lake Superior region the ground was

often covered with one to five feet of snow from the middle of autumn to the late spring.

The influence of the Great Lakes on the degree of cloudiness is very interesting as well as enlightening. Seeley explains that the unusually cloudy weather in Michigan during the late fall and winter months, especially in the western half of the Lower Peninsula is due to the warm, moist air over the lakes being carried land-ward by the prevailing westerly winds, and clouds are continuously formed by condensation when the colder land areas are reached. Quoting Seeley, he says: "In fact with the exception of portions of New York state, along the eastern end of Lake Erie, and in the eastern portion of the Upper Peninsula of Michigan, there is less sunshine along the Lake Michigan shore than in any other section of the country. In January the actual sunshine in western Michigan is less than twenty per cent of the possible amount."

SOILS AND PLANT DISTRIBUTION: Veatch (1933) roughly divides the soils of Michigan into two broad groups (although a large number of soil types are recognized), the Northern group and the Southern group and are separated by a rather arbitrary line of division. In the southern two-thirds of the Lower Peninsula are included the soils of the Southern group, while the soils of the upper one-third of the Lower Peninsula and all of the Upper Peninsula are included in the Northern group. He traces the soil peculiarities which

afford a basis for the two groups primarily to the differences in climate, and describes the two soil groups as follows: "The soils of the north are characterized by a relatively thick layer of organic matter or forest mold at the surface of the virgin soil; a grayish, or ashy color and a leached appearance of the surface mineral soil; and a brownish layer, colored by organic matter, at shallow depths. The soils of the Southern group are of a light-brown and brown color at the surface, the thickness of true humous soil is greater than in the north, the colors, due to various iron oxides, developed by weathering processes, are marked, and a layer at shallow depths in which there is a maximum clay and colloids. The gray mineral soil layer and the brown layer due to organic compounds which characterize the North group are absent or only faintly developed."

It is significant to note that the flora of Michigan is also roughly divided into two large divisions, the flora of the hardwood lands and the flora of the softwood lands; the first representing the Appalachian flora and the second the Canadian. The Appalachian flora representing the hardwood lands lies in the southern two-thirds of the Lower Peninsula which corresponds to the area occupied by the Southern Group of soils. The soils in this section consist mostly of fertile sand, clay, or loam, practically cleared of the original forests, and largely cultivated. The river valleys support a growth of oak, frequently interspersed with walnut and hickory. Along the margins of streams and swamps are found the soft

maples, elm, white and black ash, swamp and chestnut oak, sycamore, and butternut, while in the swamps, such shrubs as the willows, dogwoods, viburnums, and buttonbush are abundant. On the dryer ground, the hazel, hawthorn, witch-hazel, June berry, wild cherry are common. In the marshes, tamarack along with such plants as poison sumac, gooseberry, false solomon's seal, pitcher plants, and orchids are common. On the uplands, and away from rivers and streams, beech and maple and oak forest are found in about equal proportions.

Roughly, the Canadian flora representing the softwood lands lies in the upper one-third of the Lower Peninsula and in the whole of the Upper Peninsula. On its southern border lies the pine country which embraces about 15,000 square miles. This area is composed largely of sandy hills and plains, which are mostly covered with large stands of Jack pine interspersed with white and red pine. Scattering argillaceous tracts wooded with beech and maple and occasional ridges of oak also occur. In the numerous swamps are found the lowland types such as spruce, balsam and cedar. Yellow and white birch begin to be a common forest tree. Proceeding north from the pine country to the northern border of the Lower Peninsula are to be found deep forests of hemlock and yellow birch mixed with striped maple and having underneath a tangle growth of ground hemlock, and under all a carpet of moss. Alternating with these are sandy plains covered with a dense growth of blueberries; large forests of sugar maples and basswood; extensive areas of aspen with cherry, white birch, and blackberry canes which

have followed the cutting and fire; numerous swamps of spruce, balsam, cedar, and tamarack, and in certain districts considerable beech associated with pine.

On the physiography of the Upper Peninsula Westveld (1933) reports as follows: "The physiography and vegetation of the region is extremely diversified. The altitude varies from less than 600 to more than 2000 feet above sea level. Differences in topography are noticeable. In some parts of the region the surface is mostly smooth to undulating while in other parts it is rolling to precipitous. Extensive muck and peat swamps interspersed between the uplands give additional character to the diversified topographic features.

"A variety of soils occur in the Upper Peninsula of Michigan. Sand, loam, silt, clay, muck, and peat all occur extensively. The natural forest cover is as diversified as the soil. The sands support forests of Jack pine, Norway pine, and white pine; the loams support a deciduous forest in which beech, sugar maple, yellow birch, and hemlock are conspicuous; the silts and clays usually support a mixture of swamp conifers and deciduous trees; and the muck and peats support a mixture of swamp conifers of which black spruce, northern white cedar, balsam fir, and tamarack are the most common. The aspen forests which followed cutting and fire on many different classes of soil add further variety of forest cover."

DESCRIPTION OF THE RUFFED GROUSE CENSUS AREAS

The Ruffed Grouse Census Area I is located in the Pigeon River State Forest, in T 33N-R1W, Nunda Township, Cheboygan County, comprising of sections 29, 30, 31 and 32. The forest proper lies in Cheboygan, Otsego, and Montmorency Counties, and contains 113,203 acres, of which the state owns sixty-eight per cent. (See Map I and VI).

The Census Area contains approximately 2,520 acres of second growth forest. It was selected as being typical of the large areas of grouse country in this region.

The soils of the area are mainly sands and sandy loams which are medium in fertility. The land is partly rolling to hilly and remains in a wild and cut-over condition, but originally supported pine forests. Coniferous swamps are scattered throughout the area which contain such lowland tree types as spruce, cedar, balsam fir, and tamarack. On the margins of these swamps may be found the dogwoods, willows, and alders. On the uplands are found mixed and pure stands of poplar, maple, beech, basswood, cherry, birch, jack pine, and a scattering of red and white pine. The ground cover plants such as bracken, wintergreen, lichen, briers, and grasses are common. Several small streams and a beaver dam are present on the area. See Map I for a more detailed description of the area.

The Ruffed Grouse Census Area II is located in the Pigeon River State Forest and only a few miles from Area I,

in T 33N-R1W, Nunda Township, Cheboygan County, sections 13, 14, 23, and 24. (See Map II and VI).

This area is similar in size, cover types, topography, and soils as Area I. Likewise there are present on the area several small streams and a beaver pond. See Map II for a more detailed description of the area.

The Ruffed Grouse Census Area III is located in the Houghton Lake State Forest, Roscommon Township, Roscommon County, sections 21, 22, 27, and 28. The forest contains 172,949 acres, of which the state owns thirty-five per cent. (See Map III and VI).

The Census Area contains approximately 2,574 acres of second growth forests. It was selected as being typical of the grouse country in this region.

The soils of the area are mainly sands and sandy loams which are low in fertility. The land is nearly level to gently undulating and originally supported dense forests of red and white pine. There are scattered throughout the area small ridges of oak and swamp areas of spruce, balsam, cedar, and tamarack which are interspersed with mixed and pure stands of jack pine, poplar, maple birch, hemlock, and some red and white pine. The ground cover plants such as bracken, sweet fern, lichen, briers, and grasses are common. See Map III for a more detailed description of the area.

The Ruffed Grouse Census Area IV is located in the Forest of the Munuscong State Park, Pickford Township, Chippewa County, in parts of sections 14, 15, 22, 23, 25, and 26.

It will be noted by referring to Map IV that this area contains parts of six sections, in order to get all representative species or the major cover types in the censused area. The park contains 3,756 acres which are owned by the state. (See Map IV and VI).

The Census Area contains approximately 2,044 acres of second growth forests. It was selected as being typical of the ruffed grouse country in this region.

The soils of the area are mainly fine sandy loams which are fertile but poorly drained. The land is level and supports scattered stands of mixed conifers and swamp hardwoods, mainly balsam fir, spruce, cedar, hemlock, white pine, elm, ash, balm-of-Gilead, and red maple. Alternating with these are mixed stands of poplar, willow, and white birch. There are present on the area several small streams and beaver dams. See Map IV for a more detailed description of this area.

The Ruffed Grouse Census Area V, known as the Rudyard Area, is located north of the village of Rudyard, in Kinross Township, Chippewa County, T 45N-R1W, 2W, sections 7, 18, 12, and 13. (See Map V and VI)

This area contains approximately 2,161 acres which supports second growth forests. The soils of the area are mainly sands and sandy loams which are interspersed with areas of muck and peat. The muck and peat lands support a mixture of swamp conifers of which spruce, cedar, balsam fir, and tamarack are the most common; the sandy loams support decidu-

ous stands in which maple, birch, and hemlock are common. Poplar stands are scattered throughout the area and alternating with these are mixed and pure stands of alder and willow. There are present on the area several small streams and beaver dams. See Map V for a more detailed description of the area.

CENSUS METHODS

Various methods of enumerating animals have been developed. Dice (1930) gives census techniques for birds, and (1931) for mammals; Wight (1931) for pheasants; Leopold (1931), (1933), Stoddard (1931), and McLean (1930) for quail; Yeatter (1932) for Hungarian Partridge; Maxwell (1911), Malcalm (1912), Leopold and Ball (1931), for red grouse; Schmitt (unpublished) for prairie chickens; King (unpublished), and Clarke (1936), for ruffed grouse; and Lincoln (1930), for waterfowl.

In the foregoing literature one finds census techniques which may be used with more or less success for particular species. However, methods which are applicable to a census of one species may not be to another, for each method must be adapted to the habits of the animal being censused. Thus, on account of the peculiar habits of the ruffed grouse ordinary census methods can not be used. Where woods are not continuous and ruffed grouse areas are relatively small, a complete census can be taken by entirely covering or stripping the area. Clarke (1936) based a census on breeding territories. King (unpublished) developed a method of censusing ruffed grouse by counting the number of feigning hens on a sample plot or strip of known area, the hens serving as an index to the number of broods. Another method developed by King (unpublished), and more widely used, is the strip method and commonly known as King's Method.

As the strip method developed by King was used for collecting the census data presented in this paper, the following account describes and illustrates how the method was applied.

The actual census operation required the walking along all north and south, and east and west forty lines. (See Map I.) The area is composed of approximately four square miles, with all census lines blazed out, in order that they may be more readily followed. All birds flushed are marked on the map and flushing distance recorded. The flushing distance is the distance between the observer and the point where the bird flushed.

The unique part of King's method is the formula which he derived in order to calculate the grouse population from the data obtained on the number of birds flushed and their known flushing distance. It is as follows: $P = \frac{A}{X} \times \frac{Z}{Y}$ or $P = \frac{AZ}{XY}$, where P(Total population for area censused)=

$$\frac{A(\text{Total area in sq.yds. of census area}) \times (\text{Total No.grouse on strips})}{X(\text{Total lineal yds. of dist.traveled}) \times (\text{Twice aver.flush.dist.in yds.})}$$

Example

The following is calculated from actual data collected in September 1933, on the Pigeon River Grouse Area I. (See Map I.)

P = Total population for area censused

A = Total area, 2,518 acres or 12,187,120 sq. yds.

Z = Total grouse seen on strips, 66

X = Total distance actually covered, 36 miles or 63,360 yds.

Y = Twice the average flushing distance, 23.6 yds.

$$P = \frac{12,187,120 \times 66}{63,360 \times 23.6} = \frac{804,449,920}{1,487,059.2}$$

P = 540.9 grouse on 2,518 acres or an average of 135 grouse per section.

In addition to calculating the ruffed grouse population by the foregoing method, which for the sake of convenience will hereafter be called Method I in order to differentiate it from the following procedure which is designated as Method II, it is also calculated for each type of cover and degree of stocking. The term "stocking" is defined in the Key to Forest Types on page 20.

The same formula $P = \frac{AZ}{XY}$ or $\frac{\text{Total area x Grouse seen}}{\text{Dist. traveled x Width of Strip}}$ is used for calculating the grouse population in the two methods.

In Method II the total area of each type of cover and degree of stocking in which the birds are flushed is determined by multiplying the width of the strip for that type and degree of stocking by the yards of line running through that type. Then the total area of each type of cover and degree of stocking is divided by the area actually censused and this quotient multiplied by the number of birds seen in that type will give the total number of birds for each type. By adding the number of birds flushed in each of the various cover types the total number is determined for the total area. See Tables VI, VII, and VIII for the total, and per cent of total, amount of line running through each cover type and degree of stocking; and Tables IX, X, and XI for the total, and per cent of

total, amount of area for each cover type and degree of stocking.

Each year the Game Division maintains checking stations on all roads leading into two grouse areas. One located in the Upper Peninsula, the other in the Lower Peninsula. Tally cards are filled out and returned by each hunter, giving information on the number of birds seen per gun hour, birds bagged per gun hour, number of hunters, and the number of hours hunted in the areas. The summation of these reports are tabulated in Table XV.

Censuses were not taken on days of heavy wind or rain. One section was covered per day, and the average census on an area extended over a period of four days.

KEY TO FOREST TYPES

UPLAND FOREST TYPES

Pine
- W- White pine
- N- Norway pine
- J- Jack pine

Upland Hardwood Type
- M- Hard maple, basswood, beech, elm

Miscellaneous
- H- Hemlock with a light scattering of yellow birch and an occasional hard maple, balsam, and cedar
- P- Poplar
- Wb-White birch
- Rm- Red Maple
- O- Oak
- Ch-Cherry
- F- Fire cherry
- Wl-Upland willow

SWAMP FOREST TYPES

Swamp Hardwoods
- E- Elm, black ash, balm-of-Gilead, y.birch, r.maple

Swamp Conifers
- S- Cedar, spruce, tamarack balsam
- Sc- Cedar predominant
- Ss- Spruce predominant
- St- Tamarack predominant
- Sb- Balsam predominant

Marsh and Bog Types

Marsh
- Gs- Marsh grass
- Gc- Cattail marsh

Bogs
- Ll- Leatherleaf bog

Miscellaneous
- A- Alder, willow

Improved Land Types	Open Wild Land Types
Fc-Farm land, stumps	Gr-Upland grass
Fg-Farm land, grass	Su-Sumac
	Br-Briars

Occasionally the species common to two or more types are found growing together. These combination stands are shown on the map by combining the type symbols which represent the species growing in the association. With the exception of Map I, the major type in the combination is designated by placing its symbol uppermost while the symbol representing the minor type is placed below.

The degree of stocking is indicated by short vertical dashes above the symbols as: P''' indicates good stocking, P'' medium stocking, and P' poor stocking. The term "stocking" defines the relative number of trees per acre, and the completeness with which they utilize the available land and light. The diameter is indicated by the figures at the side of type symbol.

PRESENTATION OF THE CENSUS DATA

Descriptions of the five ruffed grouse census areas have been given, and as indicated each consisted of approximately four square miles in area and representing all the major cover types of the respective regions. It was intimated that extensive logging operations and forest fires have taken place in the past throughout each region; therefore the areas consist of well matured second and third growth. All areas have been accessible to public hunting during the open season, with the exception of the Munuscong Grouse Census Area IV.

The censuses on each of the five grouse areas were taken by the following persons:

On Grouse Area I the censuses for 1932 and 1933 were taken by J. H. Stephenson and M. C. Wakeman of the Game Division; for 1934 and 1935 by the writer; and for 1936 by L. C. Buchanan of the C.C.C. and the writer. (See Table I)

On Grouse Area II the census for 1933 was taken by M. C. Wakeman; for 1934 and 1935 by the writer; and for 1936 by L. C. Buchanan and the writer. (See Table II)

On Grouse Area III the censuses for 1932 and 1933 were taken by J. H. Stephenson and M. C. Wakeman; for 1934 and 1935 by G. Entriken of the Game Division; and for 1936 by F. M. Baumgartner of the Game Division. (See Table III)

On Grouse Areas IV and V the censuses were all taken by F. C. Gillette of the Game Division. (See Tables IV and V)

In Tables I, II, III, IV, and V are recorded the numbers of birds seen, width of strips (average flushing distance) in yards, birds on areas, and birds per section by Methods I and II for each of the five grouse areas. Tables VI, VII, and VIII, gives the yards of line and per cent of total amount of line running through each cover type, while in Tables IX, X, and XI, are recorded the area and per cent of total area for the various forest cover types in the Pigeon River, Houghton Lake, and Rudyard Forest areas, respectively. Tables XII, XIII, and XIV, give a summation of the distribution of the ruffed grouse as to cover type, degree of stocking, and whether or not on the margin or interior of the particular cover type for the Pigeon River Area I, Houghton Lake Area III, and Munuscong Area IV. Table XV gives a summation of the yearly reports received from grouse hunters tally cards. On Table XVI is given the percentage of parasitic infestation found in the ruffed grouse in Michigan. The necropsies were performed by Dr. D. R. Coburn, Dr. S. C. Whitlock, and Dr. E. S. Weisner, of the Michigan Department of Conservation, Dr. E. C. O'Roke of the University of Michigan, and Dr. R. C. Green of the University of Minnesota.

A graphic comparison of the ruffed grouse population curves for the various grouse areas are represented in Figure I. Figure II graphically shows the population curves for the various months of each year for the Pigeon River Area I. The per cent of the total area in each cover type for the

Pigeon River Area I, Houghton Lake Area III, and Rudyard Area V are shown graphically in Figure III. In Figures IV, V, and VI the per cent is given of the total number of grouse flushed in each cover type.

Of the twenty-nine sample Forms presented, I to X, include field data collected on nest surveys, X to XIX, on drumming log surveys, and XIX to XXIX inclusive, on brood surveys.

Maps I, II, III, IV, and V, are of the different grouse areas. Map VI shows the general distribution of the ruffed grouse in Michigan and also the general locations of the grouse areas studied. Map VII shows a diagrammatic plan of the grouse management project. One key to forest types and several plates are also included.

DISCUSSION OF THE CENSUS DATA

RUFFED GROUSE CENSUS STUDIES: Two thousand four hundred forty-four grouse were flushed on the census lines. During the one hundred seven censuses that were taken on all areas, from September 1932 to February 1937, approximately three thousand miles of census lines were walked.

The collecting of the census data presented in this paper extends approximately through half of a grouse cycle. It covers a period of declining abundance, a period of scarcity, and, in the Pigeon River Areas, the beginning of a period of increase abundance. Leopold (1931) gives the grouse cycle a length of nine years, but adds, "It is not considered as proven that the cycle is of uniform length, or that the length is nine years." Clarke (1936) gives the grouse cycle a length of between nine and ten years for Canada. It is evident that studies need be carried on over a period of years in order to gather the most meager of information concerning the cycle which affects these birds. However, the methods used in the studies should be analyzed after being given a fair test.

ANALYSIS OF TABLES AND GRAPHS BY METHOD I: In Tables I, II, III, IV, and V, are recorded the data collected on the number of birds seen, width of strip (average flushing distance), birds on area, and birds per section for each census taken.

Note that there was a decided decrease in the number of grouse per section on all the areas from 1932 to 1935, with the exception of the Houghton Lake Area, where the number of grouse were on the increase during 1932. This is shown more clearly by the graph in Figure I, in which the September population, the month of optimum abundance, is plotted for each year. The Houghton Lake Area lags a year behind the others, and the decrease does not occur until 1933. The lag in the number of grouse also shows at the end of the curve, where instead of being on the increase as in Area I and II, the birds are still on the decrease in 1936.

Censuses were not taken in the Upper Peninsula on the Munuscong Area for 1936, and none on the Rudyard Area since 1933. The curves in the graph are completed for these two areas by dotted lines and are based upon field reports received from Conservation officers and hunters. (Table XV).

It will be noticed that the curve for the Munuscong Area turns upward for 1935 and the birds appeared to be on the increase. Apparently this increase was only temporary, for in 1936 the curve drops below the low point of 1934. The same occurs in the Rudyard Area, for the 1936 point is below that of 1935. This would indicate that the grouse on the two areas in the Upper Peninsula are near or at the bottom of the low in the cycle.

As seen in the graph it is obvious that the fluctuation in the abundance of grouse is not uniform for the different

areas studied, and that the percentage of increase or decrease in the number of birds varies considerably for the different areas during the same year. While the grouse may be on the increase in some localities, they are on the decrease in others. This condition was found to occur in the Province of Ontario by Clarke (1936), and to some extent in Wisconsin by Leopold (1931). In addition to showing the period of declining abundance from 1933 to 1935 and the increase in 1936 for the Pigeon River Areas, the graph in Figure II shows the oscillation in the population of the grouse throughout the year. This fluctuation in the population is due to the seasonal fortunes of the birds. The decimating factors such as weather, predators, disease, inherent weaknesses, hunting, and others,each take their toll.

Referring to Tables I, II, IV, and V in general there occurs a significant drop in the number of birds between the September and November censuses of each year. The drop in the number of birds during the interval between these two censuses averages forty-three per cent on the Pigeon River Areas in the Lower Peninsula and forty-six per cent on the Munuscong and Rudyard Areas in the Upper Peninsula.

Since October is the month when the hunting season on grouse is opened in Michigan, one might logically attribute this loss in numbers to the kill by hunters. But, this is not found to be the case, for by the taking of grouse tallies on several tracts (Table XV), it is estimated that the average

number of birds which are killed by hunters from year to year is not over fourteen per cent. From this information it is quite evident that hunting is not the major, but rather a minor factor in the decimation of the grouse, especially when compared to the large numbers which die off each year through the operation of other factors. By carrying on studies in order to learn how and what decimating factors may be controlled, there appears to be no reason why sportsmen cannot continue hunting ruffed grouse in Michigan.

Instead of the expected decrease after the hunting season in the number of birds for the November censuses on the Houghton Lake Area, there is a decided increase (Table III). This increase in the population averages sixteen per cent, and is apparently due to the hunting factor.

From 1925 to 1935 the hunting of ruffed grouse on the Houghton Lake Area was prohibited, while the region around the area was opened to hunting. Apparently the birds tended to move away from the region where shooting was going on, at least temporarily, and sought territory where they were not molested. This increase in the population also occurred in the November census in 1933 on the Munuscong Area and in the 1932 censuses on the Rudyard Area, and was apparently due to the same factor. It may be possible for this to happen on any census area, where, for example, shooting is prohibited; or, when poor weather conditions may force hunters to cover less, or the more accessible territory, than the previous season, when favorable weather conditions may have prevailed.

ANALYSIS OF TABLES AND GRAPHS BY METHOD II: In order to calculate the number of birds per section according to the various natural forest types in which they were flushed (page 19), it was necessary to map and measure the cover types, the degrees of stocking, and the yards of line running through each type, for the areas studied.

These measurements are recorded for the Pigeon River Area I, Houghton Lake Area, and the Rudyard Area in Tables VI, VII, VIII, IX, X, and XI. In Figure III, the per cent of the total area in each cover type is represented graphically, and, on page twenty a key to the forest types with an explanation of the different symbols as used in mapping the areas.

In Tables I, III, and V, in the right hand column it will be seen that the differences in the numbers of birds per section as calculated by Methods I and II are significant. With the exception of four censuses, the populations for Method II are always higher than for Method I, and in some instances considerably so. It is assumed that the populations for Method II approaches nearer to the actual populations on the various grouse areas. This assumption is based on data collected from over fifty weekly grouse censuses which were taken on an area of three hundred and sixty acres, and also from data collected by the complete stripping of areas which were forty acres or more in size.

The area (of three hundred and sixty acres) was selected within the boundaries of the grouse Census Area II, and

contained all the representative cover types. It was found that the population per acre as calculated from the weekly censuses on the three hundred and sixty acres, was consistently higher than that calculated from the monthly censuses which were taken on the larger Grouse Census Area II. Furthermore, it was found by completely stripping areas of forty acres or more in size within the boundaries of Grouse Census Area II, that the population again was slightly higher than that which was calculated per acre for the larger area. Therefore, it seems reasonable to assume that the populations for the Grouse Census Areas I, III, and V, as recorded by Method II approaches nearer to the actual measurements of the populations on the respective areas than those measurements recorded by Method I.

A distribution of the number of grouse flushed in each cover type, degree of stocking, and whether or not on the margin or interior of the cover types are summarized in Tables XII, XIII, and XIV, for the Pigeon River Area I, Houghton Lake Area III, and Munuscong Area IV, respectively.

The preference of ruffed grouse for the various degree of stocking are thirty-nine per cent for good, forty-two per cent for medium, and nineteen per cent for poor degree of stocking. The preference for good and medium appears to be about the same. The least per cent which is found in the poor stocking is indicative of the secretive habits of the ruffed grouse by tending to keep away from the more open areas. For large openings are not conducive to more grouse, while small openings are necessary for dust baths and drying

off after rains.

As to the grouse preference for the margin or the interior of the different cover types, the average for the areas show that seventy-seven per cent were flushed within three hundred feet from the margin and thirty-three per cent flushed further than three hundred feet from the margin. This would indicate that large or unbroken stands of timber are not desirable for optimum grouse production. Edminister (1934) found this to be true of the ruffed grouse in New York State.

The per cent of the total number of grouse flushed in each cover type at different times of the year is shown graphically in Figures IV, V, and VI. The months used in the graph roughly represent the seasons of fall, winter and spring. Although censuses were taken during the summer months on the Pigeon River Areas, too few of the birds were flushed on the census lines to get a fair per cent as to cover preference. However, the summer cover type preference was studied during the brood surveys. (Forms XIX-XXIX).

The graphs show that the birds may be found in more or less abundance in each of the various cover types throughout the year, and that there is a general shifting from one type of cover to another at different seasons of the year.

It will be seen that in the Pigeon River Area I (Figure IV), ninety-six per cent of the birds for the September censuses and ninety per cent of the November censuses were flushed in the upland types, such as poplar, maple, beech,

basswood, and cherry, and the remaining per cent in the lowland types, which include the conifers, alders, and willows. In January the per cent of grouse flushed in the upland types drop, and one perceives a considerable increase in the number of birds in the lowland types, where they tend to seek shelter and protection of the conifers from the winter weather.

The per cent of the total number of grouse flushed in each cover type in the Houghton Lake Area (Figure V) differs considerably throughout the year compared to the Pigeon River Area I (Figure IV). The graph in Figure V shows that there are more birds flushed in the swamps and lowlands during September than in January. The reverse of this occurs in the Pigeon River Area, and may be accounted for by the difference of the cover type in the two areas.

By comparing the cover types found in the Houghton Lake Area Map III, with that of the Pigeon River Area on Map I, one will note that small mixed and pure stands of jack pine are scattered throughout the Houghton Lake Area, with a fair interspersing of white and red pine. With the exception of one or two small stands, these pine types are absent from the Pigeon River Area. Therefore, the birds in the Houghton Lake Area have more accessible coniferous cover for shelter, and apparently do not tend so readily to seek the heavier swamp areas of spruce, balsam, and cedar, when such pine types are present. The same appears to be true for the Munuscong Grouse Census Area (Figure VI), for the decided preference of the

coniferous-deciduous types the year around by the grouse is clearly shown in the graph. Approximately sixty per cent of the birds were flushed in the coniferous-deciduous cover types throughout the year.

At the high of the grouse cycle in 1932 (based on the September census), in the Pigeon River Area I, and in 1933, in the Houghton Lake Area, there was approximately one grouse per five acres. At the high of the cycle in 1932, in the Munuscong Area, there was approximately one grouse per three acres and one grouse per seven acres in the Rudyard Area. At the low of the cycle, in 1935, for the Pigeon River Areas I and II, the minimum number of birds found per acre was approximately one grouse per twenty-five acres. While in the Houghton Area, where birds were fewer in number during 1936 than at any time since censusing the area, there was approximately one bird per sixty acres. This difference in the population on the respective areas may be accounted for by the more or less suitable grouse cover found on the areas.

ACCURACY OF THE CENSUS METHODS: As previously intimated the two Grouse Census Areas I and II which are located in the Pigeon River State Forest are similar in size and cover types. Therefore the number of birds per section or per acre which may be found on the two areas, at any one time, should be approximately the same. By referring to Tables I and II it will be seen that the number of birds per section (as calculated by Method I) in the two areas, at any one time, do approxi-

mate each other. Also, this may be seen in Table III for the two censuses which were taken in January 1933 in the Houghton Lake Grouse Census Area. These data show that the census method as used herein, operates with uniformity from one period to another, and as seen in Graph I, the population in a given area can be compared from year to year.

In many instances it is quite evident that the populations recorded for the various censuses in Tables I to V give the comparative abundance of grouse only, and not the actual number of birds in the given areas. This is especially true for the censuses of May and June, and is apparently due to the low mobility of the species and to the "lying close" of the female during the nesting period. But this does not account for some of the low populations and erratic fluctuations recorded for other months in the year. The reason for such low populations as recorded for the censuses taken in March 1936 (Table II), and February 1935 (Table III), or for the greater population in May than that of April 1936 (Table II), may be summarized briefly by stating - that the accuracy of the method decreases in proportion to the decrease in the number of birds in an area. For it is readily seen that the determination of the average flushing distance or the width of the strip (as used in the formula) is an important factor in calculating the total number of birds in a given area. Therefore the accuracy of the average flushing distance or width of strip would increase or decrease in proportion to the number of birds flushed in an area at any one time.

It must be remembered that the majority of the censuses were taken during the decline and the low of the cycle. Therefore, low populations were commonly encountered. But these low populations do not invalidate the recorded data or the value of the census method. For, as previously stated, the uniformity with which the census method operates makes it possible to determine the comparative abundance in an area during any period of the cycle.

SUMMARY OF THE CENSUS STUDIES

1. The fluctuation in the abundance of ruffed grouse is not uniform throughout its range in Michigan. The birds may be on the increase in some localities while they are on the decrease in others.

2. The yearly kill by hunters is a comparatively minor factor in the decimation of ruffed grouse in Michigan, when compared to the large numbers which die off each year through the operation of other factors.

3. A significant difference in the number of birds on an area was found by the use of the more complicated Method II, which took into consideration the type of cover and degree of stocking. The populations as recorded by this method approaches nearer to the actual measurements of the populations on the respective areas than those measurements recorded by Method I.

4. Ruffed grouse show a definite preference for the margin of the various cover types. This would indicate that large or unbroken stands of timber are not desirable for optimum grouse production.

5. Ruffed grouse show a definite tendency to evade a poor degree of stocking, while the preference for good and medium appear to be about the same.

6. Ruffed grouse show a definite preference for the coniferous-deciduous type of cover, but may be found in more or less abundance throughout the year in each of the various cover types on an area.

7. The densest population recorded (at the high of the cycle) was one bird per three acres, while the average was one bird per five acres.

8. It has been shown that the population of the ruffed grouse on an area can be determined by the use of the strip method, as it was applied in gathering the present data.

Such a method of censusing ruffed grouse makes it possible to compare the populations on a given area from year to year, as well as giving a means of determining the bag limit, the proper length of the open season, and whether or not an open season is justified in the years of scarcity.

HABIT STUDIES OF THE RUFFED GROUSE

GENERAL STATEMENT: In order to gather information on the mortality that may occur in the clutches and broods, ruffed grouse survey field work was conducted on drumming logs, nests, and broods, with the aid of C.C.C. Camp help during the spring of 1936 and on nests during the spring of 1937. Due to the scarcity of the birds, the number of drumming logs, nests, and broods found were few. Nine nests, eleven drumming logs, and twenty-seven broods were located and repeatedly visited. The information gathered was tabulated on forms which were provided for these surveys. (See Forms I-XXIX).

The following account is a summation of these data, with no attempt at giving the complete life history of the ruffed grouse. For such a history one may consult Forbush (1927), Bent (1932), Allen (1934), and many other ornithological papers. Although the data collected herein may not be sufficient in order to draw definite conclusions concerning this particular phase of the grouse studies, it does indicate certain trends and a need for continued investigations with this type of survey.

NEST SURVEY: On Forms I to IX inclusive, are tabulated the data collected for each of the nine nests studied.

HATCHING: It will be noted that eight of the nine nests succeeded in reaching the hatching stage. Nest Number 2 was robbed by a known person on June 8th. Of the remaining eight nests, Numbers 1, 3, 4, 5, 6, 7, 8, and 9, the dates of

hatching were June 5th, 7th, 10th, 11th, 12th, 13th, and July 8th respectively. The average date of hatching the seven nests which hatched in June would be June 9th. King (unpublished) gives the week of June 10th as the average hatching date for ruffed grouse in Minnesota.

The only data gathered on the period of incubation was from Nest Number 1, since incubation had begun on the remaining nests when found. This nest was found on May 15th, and from all indications the bird had begun incubation. The clutch hatched on June 10th; therefore, an incubation period of twenty-six days is indicated. Concerning the incubation period of the ruffed grouse Bent (1932) states: "The incubation period has been variously recorded by different observers as 21, 24, or 28 days; probably 21 days is the normal period under favorable circumstances, which may be lengthened by cold or wet weather or by interrupted incubation". Forbush (1927) gives a period of 24 days, as does King (unpublished).

HATCHING PERCENTAGE: The nine nests contained a total of ninety-five eggs, or an average clutch of approximately eleven eggs. From the study of over a thousand nests found in New York State, Bump (1935) gives eleven as the average clutch. Of the eighty-five eggs (omitting Nest Number 2) four were found to be partially developed and four infertile, approximately five per cent partially developed, five per cent infertile, and ninety per cent hatched.

All of the nests were visited several times after hatching, and as late as three months afterward the nests and shells were found undisturbed.

NESTING SITES: As tabulated on the Forms I to IX it will be seen that the nests were found either at the base of a tree, fallen tree, stump, or log, and in dry locations. These are the most common sites in which grouse nests will be found. However, they have been reported on knolls, stumps, under brush piles, beside rocks, under woodpiles, and even off of the ground in low saplings. Nests have also been found on low ground in the swamps and on knolls surrounded by water, but apparently these are extreme exceptions.

For the type of cover or the prevailing conditions where nests were found, see Forms I to IX. In general the nests were found in a stand of poplar, mixed with birch, maple, or scattering conifers. Four of the nests were located in a light degree of stocking, three in a medium degree of stocking, and two in a heavy degree of stocking. This type of stocking refers to the surrounding cover and not necessarily to the immediate vicinity of the nests. For each of the nine nests was found in a fairly open situation; that is, if the locations of the nests were known, they could easily be spotted at a distance. It was noted that in each nest the female grouse faced toward the direction in which it had an open view. This position evidently tends to prevent the grouse from being taken unawares when approached.

BEHAVIOR: To get information on the mortality of the ruffed grouse chicks by means of parasitological studies,

the taking of blood smears, banding, and so forth, it was necessary to find some method of handling the chicks soon after they were hatched. Therefore, Next Number 5, 6, 7, 8, and 9 were inclosed by a fence made of one-quarter inch wire mesh, eighteen inches in height, and encircling the nests with a diameter of ten or more feet. (See Plate II).

The reaction of the female grouse to the fence appeared to be negative, for in each instance the bird shortly returned to the nest after the fence was placed, and hopped over the fence when later flushed, to return soon after the observer appeared to leave. It may be mentioned here that at no time were precautions taken to obliterate tracks made by the observer, and the nests were visited from almost all directions. The female was flushed each time the nest was visited. However, the weather and the time of day was taken into consideration when making the call. This applies to all of the nine nests studied. As formerly intimated, no nest was disturbed as late as three months after hatching, thus pointing out the difficulty that a predator or man may have in locating a grouse nest.

The chicks in Nest Number 3 were retained within the inclosure for a period of four days, Nest Number 6, six days, Nest Number 7, one day, Nest Number 8, six days, and in Nest Number 9, two days. Meantime mash and water were placed within the inclosure and the chicks greedily helped themselves. The brood of thirteen chicks from Nest Number

3 was contacted several times after releasing.

The tenacity of the female for her young when she thinks they are in danger is well illustrated in Plate I (preface). This is a picture of the female from Nest Number 6, showing her reluctance to leave the chicks while they are being handled by the writer. Incidentally, at this time, the female can be easily captured with a fly net.

To find out where the male might be during and after the incubation period, the area surrounding each nest was carefully stripped. At no time during the incubation period was another bird seen in the vicinity. This was not found to be so after the clutch hatched, as will be seen in the remarks at the bottom of Form III, which reads: "This nest was visited the following four days after the disappearance of the eggs. Female flushed from seven to ten feet near nest, each day of the four, while the male was flushed from forty to sixty feet from nest. No trace of female or male after the fourth day." From all indications the second bird was a male. This appearance of the male near the nest as soon as the clutch hatched also occurred at Nest Number 6. The male was flushed about forty feet from the nest on the day that the chicks hatched, and also on each visit while they were within the inclosure. On several occasions the males were flushed near the female and two and three week old broods but it was not verified whether the males remained in continued contact with the broods.

Evidence of polygamy has been found in the ruffed grouse by some observers, but the foregoing examples of the males being near the nests as soon as the incubation period was over would lead one to believe that these particular birds were monogamous. With further observations of this kind, the degree of monagamy or polygamy in the relations of the sexes might be determined.

Bump (1932) states that the proportion of male to female grouse in favorable coverts is nearly equal.

DRUMMING LOG SURVEY: For the purpose of getting information on the distribution and number of male grouse on an area, a search was made for drumming logs, which were later revisited to check the regularity of use by the cock. Eleven such logs were found, and the data collected on each log recorded on Forms X to XXI.

As seen in the data the drumming male grouse seems to prefer old moss covered logs from thirty to fifty feet in length, two to three feet in diameter, and well situated from view in a coniferous or mixed coniferous stand. Drumming was heard at sometime on eight of the eleven logs, and as mentioned in the remarks on Form XX, Log 11, the male was seen several times on this particular log by the writer.

By closely searching the area around each nest, so as to find the nearest drumming log, it was found that the distances ranged from 500 feet to 1200 feet in the various nesting territories. This distance from the nest to the nearest drumming log might be accounted for by the difference in

the type of cover and the degree of stocking existing in the different nesting areas, and again it might vary considerably from year to year according to the density of the population. But before any definite conclusions can be drawn, a large number of nests and drumming logs need to be studied over a period of years.

BROOD SURVEY: Twenty-seven different broods were contacted, from the hatching time to September 22nd. During this period, nine of these broods located on the Pigeon River Grouse Area II were contacted from three to twelve times.

On Forms XXI to XXIX, inclusive, are tabulated the data on these nine broods, when flushed for the first time.

The purpose of keeping in touch with the broods was to get information on the mobility of the individual broods and to note the mortality that may occur in the young birds.

On Map II are shown the locations of the various broods from time to time. It will be seen that the average range covered by the broods during the summer approximates an area of forty acres. As shown by the cover type on map and data sheets, there appears to be a tendency for the female to keep the young birds near the borders of swamps, where it is much cooler and more moisture accumulates during the hot days of July and August.

The mortality of the young birds during the summer of 1936 was very low. No doubt, the dry weather which followed the hatching and continued throughout the summer, was a contributing factor. The hatching percentage was high, for

broods of ten, eleven, and even thirteen were commonly seen and many of the broods held up well through the summer as indicated by some of the following dates and numbers. Brood Number 7, last contacted on August 17th, contained about eleven young; Brood Number 5, September 10th, ten young; and Brood Number 9, September 26th, nine young. Of course, broods were found with a much smaller number of young birds.

FOOD OF THE RUFFED GROUSE: Of thirty-two crops and approximately two hundred fecal samples of grouse collected on the Pigeon River Forest by the writer, the food items identified were as follows: Buds and twigs of poplar, birch, maple, alder, dogwood, willow, and cherry; leaves of grass, strawberry, raspberry, wintergreen, and clover; seeds of sumac, strawberry, cherry, hawthorn; and a number of unidentified seeds, catkins of alders, remains of larvae, beetles, and other insects.

From fifty-one crops and gizzards of grouse collected from the northwestern part of the Upper Peninsula and examined by Dr. A. A. Allen of Cornell University, he adds the following items: Leaves of bracken fern, dandelion, and sorrel; seeds of dogwood, nannyberry, Rosa, black bindweed, and climbing false buckwheat; fragments of acorns; and grasshoppers.

With the exception of two birds collected in June, and two in July, the remainder were collected during October,

November, and December, while the fecal samples were collected in January, and February. Therefore, it will be seen that the above food items taken by the grouse form only a part of their yearly diet.

Gross (1928), and Bump (1930), have compiled a list of the more common foods, according to their seasonal importance. Forbush (1907) has published a rather complete list of the vegetable food of the ruffed grouse, based largely on Judd's analysis (1905), from birds that were collected in every month of the year in Canada and in fourteen states.

These data and numerous papers on the food of the ruffed grouse show that a wide variety of vegetable and animal matter is eaten by this bird. Studies on the food habits of the grouse in New York State indicate that food is not a controlling factor in grouse abundance. (Bump 1930).

SOME FACTORS STUDIED WHICH DETERMINE THE ABUNDANCE OF RUFFED GROUSE

PREDATORS: From February to October 1936, twenty-seven grouse kills were found by the writer in the Pigeon River Forest. Except to relate the evidence gathered from these kills, no attempt will be made to draw any definite conclusions as to the predatory status of the various enemies of the ruffed grouse.

Cars were responsible for the death of three birds. Four kills were attributed to hawks, and the remaining twenty to the great horned owl. That direct evidence was gathered for the killing of seven of the grouse by the great horned owl will be seen by the following account.

On February 22nd, the fresh remains of a rabbit were found with the imprint of the body and wings of the great horned owl outlined in the freshly fallen snow, where it had pounced upon and struggled with its victim. (See Plate VII). For the following two weeks the activities of this owl, which was a female, were closely followed, and within this time five freshly killed grouse were found which had been taken presumably by this bird under the same conditions as was the rabbit. Whether a male was also in the vicinity was not learned, for at no time was he seen or heard.

In April another pair of these birds were located and a search made for the nest, which was found in the top of an old tall beech tree and contained two young along with

the remains of a rabbit and grouse. On May 11th, the two young owls were removed from the nest. One of these was placed nearby on the ground and made fast to a stake in order to see if and what the parent would feed it. Five days later the writer visited the place and found the remains of a rabbit and grouse which had been brought to the young owl by its parent. The vicinity around the nest was searched for kills from time to time and the remains of three more grouse were attributed to the adult owls.

On April 21st, and again on the 22nd, the remains of recently killed grouse were found on another area and it appeared to be the work of the great horned owl. Therefore this area was closely watched and both the male and female owl were seen a number of times. A total of eight kills were found in the near environs and although a thorough search was made the nest could not be located.

Within a period of about four weeks six young great horned owls were brought into camp by workers in the forest. From reports and observations in the field there was estimated to be about one great horned owl per section. This seemingly large take of grouse by this owl might have been due to the scarcity of other animal food such as the rabbits which were not plentiful in this region during 1936, or its reluctance in going any further than necessary from the nest while caring for its young.

In reference to the economic status of the great

horned owl, Forbush (1927) states: "In the wilderness the Great Horned Owl exerts a restraining influence on both the game and the enemies of game, for it destroys both and thus does not disturb the balance of nature. But on the farm or the game preserve, it cannot be tolerated."

There exists a serious menace to our game birds in the form of an old predator, the house cat. In Michigan there are about forty-eight civilian conservation corps camps, seventy-two public parks, and innumerable camp grounds, located in some of our best game territory, and unless more drastic measures are taken to suppress the numbers of cats, or,better still, to eliminate them from these camping grounds, we may have, if we do not have already, a major self-made problem in predator control, as the following facts indicate.

Twenty-three house cats were shot by the writer on and near the Pigeon River Grouse Area II, during the spring of 1936. No evidence was collected to show that ruffed grouse were killed by house cats, but it was found by following cat tracks that they were making regular visits to the prairie chicken live traps which were located about a half mile from camp. On three occasions they were fortunate enough to kill and eat a hearty meal from the breasts of chickens, between our visits to the traps. It was not uncommon to find the remains of hornlarks, killdeer, and other small birds which were killed the preceding night by these cats, and a common sight to see a number of them at night, by the lights of a car, roaming around in some of the best grouse cover.

No evidence was found which indicated to what extent other enemies of the ruffed grouse, such as the fox, skunk, weasel, wildcat, coyote, and others contributed to their mortality. This may be due to the relatively small numbers of any of these on the areas. Feces were collected but not in sufficient numbers to be indicative of their food habits, in relation to ruffed grouse.

PARASITES AND DISEASES: As part of the ruffed grouse investigation conducted by the Game Division of the Michigan Department of Conservation, over three hundred ruffed grouse have been collected and autopsied since 1933. The specimens were collected during the month of October of each year by members of the Game Division. Necropsies were made by Dr. D. R. Coburn, Dr. S. C. Whitlock, and Dr. E. S. Weisner, of the Michigan Department of Conservation, Dr. E. C. O'Roke of the University of Michigan, and Dr. R. C. Green of the University of Minnesota.

The following is a brief account of the numbers and kinds of parasites found in the ruffed grouse, as reported in the autopsy records which are on file in the Pathology Department of the Michigan Department of Conservation. For a complete life history of the various parasites of the ruffed grouse see Cram (1927), (1931).

Cheilospirura spinosa. This gizzard worm was first reported in the ruffed grouse by Stafseth and Kotlan of the Michigan State College in 1925. Gross (1925), Allen (1928), and Clarke (1936) report that the intestinal round worm, Ascaridia lineata, was the most common parasite found in the ruffed grouse which were examined by them. This was not found to be the case with the birds examined in Michigan. It will be seen in Table XVI that the percentage of infestation by the gizzard worm is more than double that of Ascaridia lineata for the year of 1935 and a much greater

percentage of occurrence was again found in the birds examined in 1936. Many of the grouse were so heavily infested with these parasites that part of the lining of the gizzard had been destroyed and there was destruction of the surrounding tissue.

Ascaridia lineata. This intestinal round worm was found to rank second in the number of infestations of the grouse. In seventy-three grouse examined in 1933 this worm occurred forty-one times. Of eighty examined in 1935, and eighty-six in 1936, it occurred eight and twenty-eight times respectively. (See Table XVI) In one grouse specimen sixty-three ascarids were found, but the average grouse contained one to three.

Oxyspirura petrowi. This eye worm, which is found under the nectitating membrane, was first reported in the United States by Dr. G. B. Saunders (1935), of the Game Division, Michigan Department of Conservation. It was described by Dr. E. B. Cram of the Bureau of Animal Industry as the Russian species, Oxyspirura petrowi (Skrjabin, 1929).

Table XVII shows that this parasite is quite prevalent in the ruffed grouse in Michigan. As many as seventeen of these worms have been found in one eye and a number of birds developed marked cases of conjunctivitis.

The importance of this parasite in its relation to the birds of Michigan is expressed in the following quotation taken from Saunders (1935). "The occurrence of an eye

worm in the wild grouse and passerine birds (Saunders found the worms in several non-game birds) of Michigan is certainly cause for apprehension. There is reason to fear that the parasite may become more prevalent among other wild birds, as well as among domestic poultry and turkeys. The writer has taken specimens to Dr. W. L. Chandler of the Bacteriology Department, Michigan State College, who has done much work on the parasites and diseases of poultry. Dr. Chandler, on hearing that eye worms are widely distributed among wild grouse, expressed concern as to the possibility of the parasites becoming prevalent in the poultry of the State".

Davainea tetraoensis. This small tapeworm, which is easy to overlook owing to its size, was first reported in the ruffed grouse of Michigan by Dr. E. J. Stafseth and Dr. Kotlan of Michigan State College (1925). In seventy-nine grouse examined in 1934 this tapeworm was found in fourteen birds. It was discovered in one bird in 1935 and in four of eighty-six birds in 1936.

Dispharynx spiralis. This proventricular worm was found in one specimen, which was very heavily infested with it. This parasite was the cause of a large percentage of the grouse found dead in southern New England and New York State (Gross 1925).

Trematode cysts. These cysts were found in three of thirty grouse specimens examined by Dr. R. C. Green.

In a grouse examined by Stafseth (1925), two speci-

mens of an intestinal fluke were found, but due to the macerated condition of these flukes, specific characters were not established. Stafseth says they were probably closely related to the Distomum commutatum of the domestic fowl.

Leucocytozoon bonasae. The Malaria-like disease caused by this blood parasite is suggested by Clarke (1936) as the probable cause of the cyclic dying off of the ruffed grouse in Canada. It affects the young birds chiefly. This parasite was found in the blood samples of five of the seventy-nine grouse examined in 1934 by E. S. Weisner of the Game Division. Out of seven birds collected and examined by Dr. O'Roke in July 1935, this parasite was found in the blood samples of two young grouse of about the age of five weeks. Time has not yet permitted the examination of a large number of blood samples that were taken from grouse collected in 1936.

OTHER PARASITES.

Haemaphysalis leporis-palustris. Dr. Green collected from none in one specimen to 1,172 of these ticks from thirty ruffed grouse sent to him by the Game Division for the purpose of determining the prevalency of the disease Tularemia, which the ticks of the birds may have carried. The average number of ticks found per grouse was one hundred and sixty-seven.

On the occurrence of the disease found in the grouse

and grouse ticks, Dr. Green reports: "Nineteen samples of a hundred ticks each were injected into a corresponding number of guinea pigs. Two of the nineteen guinea pigs died with leisions typical of tularemia, showing that the sample of ticks obtained from grouse specimens were injected with tularemia to the extent of 10 per cent. This figure is probably to be considered a normal finding and does not represent an unusual situation for the present stage of the game cycle, as similar findings have been obtained in Minnesota.

"Necrocy on the grouse specimens received did not show the presence of any disease. An injection of the sterile liver or muscle into guinea pigs failed to produce any infection. From results obtained in other states, the occurrence of tularemia in one or two of these birds might have been expected, especially as two of them were shown to be carrying ticks infected with tularemia."

During the summer of 1936 the writer found several birds so heavily infested with these ticks that the head and neck were almost entirely bare of feathers. Many of the ticks were swollen with blood to the size of a pea. Ticks were found on all of the chicks which were within the two inclosed nests. Gross (1925) says: "Even a few ticks are a discomfort to the birds, and in cases of heavy infestation they become a serious menace, decreasing the vitality and resistance of the grouse and in certain rare cases resulting

in the death of the bird. Observers have reported that entire broods of young grouse have been destroyed by ticks."

Haemaphysalis punctata punctata. On a grouse specimen collected in October 1924, ticks of this species was found by Dr. H. J. Stafseth of the Michigan State College. This species has also been found on different mammals and birds.

Trypanosoma sp. Stafseth and Kotlan (1925), found parasitic flagellates of this genus in the blood of one grouse examined, but not found in numbers large enough to affect the health of the bird.

Thominx annulata. This crop worm was found in a grouse specimen by the writer, and identified by Dr. W. L. Chandler of Michigan State College.

It may be seen from the data presented that parasites and diseases of the ruffed grouse appear to be a major factor in the decimation of these birds in Michigan. It is evident that in order to account, if possible, for the periodic fluctuation that occurs in the population of the ruffed grouse in Michigan, it will be necessary to continue laboratory studies and field observations on these parasites that infect the ruffed grouse.

CONTROL OF COVER: A ninety-three acre cover improvement plan is being developed on the Pigeon River Grouse Area II (See Map VII). It includes twenty-two acres of underplanting of conifers, thirty-two acres of clearing, fourteen

acres of controlled burnings, and twenty-five acres devoted to the planting of experimental plots. As is shown on Map VII, there are thirty-four plots ranging in size from one acre to eight acres. Four of these are located in prairie chicken cover, in the open grass plains. The effect this management plan will be checked by an area similar in size and cover types.

In the census studies it has been shown that seventy-seven per cent of the grouse were flushed within three hundred feet from the margin of the various cover types, and that large unbroken stands of timber are not desirable for optimum grouse production. Therefore, as the marginal area will be increased by the cutting of clearings within these large swamp and pure cover types, it is expected that a more uniform distribution of the birds will occur, as well as an increase in the carrying capacity of the grouse area.

Up to date approximately fifteen acres composed of six plots have been cleared. See plot numbers 15, 16, 18, 23, 29, and 30, on Map VII. Although it will take several years before the effects of the cover improvements can be determined, indications as to the probable extent that these clearings will be used by the grouse have already been shown by flushing birds within these swamp clearings, and in which location they have not been flushed in the five years of censusing on this area.

For the purpose of furnishing fall and winter food

for prairie chickens and ruffed grouse, approximately five acres were planted in 1935, and twelve acres in 1936 (See plot numbers 49, 50, 51, 52, and 54 on Map VII). Patches of one to three acres of corn, buckwheat, rye, peas, and sunflower seed were planted by broadcasting the seed and re-disking the soil afterwards. This seed was planted in pure patches as well as in mixtures of the various seeds. It was found that buckwheat, rye, and peas germinated the best and produced the most feed, and were not affected by the long dry summer of 1936, when very little rain fell. Buckwheat has a well known value as food for prairie chickens, for they use it from early fall to late in the spring. They seem to prefer it to any of the other grains and made regular visits to the buckwheat patches during the fall and continued throughout the winter to visit the buckwheat stacks which were distributed over the area. The resistance of buckwheat to fire in summer makes this a useful crop to plant in the fire lanes and other open areas, where it would serve as food for a variety of animals.

Only a few stalks of corn came to maturity before the frost set in. The season is too short in this region to depend upon corn maturing, and without cultivation it grows very slowly. Rye is well suited to this region where early frosts are common and most of the area consists of sandy soils. Peas grew well and seem to be liked as a food by the prairie chickens. Of a half acre plot of sunflowers planted about ten plants grew to maturity, while ninety per cent did

not germinate. This may have been due to the broadcasting of the seeds and the covering with too much or too little soil when disked.

Plots 52 and 54, located in the ruffed grouse area, were planted with buckwheat. The incompatibility of having food patches for ruffed grouse in deer country was soon learned, for the deer seem to relish the tender white blossoms of the buckwheat, and it was a common sight to see several deer feeding in these patches. Very little of the buckwheat came to seed, and no doubt any other grain or plant would have been taken by the deer. The planting of hawthorn, mountain ash, barberry, snowberry, winterberry, and other fruit-bearing shrubs should furnish a more permanent source of food for the ruffed grouse.

As formerly intimated, it is hoped that by these improvements in the cover, such as making clearings within large dense cover types, the planting of coniferous species for winter cover in hardwoods lacking in ground shelter, the planting of fruit-bearing shrubs for fall and winter food, and changing the ecological succession of the vegetation by burnings, that a more uniform distribution of the grouse over the area will be obtained, thereby increasing the carrying capacity of the area, as well as the possibility of reducing the number of ruffed grouse taken by predators and epidemic diseases.

SUMMARY OF HABIT STUDIES

1. Of nine nests of the ruffed grouse found in 1936 and 1937, eight reached the hatching stage.

2. The average date of hatching was found to be the week of June 9th in Michigan.

3. An incubation period of twenty-six days was indicated in the case of one clutch.

4. The nine nests contained a total of ninety-five eggs, or an average clutch of 10.55.

5. Ninety per cent of the eggs hatched, while five per cent were partially developed and five per cent infertile.

6. The most common sites in which nests were found, were at the base of a tree, fallen tree, stump, or log, and always in dry locations. In general the nests were found in a stand of poplar, mixed with birch, maple, and a scattering of conifers. The nests ranged from fifteen feet to seven hundred feet from the nearest coniferous swamps of spruce, balsam, cedar, and tamarack.

7. Nests of the ruffed grouse were successfully enclosed by a wire fence without the female deserting the nest.

8. Nests were enclosed by a wire fence from two to sixteen days before the clutch hatched without the female deserting the nest.

9. Ruffed grouse chicks were kept within enclosures from one to six days without any detrimental effects upon their health.

10. The ruffed grouse chicks fed readily upon the mash placed within the enclosure.

11. While the grouse chicks are within the enclosure, the female grouse can be easily captured with a fly net. This gives a convenient means of handling the female in order to mark, band, or examine for parasites.

12. It was found that the drumming male grouse prefers old moss covered logs from thirty to fifty feet in length, two to three feet in diameter, and well hidden from view in a coniferous or mixed coniferous stand.

13. It was found that the distance from the various drumming logs to the nearest nest ranged from five hundred to twelve hundred feet.

14. It was found that the average range covered by the grouse broods during the summer months approximated an area of forty acres in size.

15. Of the eighty-two crops and two hundred fecal samples of the ruffed grouse examined for the food contents, it has been shown that a wide variety of vegetable and animal matter is eaten by this bird. The studies indicate that lack of food is not a controlling factor in grouse abundance of the areas studied.

16. A number of grouse kills were traced directly to the great horned owl. There was ~~found~~ estimated to be one great horned owl per section.

17. Evidence has been given of depredations by the house cat. The problem of the house cat in relation to game birds merits further study.

18. A summation of the parasitic infestation of over three hundred ruffed grouse, which were collected in Michigan has been given.

19. The most common parasite found in the ruffed grouse in Michigan was the gizzard worm, Cheilospirura spinosa, while the round worm, Ascaridia lineata, and the eye worm, Oxyspirura petrowi, ranked a close second in the number of infestations.

20. A progress report has been given of the ruffed grouse cover improvement plan, and which included a descriptive map of the cover improvement area.

TABLE I

SUMMARY OF RUFFED GROUSE CENSUSES

PIGEON RIVER STATE FOREST

AREA I

Date Censuses were taken	Birds seen	Width-yds. of strip	Birds on area	Birds per sec. Method I	Birds per sec. Method II
September 1932	77	19.71	751	191	#
September 1932	66	23.60	538	137	137
November 1932	65	47.30	264	67	113
January 1933	87	41.80	400	102	121
January 1933	59	33.08	343	87	#
April 1933	38	44.34	165	42	66
September 1933	49	24.49	385	98	112
November 1933	64	44.16	279	71	77
February 1934	22	37.36	113	29	52
May 1934	1	18.30	11	3	3
September 1934	45	30.44	284	72	73
December 1934	25	38.06	126	32	41
March 1935	8	33.12	28	7	11
June 1935	3	38.60	15	4	9
September 1935	24	38.86	119	30	63
November 1935	11	40.30	53	13	15
April 1936	14	60.00	45	11	18
May 1936	6	27.22	42	11	10
July 1936	33	20.20	314	80	121
August 1936	28	15.70	343	87	96
September 1936	30	21.66	266	68	69
November 1936	19	31.66	115	29	33

- These censuses were taken with the aid of a dog.

TABLE II

SUMMARY OF RUFFED GROUSE CENSUSES

PIGEON RIVER STATE FOREST

AREA II

Date Censuses were taken	Birds seen	Width - yds. of strip	Birds on area	Birds per sec. Method I
November 1933	59	45.40	250	82
February 1934	27	35.26	147	48
May 1934	3	36.60	16	5
September 1934	24	25.48	181	59
December 1934	21	39.66	102	33
March 1935	7	36.90	36	12
June 1935	1	70.00	3	1
September 1935	12	32.23	72	23
November 1935	16	66.34	46	15
February 1936	19	48.00	76	25
March 1936	7	153.00	9	3
April 1936	3	17.16	33	11
May 1936	5	20.14	48	16
June 1936	27	18.66	279	91
July 1936	23	25.66	173	56
August 1936	23	11.00	403	132
September 1936	17	20.32	161	53
November 1936	15	29.00	100	33

TABLE III

SUMMARY OF RUFFED GROUSE CENSUSES

HOUGHTON LAKE STATE FOREST

AREA III

Date Censuses were taken	Birds seen	Width-yds. of strip	Birds on area	Birds per sec. Method I	Birds per sec. Method II
September 1932	44	26.46	325	81	88
November 1932	93	46.70	390	97	115
January 1933	68	47.20	282	70	81 #
January 1933	52	35.31	288	72	94 #
April 1933	39	32.40	236	59	61
September 1933	64	23.30	537	134	174
November 1933	101	34.22	577	144	185
January 1934	78	34.72	439	110	121
May 1934	18	30.10	117	29	36
September 1934	31	22.96	202	51	81
January 1935	46	36.22	248	62	71
February 1935	5	33.00	30	7	12
May 1935	14	23.42	117	29	41
October 1935	33	27.80	232	58	68
June 1936	26	18.16	280	70	77
November 1936	14	63.60	43	11	15

- Two censuses were taken in January, 1933.

TABLE IV

SUMMARY OF RUFFED GROUSE CENSUSES

MUNUSCONG STATE PARK

AREA IV

Date Censuses were taken	Birds seen	Width-yds. of strip	Birds on area	Birds per sec. Method I
September 1932	59	9.51	735	233
November 1932	41	11.85	482	153
January 1933	35	12.88	322	102
April 1933	39	14.70	312	99
September 1933	18	7.17	298	94
November 1933	30	11.46	310	98
January 1934	6	7.83	91	29
September 1934	27	15.37	208	66
November 1934	12	10.25	136	43
January 1935	24	10.00	226	72
March 1935	12	24.00	59	19
May 1935	11	16.27	80	25
July 1935	11	7.00	203	64
September 1935	33	10.93	359	114
November 1935	14	10.86	153	48

TABLE V

SUMMARY OF RUFFED GROUSE CENSUSES

RUDYARD

AREA V

Date Censuses were taken	Birds seen	Width-yds. of strip	Birds on area	Birds per sec. Method I	Birds per sec. Method II
September 1932	27	10.04	296	88	110
November 1932	39	9.35	459	136	172
January 1933	36	26.16	303	90	82
September 1933	18	7.88	252	74	59
November 1933	9	9.77	102	30	

TABLE VI

PIGEON RIVER FOREST GROUSE CENSUS AREA I

Yards of line running through each type, and per cent of total amount of line lying in each type.

Forest type		Degree of Stocking: Good Yds.	Medium Yds.	Poor Yds.	Total Yds.	%
3P	0-3	3,009.6	7,656.0	2,024.0	12,689.6	19.7
3PJO	0-3	1,161.6	299.2		1,460.8	2.0
3PF	0-3	70.4	2,393.6	8,360.0	10,824.0	17.0
3PRM	0-3			2,041.6	2,041.6	3.0
3PHF	0-3	440.0	1,302.4	5,720.0	7,462.4	12.0
3HPF	0-3	2,745.6	3,291.2	3,273.6	9,310.4	15.5
3H	0-3	6,371.2	844.8	299.2	7,515.2	11.9
3FPH	0-3			1,760.0	1,760.0	3.0
3F			580.8	281.6	862.4	1.0
3GR			2,288.0		2,288.0	4.0
2PAC	0-3	158.4	792.0		950.4	1.1
1CSA	0-3	246.4	2,323.2	17.6	2,587.2	4.5
1A			1,232.0		1,232.0	1.9
1ACS	0-3	35.2	510.4	651.2	1,196.8	1.7
1SEC	0-3		774.4	52.8	827.2	1.3
1L1			158.4		158.4	.2
1Gs			88.0		88.0	.1
Beaver Pond			105.6		105.6	.1
Total		14,238.4 23%	24,640.0 38%	24,481.6 39%	63,360.0	100.0 %

TABLE VII

HOUGHTON LAKE FOREST GROUSE CENSUS AREA III

Yards of line running through each type, and per cent of total amount of line lying in each type.

Forest type	Degree of Stocking				
	Good	Medium	Poor	Total	%
	Yds.	Yds.	Yds.	Yds.	
3P	5,170	5,280	880	11,330	18.
3PO	1,100	5,016	2,640	8,756	14.
3O		2,728	4,026	6,754	11.
3OJ	462	3,366	2,420	6,248	10.
3J	1,210	1,364	242	2,816	4.
3JO		1,716	748	2,464	4.
3WN	1,232	110	198	1,540	2.
3Gr		10,648		10,648	17.
2PA	308	3,212	198	3,718	6.
2h	176	286		462	.75
2CPA	242	154	132	528	1.
1A	572	2,948	484	4,004	6.
1CSA	1,144	1,034	418	2,596	4.
1WC		286		286	.25
1PCT	66	638		704	1.
1Gs		506		506	1.
Total	11,682	39,292	12,386	63,360	100.0%
	19%	62%	19%		

TABLE VIII

RUDYARD GROUSE CENSUS AREA V

Yards of line running through each type and per cent of total amount of line lying in each type.

Forest type		Degree of Stocking: Good Yds.	Medium Yds.	Poor Yds.	Total Yds.	Per Cent
3H	0-3	770			770	1.6
3H	0-1	20,284	242		20,526	43.3
3P	0-3	154	1,386	462	2,002	4.2
3OP	0-3		220		220	0.5
3O	0-3		88	176	264	0.5
3F			1,320		1,320	2.8
3Gr			7,766		7,766	16.3
2W1			3,278		3,278	6.9
2Pb	0-3	3,872			3,872	8.1
1CS	0-3	1,738			1,738	3.7
1CSB	0-3	572			572	1.2
1SCB	0-3	66			66	0.1
1S	0-3		1,606		1,606	3.4
1A			2,838		2,838	6.0
1L1			682		682	1.4
1Gs						
Total		27,456 58%	19,426 41%	638 1%	47,520	100.0%

TABLE IX

PIGEON RIVER FOREST GROUSE CENSUS AREA I

Area of various forest types and percent of total area.

	Degree of Stocking							
	Good		Medium		Poor		Total	
Forest type	Acres	%	Acres	%	Acres	%	Acres	%
3P 0-3	118.87	4.5	316.18	13.0	92.85	3.5	527.90	21.0
3PJO 0-3	53.63	2.0	10.80	.5			64.43	2.5
3PF 0-3	7.60	.2	74.04	2.8	355.40	14.0	437.04	17.0
3PRM 0-3					70.04	3.0	70.04	3.0
3PHF 0-3	40.02	2.0	38.02	2.0	223.74	8.0	301.78	12.0
3HPF 0-3	76.44	3.0	131.27	5.0	85.25	3.5	292.96	11.5
3H 0-3	271.35	9.8	37.62	2.0	9.20	.2	318.17	12.0
3FPH 0-3					78.44	3.0	78.44	3.0
3F			46.83	2.0			46.83	2.0
3Gr			92.85	3.5			92.85	3.5
2PAC 0-3	2.00	.1	36.82	2.4			38.82	2.5
1CSA 0-3			89.25	3.4	3.60	.1	92.85	3.5
1A			67.24	3.0			67.24	3.0
1ACS 0-3			14.81	.6	29.22	1.4	44.03	2.0
1SEC 0-3			25.21	.9	4.40	.1	29.61	1.0
L1			2.40	.1			2.40	.1
Gs			9.60	.2			9.60	.2
Beaver Pond			5.60	.2			5.60	.2
Total	569.91	21.6	998.54	41.6	952.14	36.8	2520.59	100.0

TABLE X

HOUGHTON LAKE FOREST GROUSE CENSUS AREA III

Area of various types and percent of total area.

		Degree of Stocking							
		Good		Medium		Poor		Total	
Forest type		Acres	%	Acres	%	Acres	%	Acres	%
3P	0-3	183.50	7.00	207.33	8.00	45.14	2.0	435.97	17
3PO	0-3	35.11	1.00	282.57	11.00	92.38	4.0	410.06	16
3O	0-3			119.97	5.00	134.60	5.0	254.57	10
3J	0-3	36.78	1.50	57.68	2.50	9.61		104.07	4
3OJ	0-3	12.54		131.25	5.00	149.23	6.0	293.02	11
3JO	0-3			66.04	3.00	6.27		72.31	3
3WN	0-3	45.14	2.00	2.93		2.09		50.16	2
3Gr				378.29	15.00			378.29	15
2A	0-3			.84		7.11		7.95	0
2PA	0-3	4.18		122.06	5.00	5.43		131.67	5
2h	0-3	12.54	.50	16.30	.50			28.84	1
2CPA	0-3	4.18	.25	5.43	.25	10.45	.5	20.06	1
1A	0-3	32.19	1.50	119.97	5.00	17.56	.5	169.72	7
1ACS	0-3			12.54				12.54	0
1CSA	0-3	53.09	2.00	58.94	2.00	5.85		117.88	4
1EC	0-3			19.65	1.00			19.65	1
1PCT	0-3	8.78		38.46	2.00			47.24	2
1Gs				19.65	1.00			19.65	1
Total		428.03	15.75	1659.90	66.25	485.72	18.0	2573.65	100

TABLE XI

RUDYARD GROUSE CENSUS AREA V

Area of various types and percent of total area.

Forest	type	Good		Medium		Poor		Total	
		Acres	%	Acres	%	Acres	%	Acres	%
3H	0-3	53.77	2.5	13.34	0.6			67.11	3.1
3H	0-1	911.70	42.2					911.70	42.2
3P	0-3	18.60	0.9	69.94	3.2	16.58	0.8	105.12	4.9
30P	0-3			12.94	0.6			12.94	0.6
30	0-3			13.75	0.6	7.68	0.3	21.43	0.9
3F	0-3			45.28	2.1			45.28	2.1
3Gr				332.74	15.4			332.74	15.4
2W1				171.42	7.9			171.42	7.9
2Pb	0-3	179.10	8.3					179.10	8.3
1CS	0-3	82.48	3.8					82.48	3.8
1CSB	0-3	14.55	0.7					14.55	0.7
1SCB	0-3	18.60	0.9					18.60	0.9
1S	0-3	47.30	2.2					47.30	2.2
1A				136.25	6.3			136.25	6.3
1Gs				4.04	0.2			4.04	0.2
1L1				11.32	0.5			11.32	0.5
Total		1326.10	61.5	811.02	37.4	24.26	1.1	2161.38	100.0

TABLE XII

SUMMARY OF PIGEON RIVER GROUSE CENSUSES (Area I)

DISTRIBUTION AS TO COVER TYPE AND DEGREE OF STOCKING
September 1932 - November 1936

	GOOD												MEDIUM												POOR					
	Margin						Interior						Margin						Interior						Margin			Interior		
	S	A	DC	P	H	3Gs	S	A	DC	P	H	3Gs	S	A	DC	P	H	F	S	DC	P	H	F	3Gs	S	P	H	F	S	A	P	H
September 1932*			1	6	16						8		1		1	9	3		1	2	5		1		2	10	3			1	3	4
September 1932*			1		8					6	5					2	3				2	16				11	1		3		7	1
November 1932		1		7	6			2		4						6	8		2		6			1		1	1	1			19	
January 1933*		2	2	10		1					1		24			9	7				8	1			1	5	2					14
January 1933*		7		1	4		6				4		6		1	4	3	1			2	2				5	2				2	9
April 1933		3			2			3	2	4	1		1		1	4	2				3					1	2				9	
September 1933			1		8				3	2	6		1		1	9		4			3	2				2	2	1	1		3	
November 1933			1	8	8					2			6			14	10				2					2			1		10	
February 1934				7	1								1		12										1							
May 1934																1																
September 1934				7	2					3	3	1				6				1						10	1				8	3
December 1934			1	4	1						1					3										2	7				6	
March 1935	1												1				2									1		1			2	
June 1935		1																								1						1
September 1935					5						1					7	4					6				1						
November 1935				1												3										4	3					
April 1936				1									1	2		4	1									3		2				
May 1936					3								1			1												1				
July 1936		1			22											1					8					1						
August 1936					1											15										12						
September 1936					1											8	3	1								13	3				1	
November 1936		1		1									4			8										3					1	1
Totals	1	16	7	53	88	1	6	5	5	21	30	1	47	2	16	114	46	6	3	3	39	27	1	1	4	76	39	6	5	1	71	33
			166						68						231						74					125			110			
				234												305											235					

Total number of birds flushed- 774 (* Census taken twice)

LEGEND: P- 3P, 3Pb, 3PF, 3PRm, 3PHF, 3PH, 2PA.
H- 3HPF, 3H, 3HP, 3HF.
F- 3FPH, 3F.
A- 1A, 1AP

S- 1CSA, 1ACS, 1SEC, 1CS, 1CAP, 1PEC, 1L1.
DC- 3PJO, 2PAC.
3Gs- Upland grass

Margin- 1-300 ft. from edge.
Interior- More than 300 ft. from edge

TABLE XIII

SUMMARY OF HOUGHTON LAKE GROUSE CENSUSES (Area III)

DISTRIBUTION AS TO COVER TYPE AND DEGREE OF STOCKING
September 1932 - November 1936

	GOOD														MEDIUM																		POOR									
	Margin									Interior					Margin														Interior						Margin						Interior		
	3P	3DC	3C	3WPb	2P	2DC	1DC	1C	1A	3P	3DC	3C	2DC	3O	3P	3DC	3C	3Gs	2P	2DC	2C	2A	1DC	1C	1A	1Gs	3O	3P	3DC	3Gs	2PDA	2DC	1C	1Gs	3O	3P	3DC	2PDA	2DC	1C	3O	3P	3DC
September 1932	8	6			2								1	2	4	7		1		5	1				3			1	1	1						1	1						
November 1932	9	3	2	1	1	1	2			3				1	6	6	3	4		4					7		1		3	5			1	4	3	18		3		1		
January * 1933	7	1	5				4		1	6	1			1	13			7	6						1		2	2	2	4					5							
January * 1933	5				3			3							5					4			3		5			6			8	1			1					8		
April 1933	2	5				1				1					2			9					1	1	2					4	2	1			1	2			2		3		
September 1933	2		7	1	1		9			1	1				1		1		1	8			4		3			1					6		1	11		5				
November 1933	7		9		14	9	10			3	2	1			2	9		2	4					8	1		3		7	1		1		2	4		1				
January 1934	2	3	1				1			6			1	9	7	8	2	9		5			2	2	1			10	1	1				1	4	2						
May 1934		3				1	1	1		2					2			1						1	4							1					1				
September 1934	2	1			2			3			1				4	3			4	4									3					1	2	1						
January 1935			2					1	1	2					2	8				6			2	2	1					5	1				5		2	1				
February 1935	2					2									1																											
May 1935									1						1			2	1				1		1			1	1			1				1			2			
October 1935		1						2						1	1	10	1		1		3			1	8			1							1		1					
June 1936															7								5	7	7																
November 1936	5								1						1	3								1	1										1							
Totals	51	22	27	1	9	20	16	30	4	22	6	2	2	16	52	61	7	35	17	36	1	3	18	15	52	1	3	15	20	27	13	3	9	13	20	45	1	13	5	1	1	11
	180									32				314													90						97					13			
	212													404													110														

Total number of birds flushed- 726 * Census taken twice.

LEGEND:
30- 30P.
3P- 3PbRm, 3PO.
3DC- 3PNW, 3Pb, 3PbW, 3POJ, 30J, 30PJ 30JN, 30JP, 3JP, 3JO, 3JOP, 3WP, 3NP.
3C- 3J, 3WN, 3W.
3Wb- 3Wb. 3Gs- 3Gs.
2P- 2PA, 1PA.
2DC- 2APW, 2PSA, 2PCA, 2WbWs, 2hCP, 2PBW, 2CPA, 2CBP, 2SP.
1DC- 1CSA, 1ASC, 1CAP, 1CSP, 1CPA, 1EC, 1PCT, 1AT, 1PAT.
2C- 2CS. 2A- 2A. 1C- 1CS. 1A- 1AP. 1Gs- 1Gs.

Margin- 1-300 ft. from edge.
Interior- More than 300 ft. from edge.

TABLE XIV

SUMMARY OF MUNUSCONG GROUSE CENSUSES (Area IV)

DISTRIBUTION AS TO COVER TYPE AND DEGREE OF STOCKING
September 1932 - November 1935

	GOOD													MEDIUM									POOR			
	Margin								Interior					Margin						Interior			Margin		Interior	
	S	C	DC	3H	2H	P	2Gr	1Gs	S	C	DC	P		S	DC	A	3H	2H	P	S	DC		P			
September 1932	3	3	19			3			2	3	6			10	6	2		1		1						
November 1932	2	3	15			6			2		3				8						2					
January 1933	4		23			3			1		1							1			2					
April 1933	2	1	11			9			1		10				4											
September 1933	2	2	6			1	1		2		2			2									1			
November 1933*																										
January 1934*																										
September 1934	3	4	5			1	1		2		5					1		4	1							
November 1934			8		1						1				1						1					
January 1935	1		15			4					3	1														
March 1935			10			1															1					
May 1935	2	6	1				1											1								
July 1935			3											2	6											
September 1935	6	2	6			5		1		1		1			4	1	4				2					
November 1935	1		6	1							1			1	3		1									
Totals	26	21	128	1	1	33	3	1	10	4	32	2		15	32	4	5	7	1	1	8		1		0	
				214						48						64					9		1		0	
								262										73						1		

Total number of birds flushed- 336

LEGEND:

Swamp- S- 1S, 1T, 1CS, 1ST, 1BSC, 1SBC, 1CSB.
Conifer- C- 3S, 3SC, 2S, 2Bs.
Conifer-Deciduous- DC- 3SP, 3SPB, 3PS, 3PbsB, 2PAS, 2PSB, 2PSWB, 2PbsB, 2bSa, 2SP, 2SPA, 2HES, 1ESA, 1SPE.
Alder- A- 1A, 2A, 2APGs, 2AP.
Upland Hwd.- 3H- 3H, 3HP.
Swampy Borderland- 2H- 2EPb, 2EPba, 1EA.
Poplar- P- 2PA, 3PH, 3PA, 2P, 2PAE, 3P.

1Gs- Lowland Grass.
2Gr- Upland Grass.

Margin- 1-300 ft. from edge.
Interior- More than 300 ft. from edge.

* Maps missing

TABLE XV

Tabulation showing results obtained from

Ruffed Grouse Tally Cards.

	UPPER PENINSULA			LOWER PENINSULA		
Year	Birds flushed per gun hr.	Birds bagged per gun hr.	% of birds bagged	Birds flushed per gun hr.	Birds bagged per gun hr.	% of birds bagged
1929	#	.....	.....	.....	.364	
1930	#	.....	.....	2.37	.29	12.23
1931	#	.....	.....	3.00	.372	12.37
1932	2.84	.458	16.12	2.52	.324	12.86
1933	1.23	.373	30.32	1.61	.192	11.99
1934	1.09	.327	30.00	1.99	.305	15.33
1935	.98	.240	24.48	1.29	.210	16.28

No open season in Upper Peninsula.

Area	Date	Number of Hunters	Total Hunting Hours	No. Seen	No bagged	% bagged
Pigeon River State Forest-	1935	192	1,005½	1098	190	17.30
" " " " -	1936	280	1,439	2407	345	14.33
Escanaba River Tract						
" " " -	1935	164	906½	347	43	17.41
	1936	231	1,014	366	82	22.40

TABLE XVI

THE PERCENTAGE OF PARASITIC INFESTATION

FOUND IN THE RUFFED GROUSE IN MICHIGAN.

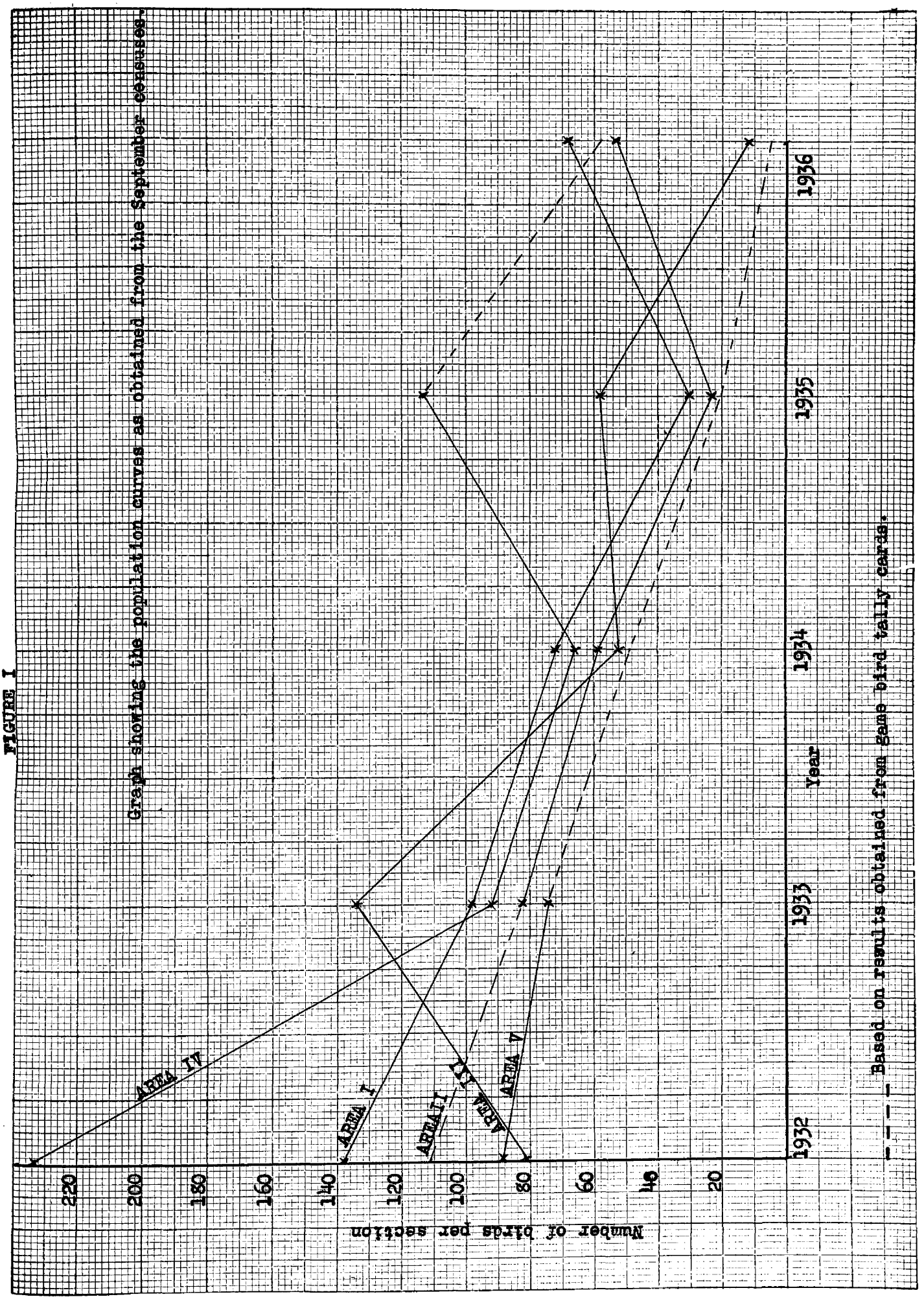
No. of Birds Examined	73	149#	80	86
Year Collected	1933	1934	1935	1936
Month Collected	October	October	October	October
Parasite				
Cheilospirura spinosa (Gizzard worm)	29.46%	28.18%	50.00%	51.16%
Ascaridia lineata (Round worm)	36.60%	##	20.00%	32.50%
Oxyspirura petrowi (Eye worm)		28.18%	22.50%	15.11%
Davainea tetraoensis (Tapeworm)		9.39%	1.25%	4.65%
Dispharynx spiralis (Proventricular worm)			1.25%	
Thominx anulata (Crop worm)				1.16%
Trematode cysts (Intestinal fluke)	2.59%			
Leucocytozoon bonasae (Blood parasite)		3.35%	2.50%	##
Total Infestation	43.43%	##	67.50%	68.64%

Includes ruffed grouse, prairie chickens and sharp-tailed grouse.

Data incomplete

FIGURE I

Graph showing the population curves as obtained from the September censuses.



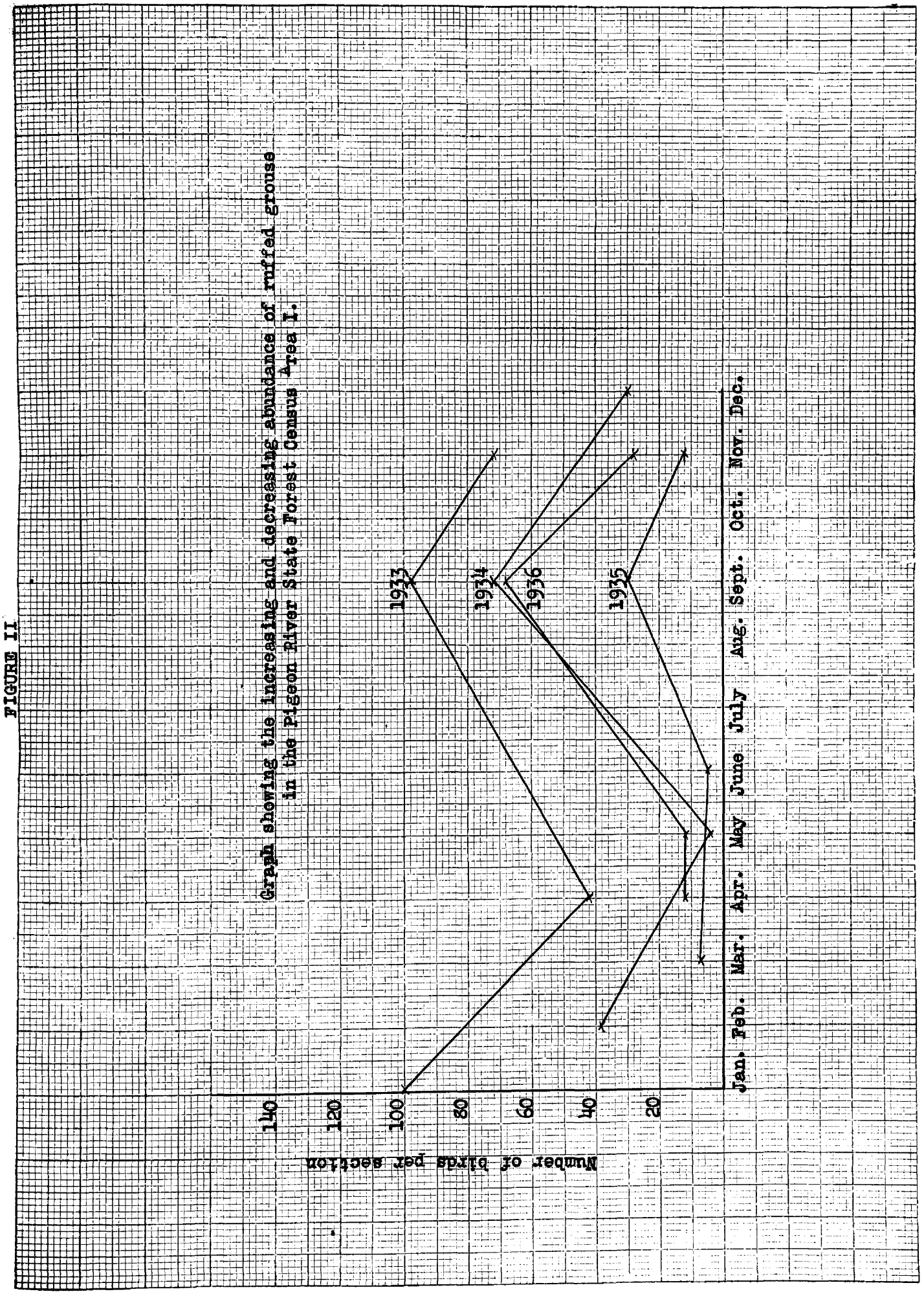

Graph showing the increasing and decreasing abundance of ruffed grouse
in the Pigeon River State Forest Census Area I.
Number of birds per section
140
120
100
80
60
40
20
1933
1934
1936
1935
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

FIGURE II

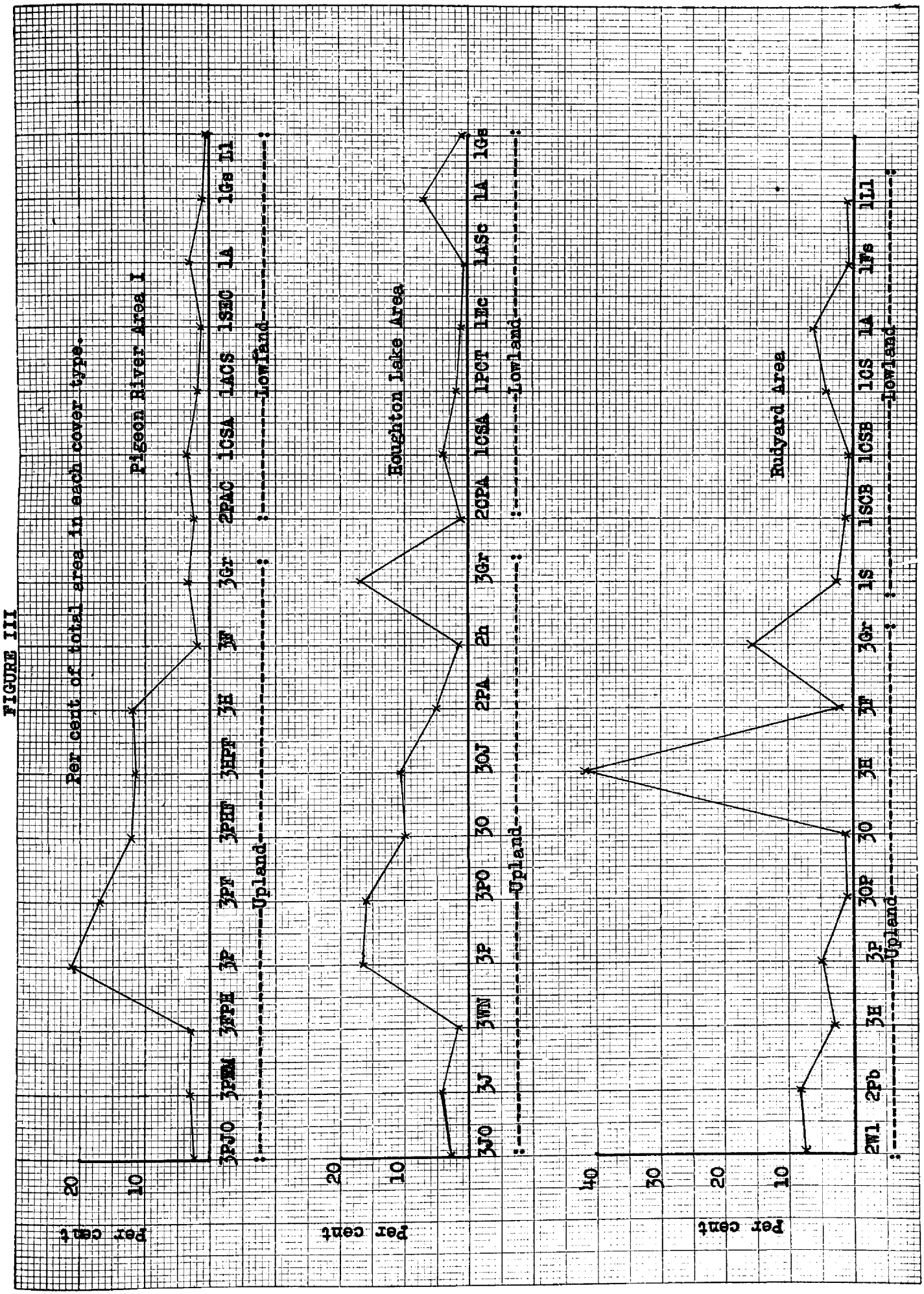

Per cent of total area in each cover type.
Pigeon River Area I
Houghton Lake Area
Rudyard Area
Per cent
Upland
Lowland
3PJO 3PM 3PK 3P 3PF 3PH 3EPT 3E 3W 3Gr 2PAC 1CSA 1ACS 1SSC 1A 1Gs Ll
3J0 3J 3W 3P 3PO 30 30J 2PA 2h 3Gr 2CPA 1CSA 1PCT 1Ec 1Asc 1A 1Gs
2W1 2Pb 3E 3P 30P 30 3E 3F 3Gr 1S 1SCB 1CSB 1CS 1A 1Ws 1Ll

FIGURE III

FIGURE IV

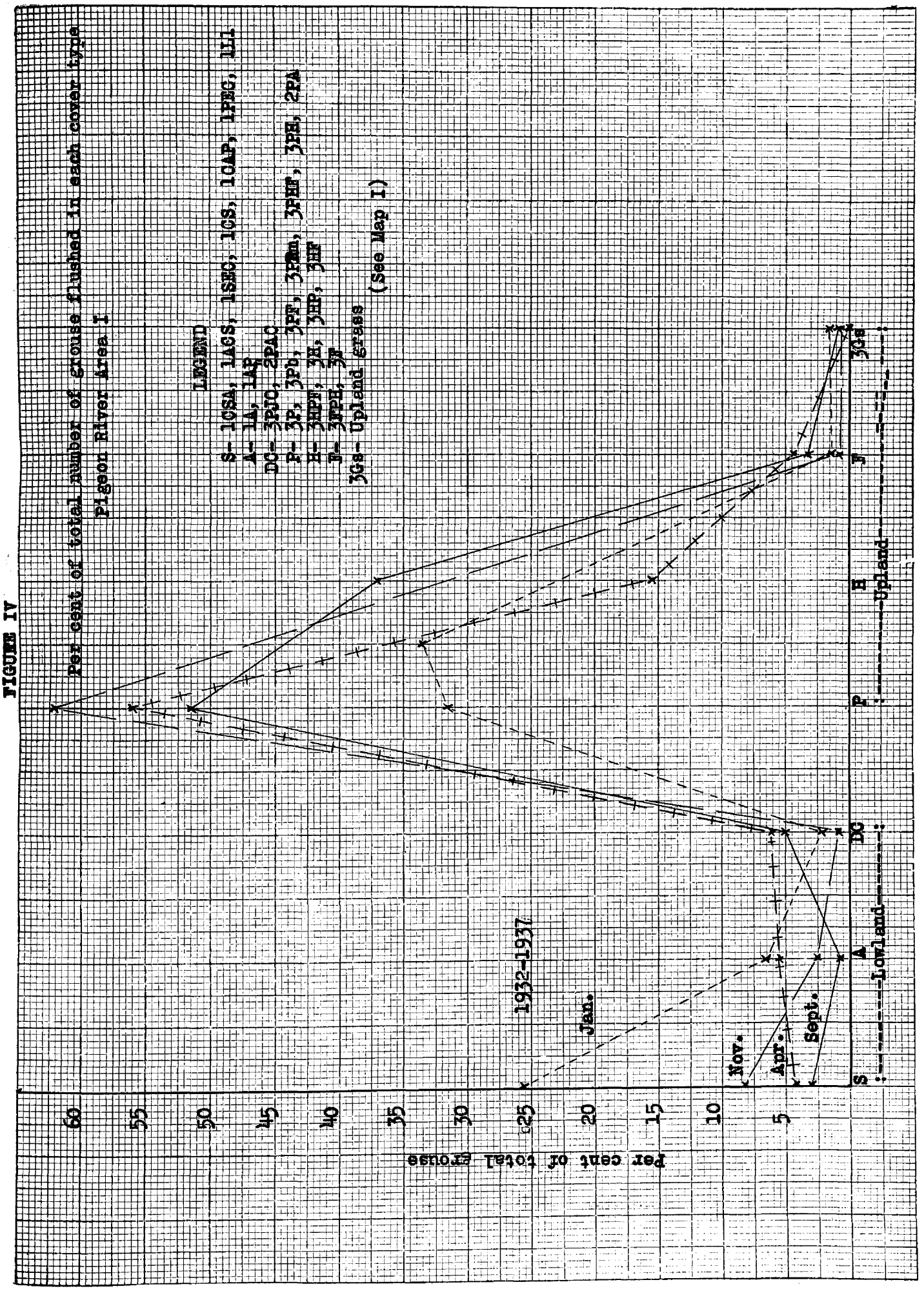
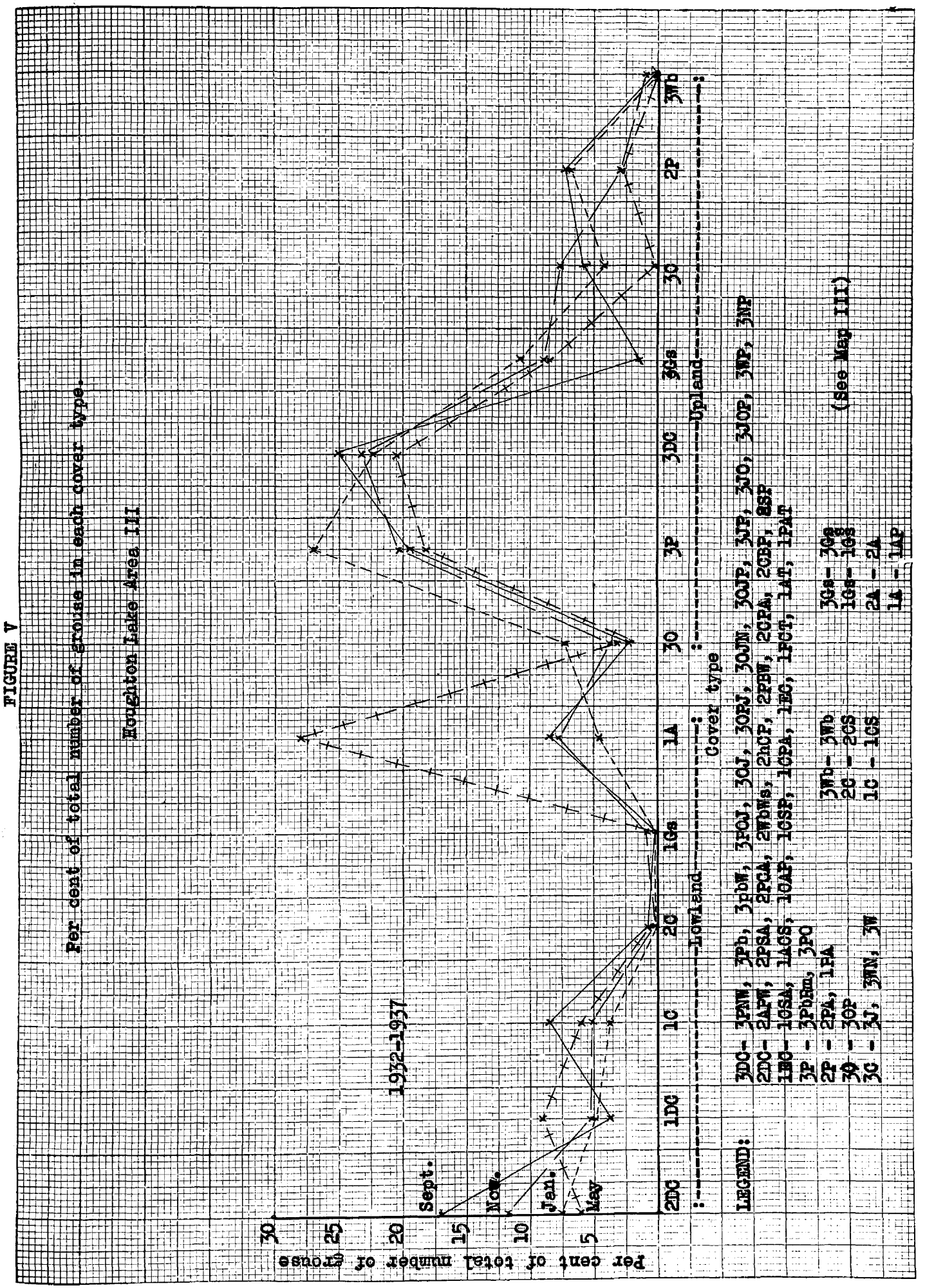

Per cent of total number of grouse flushed in each cover type
Pigeon River Area I
LEGEND
S- 10SA, 1AS, 1SE, 1CS, 10AP, 1PE, 1I.
A- 1A, 1AP
DC- 3PJO, 2PAO
P- 3P, 3Pb, 3PF, 3Pm, 3PHF, 3PE, 2PA
H- 3HPF, 3H, 3HP, 3HF
F- 3PE, 3F
3Gs- Upland grass
(See Map I)
1932-1937
Jan.
Nov.
Apr.
Sept.
S
A
DC
P
H
F
3Gs
Lowland
Upland
Per cent of total grouse
60
55
50
45
40
35
30
25
20
15
10
5

FIGURE V

Per cent of total number of grouse in each cover type.

Houghton Lake Area III



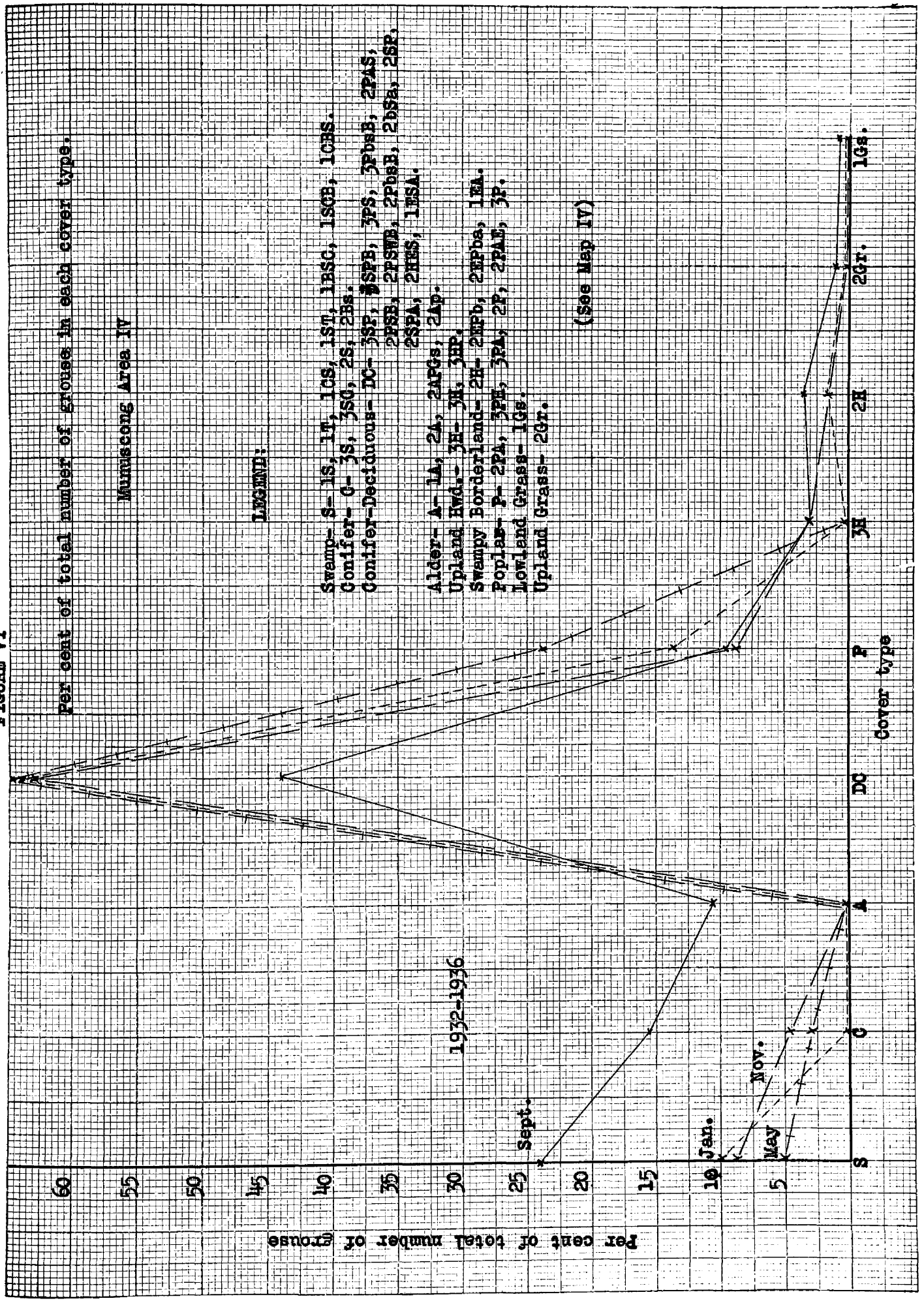

Per cent of total number of grouse in each cover type.
Munuscong Area IV
LEGEND:
Swamp- S- 1S, 1T, 1CS, 1ST, 1BSC, 1SCB, 1CBS.
Conifer- C- 3S, 3SC, 2S, 2Bs.
Conifer-Deciduous- DC- 3SP, 3SPB, 3PS, 3PbsB, 2PAS, 2PSB, 2PSWB, 2PbsB, 2bSa, 2SP, 2SPA, 2HBS, 1BSA.
Alder- A- 1A, 2A, 2APGs, 2Ap.
Upland Hwd.- 3E- 3H, 3HP.
Swampy Borderland- 2H- 2HPb, 2HPba, 1EA.
Poplars- P- 2PA, 3PE, 3PA, 2P, 2PAH, 3P.
Lowland Grass- 1Gs.
Upland Grass- 2Gr.
(See Map IV)
1932-1936
Per cent of total number of grouse
Cover type
Sept.
Jan.
May
Nov.
S
C
A
P
DC
H
2H
3H
2Gr.
1Gs.

FIGURE VI

MECW

Form I

RUFFED GROUSE SURVEY

Pigeon River State Forest

County Cheboygan T 33N R LW Sec. 26

GROUSE NEST

1. Date found May 15th, 1936

2. By whom found Jacob Sipila

3. Nest Number 1

4. a. Female flushed yes ; b. distance from observer 5 ft.
c. acted injured no ; d. distance flown 50 ft.

5. Number of eggs when found 10 ; b. total clutch 10

6. a. Nearest drumming log 700ft ; b. direction from nest east
Nest-c. distance from road or trail 200ft; d. much used no

7. Prevailing conditions
a. slope 15° ; b. distance from opening 150 ft.
c. type of opening grass and strawberry
d. type of cover on margin of poplar stand, 15 ft. from swamp of tamarack, spruce, cedar, and alder
e. density poplar stand light, coniferous stand heavy

8. Specific site
a. at base of stump white pine stump, on small knoll
b. at base of tree ---
c. diameter and height of stump or tree dia. 20 ins. ht. 10 ins.
d. other site --- e. exposure north
f. distance from nearest conifers 15 ft.

FATE OF NEST

9. a. Number hatched 9 ; b. number un-hatched 1
c. number infertile 0 ; d. number partially developed 1
e. condition of nest and shells following hatching nest and shells not broken or disturbed after hatching

10. Revisits
Date May 21st, 26th, 27th, June 5th, 8th, 9th, 10th,
Date 15th, 22nd, and 24th

11. Remarks: Hatched on June 10th, 1936.
Nest partially covered and protected by bracken, also one inch alder branch leaning over nest. Bird did not act injured, and moved south into swamp each time it was flushed. In unhatched egg chick well developed, but found ants in shell, which may have entered when egg was chipped. Nest at bottom of slope.

MECW

RUFFED GROUSE SURVEY

Form II

Pigeon River State Forest

County Cheboygan T33N R1W Sec. 36

GROUSE NEST

1. Date found May 20th, 1936

2. By whom found Alexander Jasinski

3. Nest Number 2

4. a. Female flushed yes ; b. distance from observer 8 ft.
c. acted injured no ; d. distance flown 40 ft.

5. Number of eggs when found 10 ; b. total clutch 10

6. a. Nearest drumming log --- ; b. direction from nest ---
Nest c. distance from road or trail 1000 ft. d. much used no

7. Prevailing conditions
a. slope 35° ; b. distance from opening 25 ft.
c. type of opening grass, raspberry, blackberry and sumac
d. type of cover poplar stand with maple, and cherry
e. density medium

8. Specific site
a. at base of stump ---
b. at base of tree poplar, on small knoll
c. diameter and height of stump or tree dia. 3 ins. ht. 15 ft.
d. other site --- c. exposure east
f. distance from nearest conifers 600 ft.

FATE OF NEST

9. a. Number hatched 0 ; b. number un-hatched ---
c. number infertile --- ; d. number partially developed ---
e. condition of nest and shells following hatching no trace of eggs when visited on June 8th.

10. Revisits
Date May 26th, June 3rd, 5th, 8th, 9th, 10th, 11th,
Date and 13th.

11. Remarks: Nest visited the following four days after disappearance of eggs. Female flushed from seven to ten feet near nest each day of the four, while male was flushed from forty to sixty feet from nest. No trace of male or female on fourth day. Man known who was suspicioned of taken eggs. Nest located at bottom of slope.

MECW

Form III

RUFFED GROUSE SURVEY

Pigeon River State Forest

County Cheboygan T 33N R 1W Sec. 23

GROUSE NEST

1. Date found May 23rd, 1936

2. By whom found Frank Walazek

3. Nest Number 3

4. a. Female flushed yes ; b. distance from observer 3 ft.
e. acted injured no ; d. distance flown 60 ft.

5. Number of eggs when found 13 ; b. total clutch 13

6. a. Nearest drumming log 500 ft; b. direction from nest south west
Nest-c. distance from road or trail 60 ft; d. much used no

7. Prevailing conditions
a. slope 5° ; b. distance from opening 60 ft.
c. type of opening old logging road
d. type of cover maple stand with scattered poplar, ground cover of bracken, blackberry, and raspberry.
e. density heavy

8. Specific site
a. at base of stump ---
b. at base of tree ---
c. diameter and height of stump or tree dia. 6 ins. length 20 ft.
d. other site fallen maple tree e. exposure east
f. distance from nearest conifers 50 ft.

FATE OF NEST

9. a. Number hatched 13 ; b. number un-hatched 0
c. number infertile 0 ; d. number partially developed 0
e. condition of nest and shells following hatching nest and shells not broken or disturbed after hatching

10. Revisits
Date May 25th, 29th, June 3rd, 5th, 8th, 12th, 13th,
Date 15th, 16th and 17th.

11. Remarks: Hatched on June 12th, 1936
This nest was protected by bracken and small fallen tree. (See Plate No.) The nest was fenced in and female and chicks contacted. Chicks were released on fourth day, brood later contacted several times.

MECW

RUFTED GROUSE SURVEY

Form IV

Pigeon River State Forest

County Cheboygan T 33N R 1W Sec. 24

GROUSE NEST

1. Date found May 27th, 1936

2. By whom found Lawrence Meldrum

3. Nest Number 4

4. a. Female flushed yes ; b. distance from observer 10 ft.
c. acted injured no ; d. distance flown 100 ft.

5. Number of eggs when found 11 ; b. total clutch 11

6. a. Nearest drumming log 1200ft; b. direction from nest east
Nest c. distance from road or trail 2 ft; d. much used no

7. Prevailing conditions
a. slope 10° ; b. distance from opening 500 ft.
c. type of opening grass
d. type of cover Poplar stand with w. birch, maple, scattered balsam and spruce, about 100 ft. from swamp
e. density heavy

8. Specific site
a. at base of stump ---
b. at base of tree balsam
c. diameter and height of stump or tree dia. 5 ins. ht. 15 ft.
d. other site --- e. exposure south
f. distance from nearest conifers 100 ft.

FATE OF NEST

9. a. Number hatched 9 ; b. number un-hatched 2
c. number infertile 2 ; d. number partially developed 0
e. condition of nest and shells following hatching nest and shells not broken or disturbed after hatching

10. Revisits
Date June 2nd, 5th, 9th, 11th, 12th, 13th, 16th,
Date and 19th

11. Remarks: Hatched on June 13th, 1936
This nest was located about 2 ft. from census line, and very difficult to flush from nest. Same brood contacted several times later.

MECW

Form V

RUFFED GROUSE SURVEY

Pigeon River State Forest

County Otsego T 32N R 2W Sec. 11

GROUSE NEST

1. Date found June 3rd, 1936

2. By whom found Lewis Snyder

3. Nest Number 5

4. a. Female flushed yes ; b. distance from observer 15 ft.
c. acted injured no ; d. distance flown 40 ft.

5. Number of eggs when found 9 ; b. total clutch 9

6. a. Nearest drumming log 1000 ft; b. direction from nest south
Nest-c. distance from road or trail 200 ft d. much used no

7. Prevailing conditions
a. slope 10° ; b. distance from opening 50 ft.
c. type of opening grass, bracken, and sweet fern
d. type of cover Poplar stand about 50 ft. from Jack pine stand
e. density medium

8. Specific site
a. at base of stump ---
b. at base of tree poplar
c. diameter and height of stump or tree dia. 5 ins. ht. 20 ft.
d. other site --- e. exposure west
f. distance from nearest conifers 50 ft.

FATE OF NEST

9. a. Number hatched 7 ; b. number un-hatched 2
c. number infertile 2 ; d. number partially developed 0
e. condition of nest and shells following hatching nest and shells not broken or disturbed after hatching

10. Revisits
Date June 4th, 8th, 10th, 11th, 15th, and 23rd.
Date

11. Remarks: Hatched June 11th, 1936. Brood contacted several times later.

MECW

Form VI

RUFFED GROUSE SURVEY

Pigeon River State Forest

County Otsego T32N R2W Sec. 12

GROUSE NEST

1. Date found June 19th, 1936

2. By whom found Lewis Snyder

3. Nest Number 6

4. a. Female flushed yes ; b. distance from observer 15 ft.
c. acted injured no ; d. distance flown 30 ft.

5. Number of eggs when found 9 ; b. total clutch 9

6. a. Nearest drumming log 700ft ; b. direction from nest south west
Nest c. distance from road or trail 600ft ; d. much used no

7. Prevailing conditions
a. slope 5° ; b. distance from opening 600 ft.
c. type of opening old railroad grade
d. type of cover white birch stand mixed with poplar, maple jack pine and willow. Ground cover of bracken, sweet fern and raspberry
e. density light

8. Specific site
a. at base of stump ---
b. at base of tree maple
c. diameter and height of stump or tree dia. 4 ins. ht. 15 ft.
d. other site --- e. exposure east
f. distance from nearest conifers 700 ft. from swamp of sp.ce.bal.

FATE OF NEST

9. a. Number hatched 7 ; b. number un-hatched 2
c. number infertile 0 ; d. number partially developed 2
e. condition of nest and shells following hatching nest and shells not broken or disturbed after hatching

10. Revisits
Date June 22nd, 26th, 29th, July 3rd, 4th, 5th, 6th,
Date 7th, 8th, 10th, 11th, 12th, 13th, 14th, and 20th.

11. Remarks: Hatched on July 8th, 1936.
This nest was fenced in and chicks contacted for a period of six days. (See Plate No.)

MECW

RUFFED GROUSE SURVEY

Form VII

Pigeon River State Forest

County Cheboygan T 33N R 1W Sec. 26

GROUSE NEST

1. Date found May 26th, 1937 Clear an Sunny

2. By whom found Lewis Buchanan

3. Nest Number 7

4. a. Female flushed yes ; b. distance from observer 14 ft.
c. acted injured no ; d. distance flown 150 ft.

5. Number of eggs when found 11 ; b. total clutch 11

6. a. Nearest drumming log 500 ft. b. direction from nest east
c. distance from road or trail ¼ mi.; d. much used yes

7. Prevailing conditions
a. slope 5% ; b. distance from opening 150 Ft.
c. type of opening grass, strawberry, and raspberry
d. type of cover Poplar stand with alder, w. birch, grass and bracken
e. density light

8. Specific site
a. at base of stump
b. at base of tree
c. diameter and height of stump or tree dia. 8 in. length 13 ft.
d. other site under root of fallen balsam exposure west
f. distance from nearest conifers 50 ft. from swamp of tamarack, with spruce and balsam

FATE OF NEST

9. a. Number hatched 11 ; b. number un-hatched 0
c. number infertile 0 ; d. number partially developed 0
e. condition of nest and shells following hatching Unknown person removed egg shells and let out the chicks, which were enclosed by wire fence.

10. Revisits
Date May 28th, June 3rd, 4th, 5th, 6th, and 7th.
Date

11. Remarks: Nest enclosed by wire fence. Clutch hatched on June 5th. Fence torn down by unknown person and chicks let out.

MECW

Form VIII

RUFFED GROUSE SURVEY

Pigeon River State Forest

County Cheboygan T 33N R 1W Sec. 22

GROUSE NEST

1. Date found June 1st, 1937 Clear and Sunny

2. By whom found Guy Johnson

3. Nest Number 8

4. a. Female flushed yes ; b. distance from observer 6 ft.
c. acted injured no ; d. distance flown 200 ft.

5. Number of eggs when found 10 ; b. total clutch 10

6. a. Nearest drumming log - ; b. direction from nest -
c. distance from road or trail - ; d. much used -

7. Prevailing conditions
a. slope 0 ; b. distance from opening 40 ft.
c. type of opening old logging road covered with grass
d. type of cover Poplar stand with scattered birch and maple, bracken and grass.
e. density light

8. Specific site
a. at base of stump
b. at base of tree
c. diameter and height of stump or tree 14 ft. in length. dia. 6 in.
d. other site under root of fallen cedar exposure west
f. distance from nearest conifers 100 ft. from swamp of balsam, spruce and tamarack

FATE OF NEST

9. a. Number hatched 9 ; b. number un-hatched 1
c. number infertile 0 ; d. number partially developed 1
e. condition of nest and shells following hatching undisturbed

10. Revisits
Date June 4th, 5th, 7th, 9th, 10th, and 11th, 12th, 14th.

11. Remarks: Nest enclosed by wire fence. Clutch hatched on June 7th Chicks kept within enclosure for a period of six days. Chicks ate prepared mash readily. No ticks found on female or chicks. Female trapped with fly net and banded. Female moulting unable to fasten colored feathers on tail. Five of the chicks apparently taken by milk snake. Snake seen and one chick dragged in hole.

MECW

Form IX

RUFFED GROUSE SURVEY

Pigeon River State Forest

County Cheboygan T 33N R 1W Sec. 22

GROUSE NEST

1. Date found June 1st, 1937 Clear and Sunny

2. By whom found Lewis Buchanan

3. Nest Number 9

4. a. Female flushed yes ; b. distance from observer 2 ft.
c. acted injured no ; d. distance flown 200 ft.

5. Number of eggs when found 12 ; b. total clutch 12

6. a. Nearest drumming log - ; b. direction from nest -
c. distance from road or trail - ; d. much used -

7. Prevailing conditions
a. slope 0 ; b. distance from opening approx. ¼ mi.
c. type of opening old logging road, grass covered
d. type of cover Poplar stand with w. birch, maple, cherry, and scattered balsam. Grass, strawberry, and raspberry.
e. density medium

8. Specific site
a. at base of stump
b. at base of tree 2 inch white birch on knoll
c. diameter and height of stump or tree
d. other site e. exposure west
f. distance from nearest conifers 40 ft. from balsam

FATE OF NEST

9. a. Number hatched 12 ; b. number un-hatched 0
c. number infertile 0 ; d. number partially developed 0
e. condition of nest and shells following hatching undisturbed

10. Revisits
Date June 4th, 5th, 7th, and 9th
Date

11. Remarks: Nest enclosed by wire fence. Clutch hatched on June 7th Chicks kept within enclosure for a period of two days. Heavy thunder showers washed out fence allowing female to escape with chicks. No ticks found on chicks. Readily fed on prepared mash.

MECW

RUFFED GROUSE SURVEY

Form X

Pigeon River State Forest

County Cheboygan

T 33N R 1W Sec. 23

DRUMMING LOGS

1. Date found April 29th, 1936

2. By whom found Lee Fisher

3. Log number 1

4. Male heard drumming (yes)(No) no

5. Number of droppings when found
   a. number fresh yes
   b. number old yes
   c. number enlarged female no

6. Number of new droppings on revisit

	Male	Female
Date May 11th	yes	no
Date May 14th	yes	no
Date May 18th	no	no
Date May 22nd	yes	no
Date June 6th	yes	no
Date June 9th	yes	no
Date June 23rd	no	no

7. Type of log
   a. diameter 3.½ ft.
   b. length 35 ft.
   c. moss-covered or bare moss covered pine log

8. Prevailing conditions
   a. slope 30°
   b. distance from opening 300 ft.
   c. type of opening grass and sumac
   d. type of cover maple stand with scattered basswood

9. Degree of use by male
   a. regular regular
   b. occasional

10. Remarks: This log is located about a quarter of a mile from nest number three. (See Map No.)

MECW

RUFFED GROUSE SURVEY

Form XI

Pigeon River State Forest

County Cheboygan

T 33N R 1W Sec. 23

DRUMMING LOGS

1. Date found May 4th, 1936

2. By whom found Lewis Buchanan

3. Log number 2

4. Male heard drumming (yes)(No) yes

5. Number of droppings when found
   a. number fresh yes
   b. number old yes
   c. number enlarged female no

6. Number of new droppings on revisit

	Male	Female
Date May 6th	no	no
Date May 9th	no	no
Date May 14th	yes	no
Date May 23rd	no	no
Date June 29th	no	no
Date		
Date		

7. Type of log
   a. diameter 1½ ft.
   b. length 40 ft.
   c. moss-covered or bare bare cedar log

8. Prevailing conditions
   a. slope level
   b. distance from opening 200 ft.
   c. type of opening open grass spot
   d. type of cover poplar and tag alder swamp, log on margin

9. Degree of use by male
   a. regular ---
   b. occasional occasional

10. Remarks: This log was found about 500 ft. from grouse nest number three.

MECW

Form XII

RUFFED GROUSE SURVEY

Pigeon River State Forest

County Cheboygan T33N R 1W Sec. 23

DRUMMING LOGS

1. Date found May 5th, 1936

2. By whom found Lawrence Meldrum

3. Log number 3

4. Male heard drumming (yes)(No) no

5. Number of droppings when found
   a. number fresh yes
   b. number old yes
   c. number enlarged female

6. Number of new droppings on revisit

	Male	Female
Date May 15th	yes	no
Date May 18th	no	no
Date May 22nd	yes	no
Date June 9th	yes	no
Date June 19th	yes	no
Date June 20th	no	no
Date October 3rd	yes	no

7. Type of log
   a. diameter 2 ft.
   b. length 25 ft.
   c. moss-covered or bare moss covered ash

8. Prevailing conditions
   a. slope 5°
   b. distance from opening 150 ft.
   c. type of opening open grass on old road
   d. type of cover mixed stand of maple, basswood, birch, ash, and hemlock

9. Degree of use by male
   a. regular regular
   b. occasional

10. Remarks: A grouse brood contacted several times in this vicinity. See experimental planting Map no

MECW

RUFFED GROUSE SURVEY

Form XIII

Pigeon River State Forest

County Cheboygan T 33N R1W Sec. 14

DRUMMING LOGS

1. Date found May 7th, 1936

2. By whom found Lee Fisher

3. Log number 4

4. Male heard drumming (yes)(No) yes

5. Number of droppings when found
   a. number fresh yes
   b. number old yes
   c. number enlarged female no

6. Number of new droppings on revisit

	Male	Female
Date May 14th	yes	no
Date May 18th	yes	no
Date May 21st	yes	no
Date May 29th	yes	no
Date June 1st	no	no
Date June 20th	yes	no
Date August 25th	yes	no

7. Type of log
   a. diameter 3 ft.
   b. length 50 ft.
   c. moss-covered or bare moss covered pine log

8. Prevailing conditions
   a. slope level
   b. distance from opening 500 ft
   c. type of opening fire line, open grass
   d. type of cover in dry swamp of balsam, w. birch, cedar, with ground hemlock and moss

9. Degree of use by male
   a. regular regular
   b. occasional ---

10. Remarks: At a distance of twenty feet another log of pine about the same size, but no droppings on it.

MECW

Form XIV

RUFFED GROUSE SURVEY

Pigeon River State Forest

County Cheboygan T33N R1W Sec. 24

DRUMMING LOGS

1. Date found May 7th, 1936

2. By whom found Lewis Buchanan

3. Log number 5

4. Male heard drumming (yes)(No) yes

5. Number of droppings when found
   a. number fresh yes
   b. number old yes
   c. number enlarged female no

6. Number of new droppings on revisit

	Male	Female
Date May 10th	yes	no
Date May 14th	yes	no
Date May 16th	bno	no
Date June 4th	yes	no
Date June 8th	no	no
Date June 20th	yes	no
Date		

7. Type of log
   a. diameter 2 ft.
   b. length 12 ft.
   c. moss-covered or bare bare cedar log

8. Prevailing conditions
   a. slope 5°
   b. distance from opening 60 ft.
   c. type of opening grass, bracken, and goldenrod
   d. type of cover mixed stand of poplar, cedar, and willow

9. Degree of use by male
   a. regular regular
   b. occasional

10. Remarks: This drumming log is located at approximately a distance of 1200 ft. from nest number four. See Map no.

MECW

Form XV

RUFFED GROUSE SURVEY

Pigeon River State Forest

County Cheboygan T33N R1W Sec 24

DRUMMING LOGS

1. Date found May 7th, 1936

2. By whom found Lewis Buchanan

3. Log number 6

4. Male heard drumming (yes)(No) no

5. Number of droppings when found
   a. number fresh yes
   b. number old yes
   c. number enlarged female no

6. Number of new droppings on revisit

	Male	Female
Date May 10th	yes	no
Date May 14th	no	no
Date May 16th	yes	no
Date June 4th	yes	no
Date June 8th	yes	no
Date June 20th	yes	no
Date June 23rd	yes	no

7. Type of log
   a. diameter 1½ ft.
   b. length 40 ft.
   c. moss-covered or bare moss covered cedar

8. Prevailing conditions
   a. slope 5°
   b. distance from opening 100 ft.
   c. type of opening bracken covered ridge
   d. type of cover mixed stand of white birch, poplar, maple, cedar, balsam, and white pine

9. Degree of use by male
   a. regular regular
   b. occasional ---

10. Remarks: This drumming log is located near census line, and brood was contacted several times in this area.

MECW

Form XVI

RUFFED GROUSE SURVEY

Pigeon River State Forest

County Cheboygan T 33N R 1W Sec. 14

DRUMMING LOGS

1. Date found May 10th, 1936

2. By whom found Harold Rossman

3. Log number 7

4. Male heard drumming (yes)(No) yes

5. Number of droppings when found
   a. number fresh yes
   b. number old yes
   c. number enlarged female no

6. Number of new droppings on revisit

	Male	Female
Date May 14th	no	no
Date May 15th	no	no
Date May 18th	no	no
Date May 23rd	yes	no
Date June 4th	yes	no
Date June 9th	no	no
Date June 23rd	yes	no

7. Type of log
   a. diameter 2 ft.
   b. length 30 ft.
   c. moss-covered or bare moss covered maple

8. Prevailing conditions
   a. slope 5°
   b. distance from opening 400 ft fromm old road
   c. type of opening grass
   d. type of cover poplar stand with maple, white birch, and balsam

9. Degree of use by male
   a. regular ---
   b. occasional occasional

10. Remarks: Brood contacted several times in this vicinity. See brood Map No.

MECW

RUFFED GROUSE SURVEY

Form XVII

Pigeon River State Forest

County Cheboygan T 33N R 1W Sec. 26

DRUMMING LOGS

1. Date found May 25th, 1936

2. By whom found Lewis Buchanan

3. Log number 8

4. Male heard drumming (yes)(No) yes

5. Number of droppings when found
   a. number fresh yes
   b. number old yes
   c. number enlarged female no

6. Number of new droppings on revisit

	Male	Female
Date June 5th	yes	no
Date June 8th	yes	no
Date June 15th	yes	no
Date June 20th	no	no
Date June 24th	yes	no
Date June 30th	no	no
Date		

7. Type of log
   a. diameter 1½ ft.
   b. length 20 ft.
   c. moss-covered or bare bare pine log

8. Prevailing conditions
   a. slope level
   b. distance from opening 20 ft.
   c. type of opening burnt over opening
   d. type of cover poplar stand with maple, cherry, willow, and scattering bracken and grass

9. Degree of use by male
   a. regular regular
   b. occasional ---

10. Remarks: This log was found about 700 ft. from nest number one. See Map

MECW

RUFFED GROUSE SURVEY

Form XVIII

Pigeon River State Forest

County Otsego

T 32N R 2W Sec. 11

DRUMMING LOGS

1. Date found May 25th, 1936

2. By whom found Lewis Snyder

3. Log number 9

4. Male heard drumming (yes)(No) yes

5. Number of droppings when found
   a. number fresh yes
   b. number old yes
   c. number enlarged female no

6. Number of new droppings on revisit

	Male	Female
Date May 27th	yes	no
Date May 29th	yes	no
Date June 1st	yes	no
Date June 4th	yes	no
Date June 9th	yes	nO
Date June 12th	no	no
Date June 17th, 18th, 20th	no	no

7. Type of log
   a. diameter 2½ ft.
   b. length 20 ft.
   c. moss-covered or bare moss covered pine log

8. Prevailing conditions
   a. slope 20°
   b. distance from opening 100 ft.
   c. type of opening grass, bracken, and sweet fern
   d. type of cover mixed stand of poplar, spruce, balsam, white pine, with grd. cover of wintergreen, sweet fern, bracken, and adder's tongue

9. Degree of use by male
   a. regular regular
   b. occasional ---

10. Remarks: This drumming log is located about 300 ft. north of the Vanderbilt CCC Camp Hdqts. on margin of small coniferous stand bordering Pickerel Lake. Drumming plainly heard from buildings, in the evenings and early mornings. It is located approximately 1000 ft. from nest number five. See Map No.

MECW

Form XIX

RUFFED GROUSE SURVEY

Pigeon River State Forest

County Otsego T 32N R 2W Sec. 12

DRUMMING LOGS

1. Date found May 28th, 1936

2. By whom found Lewis Snyder

3. Log number 10

4. Male heard drumming (yes)(No) yes

5. Number of droppings when found
   a. number fresh yes
   b. number old yes
   c. number enlarged female no

6. Number of new droppings on revisit

	Male	Female
Date May 29th	yes	no
Date June 1st	yes	no
Date June 4th	yes	no
Date June 9th	yes	no
Date June 12th, 17th, 18th	yes	no
Date June 20th	no	no
Date		

7. Type of log
   a. diameter 2½ ft.
   b. length 50 ft.
   c. moss-covered or bare moss covered pine

8. Prevailing conditions
   a. slope 5°
   b. distance from opening 300 ft.
   c. type of opening old railroad grade, with s.fern & grass
   d. type of cover poplar stand with maple, white birch and white pine, and ground cover of sweet fern, bracken, and wintergreen

9. Degree of use by male
   a. regular regular
   b. occasional ---

10. Remarks: This drumming log is located approximately 1400 ft. from grouse nest number six. See Map No.

MECW

Form XX

RUFFED GROUSE SURVEY

Pigeon River State Forest

County Otsego

T 32N R 2W Sec. 12

DRUMMING LOGS

1. Date found May 29th, 1936

2. By whom found Lewis Snyder

3. Log number 11

4. Male heard drumming (yes)(No) yes

5. Number of droppings when found
   a. number fresh yes
   b. number old yes
   c. number enlarged female no

6. Number of new droppings on revisit

	Male	Female
Date June 1st	no	no
Date June 4th	yes	no
Date June 9th	no	no
Date June 12th	yes	no
Date June 17th	yes	no
Date June 18th, 20th	no	no
Date June 29th	no	no

7. Type of log
   a. diameter 3 ft.
   b. length 30 ft.
   c. moss-covered or bare moss covered pine

8. Prevailing conditions
   a. slope 5°
   b. distance from opening 500 ft.
   c. type of opening old rr. bed with grass, bracken, s.fern
   d. type of cover mixed stand of poplar, maple, white pine, Jack pine, June berry, sweet fern, bracken, and wintergreen

9. Degree of use by male
   a. regular regular
   b. occasional ---

10. Remarks: This drumming log is located approximately 700 ft. from grouse nest number six. Male was seen drumming on this log.

MECW

RUFFED GROUSE SURVEY Form XXI

Pigeon River State Forest

County Cheboygan T33N R 1W, Sec. 23

6/19/36

GROUSE BROOD FLUSH

1. Weather
   a. warm, cold; b. sunny, cloudy, rainy warm, sunny, dry
   c. strong wind, light wind, still still

2. Ground conditions: dry, damp, wet dry Temp. 73

3. a. Brood No. 1 ; b. contact No. 1 ; c. time od day 3.45 P.M.

4. Distance from female 10 ft, from nearest chick 10 ft.

5. Prevailing conditions
   a. slope 0; b. distance from opening 70 ft.
   c. type of opening old logging road
   d. type of cover almost pure maple stand with scattered poplar, grd. cover of bracken, blackberry & raspberry
   E. density heavy

6. Cover within 20 ft. from point of flush
   a. type of crown cover maple stand with scattered poplars
   b. type of ground cover bracken, blackberry, raspberry, grass
   c. distance from tree or shrub 2 ft. from maple seedlings

7. a. Male grouse flushed near by (yes) (No)
   b. distance from brood 10 ft.

8. Condition of brood
   a. number of chicks seen 13
   b. estimated number of chicks in brood 13
   c. age of brood 3 days
   d. size of chick bantam chick
   e. brood scattered or bunched bunched
   f. behavior of brood active and healthy, immediately took to cover

9. Behavior of female very hostile and refusing to leave area, repeatedly charging toward person

10. Remarks: This brood from nest number three, see map no. II Brood released from fenced inclosure on 6/15/36. See plate no. Brood contacted six times during the summer.

MECW

RUFFED GROUSE SURVEY

Pigeon River State Forest

Form XXII

County Cheboygan

T 33N R 1W, Sec. 24

6/23/36

GROUSE BROOD FLUSH

1. Weather
   a. warm, cold; b. sunny, cloudy, rainy warm, sunny
   c. strong wind, light wind, still damp, still

2. Ground conditions: dry, damp, wet damp Temp. 81

3. a. Brood No. 2 ; b. contact No. 1 ; c. time od day 9.35 A.M.

4. Distance from female 15 ft.; from nearest chick 10 ft.

5. Prevailing conditions
   a. slope 0 ; b. distance from opening 300 ft.
   c. type of opening grass
   d. type of cover mixed stand of spruce, cedar, balsam and tamarack
   e. density heavy

6. Cover within 20 ft. from point of flush
   a. type of crown cover spruce, cedar, balsam, tamarack
   b. type of ground cover moss and strawberries
   c. distance from tree or shrub 5 ft. from small cedar

7. a. Male grouse flushed near by (yes) (No)
   b. distance from brood --

8. Condition of brood
   a. number of chicks seen 1
   b. estimated number of chicks in brood 8
   c. age of brood about two weeks
   d. size of chick size of English sparrow
   e. brood scattered or bunched bunched
   f. behavior of brood scattered on ground to cover

9. Behavior of female hostile, feigning to attack intruder, finally ran to cover, but would not leave location

10. Remarks: This brood contacted four times during the summer. Later counted 10 chicks in brood. See Map no. II

MECW

RUFFED GROUSE SURVEY

Pigeon River State Forest. Form XXIII

County Cheboygan T33NR1W, Sec. 23

6/29/36

GROUSE BROOD FLUSH

1. Weather
   a. warm, cold; b. sunny, cloudy, rainy warm, sunny, dry
   c. strong wind, light wind, still still

2. Ground conditions: dry, damp, wet dry Temp. 78

3. a. Brood No. 3 ; b. contact No. 1 ; c. time od day 10.40 A.M.

4. Distance from female 20 ft. from nearest chick 15 ft.

5. Prevailing conditions
   a. slope 0 ; b. distance from opening 5 ft.
   c. type of opening fire line
   d. type of cover maple, poplar, and basswood
   E. density heavy

6. Cover within 20 ft. from point of flush
   a. type of crown cover maple, poplar, and basswood
   b. type of ground cover bracken, blberry, raspberry, grass
   c. distance from tree or shrub 10 ft. from large maple

7. a. Male grouse flushed near by (yes) (No)
   b. distance from brood 25 ft.

8. Condition of brood
   a. number of chicks seen 7
   b. estimated number of chicks in brood 10
   c. age of brood 3 weeks
   d. size of chick smaller than woodcock
   e. brood scattered or bunched bunched
   f. behavior of brood active and healthy took to flight in several directions

9. Behavior of female did not flush but stole away very quietly could be seen running through dense under cover

10. Remarks: This brood was contacted ten times during the summer. See map no. II

RUFFED GROUSE SURVEY

Form XXIV

Pigeon River State Forest

County Cheboygan T 33N R 1W, Sec. 23

7/2/36

GROUSE BROOD FLUSH

1. Weather
   a. warm, cold; b. sunny, cloudy, rainy warm, sunny, dry
   c. strong wind, light wind, still light wind

2. Ground conditions: dry, damp, wet dry Temp. 72

3. a. Brood No. 4 ; b. contact No. 1 ; c. time od day 11.00 A.M.

4. Distance from female 15 ft.; from nearest chick 3 ft.

5. Prevailing conditions
   a. slope 0 ; b. distance from opening 10 ft.
   c. type of opening grass, bracken, sumac
   d. type of cover maple stand with scattered ash, basswood and hemlock
   e. density heavy

6. Cover within 20 ft. from point of flush
   a. type of crown cover maple
   b. type of ground cover grass, bracken, and sumac
   c. distance from tree or shrub 5 ft. from sumac

7. a. Male grouse flushed near by (yes) (No)
   b. distance from brood 20 ft.

8. Condition of brood
   a. number of chicks seen 10
   b. estimated number of chicks in brood 10
   c. age of brood 3 weeks about
   d. size of chick size of woodcock
   e. brood scattered or bunched bunched
   f. behavior of brood active and healthy all took flight

9. Behavior of female took flight with brood but in different direction

10. Remarks: Brood contacted seven times during the summer, and remained on margin of maple stand near open prairie chicken cover of grass and sumac. See map no. II

MECW

RUFFED GROUSE SURVEY

Form XXV

Pigeon River State Forest

County Cheboygan

T33N R1W, Sec. 25

7/8/36

GROUSE BROOD FLUSH

1. Weather
   a. warm, cold; b. sunny, cloudy, rainy warm, sunny
   c. strong wind, light wind, still light wind

2. Ground conditions: dry, damp, wet damp

3. a. Brood No. 5 ; b. contact No. 1 ; c. time od day 8.30 A.M.

4. Distance from female 10 ft, from nearest chick 10 ft.

5. Prevailing conditions
   a. slope 0 ; b. distance from opening 20 ft.
   c. type of opening opening of grass near old logging road
   d. type of cover poplar and birch along edge of medium stand of spruce, cedar, balsam, willow, red osier, cherry
   e. density medium

6. Cover within 20 ft. from point of flush
   a. type of crown cover poplar, birch, cherry
   b. type of ground cover bracken, grass, raspberry, blackberry
   c. distance from tree or shrub 2 ft. from poplar

7. a. Male grouse flushed near by (yes) (No)
   b. distance from brood --

8. Condition of brood
   a. number of chicks seen 3
   b. estimated number of chicks in brood 6
   c. age of brood about four weeks
   d. size of chick size of woodcock
   e. brood scattered or bunched bunched
   f. behavior of brood active and immediately took to flight

9. Behavior of female hostile, alarm notes and feigning with wings drooped, pretending injury

10. Remarks: Brood contacted eight times during the summer. Later counted eleven chicks in brood. See map no. II

MECW
RUFFED GROUSE SURVEY

Form XXVI

Pigeon River State Forest

County Cheboygan T 33N R 1W, Sec. 24

7/24/36

GROUSE BROOD FLUSH

1. Weather
   a. warm, cold; b. sunny, cloudy, rainy warm, sunny
   c. strong wind, light wind, still light wind

2. Ground conditions: dry, damp, wet dry Temp. 77

3. a. Brood No. 6 ; b. contact No. 1 ; c. time od day 2.30 P.M.

4. Distance from female 50 ft. from nearest chick 60 ft.

5. Prevailing conditions
   a. slope 0 ; b. distance from opening 30 ft.
   c. type of opening bracken, willow, and strawberry, grass
   d. type of cover cedar, balsam, poplar, and willow
   E. density heavy

6. Cover within 20 ft. from point of flush
   a. type of crown cover cedar, balsam, poplar
   b. type of ground cover bracken, grass, strawberry
   c. distance from tree or shrub 5 ft.

7. a. Male grouse flushed near by (yes) (No)
   b. distance from brood --

8. Condition of brood
   a. number of chicks seen 10
   b. estimated number of chicks in brood 10
   c. age of brood about six weeks
   d. size of chick size of quail
   e. brood scattered or bunched scattered
   f. behavior of brood active and healthy all took flight

9. Behavior of female Took flight with brood

10. Remarks: This brood located about 1200 ft. from where nest number four was found. See map no. II
Brood contacted three times during the summer.

MECW

RUFFED GROUSE SURVEY

Form XXVII

Pigeon River State Forest

County Cheboygan

T33N R 1W, Sec. 26

7/26/36

GROUSE BROOD FLUSH

1. Weather
   a. warm, cold; b. sunny, cloudy, rainy warm, sunny
   c. strong wind, light wind, still light wind

2. Ground conditions: dry, damp, wet ~~damp~~ dry Temp. 85

3. a. Brood No. 7 ; b. contact No. 1 ; c. time od day 9.00 A.M.

4. Distance from female 25 ft.; from nearest chick 20 ft.

5. Prevailing conditions
   a. slope 0 ; b. distance from opening 5 ft. from grass
   c. type of opening grass, bracken, and strawberries
   d. type of cover Poplar stand with scattered maple, balsam, spruce, and willow
   e. density medium

6. Cover within 20 ft. from point of flush
   a. type of crown cover poplar
   b. type of ground cover grass, bracken, strawberries
   c. distance from tree or shrub 15 ft. from poplar

7. a. Male grouse flushed near by (yes) (No)
   b. distance from brood 30 ft. from brood

8. Condition of brood
   a. number of chicks seen 10
   b. estimated number of chicks in brood 10
   c. age of brood about six weeks
   d. size of chick about size of quail
   e. brood scattered or bunched bunched
   f. behavior of brood immediately took flight with female

9. Behavior of female immediately took flight with brood, male also took flight, but before female or brood.

10. Remarks: Brood contacted five times during summer. Nest number one located about 1200 ft. west. But ten chicks were carefully checked in this brood, while there were only nine chicks hat ched from nest number one, therefore apparently a different brood. See map no. II

MECW

RUFFED GROUSE SURVEY

Pigeon River State Forest — Form XXVIII

County Cheboygan — T 33N R 1W, Sec. 14

8/6/36

GROUSE BROOD FLUSH

1. Weather
   a. warm, cold; b. sunny, cloudy, rainy warm, sunny
   c. strong wind, light wind, still still

2. Ground conditions: dry, damp, wet damp Temp. 81

3. a. Brood No. 8 ; b. contact No. 1 ; c. time od day 10.00 A.M.

4. Distance from female 40 ft. from nearest chick 15 ft.

5. Prevailing conditions
   a. slope 0 ; b. distance from opening 100 ft.
   c. type of opening burnt over swamp with heavy map of moss
   d. type of cover spruce, balsam and cedar swamp
   E. density light

6. Cover within 20 ft. from point of flush
   a. type of crown cover spruce, balsam and cedar
   b. type of ground cover moss and cedar seedlings
   c. distance from tree or shrub 3 ft.

7. a. Male grouse flushed near by (yes) (No)
   b. distance from brood --

8. Condition of brood
   a. number of chicks seen 6
   b. estimated number of chicks in brood 9
   c. age of brood about 8 weeks
   d. size of chick larger than quail
   e. brood scattered or bunched bunched
   f. behavior of brood active, did not flush but ran through brush

9. Behavior of female did not take to flight but disappeared in cover after emitting alarm notes.

10. Remarks: This brood was contacted eight times during the summer . Later counted eleven chicks in brood. Male later flushed near brood. See map no. II

MECW

RUFFED GROUSE SURVEY

Pigeon River State Forest Form XXIX

County Cheboygan T33NR 1W, Sec. 23

8/10/36

GROUSE BROOD FLUSH

1. Weather
   a. warm, cold; b. sunny, cloudy, rainy warm, sunny, dry
   c. strong wind, light wind, still still Temp. 77

2. Ground conditions: dry, damp, wet damp

3. a. Brood No. 9 ; b. contact No. 1 ; c. time od day 9.40 A.M.

4. Distance from female 60 ft, from nearest chick 60 ft.

5. Prevailing conditions
   a. slope 0 ; b. distance from opening 100 ft.
   c. type of opening grass and sumac
   d. type of cover on margin of balsam, spruce, hemlock, cedar, willow, red osier, scattered poplar and maple
   E. density heavy

6. Cover within 20 ft. from point of flush
   a. type of crown cover balsam, spruce, willow and poplar
   b. type of ground cover grass, moss, strawberries
   c. distance from tree or shrub 2 ft. from large spruce

7. a. Male grouse flushed near by (yes) (No)
   b. distance from brood --

8. Condition of brood
   a. number of chicks seen 3
   b. estimated number of chicks in brood 7
   c. age of brood about 8 weeks
   d. size of chick almost as large as adult female grouse
   e. brood scattered or bunched bunched
   f. behavior of brood all took flight with female

9. Behavior of female emitted alarm notes and immediately took to flight with brood

10. Remarks:
    This brood was contacted fifteen times during the summer. Eleven chicks were in the brood. See Map no. II

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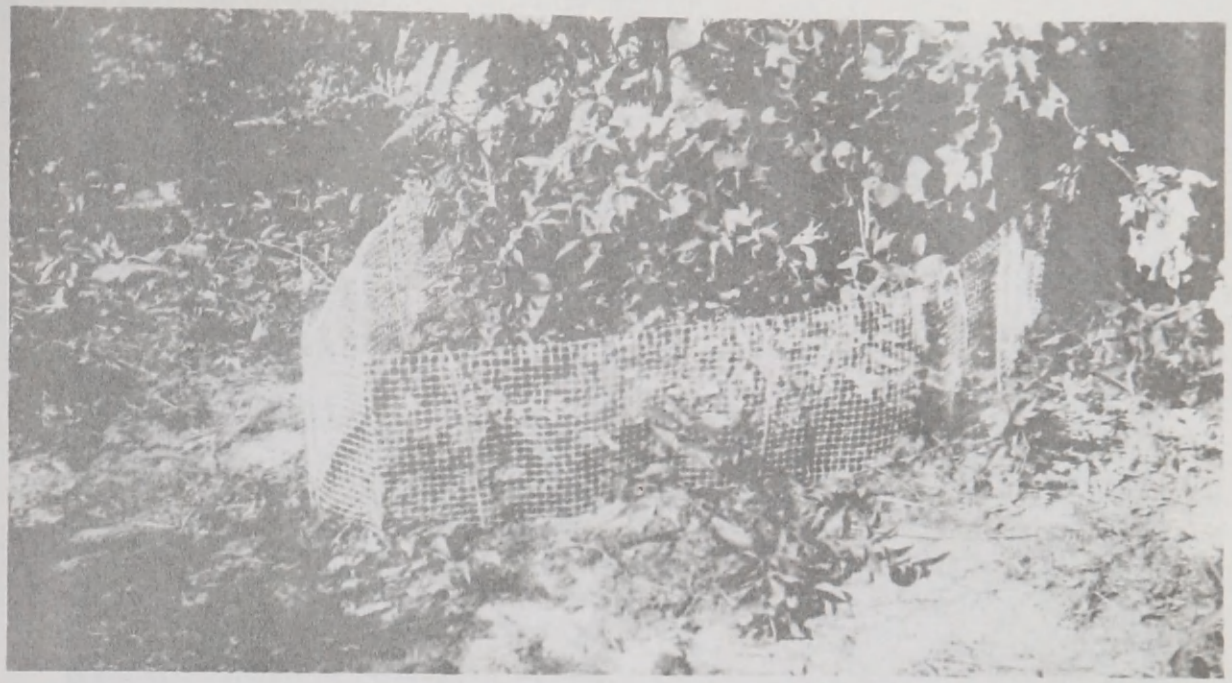
Plate II



Upper- Ruffed Grouse nest encircled by wire fence.

Lower- Ruffed Grouse nest.

Plate III

Plate IV

Female Grouse guarding the young chicks which are within the wire enclosure.

Plate V

Female Grouse nesting within the wire enclosure.

Plate VI

Ruffed Grouse snow roost.

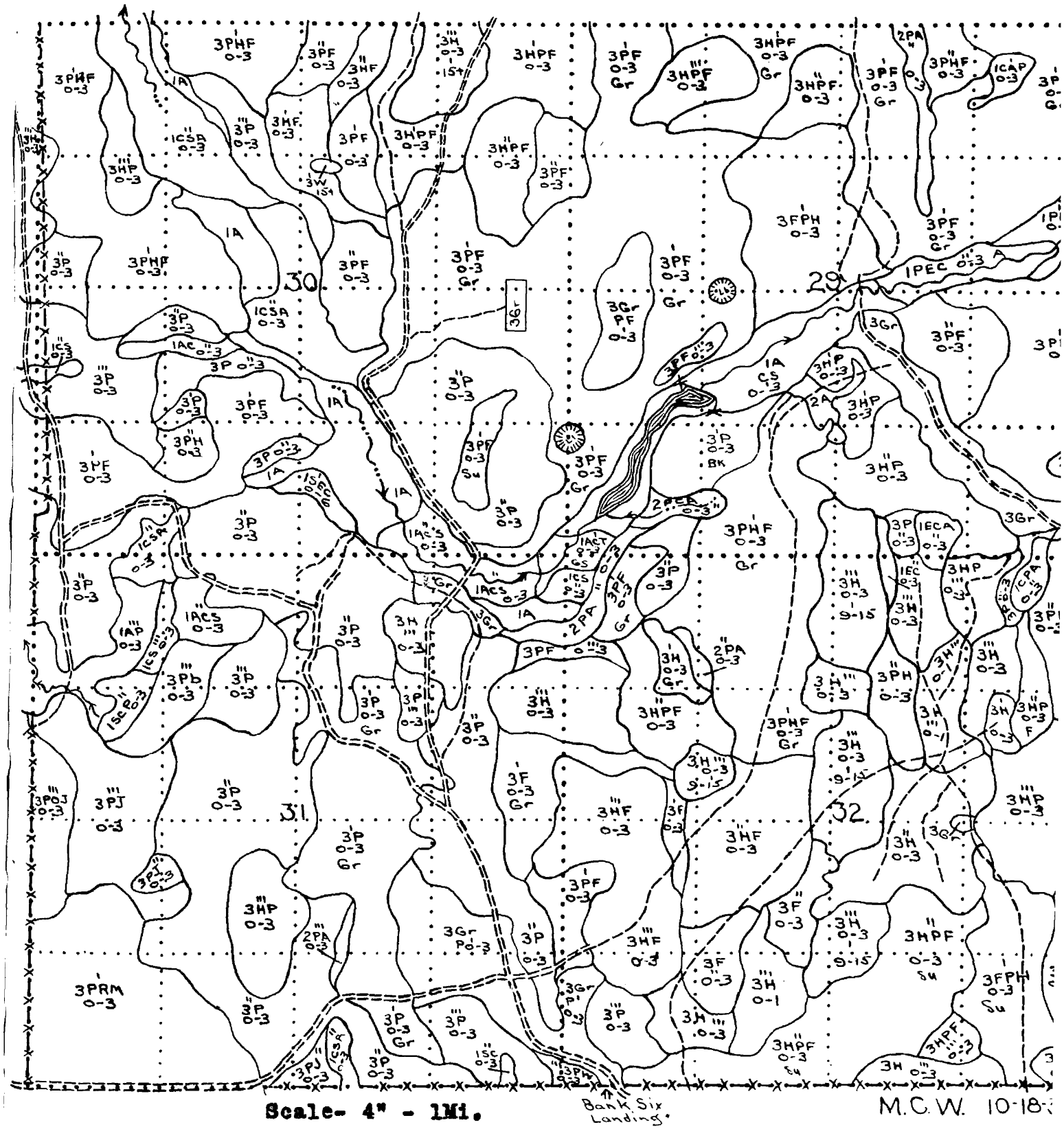
Plate VII

The depredation of a Great Horned Owl.

GROUSE CENSUS AREA-I

PIGEON RIVER STATE FOREST

CHEBOYGAN COUNTY T33N-R1W



Scale- 4" - 1Mi.

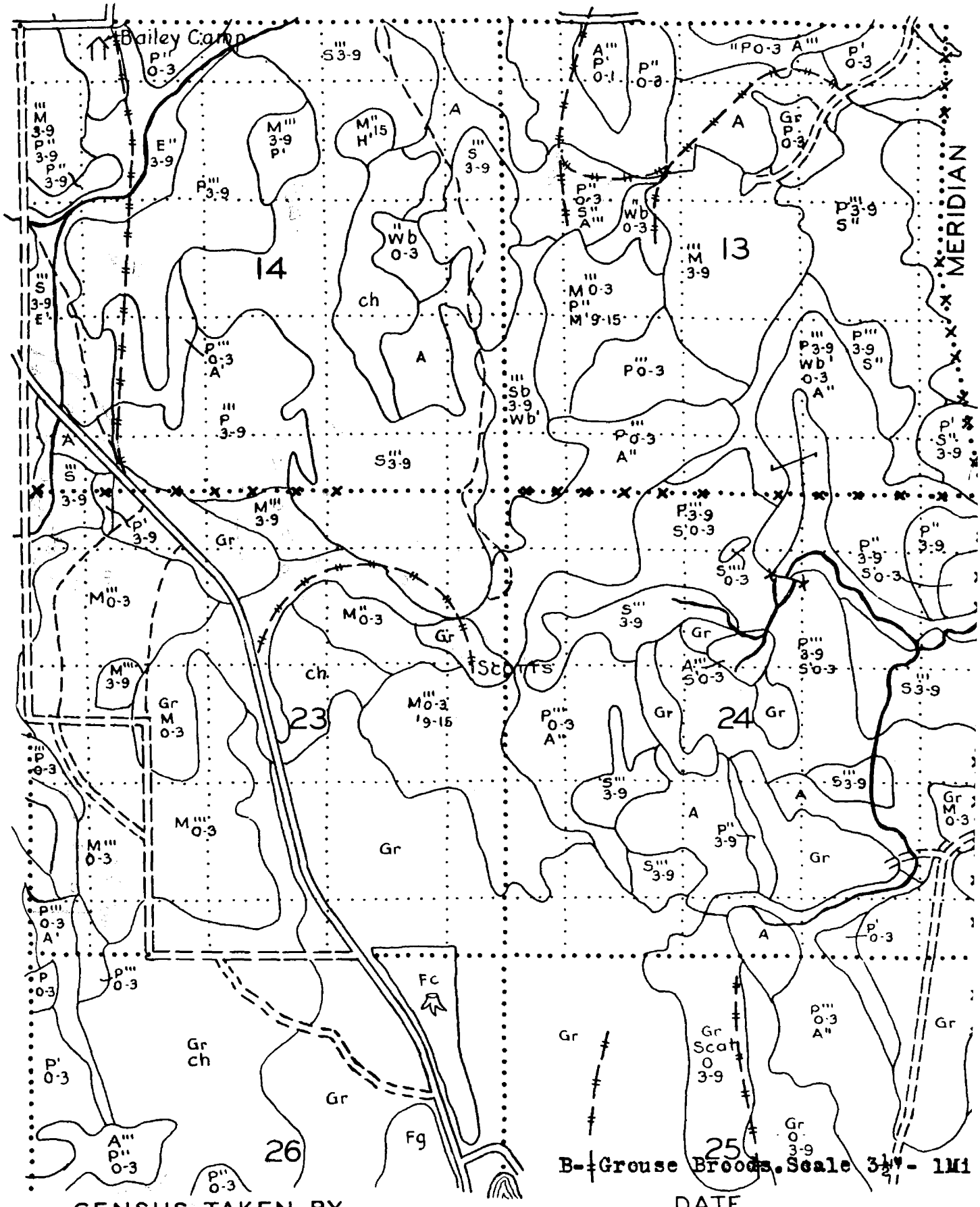
M.C.W. 10-18-

CENSUS TAKEN BY DATE

GROUSE CENSUS AREA-II

PIGEON RIVER STATE FOREST

CHEBOYGAN COUNTY T33N-R1W



CENSUS TAKEN BY

DATE

Wb WHITE BIRCH	T TAMARACK	I POOR STOCKING
Rm RED MAPLE	B BALSAM	II MEDIUM STOCKING
h HEMLOCK	A ALDER	III GOOD STOCKING
W WHITE PINE	Gs MARSH GRASS	VACANT HOUSE
N NORWAY PINE	E SWAMP HARDWOOD	LOGGING CAMP SITE
J JACK PINE	-x-x- FIRE LINE	SECOND CLASS ROAD
------TRAIL	.....CENSUS LINES	RAILROAD GRADE

SCALE 4" = 1 MILE

CENSUS TAKEN BY -

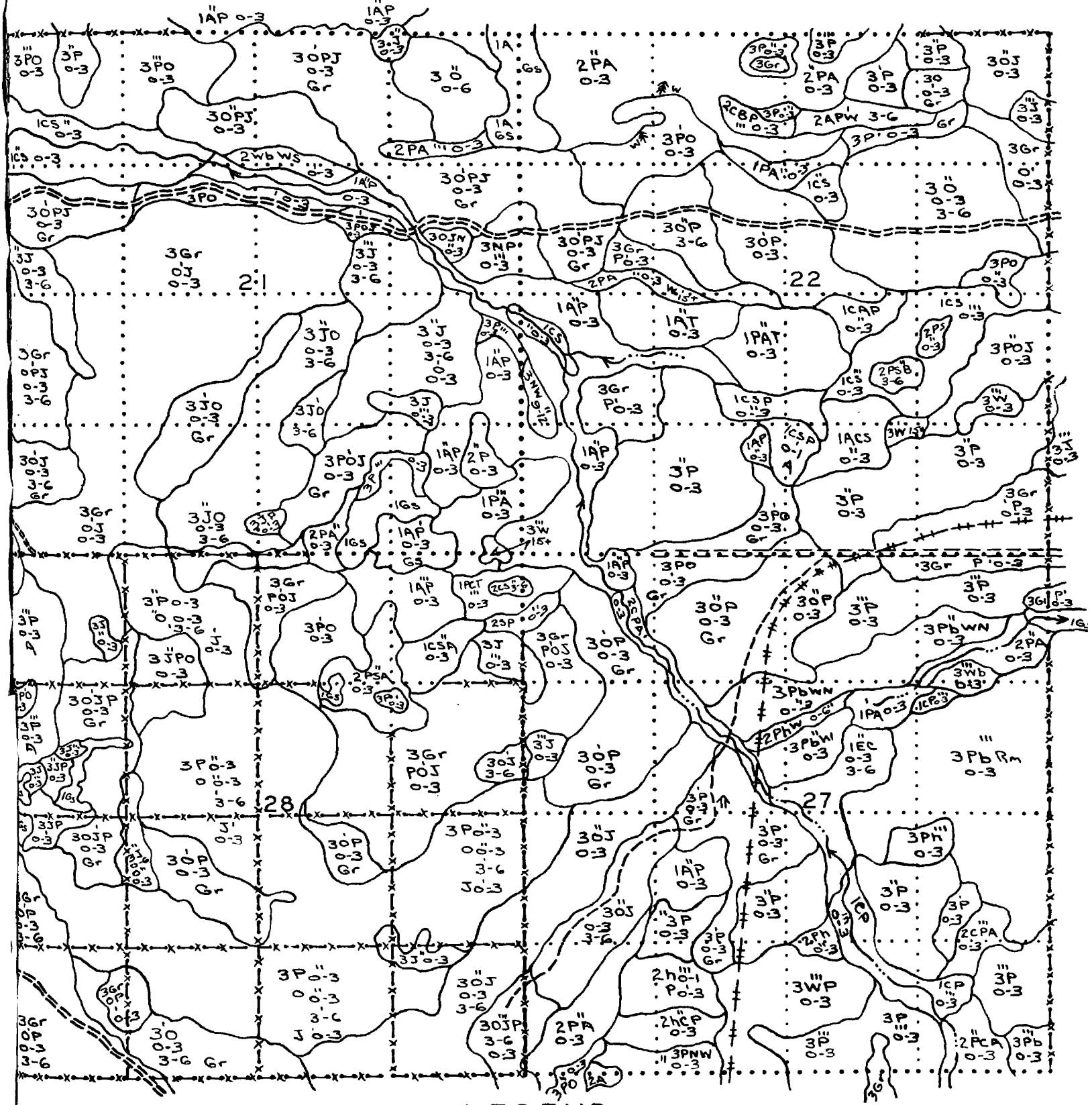
DATE -

MICHIGAN DEPARTMENT OF CONSERVATION - GAME DIVISION

GROUSE CENSUS AREA-III

HOUGHTON LAKE STATE FOREST

ROSCOMMON COUNTY T21N-R3W



LEGEND

O OAK	Gr UPLAND GRASS	1 SWAMP
P POPLAR	C CEDAR	2 LOW LAND

MAP IV

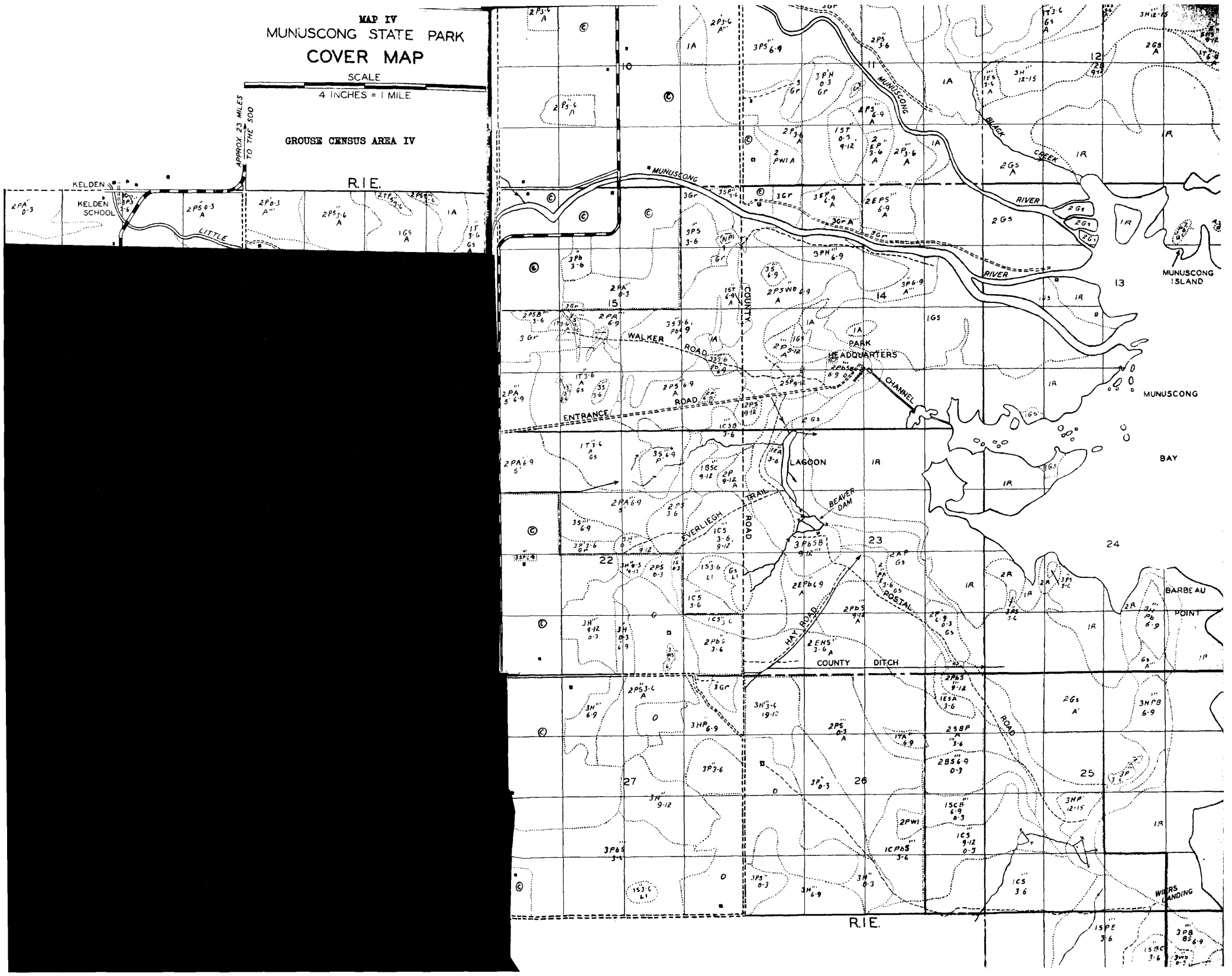
MUNUSCONG STATE PARK

COVER MAP

SCALE

4 INCHES = 1 MILE

GROUSE CENSUS AREA IV



Gr	UPLAND GRASS	E	SWAMP HARDWOOD		LOGGING CAMP SITE
C	CEDAR	I	SWAMP		SECOND CLASS ROAD
S	SPRUCE	2	LOWLAND		TRAIL
T	TAMARACK	3	HIGHLAND		RAILROAD GRADE
					BEAVER POND

SCALE 4"= 1 MILE

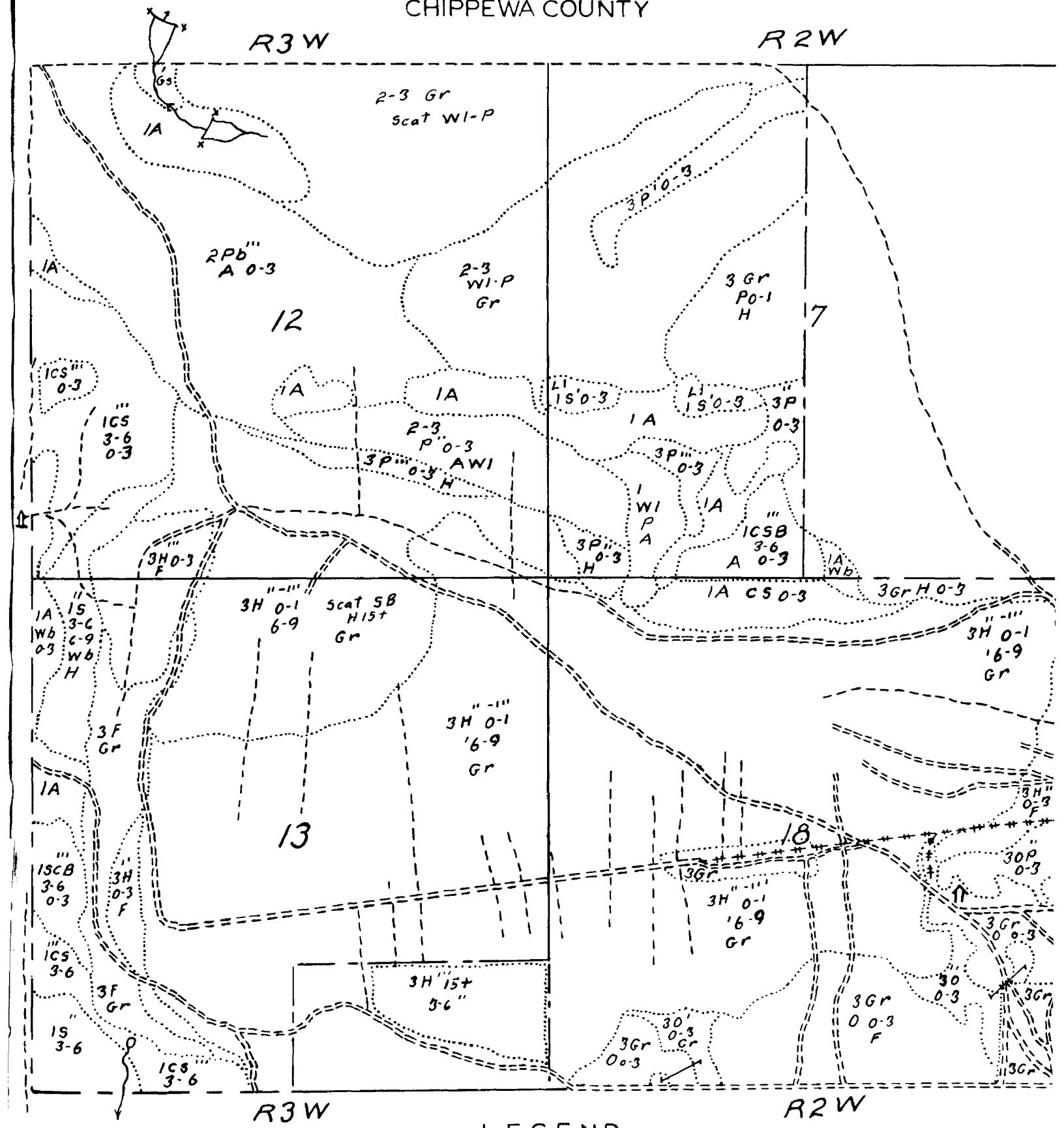
CENSUS TAKEN BY -

DATE -

MICHIGAN DEPARTMENT OF CONSERVATION - GAME DIVISION

RUDYARD GROUSE CENSUS AREA-V

CHIPPEWA COUNTY

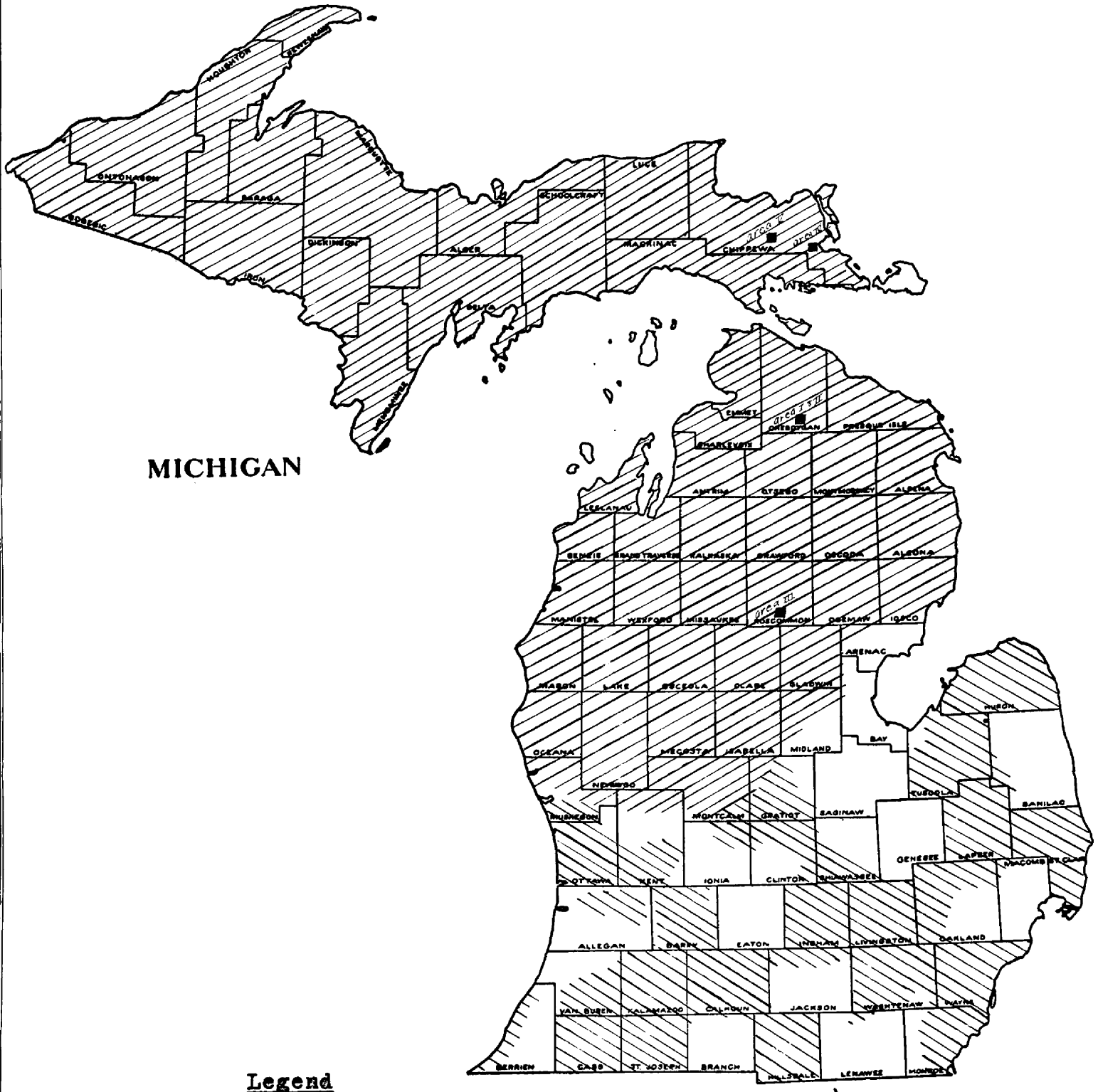


LEGEND

O OAK	B BALSAM	I POOR STOCKING
P POPLAR	A ALDER	II MEDIUM STOCKING

Map VI

Present Distribution of Ruffed Grouse in Michigan



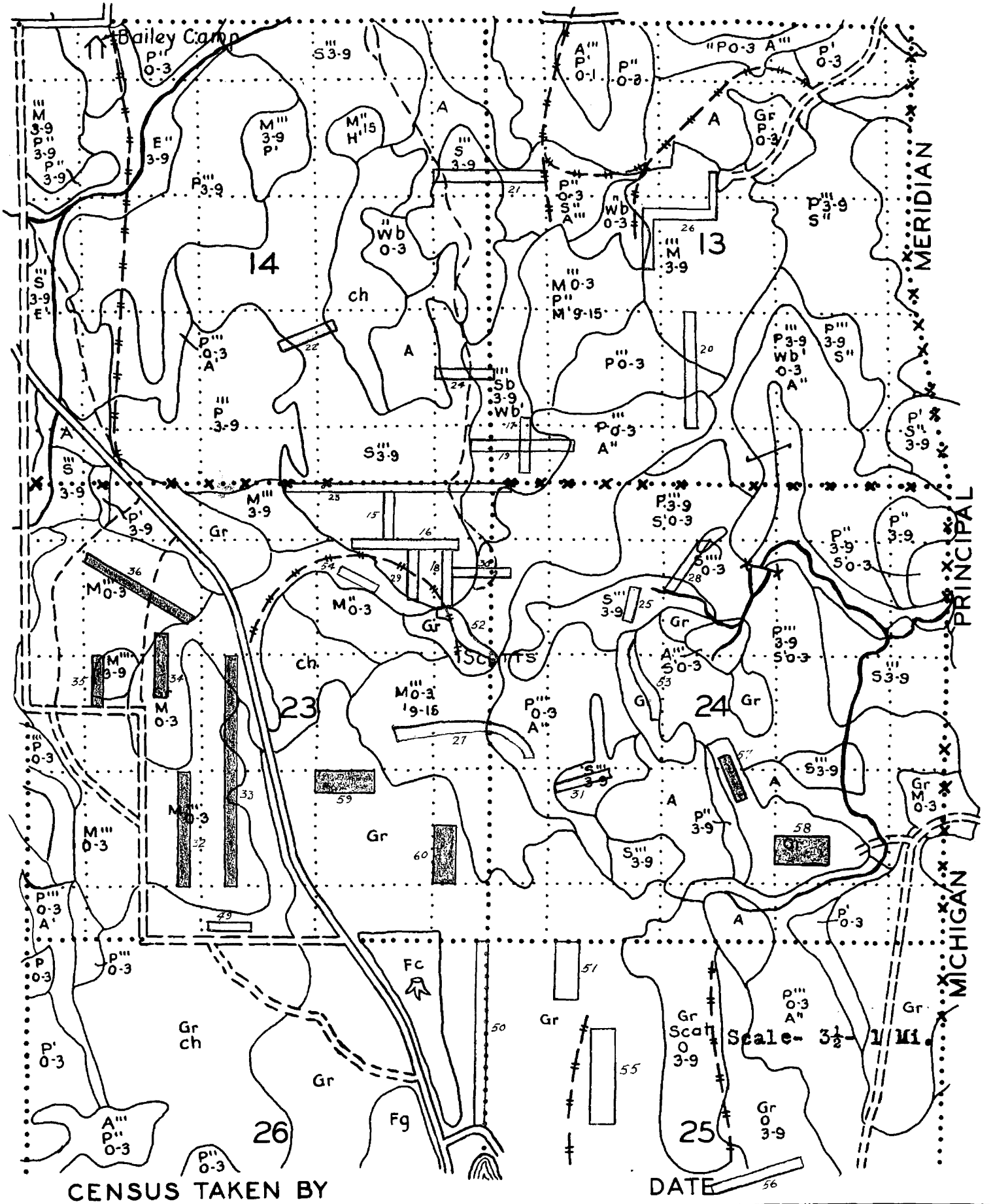
Legend

- Present Range (Ruffed Grouse in every township)
- Scattering Range (Ruffed Grouse not in every township)
- General location of Ruffed Grouse Census Areas.

GROUSE CENSUS AREA

PIGEON RIVER STATE FOREST

CHEBOYGAN COUNTY T33N-R1W



CENSUS TAKEN BY

DATE

Experimental plantings Burnings Clearings