POPULATION DYNAMICS OF THE DEER HERD IN WESTERN POPE COUNTY, ILLINOIS

R. E. HAWKINS and G. G. MONTGOMERY
Illinois Natural History Survey, Urbana

ABSTRACT. — The population dynamics of the white-tailed deer (*Odocoileus virginianus*) was studied from 1965 through 1966 on a 19,840-acre area on the Shawnee National Forest including the 5,400-acre Dixon Springs Agricultural Center in western Pope County, Illinois. Population trends, based on data from compulsory check-stations during shotgun hunting seasons in both years, were indicated by: Lincoln Index calculations for radio-marked and unmarked deer, (2) age compositions among deer killed, and (3) hunter success ratios. Lincoln Index calculations indicated a substantial decrease in the population from 1965 to 1966. Combined data for the 2 years revealed that 42 percent of the deer killed on the area were fawns, 73 percent were 1½ years old or younger, and only 11 percent were over 2½ years old. Hunter success for northern Pope County was one deer per 2.9 hunters in 1965, one deer per 5.5 hunters in 1966, and one deer per 8.0 hunters in 1967.

Because many residents complained of seeing fewer deer in 1965 and 1966 than in recent years, we decided to make a quantitative investigation of the population dynamics of the white-tailed deer herd from 1965 through 1966 on a 19,840-acre area in western Pope County, Illinois. This research was in connection with a 4-year study of deer in the spread of zoonoses, which began in January, 1964, on the Shawnee National Forest (SNF), including the 5,400-acre Dixon Springs Agricultural Center (DSAC) in southern Illinois.

METHODS

Population trends were studied using the following criteria: (1) Lincoln Index (Lincoln, 1930), (2) age composition, and (3) hunter success. Deer were captured in a variety of ways (Hawkins et al., 1967*b*; Montgomery and Hawkins, 1967; Hawkins et al., 1968), radio-marked with 53-mc transmitters (unpublished data, Illinois Natural History Survey) and released at capture sites. In addition, 28 deer were translocated from other areas in southern Illinois, radio-marked, and released on the study area (Hawkins and Montgomery, 1967*a*). To aid visual observation of marked deer, females were marked with a vinyl-coated nylon collar (Hawkins et al., 1967*c*). Locations of radio-marked deer were continually monitored with a semi-automatic radio-direction-finding (RDF) system similar to the one described by Cochran et al. (1965).

Radio-marked deer were considered alive and available to be shot during a hunting season if they were being tracked by the RDF system or had been observed in the field during the month prior to the beginning of the annual shotgun hunting season. The 19,840-acre area in which the deer populations were compared for 1965 and 1966 was determined by detailed study of over 100 daily and seasonal radio-location maps (Figures 1 & 2) and over 130 observations or radio locations (Figure 3) of radio-marked deer with a hand-held receiver (Cochran and Lord, 1963; Verts, 1963). The locations were compiled by township, range, and section on a comparable basis with the kill data. Any section in which a radio-marked deer was located at any time was included to derive the

total area. Movement data were analyzed with an IBM 7094 computer; figures were plotted on a CALCOMP 564 plotter at the University of Illinois.

Each successful hunter was interviewed at a compulsory check-station to determine the township, range, and section where he had killed his deer. The results of these interviews, when applicable to the 19,840-acre area defined on the basis of locations used by radio-marked deer, were used to estimate the numbers of deer killed on the area. The age of each deer brought to the check-station was estimated on the basis of tooth emergence and wear (Severinghaus, 1949).

We assumed that there was no bias either for or against killing radio-marked deer. This was believed to be a valid assumption because it had been widely advertised before the hunting seasons began that radio-marked deer were legal game. Several of the hunters that shot radio-marked deer reported that they did not know, prior to shooting, that the deer were marked. Some hunters may have passed up shots at radio-marked deer, while some radio-marked deer may have been killed because they were more visible. At the beginning of the hunting season each year two of the radio-marked deer available to be killed were transplants and may have been more vulnerable to hunting than native deer.

The shotgun hunting season for each of the 2 years consisted of two 3-day weekends beginning on Friday morning. In 1965, the two weekends were 2 weeks apart, while in 1966 they were 3 weeks apart.

Results

Fourteen radio-marked deer were known to be alive and randomly scattered over the 19,840-acre area at the beginning of the split, 6-day, shotgun deer-hunting season which began November 19, 1965 (Table 1). Two hundred and twelve deer were killed in this area during the 1965 hunting season; seven of these were radio-marked. Thus, 50 percent of the radio-marked deer known to be alive at the beginning of the hunting season were killed. By use of simple Lincoln Index calculations, the prehunt population was determined to be 424 deer (one deer per 49 acres); since half of these were removed, the posthunt population was 212 deer. Four radio-marked deer were known to be alive on the

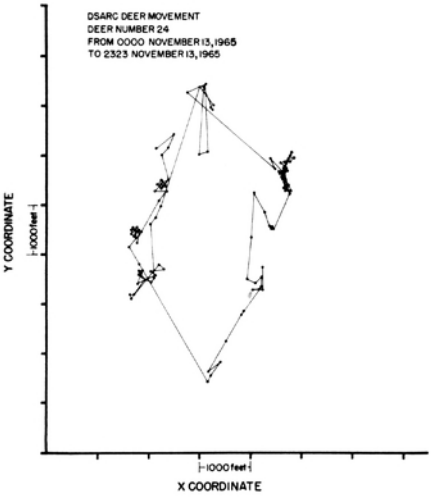

FIGURE 1. — Example of a daily range map of a radio-marked deer.

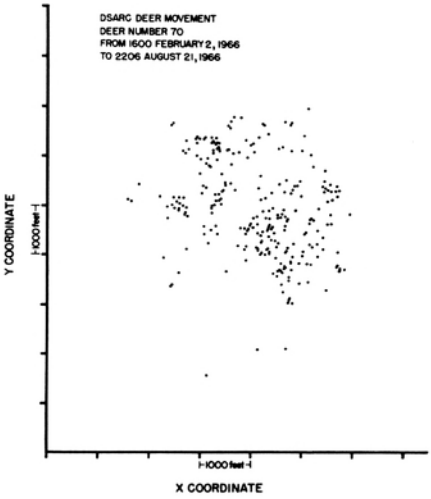

FIGURE 2. — Example of a seasonal range map of a radio-marked deer.

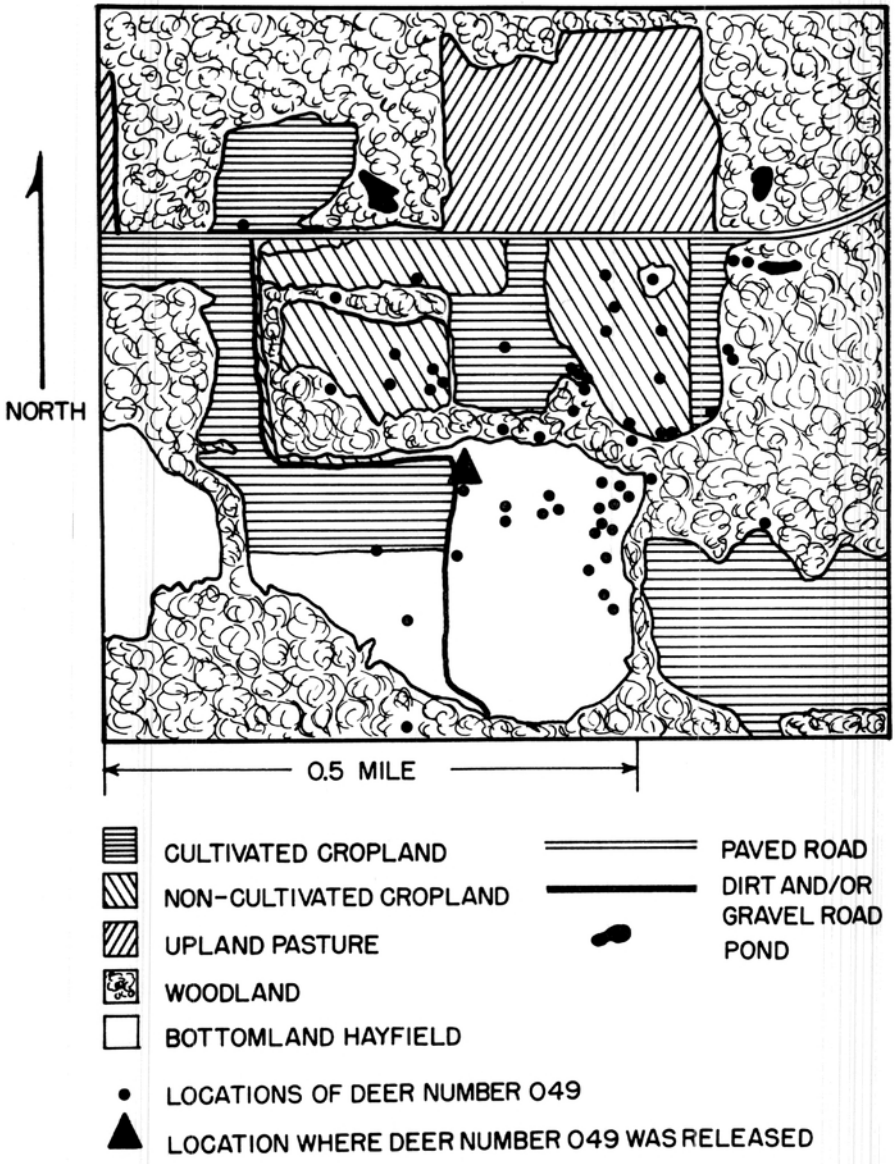

FIGURE 3. — Example of a seasonal range map plotted from visual observations after location with a hand-held receiver.

same 19,840-acre area at the beginning of the shotgun deer-hunting season in 1966 (Table 1). One hundred forty-one deer were killed in this area; two of these were radio-marked. Thus, as in the preceding year, 50 percent of the radio-marked deer known to be alive at the begin-

TABLE 1.—Radio-marked and Total Deer Killed During Shotgun Deer-Hunting Seasons on a 19,840-acre area in Western Pope County, Illinois, 1965 and 1966.

Year	Radio-marked Deer Known to be Alive at Beginning of Hunting Season	Radio-marked Deer Killed During Hunting Season	Total Deer Killed During Hunting Season
1965	14	7	212
1966	4	2	141

ning of the hunting season were killed. Lincoln Index calculations showed that the prehunt population was 282 deer (one deer per 70 acres) and the posthunt population was 141 deer. Because of the small sample of radio-marked deer each year, analyses did not reveal a significant difference in the populations; however, we believe the downward trend indicated for 1966 is valid.

There was no significant difference between 1965 and 1966 in the age composition of the deer killed on the 19,840-acre area, according to Chi-square calculations (Table 2). However, when both years were considered, 150 (42 percent) of the 353 deer killed were fawns and 257 (73 percent) were 1½ years old or younger. Conversely, only 42 (12 percent) of the deer killed were over 2½ years old. Andrews and Calhoun (1968 p. 7) found that over 40 percent of the kill in 1965 and 1966 for Pope County were fawns; Nixon (1963) concluded that harvest rates of fawns in excess of 40 percent were probably too high to maintain stability of the herd.

Severinghaus and Cheatum (1956, p. 477) stated that hunter success may give an indication of deer population trend. A total of 4,147 shotgun deer-hunting permits were issued for northern Pope County in 1965; 1,427 deer were harvested on this area for a hunter success ratio of one deer per 2.9 hunters. Likewise, 6,576 permits were issued in 1966 for the same area; 1,190 deer were harvested for a hunter success ratio of one deer per 5.5 hunters (personal communication, Mr. Thomas R. Evans, Superintendent, Division of Game, Department of Conservation).

TABLE 2.—Sex and Age Composition of the Deer Killed During Shotgun Deer-Hunting Seasons on a 19,840-acre in Western Pope County, Illinois, 1965 and 1966.

Year	Males				Females			
	Fawn	Yearlings	2½ Years	Over 2½ Years	Fawn	Yearlings	2½ Years	Over 2½ Years
1965	55	29	13	10	37	29	23	16
1966	34	31	1	3	24	18	17	13

One obvious problem of calculating hunter success is the impossibility of determining exactly how many of the hunters that obtained permits actually hunt; however, this bias probably does not vary from year to year. Weather may have affected the deer kill in 1966 and lowered the hunter success; however, there were only slight differences with respect to temperature and precipitation between the 2 years at the DSAC weather station. A 2-inch rain fell on the fourth day of the 1966 season, compared with about ½ inch of rain on the third day of the 1965 season (U. S. Dept. Commerce, Weather Bureau; 1965 and 1966).

The success ratio for 1967 in Pope County was one deer killed per eight hunters (Ill. Dept. Conserv.), which was considerably poorer than the 1966 ratio. This may have resulted, in part, from bad weather and a continuous 6-day season beginning on Friday, instead of a split season as in the past. Murphy (1966 (1965), p. 143) reported that when the 6-day deer season opened on Friday in Missouri, the season was, for all practical purposes, reduced to only 3 days.

The above information seems to indicate that there was a substantial decrease in the deer herd between 1965 and 1966 that may have begun in 1964, as suggested by Andrews and Calhoun (1968 p. 4), who have studied the population dynamics of the Pope County deer herd since the first hunting season in 1957. Although most of the herd reduction was believed to have resulted from shotgun hunting, 8 to 10 deer are killed by automobiles each year and 2 or 3 by bowhunters on the DSAC (personal communication, Mr. Glen Hombirg, Conservation Officer for Pope County). Illegal hunting may have been an important factor in the reduction of the deer herd during the period of this study; at least one radio-marked deer was illegally killed. Natural mortality, although believed to be low, has not been investigated thoroughly. Ohio suffers approximately 24 percent herd reduction each year in areas hunted (Severinghaus and Cheatum, 1956, p. 179-180). Game managers of that state realize that losses of this magnitude cannot be sustained indefinitely; therefore, they hold open season in particular areas only every 2 or 3 years (Severinghaus and Cheatum, 1956, p. 184).

We make the following recommendations with regard to management of the deer herd in northern Pope County: (1) a continuous 6-day season, as in 1967, until the herd has recuperated; (2) a reduction in the number of hunting permits issued; and (3) should these measures not restore the population to pre-1965 levels, closing the season for a year or two.

Acknowledgments

This study was supported by Public Health Service research grant #CC 00052, from the National Communicable Disease Center, Atlanta, Georgia; Dr. Glen C. Sanderson was the Principal Investigator. We appreciate the cooperation of the U.S. Forest Service and the Dixon Springs Agricultural Center, University of Illinois, and are grateful to Dr. Richard Andrews, Eastern Illinois University, for furnishing data relative to the deer killed on the study area during the shotgun hunting seasons of 1965 and 1966. Mr. Thomas R. Evans furnished information concerning the number of permits issued each year. Dr. Glen C. Sanderson and Mrs. Helen C.

Schultz, both of the Illinois Natural History Survey, offered editorial suggestions. P. R. Robinson, R. A. Montgomery, L. D. Martoglio, and James Seets assisted with capture of deer. The present address of R. E. Hawkins is Cooperative Wildlife Research Laboratory, Southern Illinois University, Carbondale; the present address of G. G. Montgomery is James Ford Bell Museum of Natural History, University of Minnesota, Minneapolis.

Literature Cited

Andrews, R. D., and J. C. Calhoun. 1968. Characteristics of a white-tailed deer population in Illinois. Illinois Department of Conservation Game Mgmt. Rept. 1. 8 pp.

Cochran, W. W., and R. D. Lord, Jr. 1963. A radio-tracking system for wild animals. J. Wildl. Mgmt. 27(1):9-24.

———, D. W. Warner, J. R. Tester, and V. B. Kuechle. 1965. Automatic radio-tracking system for monitoring animal movements. BioScience 15(2): 98-100.

Hawkins, R. E., and G. G. Montgomery. 1967*a*. Movements of translocated deer determined by telemetry. Paper presented, Midwest Fish and Wildl. Conf. 29, Madison, Wisconsin.

———, D. C. Autry, and W. D. Klimstra. 1967*b*. Comparison of methods used to capture white-tailed deer. J. Wildl. Mgmt. 31(3):460-464.

———, W. D. Klimstra, G. Fooks, and J. Davis. 1967*c*. Improved collar for white-tailed deer. J. Wildl. Mgmt. 31 (2):356-359.

———, L. D. Martoglio, and G. G. Montgomery. 1968. Cannon-netting deer. J. Wildl. Mgmt. 32(1):191-195.

Illinois Department of Conservation. [1968.] News Release 124-68.

Lincoln, F. C. 1930. Calculating waterfowl abundance on the basis of banding returns. U. S. Dept. Agr. Circ. 118. 4 pp.

Montgomery, G. G., and R. E. Hawkins. 1967. Diazepam bait for capture of white-tailed deer. J. Wildl. Mgmt. 31(3):464-468.

Murphy, D. A. 1966 (1965). Effects of various opening days on deer harvest and hunting pressure. Proc. Southeastern Assoc. Game and Fish Commissioners. 19:141-146.

Nixon, C. M. 1963. Deer harvest analysis, 1959. Game Research in Ohio. 2: 60-69.

Severinghaus, C. W. 1949. Tooth development and wear as a criteria of age in white-tailed deer. J. Wildl. Mgmt. 13(2):195-216.

Severinghaus, C. W., and E. L. Cheatum. 1956. Life and times of the white-tailed deer Pp. 57-259. *In* W. P. Taylor (Editor), The deer of North America. The Stackpole Co., Harrisburg, Pennsylvania, and the Wildlife Management Institute, Washington, D.C. xvii + 668 pp.

U. S. Department of Commerce, Weather Bureau. 1965. 1966. Climatological data: Illinois.

Verts, B. J. 1963. Equipment and techniques for radio-tracking striped skunks. J. Wildl. Mgmt. 27(3):325-339.

Manuscript received July 15, 1968.