

QUANTITATIVE METHODS IN UPLAND GAME BIRD INVESTIGATION.¹

H. M. WIGHT.

THE need of standardized methods in field investigation has been felt by many investigators and has been pointed out from time to time. For instance Graham (1929) states that "biotic information to be of maximum value, must be expressed in accurate comparable terms." One of the basic problems in game management is the development of methods by which a game census may be rapidly and yet accurately made. A satisfactory method must be both quantitative and standardized and the results should be expressed in birds per acre for each cover type and season.

The need for such a method was keenly felt by the author when in 1928 he undertook an investigation of Michigan's privately owned state game refuge system; a study conducted by the School of Forestry and Conservation, University of Michigan in coöperation with the Michigan State Department of Conservation. Naturally an attempt was made to utilize any methods which had actually been proven in the field, but a search of the literature failed to reveal that a comparable problem had been attempted previously. Several methods have been used, however, in estimating the abundance of animals, for instance, various means of taking bird censuses have been followed with more or less success, and these have been quite fully discussed by Dice (1930). The oldest of these consists of estimates indicating whether the birds observed at any particular time were "rare," "occasional," "common," or "abundant." More intensive methods have also been used, such as that of Forbes (1907) which may be called the strip survey method; the methods of Grinnell and Storer (1924); Linsdale (1924); and Kaskarov (1927), all of whom in one way or another have utilized the time unit as an indication of the abundance of various species of birds. Graham (1927) determined the nesting birds on one-acre plots by the songs heard during the early morning, a method also

¹ Contribution No. 20, School of Forestry and Conservation, University of Michigan.

advised by Cook (1923). Various investigators have estimated bird abundance during the breeding season by locating the nests.

It is obvious that none of these methods are suitable to use in making rapid and yet accurate counts of upland game birds. The first method of course is now antiquated. Such terms as "rare," "common," and "abundant," have little or no meaning when used by more than one individual. The strip survey by man, as well as the quadrat, and the count on the basis of a time unit, would prove entirely inadequate for this group of birds, because of their peculiar habit of seeking cover and not readily flushing, and the nature of the nesting habits of all of our upland game birds precludes the method based upon a count of the nests. The method of determining the nesting birds by listening to the early morning songs is used successfully in determining the population of cock ring-necked pheasants during the breeding period, but will probably prove unsatisfactory for the other species of upland game birds.

Game bird numbers may be determined during the winter months through a detailed examination of their tracks on a morning following a light snowfall, but this can be used only during the winter period and even then ideal days are too infrequent to make it reliable over extensive areas. The information required in this census was more comprehensive than simply taking a count of game birds, for the activities of predatory animals, the weather and soil conditions, the character of the type and density of the cover, proximity to ponds, streams and other waters, the economic and ecological trend, evidence of interest or lack of interest on the part of the owners, and many other factors, had to be taken into consideration and in addition it was necessary to make a cover map of each area. The areas averaged about one hundred seventy acres in size and one hundred nineteen were investigated between February and August. Under such requirements every available expediency must be utilized to facilitate the work and yet maintain a reasonable degree of accuracy. These requirements compelled the development of a new census method that would be both expeditious and accurate; and it is the purpose of this paper to discuss the method that was developed. The game bird count was made with the assistance of a bird dog, especially trained for the work, who combed the entire area. Records were kept of the hour when each

observation was made, temperature and general weather conditions, birds observed with number and sex when obtainable, type of cover, available food, and activity of birds and dog. From this information it has been possible to learn much regarding seasonal cover preferences of the different species, and the birds' reactions to various other environmental and physiological influences, all of which combined is, in the writer's opinion, the true function of a bird census.

The use of a dog in this type of work has many very obvious advantages. All of the upland game birds seek cover in which they quite successfully evade observation by either remaining quiet or through which they just as successfully move out of possible vision. The bird dog's remarkable ability to scent game, however, is almost infallible in detecting the game bird's presence. As an indication of the effectiveness of the dog in this work we may cite a typical instance when during eight hours the setter used in this work, accompanied by a pointer, hunted over a 2,000-acre plot and located one hundred sixteen birds. At another time in two hours the setter, working alone, located thirty-seven Ring-necked Pheasants and five covies of Bobwhite Quail in cornfields and heavy marsh cover, where it is practically certain that the writer working alone would not have flushed a single bird. Even under the most favorable conditions a man alone could find only a small proportion of the birds on an area; and those which he does find may be driven before him into unfavorable cover before they are seen, thus making the determination of favored cover difficult. Because of the incompleteness of such observations, an accurate determination of the size of flocks, the sex ratio, and the favored cover for each season is impossible by direct observation of the birds themselves. In using a dog for this work the birds are not driven out of their favored areas and much time is saved which can be utilized in recording the environmental conditions under which the birds are observed.

In this particular study the areas were completely covered by the dog, while the writer counted the birds flushed, recorded the data mentioned above and prepared a rough cover map of the area. Since the entire area in each case was covered in this manner this census may in a way be considered a modification of the quadrat method, in which the sample plots varied in size from ten acres to a

thousand acres. It may or it may not have been a representative sample for Southern Michigan, as the work was done entirely on game refuges, but the work illustrates the general practicability of this survey method.

It has been suggested that instead of covering the entire unit, a dog could be utilized in a wide strip survey more quickly and with equally accurate results. A careful comparison of the two methods indicates that provided the sampling be carefully made, that the dog be kept entirely within the designated strip and that the interpretation of the results take into consideration the relative acreage of each type of cover, both methods would yield approximately the same result. But in order for the dog to do satisfactory work in finding birds, he should possess the inclination to range wide coupled with a nearly infallible ability to locate birds. Such a dog will have a tendency to make wide casts carrying him far from the belt laid out for him to follow. The bird dog's tendency to seek good game cover would interfere materially with a fair sampling and the number of birds located for the miles traveled would not be comparable with the birds per unit area representative of the larger territory. Moreover the cross country method would take the surveyor far from his car and the return to it would require additional time and energy with the extra expense involved.

A practical application of this method may be made to smaller areas such as hunting preserves, experimental plots and game sanctuaries, or it may be used to estimate the game bird population on larger areas, such as townships, counties, or even the entire state. In the latter group sample plots would be necessitated and the population would be expressed in birds per acre of specific cover types, and converted into the total population in the area depending upon the relative acreage in various cover types. The population in the different types of cover would vary with the season in which the survey was made. In the survey of Michigan's privately owned state game refuges during the winter period approximately sixty-eight per cent of all Pheasants recorded were observed in marshes and swamps, whereas during a summer study comparatively few were found in these cover types.

It has been found that the use of a dog is particularly indispensable in an intensive study of experimental plots, where the exact

distribution of the birds must be known. This is well illustrated by much work on an area where birds were numerous and yet a day's observation without the dog did not yield the direct observation of a Pheasant, although the following day's work over the same area with a dog yielded a total of sixty Pheasants and twenty-four Quail.

Any method chosen may have its weak points and the method that has been discussed here is no exception. If every dog could possess the same ability to locate the same number of birds on any particular area, this method would probably meet any criticism that might arise, but such is not true. Dogs vary in their ability to detect the presence of birds just as field workers vary in their knack of seeing the same things on an area, but the dog depends very largely upon one single sense to locate game, although several other factors must be considered, which determine to some extent the difference between a good dog and a poor dog. Fortunately this remarkable characteristic to find game has been developed to such a high degree in the bird dog and over such a long period that it seems probable that the relative ability to find birds will be less variable in a bird dog than in man, and it appears that the bird dog will provide a relatively constant and very useful instrument in measuring game bird abundance.

It seems logical to advocate this method as a standardized means of obtaining quantitative information on the abundance of upland game birds, which can be expressed in comparable terms. In order that the sampling may be representative of the various types, it is advisable that a cover map be prepared in advance of the census work. Fortunately Northern Michigan is rapidly being provided with such maps by the Land Economic Survey, and it is hoped that eventually Southern Michigan will be cover-mapped. When these become available the problem of sampling and final interpretation of the results of a census for upland game birds will be greatly facilitated.

BIBLIOGRAPHY.

COOKE, MAY T.

1923. The purposes of bird censuses and how to take them. *U. S. Dept. Agri., Dept. Circ. 261.*

DICE, LEE R.

1930. *The Auk*, Vol. XLVII, No. 1, January, 1930. Methods indicating relative abundance of birds.

FORBES, STEPHEN A.

1907. *Bull. Ill. State Lab. of Nat. Hist. Vol. VII.* An ornithological cross section of Illinois in autumn.

GRAHAM, SAMUEL A.

1927. *Michigan Academy of Science, Arts and Letters, Vol. XI.* Ornithology and forest entomology.

GRAHAM, SAMUEL A.

1929. *Ecology, Vol. X, No. 2, April, 1929.* The need for standardized quantitative methods in Forest Biology.

GRINNELL AND STORER.

1924. *Animal Life in the Yosemite, p. 22. Berkeley, 1924.*

KASHKAROV, D. N.

1927. The quantitative method in the field study of vertebrate fauna and analysis of the data obtained. *Universitatis Asiae Mediae, Acta. Sa Zoologia; 1: 1-24.*

LINSDALE, JEAN M.

1928. *Condor, Vol. XXX, pp. 180-184.* A method of showing relative frequency of occurrence of birds.