DAILY AND SEASONAL ACTIVITY PATTERNS OF MOURNING DOVES ON THE AEC SAVANNAH RIVER PLANT

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ABSTRACT

The daily and seasonal variation in dove abundance along roads was studied on the AEC Savannah River Plant between May 3 and October 16, 1965. A 58-mile road census was conducted five days a week sampling all times of the day during each week. The effect of ten weather factors on daily dove counts was tested.

Mourning doves were active primarily between the hours of 0530 to 0900 and 1600 to 1930. Within these periods, greatest numbers were observed from 0600 to 0700 and 1700 to 1800. This pattern was maintained throughout the study period and was not noticeably affected by the time of official sunrise and sunset. No doves were observed at night or during the early afternoon hours.

Doves were most abundant in May during the spring migration, followed by a decrease to the summer breeding population in June. The number of doves increased with the addition of young until the end of August when the fall migration began. Only scattered individuals were observed after mid-September. The lack of a late summer population peak is attributed to the absence of feeding areas for large migrating flocks.

Increased dove activity was correlated with increasing maximum temperature and decreasing maximum relative humidity.

INTRODUCTION

Sight and call count road censuses are regularly used to predict annual production or population fluctuations of game species. The results of these road censuses are complicated by many variables, i.e., weather conditions, time of day and season when they are conducted, as well as the age and sex of the animal and the habitats sampled (Fisher et. al., 1947; S.E. Assoc. Game and Fish Comm., 1957).

While conducting a road census study of the reptile fauna of the Savannah River Plant (SRP), data were also collected on the mourning dove *(Zenaidura macroura)*, bobwhite quail *(Colinus virginianus)*, and a number of larger mammals observed along the census route. This paper summarizes the data collected on daily and seasonal activity patterns of the mourning dove. The relationship of ten weather factors to these activity patterns will also be discussed. A second paper, which will appear in the published proceedings of this conference, discusses the bobwhite quail activity data. Subsequent papers will be concerned with the results of the mammal activity data and the distribution of game species.

The ecology and population dynamics of mourning doves have been studied extensively during the past 25 years, primarily for the development of census methods. McClure (1945, 1946, and 1950) conducted numerous road and coo-count censuses in the midwestern and western United States. The Southeastern Association of Game and Fish Commissioners (1957) summarized census data collected by many workers in the southeastern states during the early 1950's. These and other writers found that peak daily activity occurred around the hours of sunrise and sunset when the birds were feeding and watering. Seasonal abundance peaked in August with the addition of large numbers of young birds and the southward movement of migrants.

Previous studies comparing weather factors with dove activity have dealt with the effect on cooing. Weather factors that adversely affect cooing include rain and high winds (Keeler, 1952; Leopold and Eynon, 1961), while temperature has shown

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varying effects in different studies (Elliott, 1932; McClure, 1939; Golley, 1962). The only other weather factors investigated, cloud cover (S.E. Assoc. Game and Fish Comm., 1957) and relative humidity (Elliott, 1932), showed no correlation with dove activity.

The SRP is a 315-square-mile reservation located in the Upper Coastal Plain in Aiken, Barnwell, and Allendale Counties, South Carolina. Approximately 75 per cent of the area was covered by forests in 1963. The habitats include: the longleaf pine *(Pinus paluskris)*-scrub oak *(Quercus* spp.) association (13%); pine plantations (39%); several hardwood types (23%); old fields (20%); and aquatic habitats (5%). At the time of this study the old fields were about 13 years old, since farming ceased in 1952 when the area was closed to the public.

METHODS

Doves were censused along a 58-mile route run throughout the day and night in five periods of nearly five hours each, as follows:

Monday	0449 - 0936
Tuesday	0001 - 0448
Wednesday	0937 - 1424
Thursday	1913 - 2400
Friday	1425 - 1912

Censuses actually varied from three to six hours, depending on the number of reptiles observed and delays due to collecting data. Dove sightings were recorded to the nearest five minute interval. Car speeds varied from 20-30 mph, and the route was run regardless of weather conditions. Direction of travel was reversed each week to randomize the bias attributable to covering certain sections of the route consistently early or late during a census. This pattern was followed from May 3 through October 16, 1965, except for the week of July 10-17 when no censuses were conducted. Activity is defined, for the purposes of this study, as the presence of doves on the road or roadsides. Birds beyond the maintained roadside were not recorded. The daily and seasonal activity data were tested for significant differences by the new Duncan's multiple-range test (Duncan, 1955) with confidence limits set at the .05 level.

Weather data were obtained from monthly summaries from the United States Weather Bureau in Augusta, Georgia, located approximately 15 miles northwest of the SRP. Weather data were correlated with road counts on the same date. A least-squares multiple regression was used to determine the effect of various combinations of weather factors on roadside activity.

RESULTS

A total of 299 mourning doves was recorded on 6670 miles of road censuses, 4002 miles of which were run during the daylight hours when doves were active. Using the latter mileage, an average of 7.5 doves were seen per 100 miles.

The distribution of mourning dove sightings by time of day and season is shown in Figure 1. All but three were observed between official sunrise and sunset. The three exceptions were recorded within 10 minutes of sunrise or sunset.

Doves were generally most active during the same times of the day throughout the study. Peak morning activity (43%) occurred between 0600 and 0700 and peak afternoon activity (41%) occurred between 1700 to 1800 (Figure 2). During the morning hours, 85% of the doves were observed between 0530 and 0900, and 85% of the doves observed in the afternoon were seen between 1600 and 1930. No doves were observed between 1310 and 1500 or at night. Although more individuals were sighted in the morning (174) than in the afternoon (125), the peak morning and afternoon periods were not significantly different from one another (Table 1). Sightings during most midday hours between 0900 and 1700 were not significantly different from the night-time periods 1900 to 0500.

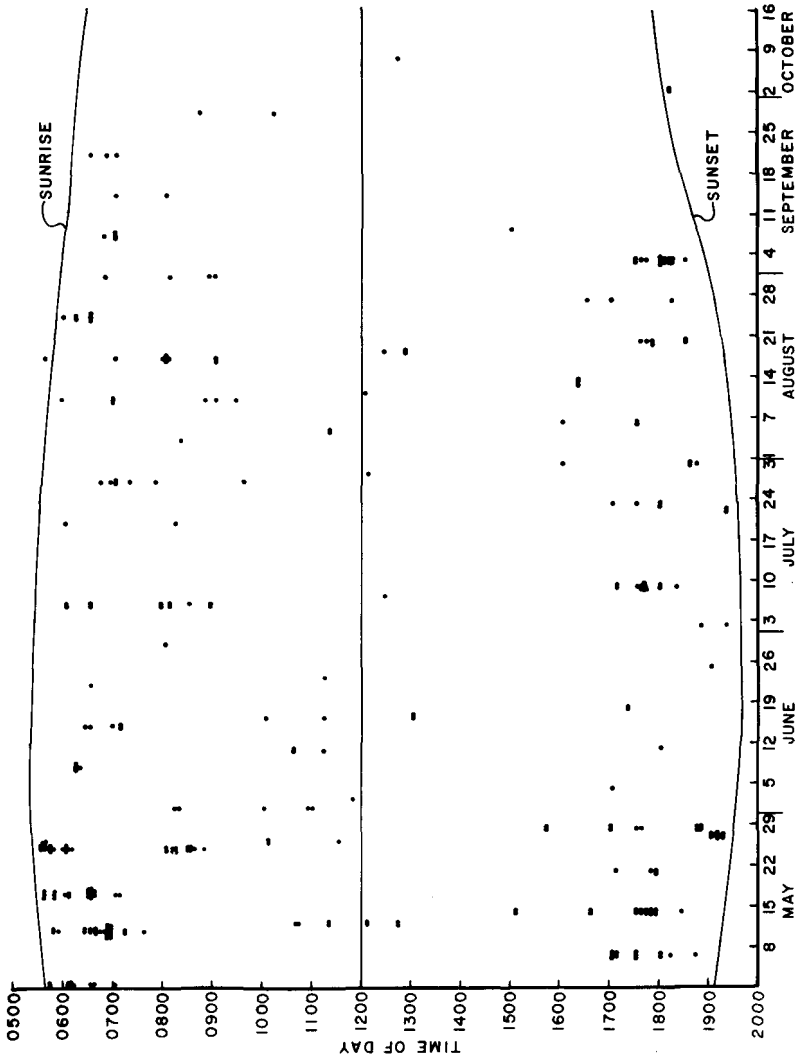

Figure 1. Times of day and season when mourning doves were seen on road censuses conducted between May 3 and October 16, 1965. Each point represents one dove.

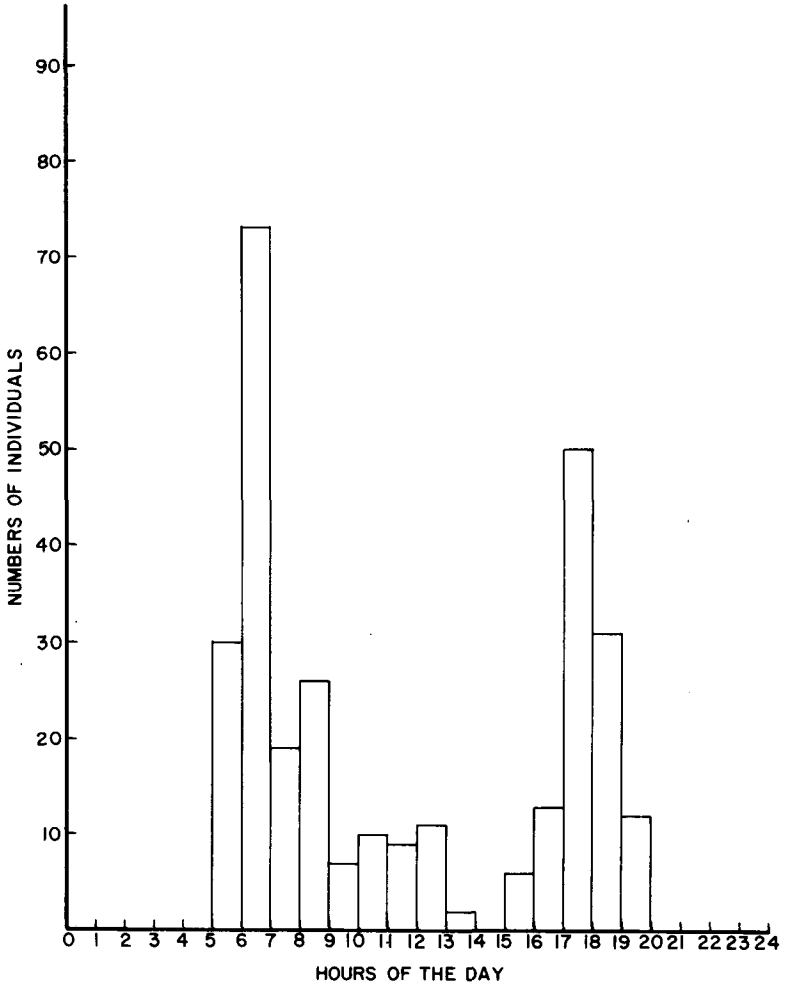

Figure 2. Total numbers of mourning doves seen during each hour of the day.

When dove sightings are plotted from time of official sunrise or sunset, peak morning activity lasted for 1.5 hours beginning at sunrise and peak afternoon activity lasted for 2.5 hours ending at sunset (Figure 3).

Seasonal activity of the mourning dove may be divided into four periods (Figure 4). The greatest numbers were seen from May 3 to 28 with an average of 36.8 per week. The numbers then decreased to 6.4 per week until July 2, when an increase to 13.1 per week occurred. This level continued to September 3, after which activity decreased to 2.5 per week until October 16. The number of dove sightings in May was significantly different from the other periods of the study (Table 2).

The largest flock observed included four individuals. The groups of three and four birds occurring in the May and mid-August to mid-September periods were probably migrants.

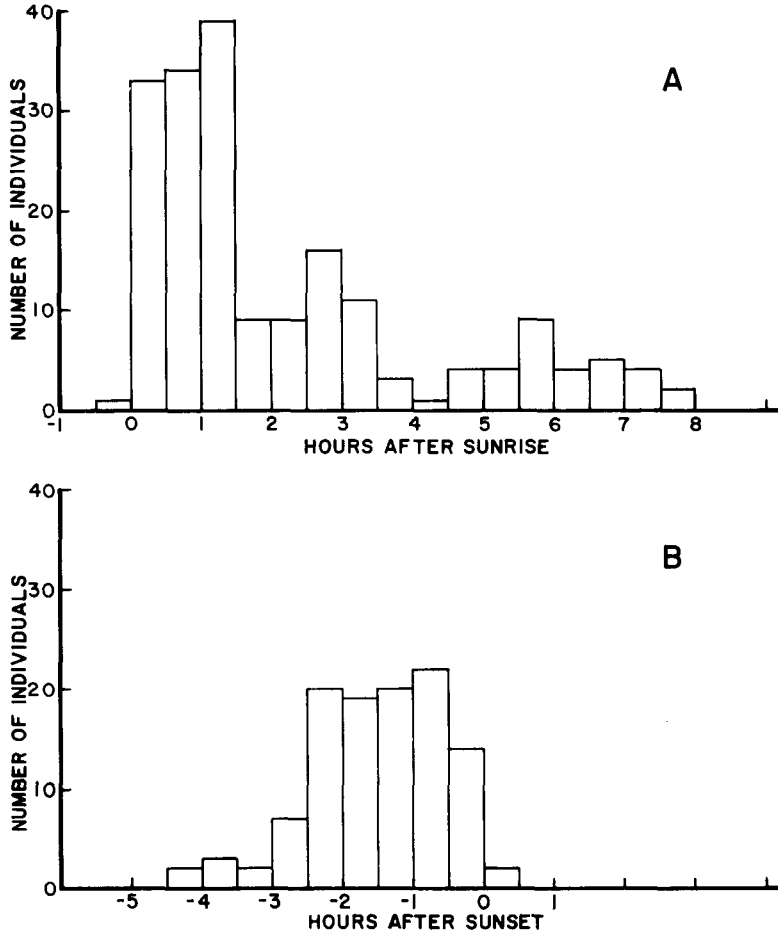

Figure 3. Total numbers of mourning doves seen within half-hour intervals from times of official sunrise (A) and sunset (B). Times of official sunrise and sunset were set at zero (O).

The daily weather factors tested with activity were maximum, minimum, and average temperature, maximum and minimum relative humidity, average percentage cloud cover, total rainfall, average wind velocity, average barometric pressure, and the presence of light or heavy fog. A significant equation involving maximum daily temperature (positive) and relative humidity (negative) as significant factors, and rain, not a significant factor, was obtained by a least-squares multiple regression (Table 3). The equation accounted for 13 per cent of the variability in dove activity. The other weather factors were not found to be significantly correlated with dove activity.

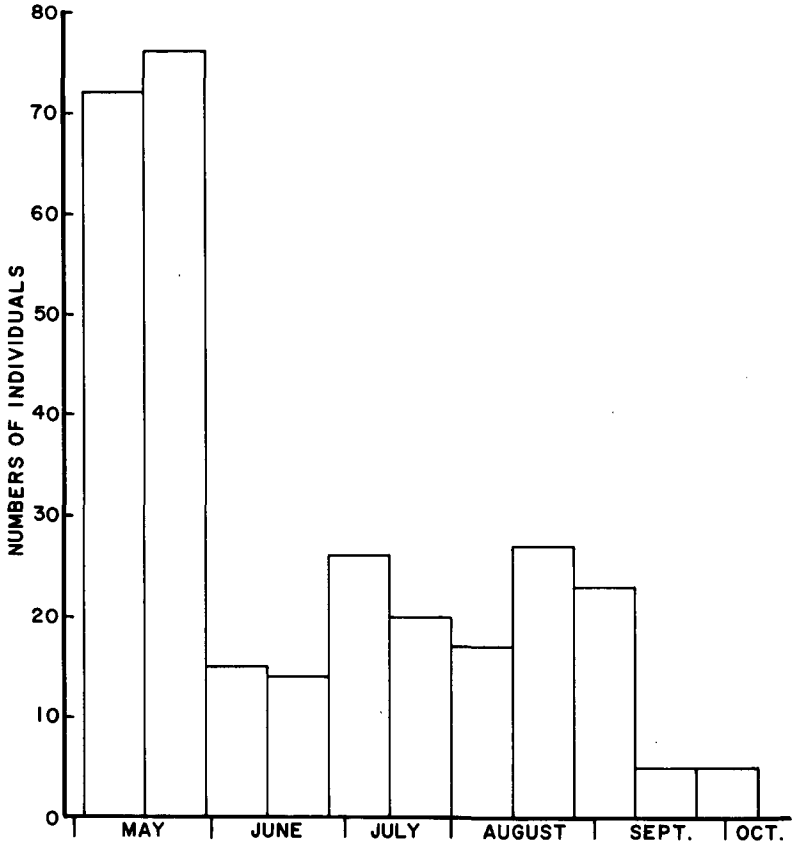

Figure 4. Total numbers of mourning doves observed within two-week intervals from May 3 to October 16, 1965. The week of July 10-17 was not sampled.

DISCUSSION

Early morning and late afternoon activity peaks found on the SRP agree with the results of previous studies on the mourning dove (McClure, 1939; Ginn, 1950; Schmid, 1965). Few birds were seen before sunrise, after sunset, or during the midday hours when they are usually resting. Schmid (1965) demonstrated a general daily activity pattern of feeding and watering followed by resting which occurred in the morning after sunrise and again in the afternoon before sunset. Schmid also found that the amount of food taken in these two periods did not differ, which may explain the non-significant differences in numbers active in these two periods as shown here and by Ginn (1950).

In addition to feeding and watering, breeding and nesting activities generally occur in the early morning and late afternoon (McClure, 1939; Moore and Pearson, 1941). Robinson (1963) tested bobwhite quail in a chamber with a continuous light gradient and found a preference for low light intensities except for breeding males which chose areas with higher light levels. The midday activity noted in this study

TABLE 1

Comparison of numbers of mourning doves observed within two-hour intervals during the day.

Hours	Number of Individuals	
0101-0300	0	e*
0301-0500	0	e
0501-0700	104	a
0701-0900	44	bc
0901-1100	17	cde
1101-1300	20	cd
1301-1500	2	de
1501-1700	20	cde
1701-1900	80	ab
1901-2100	12	de
2101-2300	0	e
2301-0100	0	e

*Means having similar letters are similar at the $P \leqslant .05$ level.

TABLE 2

Comparison of numbers of mourning doves observed within 23-day intervals from May 3 to October 16, 1965.

Periods	Number of Individuals	
May 3 – June 2	153	a*
June 3 – July 5	36	bc
July 6 – August 12	47	bc
August 13 – September 14	55	b
September 15 – October 16	8	c

*Means having similar letters are similar at the $P \leqslant .05$ level.

TABLE 3.

Least-squares prediction model for the occurrence of doves as affected by maximum temperature, maximum relative humidity, and rainfall.

F-model	3.309*
constant (b_o)	16.289
Maximum temperature (b_1)	0.176
F	4.308*
t	2.076*
Maximum relative humidity (b_2)	−0.306
F	6.474*
t	2.536*
Rainfall (b_3)	0.023
F	2.101
t	1.449
multiple R	0.364*
R^2	0.133
n	0.650

*Statistically significant at the $P \leqslant .05$ level of probability.

might be due to breeding males, although weather conditions could have had an influence. Nocturnal activity was not observed, although Tordoff and Mengel (1956) reported finding ten doves killed at a Kansas TV tower during the fall migration. That an association exists between low, but not specific, light intensities and dove activity is indicated by the wide spread of activity within several hours of sunrise and sunset. Doves on the SRP seemed to be active at a specific time of day regardless of changing day length during the warmer months when the study was conducted. This might suggest an endogenous rhythm affected by more than just light intensity.

The general pattern of seasonal abundance during the warmer months is: (1) an initial increase in the population in March during the spring migration; (2) a gradual population buildup through the spring and summer due to the production of young; (3) attainment of peak numbers in late August or early September with the addition of fall migrants; (4) a reduction in numbers to a low level which is generally maintained until spring (McClure, 1946; Ginn, 1950; Quay, 1954). However, this pattern appears to be subject to much variation in different geographic areas and in different years in the same area. Keeler (1952) and McGowan (1953) each conducted three-year studies in Alabama and Georgia, respectively, and found the late summer peak to be low or completely missing in some years while quite distinct in others. Siegler and Newman (1944) found a slight increase in population levels during May in Texas, but otherwise low populations throughout the year. McClure (1950) suggested that their May peak was due to the spring migration. The data from the SRP show the same pattern as found by Siegler and Newman. The highest population occurred in May, which was probably associated with the end of the spring migration as indicated by the presence of small flocks during this period. After the migrants passed through, the flocks disappeared, and the lower population level probably consisted primarily of breeders. There was then an irregular increase in numbers until September due to the addition of young. Small flocks appeared in mid-August, and the major part of the population migrated about the beginning of September.

Golley (1962) reported that breeding doves had maintained their population levels from 1952 to 1959 on the SRP. While the population density of breeding birds has not changed, old field succession has reduced the number of young birds that the area can support. When the young fledge, they form large flocks which normally feed in grain fields (Moore and Pearson, 1941). The lack of these fields on the SRP is probably responsible for the low late-summer populations and the absence of large flocks. The low summer populations found by Siegler and Newman (1944), Keeler (1952), and McGowan (1953) may also be associated with a lack of suitable feeding areas or crop or nesting failures.

The relatively small numbers of doves sighted during this study could be the result of several factors, including: (1) censuses were conducted regardless of weather conditions; (2) censuses included periods of the day when doves were not at peak activity; and, (3) only those doves on the road or roadside were counted.

The present study indicated that increasing maximum temperature and decreasing maximum relative humidity were correlated with an increasing number of doves observed along the census route. Rain was also included in the equation which accounted for 13 per cent of the variability in daily counts of doves.

The low predictability of these data may be attributable to two factors: (1) the weather data were daily averages or sums for each factor rather than the existing weather conditions during a particular census period; and, (2) the length of the census route and the distance of the Weather Bureau station from the SRP obscured the relationships between a day's count and weather conditions along the route. The data indicate that doves were more active on warmer days with a relatively low humidity, although other untested factors were more influential in determining activity on a particular day.

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LITERATURE CITED

Duncan, D. B. 1955. Multiple range and multiple F tests. Biometrics 11 : 1-42.

Elliott, P. R. 1932. Temperature and relative humidity in relation to the ending of the evening song of birds. J. Tenn. Acad. Sci. 7 : 204-213.

Fisher, H. I., R. W. Hiatt, and W. Bergeson. 1947. The validity of the roadside census as applied to pheasants. J. Wildl. Mgmt. 11 (3) : 205-226.

Ginn, W. E. 1950. Migration tendencies of the eastern mourning dove in northern Indiana. J. Wildl. Mgmt. 14 (4) : 378-382.

Golley, F. B. 1962. The eight-year trend in quail and dove call counts in the AEC Savannah River Plant area. Trans. 27th N. Amer. Wildl. Conf. : 212-224.

Keeler, J. E. 1952. The mourning dove study. Alabama Dept. Consv., Montgomery. 79 pp.

Leopold, A., and A. E. Eynon. 1961. Avian daybreak and evening song in relation to time and light intensity. Condor 63 (4) : 269-293.

McClure, H. E. 1939. Cooing activity and censusing of the mourning dove. J. Wildl. Mgmt. 3 (4) : 323-328.

———— 1945. Comparison of census methods for pheasants in Nebraska. J. Wildl. Mgmt. 9 (1) : 38-45.

———— 1946. Mourning doves in Nebraska and the west. Auk. 63 (1) : 24-42.

———— 1950. An eleven-year summary of mourning dove observations in the west. Trans. 15th N. Amer. Wildl. Conf. : 335-345.

McGowan, T. A. 1953. The call-count as a census method for breeding mourning doves in Georgia. J. Wildl. Mgmt. 17 (4) : 437-445.

Moore, G. C., and A. M. Pearson. 1941. The mourning dove in Alabama. Alabama Dept. Consv., Montgomery. 37 pp.

Quay, T. L. 1954. Mourning dove populations in North Carolina. North Carolina Wildl. Res. Comm., Raleigh. 47 pp.

Robinson, T. S. 1963. Illumination preferenda of bobwhites. Occas. Papers Adams Center Ecol. Study 8 : 1-10.

Schmid, W. D. 1965. Energy intake of the mourning dove *Zenaidura macroura marginella.* Sci. 150 : 1171-1172.

Siegler, H. R., and C. C. Newman. 1944. The value and practicability of wildlife censuses along highways. J. Wildl. Mgmt. 8 (2) : 93-99.

Southeastern Association of Game and Fish Commissioners. 1957. Mourning dove investigations, 1948-1956. Bull. No. 1. 166 pp.

Tordoff, H. B., and R. M. Mengel. 1956. Studies of birds killed in nocturnal migration. Univ. Kansas Publ., Mus. Nat. Hist. 10 (1) : 1-44.

DAILY AND SEASONAL ACTIVITY PATTERNS OF BOBWHITE QUAIL ON THE AEC SAVANNAH RIVER PLANT

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INTRODUCTION

While conducting a study of reptile activity and habitat-distribution on the Savannah River Plant, roadside census data were also gathered on bobwhite *(Colinus virginianus)*, mourning dove *(Zenaidura macroura)*, and several of the larger mammals. This paper summarizes daily and seasonal activity patterns of the bobwhite during the warmer months of the year on the Savannah River Plant (hereafter

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