operative Deer Disease Unit. The Missouri Conservation Commission provided advice and assisted with the deer restocking program. Many individuals have offered their ideas and have actively helped.

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ELEVEN YEARS OF RUFFED GROUSE CENSUSING IN WESTERN NORTH CAROLINA*

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INTRODUCTION

Fluctuations in ruffed grouse (*Bonasa umbellus umbellus* L.) populations have been the subject of much study. Hickey (1955) notes evidence of three to four-year periodic fluctuations of gallinaceous birds in the North that gradually change into a ten-year cycle toward the South, disappearing below 40° north latitude. Rowan (1954), Hickey (1954), and Marshall (1954) present population data indicating periodic oscillations of grouse populations in the lake states and southern Canada. With minor differences these authors depict periods of maximum abundance as 1933, 1942, and 1951 and the periods of maximum scarcity as 1937, 1944 and 1955.

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DESCRIPTION OF THE AREA

The Flat Top Wildlife Management Area is located in Yancey County of North Carolina, adjacent to the Tennessee state line. Elevations on the area range from 2,800 feet to 4,716 feet above sea level. In this portion of the Appalachian Mountain Range there are numerous cross chains of ridges extending at right angles to the general line of the mountain system, however, there are no broad and well-defined valleys. The terrain is steep and covered with dense vegetation, mostly mountain hardwoods ranging from moist coves dominated by yellow poplar and sweet birch to oak ridges with a mixture of red, black, white, chestnut and scarlet oaks and occasional red maples, hemlock and yellow pine. Lesser vegetation of importance to the grouse includes dense rhododendron "slicks" in moist locations and equally dense mountain laurel on dry slopes. Characteristic fruit-producing species include

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wild grape, greenbrier, black cherry, fire cherry, shad bush and apple trees at abandoned home places.

METHODS

The census techniques employed were those described by Trippensee (1948). This method consists of a system of two sets of permanently marked parallel lines with one set at right angles to the other. Intervals between the lines were one-quarter of a mile and the total census area contained 3,350 acres. Flushing distances, the shortest distance between the observer and the point at which the bird flushed, and details of observed behavior were recorded.

While Hayne (1949) and Robinette, et al. (1956), raise some questions in regard to the definition and use of flushing distances, the population estimates herein were calculated as set forth by Trippensee (1948). Censuses were conducted each fall (October) and spring (April) during the 11-year period.

FINDINGS

The mean fall and spring populations as estimated from the censuses during the period 1952-62 were 4.35 $\pm$ .455 and 3.76 $\pm$ .415 grouse per 100 acres, respectively. Due to adverse weather, the censuses of 1956 (spring) and 1961 (spring and fall) were not used. The 1958 fall census may also be questionable due to adverse weather conditions but is nevertheless included in the analysis since the figures did not appear to be excessively divergent.

TABLE I
GROUSE CENSUS RESULTS 1952-1962
(Grouse per 100 Acres)

YEAR	SPRING	FALL
1952	4.58	5.29
1953	4.02	4.63
1954	3.85	3.66
1955	3.90	4.17
1956	—	4.22
1957	3.45	5.10
1958	4.22	3.57
1959	3.85	3.92
1960	3.18	4.59
1961	—	—
1962	2.76	No Census

If the census data are grouped into two periods: 1952 through 1956 and 1957 through 1962 (Table II), the former grouping will encompass the period of decreasing abundance and the period of maximum scarcity as reported by Hickey (1954), Rowan (1954) and Marshall (1954) and the latter will cover only the period of increasing abundance. Using this grouping the mean population estimate for the periods of decreasing abundance and maximum scarcity should be less than the mean population estimate for the period of increasing abundance if cyclic fluctuations existed. However, the data do not substantiate this. The mean fall and spring population estimates during the periods of decreasing abundance and maximum scarcity are higher by .089 and .596 grouse per 100 acres, respectively, than for the fall and spring population estimates during the period of increasing abundance.

Cyclic phenomena, as noted in the literature, create somewhat regular oscillations in population numbers. These periodic fluctuations may be graphically described as having a "U" or "V" shape with the period of scarcity at the vortex and the period of increasing abundance on one side and the period of decreasing abundance on the other side.

The years 1953-57 were grouped to bracket the period of maximum scarcity in 1955, and the years 1952 and 1958-62 were grouped to bracket the years of abundance (Table II) as reported above for the northern states.

TABLE II

MEAN GROUSE POPULATIONS FOR THE PERIODS 1952-56 and 1957-62
(Grouse per 100 Acres)

YEARS	SPRING	FALL	SPRING-FALL MEAN
1952-56	4.088	4.394	4.258
1957-62	3.492	4.295	3.849
Difference	.596	.089	.409

Censuses for the years 1953-57 produced a mean population estimate for spring and fall of 3.805 and 4.365 grouse per 100 acres, respectively. This was higher by .097 and .022 grouse per 100 acres than for the same periods in 1952 and 1958-62 (Table III).

TABLE III

MEAN GROUSE POPULATIONS FOR THE PERIODS 1953-57 and 1952, 1958-62
(Grouse per 100 Acres)

YEARS	SPRING	FALL	SPRING-FALL MEAN
1953-57	3.805	4.365	4.111
1952, 1958-62	3.718	4.343	3.996
Difference	.097	.022	.115

CONCLUSIONS

Had this grouse population exhibited periodic cyclic fluctuations synchronous with those in northern latitudes, the mean 1953-57 population estimate should have been lower than the mean population estimate for the period 1952 and 1958-62. From these data it is concluded that cyclic prenomena or regular oscillations, as described in the literature and characteristic of grouse populations in northern latitudes, were not a characteristic of the Flat Top Wildlife Management Area grouse population during the period 1952-62.

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