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AN 8-YEAR CENSUS OF LESSER PRAIRIE CHICKENS¹

Verne E. Davison

Inventory of wildlife is essential to good management, and varying conditions in the field make it an annual requirement. Methods of enumeration, to be widely useful, must be dependable, inexpensive, and even more important, they must be applicable by such game managers as farmers, ranchers, and local wardens untrained in biology. Trained biologists have the responsibility of developing accurate and practicable ways of censusing game birds and mammals and of extending this knowledge wherever needed.

The habits of animals vary so greatly that effective observations concerning numbers must be planned with reference to the species concerned. The census method and the results described herein apply to the lesser prairie chicken (*Tympanuchus pallidicinctus*) on the Davison Ranch near Arnett, in western Oklahoma. The report covers 8 years including the most severe period of drouth on record. The method probably is applicable to the lesser prairie chicken throughout its range and possibly also to other species of prairie grouse.

The American Game Association established a game bird project on the ranch early in 1932 in co-operation with the Oklahoma State Game and Fish Commission, the Bureau of Biological Survey, and the author who carried out

the plans as project manager. The original purpose included studies of factors governing the natural production of the lesser prairie chicken and bob-white (*Colinus virginianus*) and demonstrations of game management. W. L. McAtee briefed the results of the work to September 1935 in Biological Survey Leaflet BS-39 (March 1936). Most studies ceased at that time but the spring census of cock prairie chickens has been taken each year except 1937.

Within the Davison Ranch of approximately 100,000 acres, lie portions of the lesser prairie chicken's favored range, though less than half of the total ranch acreage is used by the species during the breeding season (March to September). An area 4 miles square (16 sections or 10,240 acres), typical of the best producing areas of comparable size or larger, was selected for intensive study. Surrounding lands with one minor exception belonged to the same ranch and all were managed together.

METHOD

Maps on 8-inches-to-the-mile scale were prepared and blueprinted to show fences, roads, windmills, fields, groves, and other permanent landmarks (Fig. 1). Census observations recorded on these maps proved invaluable both in analyzing progress and in presenting a clear picture of "gobbling ground" locations. Gobbling grounds are the small areas on which groups of cock birds "strut," "gobble," or "drum" every morning from late February to early June. It was on these spots that counts

¹ Grateful acknowledgement is made to W. L. McAtee, U. S. Bureau of Biological Survey, and Wm. R. Van Dersal, U. S. Soil Conservation Service, for suggestions and assistance in the preparation of this manuscript.

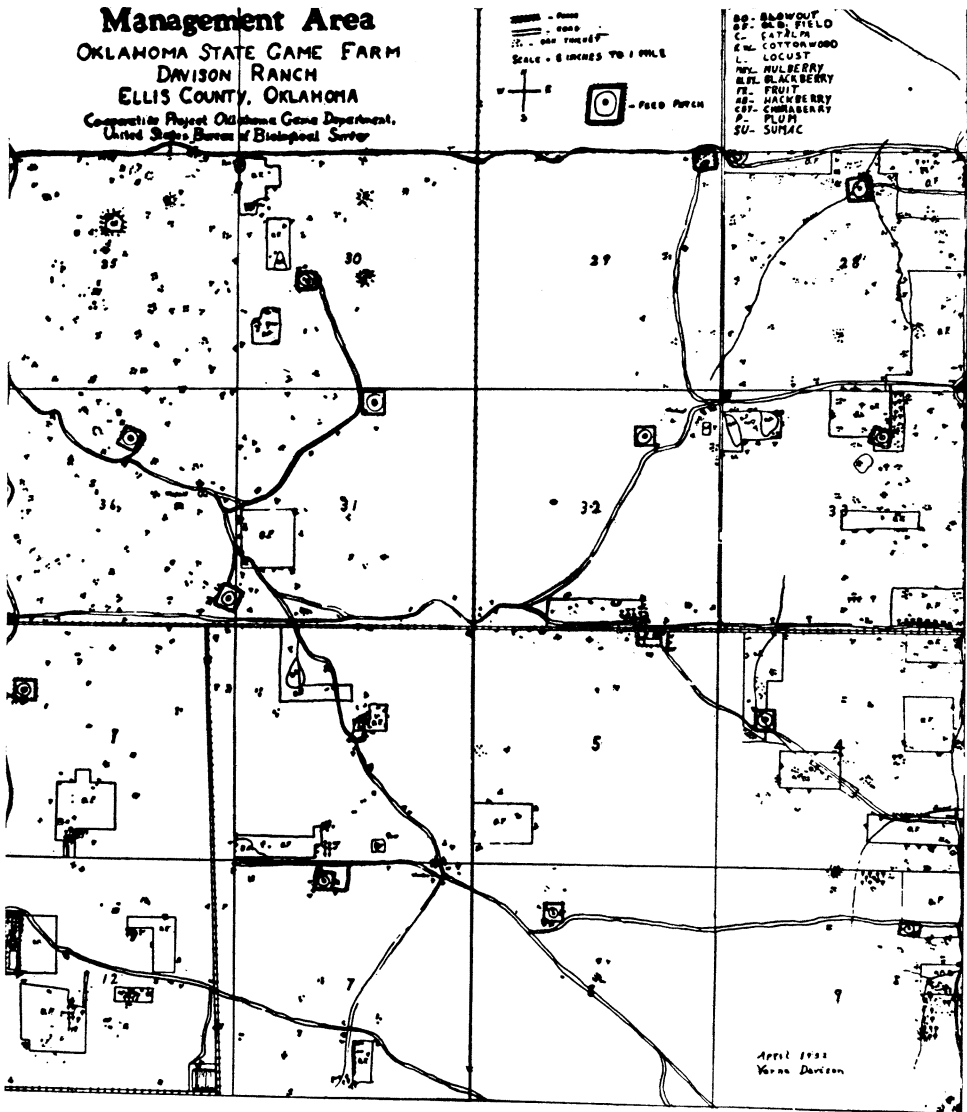


FIG. 1. A detailed map showing roads, fences, and other landmarks is convenient for recording censuses. The above map is of the 10,240-acre area on which this study was made. (Blueprint photographically reduced from 8" to 1 1/4" = 1 mile.)

were made from April 10 to May 1 in the various years.

Sites selected for gobbling are usually on high flat-topped ridges overlooking considerable areas. A slightly raised knoll in a broad valley is occa-

sionally chosen but it, too, commands a distant view. Cover is sparse to suit the birds' evident desire to be in the open. This facilitates observation, and coupled with the calls of the birds, permits quick location of the grounds.

Observations could not be made from horseback or afoot because both methods disturbed the birds too greatly. A car was found to be satisfactory though the birds will always fly when a person steps out. Counts are made at dawn from the car, the driver never leaving the wheel. The birds usually flush when the car comes near but all will return in less than 10 minutes if the motor is turned off. An average of about 3 gobbling grounds can be censused each morning before gobbling ceases or becomes intermittent, usually some 2 hours after daylight. Results are found to be exactly the same day after day.

DISCUSSION

From the last week in February until about April 10, the cocks are contending for positions within the gobbling grounds. During this period they do not display their colors to the full, particularly the orange eyebrows that later appear almost as a hood across the head. Cocks cannot be distinguished readily from hens except by the most experienced observer unless eyebrows, raised neck tufts, puffed airsacs, and spread tail are evident. These are displays of courtship performed during the mating season when the hens come to the grounds; the first mating date is within two or three days of April 10. Since the number of hens on gobbling grounds is not constant, one must distinguish between the sexes and depend on the number of cock birds only for the counts.

Early morning counts were found to be exactly consistent except when high winds or rains lessened the birds' activities and the observer failed to see the motionless, well-concealed birds which

nevertheless, were there. Evening counts are often low because some birds may feed until dusk.

In 1934 and 1935 previous banding activities proved their value to field observations particularly on the gobbling grounds. Bands placed on the left leg in 1933 and on the right in 1934 provided distinguishing marks which aided in determining that each male takes the same position relative to other birds on a given gobbling ground throughout the season.

Perhaps no accurate field counts can be made of the mature hens to determine the ratio between the sexes or the actual numbers of hens on an area. Nesting studies are very difficult because nests are hard to find and the abandonment of visited nests is high. It is also hard to obtain information during the first 5 or 6 weeks after the young birds are hatched, but on this particular range a second period of advantageous study occurs in July and August. Then the hen with her young can be caught in nets and the sex ratio, number per covey, and approximate age of the young may be determined. Such information when studied in connection with data on cock populations helps to bridge the gap left by the lack of information on numbers of hens and furnishes clues to reproduction on a given range that are of utmost importance to the game manager. The second favorable period of study may not be experienced in other areas where prairie grouse enumeration may be desirable. Spring censusing of cocks, however, is probably applicable wherever these birds occur.

RESULTS

The tables, graphs, and discussion

that follow give the results of censuses from 1932 to 1939 inclusive (except 1937) on the same 16-section study area of the Davison Ranch, Ellis County, Oklahoma.

Table 1 records the numbers of cock birds on each section by years together with the number of gobbling grounds on the total area. Some grounds were

due to open season shooting. Throughout the period covered, no unusual losses were known to be attributable to winter storms despite rather low availability of normal winter food. Birds taken at intervals were all found to be in good condition.

The drouth no doubt affected the numbers of young per covey and the

TABLE 1
NUMBERS OF COCK PRAIRIE CHICKENS BY SECTIONS AND NUMBER OF GOBBLING GROUNDS BY YEARS

Section number	1932	1933	1934	1935	1936	1938	1939
1	36	67	41	31	26	39	38
4	5	6	6	0	0	0	7
5	38	35	38	20	21	32	40
6	0	11	17	12	10	0	6
7	34	35	5	12	17	2	0
8	33	52	25	41	23	8	8
9	29	31	26	30	25	19	39
12	55	84	44	51	38	28	28
25	42	22	4	20	16	8	1
28	0	12	14	8	9	7	4
29	56	84	38	49	38	34	66
30	52	47	27	23	14	17	28
31	32	56	36	32	26	33	31
32	17	6	0	1	0	1	12
33	26	31	20	23	18	28	15
36	35	27	12	7	8	10	29
Total for 16 sections	490	606	353	360	289	266	352
Number of grounds	34	40	28	31	29	18	24

on the line between sections and though recorded consistently in one section, the numbers would more nearly equalize if their relation could be shown to the acreage each ground actually serves. It is of interest that only about 3 hours each morning of 5 and 6 days were required to make the count for 1938 and 1939. Only 13 grounds have been occupied every year of the seven.

It should be remembered that the numbers apply to cock birds only in April of the year recorded. Changes are the result of degree of success in breeding and of losses both natural and those

ratio of successful nests. The following records of netting operations in July, August, and September, show the average number of young per covey in each of four years (total young handled in parentheses): 1932, 7.5 (112); 1933, 6.47 (330); 1934, 5.46 (410); and 1935, 5.17 (181). No determination of nesting success was obtained. The ratio of cocks to hens among young birds in three years was: 1933, 140/100; 1934, 146/100; 1935, 163/100.

An open shooting season adjacent to the study area in the fall of 1933 was followed by a great decrease in numbers

within the area. No hunting was permitted on the study area, in fact, only the lands west of it were shot over, yet it is significant that losses on the four western sections were but slightly more than on the other sections in the area.

Some idea of the surplus that might properly have been taken in the fall of 1932 can be gained by comparing the figures for that year and for 1933, in light of the sex ratios for young birds. In order to retain a cock population equal to the 490 of 1932, only 116 cocks could be considered surplus (winter mortality if known should be deducted but the collection of some 15 or 16 cocks for food study may substitute for that factor). If hens remain in the ratio of 100 to 140 cocks, then 83 females would probably be shot to the 116 males. Thus no more than 199 birds could have been shot without reducing the breeding stock. This would be equivalent to 12.5 birds per section or 1 bird from each 43.2 acres and conservative management would have limited the harvest to 10 birds per section—160 total. On this occasion, because of lack of information the number could not have been set in advance but harvest records, spring censuses, and information on numbers of young per covey studied together should develop tables of reasonable expectancy for future guidance.

The minimum area that can be censused and yet be representative of a range is problematical. Study of Table 1 conclusively reveals that a single section may not show a dependable trend as the results for various sections are not consistent with the whole.

Passing to a larger unit of 4 sections within the study area, the northwest, northeast, southwest, southeast and

center sectors, each 2 miles square, are compared with the total by graph in Figure 2. It was necessary to divide the total census by 4 to obtain a directly comparable figure for the smaller areas.

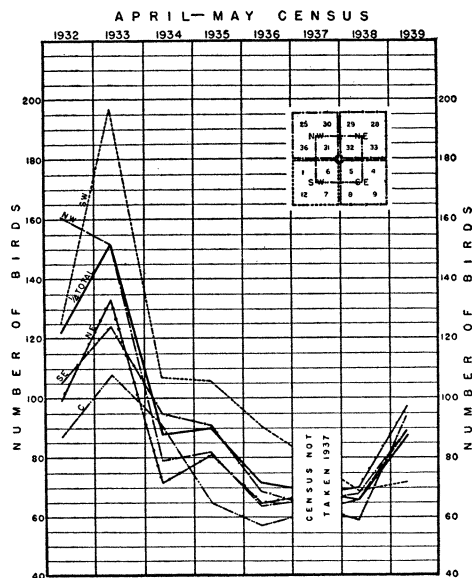


Fig. 2. The trends in numbers of cock prairie chickens on five sectors, each 2 miles square, are compared with the total number on a 4-mile square tract. Figures 3 and 4 show trends on areas of equal size but in strips 4 miles long and 1 mile wide.

Eight additional 4-section areas, each 4 miles long by 1 mile wide, are similarly graphed in figures 3 and 4.

While some variation is shown by the census data for the 13 areas of 4 sections each, and they are more uniform for the squares than for the long narrow blocks, they have similar trends. The figures show population increases from 1932 to 1933 in 12 of the 13 areas. The drop in each set of figures is remarkably uniform the following year. The graphs show varying trends from 1934 to 1935 but all were downward

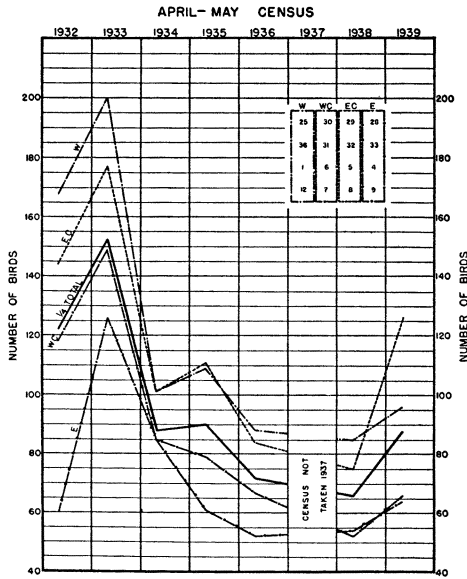


Fig. 3. A study of cock bird numbers on strips 4 miles long and 1 mile wide from west to east reveals trends similar to those for the whole study area. Figures 2 and 4 compare other 2,560-acre sectors to the whole 10,240-acre tract.

1935 to 1936 and are with two exceptions in the same relative positions as for 4 years earlier. All 13 reached their lowest point in 1936 or 1938 and one may surmise that a 1937 count might have produced the extreme low for each of them. A rise to 1939 is shown by all 13 though the rate is not uniform. Even if general trends are similarly indicated in the results for each 4-section sector, one must conclude that censusing a still larger area would more safely indicate the varying fortunes of the prairie chicken population.

Six areas 4 miles long by 2 miles wide are graphed in figure 5. In this test the graphs showing fluctuations in numbers for each sector remain closer to the average than those for areas one-half the

size, and the general trends are more uniform. While these results show considerable improvement over those for 4- by 1-mile strips, they seem to have nearly the same factor of error that is evident in figures for the 2- by 2-mile squares, perhaps because the width is equal.

Data for four sectors of nine sections each in 3- by 3-mile squares are compared to those for 9/16 the total number in figure 6. Trends revealed by this graph are more consistent than in the others. It is evident that dependability increases with the size of area censused. Counts for 2- by 2- or 3- by 3-mile squares are accurate enough

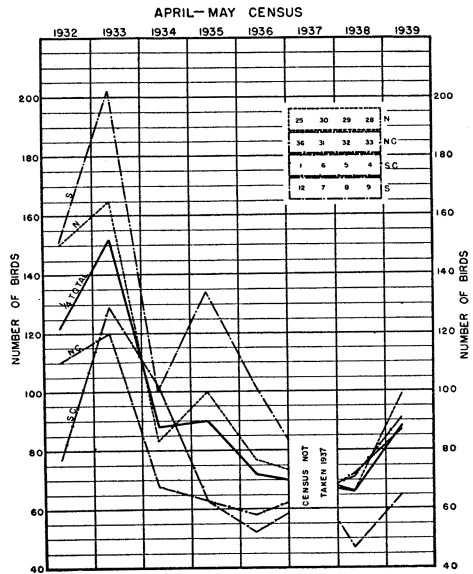


Fig. 4. The largest variation of trends is shown by two of these 4- by 1-mile sectors for 1934 and 1935 but by 1936 normal positions are again taken. Study of figures 2, 3, and 4 shows remarkable similarity to the whole of areas one-fourth the size, and indicates that a square area has a smaller factor of error than a long narrow strip of the same size.

to be significant and management based on the trends as shown by such counts should be safe.

Several considerations indicate the relative stability of the prairie chicken population. The similarity of increase and decrease in the several groupings figured to those of the total is astonishing when one considers that the daily flight range of lesser prairie chickens is commonly more than the radius of the entire study tract. It is doubly surprising because the northern half of the area was more heavily grazed than the southern half during the first 5 years of the study and the area contained part or all of 4 different fenced pastures in which the handling of stock varied considerably. Of equal significance is the fact that grain fields were within 1½ miles of the west border while for the

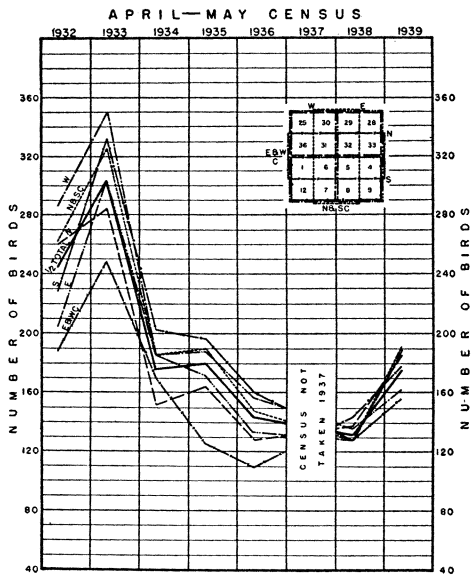


Fig. 5. Six sectors 4 miles long and 2 miles wide (8 sections) compare favorably in numbers of birds with one-half the total. No great difference in trend is shown by any of these divisions.

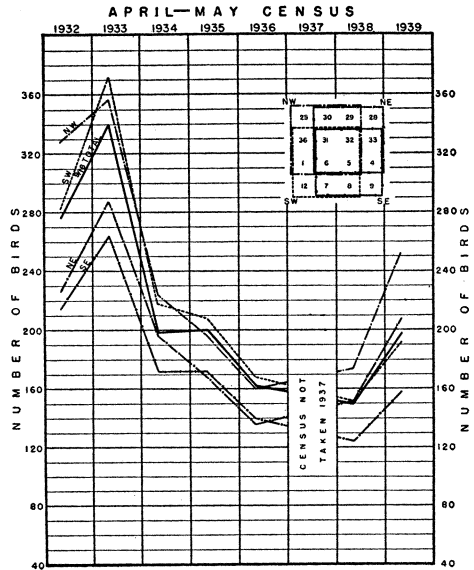


Fig. 6. The four sectors each 3 miles square, are fairly consistent with each other and with 9/16 of the total. Figures 2 and 6 indicate that square areas are preferable to long rectangular areas of about equal size for censusing and that counts on 2- by 2-, 3- by 3-, or 4- by 4-mile areas reveal dependable trends in prairie chicken numbers from one year to the next; the largest area is better than the smaller ones.

eastern part of the area only negligible amounts of grain were accessible.

The figures given herein include no estimates but are exact counts, ground by ground, each year. Domestic stock can be counted no more accurately on the same range. The practical application of either wild or domestic animal management requires an annual inventory of the breeding stock. Inability of wildlife administrators to determine actual numbers on a range is responsible for too liberal hunting seasons and bag limits, for much misinformation distributed to sportsmen, and hence for overshooting.

Field research into the status of any bird is hampered if population figures are only estimated. The literature is colored by estimates that must exceed actual numbers if those made for Oklahoma prairie chickens, which by actual count prove to be much too high, form a reliable indicator. For example, the 1936-38 Biennial Report of the Oklahoma Game and Fish Department, which lists the numbers of prairie chicken in the five counties including the Davison ranch as of March 1938, gives a total of 14,790 birds of which 5,000 are recorded from the Davison ranch. Our studies indicate that at the peak of the population (1933) it is doubtful if the birds exceeded 3,000 on this ranch and continued records indicate less than half this number in March 1938. By a similar censusing of prairie chickens in Missouri, Bennitt² recorded the numbers 12,500 (1907), 8,467 (1931), 5,110 (1937), 6,600 (spring 1938) and 10,000 plus (estimated fall 1938). Lehmann³ estimated the numbers of Attwater's prairie chicken (*Tympanuchus cupido attwateri*) in several Texas counties for 1937 by the "rope method." The total population of 8,711 is pro-

² Bennitt, Rudolf. Some agricultural characteristics of the Missouri prairie chicken range. Trans. Fourth N. Amer. Wildlife Conference. 1939: 491-500.

³ Lehmann, Valgene W. The heath hen of the South. Game, Fish, and Oyster Commission, Austin, Texas. July 1939.

jected from an actual count of only 504 birds.

It should be emphasized that estimates and guess work make dependable management policies virtually impossible, and that prairie chickens of all species are so low in numbers that publicizing figures in excess of actuality is a menace to conservation of the birds.

SUMMARY

A spring census of lesser prairie chickens has been taken each year including 1932 to 1939 (except 1937), on the Davison Ranch in western Oklahoma. The counts were made of cocks only on gobbling grounds on which the same birds gather at dawn every day from late February to early June. A complete count of hens was found impossible.

The method is probably applicable throughout the range of the lesser prairie chicken and possibly to other prairie grouse. Its importance lies in its contribution to reliable annual inventory of the breeding stock as a basis of sound management.

The minimum area to be censused as representative of a range is indicated as 2×2 miles square (2,540 acres) but the results from areas 3×3 or 4×4 miles square are more dependable. The 4×4-mile tract (10,260 acres) can be censused in 5 or 6 days using about 3 hours each day.

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