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The One Quail Per Acre Myth

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The total acreage developed for quail food plots in both commercial forest land and national forest land was insignificant considering the acreage involved. The reported increase in interest in quail hunting reported by Rangers in 6 southeastern states should point out the need for greatly increased habitat management programs in Region 8.

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PANEL SESSION II

HERETICAL IDEAS ABOUT BOBWHITE ECOLOGY AND MANAGEMENT

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THE ONE QUAIL PER ACRE MYTH

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Abstract:

Data are presented which conflict with the 1-bird-per-acre saturation point concept for bobwhites (Colinus virginianus). Conclusions are that if a saturation point exists it is at a level greater than 2 bobwhites per acre.

A well-accepted dictum in bobwhite management has been that 1 quail per acre is the maximum attainable population level. Present-day concepts were summarized by Rosene (6:221) who indicated that the maximum stable population was only slightly over 1 bird per acre. He suggested that regardless of habitat quality, bobwhites would not tolerate greater densities since mature birds refused to be crowded beyond that point.

Data gathered by the authors during the first 4 years of a bobwhite management study appear to refute the validity of a 1-bobwhite-per-acre maximum.

Funds for this study were provided by Tall Timbers Research Station, Tallahassee, Florida; the Federal Aid in Wildlife Restoration Act (50 Stat. 917); and through Contract No. 14-16-0008-676, Bureau of Sport Fisheries and Wildlife, U. S. Department of the Interior.

Methods

This study was conducted at Tall Timbers Research Station, a 2800-acre area located in a limestone region of broken terrain in the northern part of Leon County, Florida. Prior to 1800, vegetation on most upland sites in the area was largely pine (Pinus spp.) and wiregrass (Aristida stricta). At some time during the 1800's most upland sites were in cropland. By 1900 many of the fields had reverted to woodland, and annual burning in late winter or early spring was the local practice. As a result of such treatment a rich herbaceous flora developed as an understory in an open pine woodland. The area under consideration was managed primarily for quail hunting from 1895 until 1964 when it was transferred to Tall Timbers Research Station (1). Tall Timbers Research Station is bordered on the south by a large lake, on the west by a dense hardwood hammock, and on the north and east by quail-hunting lands of other plantations. The bobwhite population on Tall Timbers was high in 1964 and remained high throughout the present studies.

In 1968, a portion of the Research Station, including corn fields, fallow fields, botanical plots (9), mature pine woodlands, and some thickets in wet areas, was selected for study. Ninety % of the area in thickets and woodland was burned annually, whereas the fields and scattered 0.5-acre botanical plots were not. An extensive network of fire lanes was plowed each year to protect the plots. Mature pine (Pinus taeda and P. echinata) and live oak (Quercus virginiana) predominated in the open woodland areas, whereas water oak (Q. nigra), sweetgum (Liquidambar styraciflua), black gum (Nyssa sylvatica), and mockernut hickory (Carya tomentosa) were the primary species along water courses. Partridge pea (Cassia spp.), native lespedezas (Lespedeza spp.), beggarweeds (Desmodium spp.), and other herbaceous plants were common each spring after the February and March burns. Over 200 species of plants, 29 of which were legumes, were recorded in an experimental plot of 20 acres (unpublished data, Tall Timbers Research Station). No food patches were planted for quail.

Estimates of the bobwhite population density on 1118 acres were made in November 1968 and February 1969 (4). Using data obtained during these population estimates as a guide, 2 study sites of approximately equal population density were selected (Fig. 1). Sizes of the study sites--1 of 505 acres and 1 of 524 acres--were dictated by the amount of manpower available for census work. At the nearest point the 2 sites were separated by approximately 200 yards.

In the springs of 1969, 1970, and 1971 most of the fields on Study Site 1 were planted in corn, whereas cultivation was terminated in the spring of 1969 on Study Site 2. Annual burning of the woodlands was continued on both areas. Herbicides and pesticides were not used in the corn fields. Corn was harvested with mechanical pickers in October and November of each year, and in 1969 and 1970 the fields were plowed in December. Little grain was available after the fields were plowed. In accordance with plans for a future study, the fields were not plowed in December 1971.

In February of 1970, 1971, and 1972, quail populations were estimated using the Lincoln Index method. Quail traps (7) were placed at selected high-use sites, baited with cracked corn, and checked twice daily. Approximately 1 trap was used per 6 acres. Quail were banded and released at the trapping site. Efforts were made to band approximately 0.5 of the population. Additional traps were set 200 to 400 yards from the boundaries of the study sites in 1970 and in 1971 to determine if banded birds were moving off the study sites due to increased human activity. Birds captured off the study sites were not banded. In no year did trapping take more than 2 weeks. Collection by shooting commenced 2 days after banding operations ceased and is assumed to have provided a random sample of the population. The collection parties, using dogs, swept back and forth across each study area covering the total area as many times as necessary to collect an estimated 20% of the population. Collections usually took 6 to 9 days. Population estimates and 95% confidence levels were calculated using the method of Davis (2:107).

Results

In 1970 and 1971, population density on the study site with corn fields exceeded 2 bobwhites per acre, and in 1972 increased to more than 3 bobwhites per acre (Table 1). The study site with fallow fields held more than 1 but less than 2 quail per acre during each year of the study.

Trapping records indicated that quail moved only short distances during our trapping sessions. Seldom were quail trapped more than 200 yards from the original point of capture. In one trap, 58 different birds were caught in a period of 9 days. Three different coveys were often captured at a single trapsite within a week, and it was not uncommon to catch 20 or more birds in a trap at 1 time. Trapping conducted off the study sites in 1970 and 1971 did not yield birds banded on the study sites.

Discussion and Conclusions

Stoddard's (7) early work on bobwhites indicated that a November population of 1 bird per acre over areas exceeding 1,000 acres was exceptionally high and was approached "only on the finest and most diversified quail ground." He also noted that intensive quail preserve development was just beginning and that there was no basis upon which to predict the maximum density of quail that could be produced in the

future. In reports to the Cooperative Quail Study Association in the mid thirties, Stoddard (8) indicated a belief in a saturation point for bobwhites.

The saturation point concept for bobwhites, with a 1-bird-per-acre maximum, was developed by Leopold (5). Saturation point was an upper density limit determined by competition among individuals of the same species. It was considered an inherent property of certain species. and was said to exist when the same maximum population densities existed on a large number of widely separated optimum ranges. Leopold based this 1-bird-per-acre maximum density concept for bobwhites upon wide experience in game surveys, historical records, and Stoddard's (7) quail investigations. He believed that bobwhite populations occasionally surpassed 1 bird per acre, but only for a short time.

Leopold's 1-bird-per-acre concept was well accepted by wildlife managers, and little information has been presented to challenge such a viewpoint. However, Stoddard in his later years (1964, personal communication) surmised that fall population densities on managed lands in the Thomasville, Georgia/Tallahassee, Florida region were approaching 2 bobwhites per acre over large areas. Ellis et al. (3) contended that with proper management, bobwhite densities in the fall could exceed 1 bird per acre. Kellogg, Doster, and Williamson (4) reported a late winter density of 1.2 bobwhites per acre. Although Leopold (5:71) undoubtedly was responsible for the widespread belief in the 1-bird-per-acre limit, he did not close the door to new ideas. His chapter on density limits was summarized in the following manner:

> This account of what little is known, or guessed at, about fluctuation and density limits in game, contains a high percentage of surmise or speculation, because the accumulated labor of naturalists contains a low percentage of attention to this fundamental subject. Scientists have been studying it in the handmade glass-bottle environments of the laboratory. This is proper--they will some day extend their experiments to the hills and fields.

Our experiments were extended to the field, and at this interim point in our study we have documented bobwhite densities greater than 1 bird per acre for a period of 4 years. There is no indication that the high population densities on our study areas were the result of recruitment from outside. On adjoining plantations supplemental feeds were abundantly available as were natural feeds. We suspect that the weedy corn fields on Study Site 1 produced good brood-rearing range and thereby contributed to the high population density indicated by the February estimates. It should be emphasized that these population estimates are not the usual fall estimates upon which the concept of saturation point has been based. These are late winter estimates. Fall estimates would have indicated even higher population levels. These findings do not necessarily invalidate the concept of a saturation point for bobwhites, but they do suggest that if such a population density limit exists, it is at a level greater than 2 bobwhites per acre. Population densities of 2 to 3 quail per acre are not rare in the Thomasville, Georgia/Tallahassee, Florida region today.

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Table 1. Banding data and population estimates.

Area	Date	Bobwhites banded	Bobwhites collected	Banded bobwhites collected	Total population estimates (P=0.05)	No. bobwhites per acre	Total # coveys* on study site	Average # acres/covey
Study Site 1 (505 acres with corn fields)	1970	663	219	127	1143± 132	2.3	95	5.3
	1971	684	237	117	1386± 182	2.7	115	4.4
	1972	806	312	163	1543±177	3.1	128	3.9
Study Site 2 (524 acres with fallow fields)	1970	284	127	50	721±159	1.4	60	8.7
	1971	438	140	74	829±132	1.6	69	7.6
	1972	535	133	77	584±87	1.1	48	10.9

*Average covey size = 12 birds

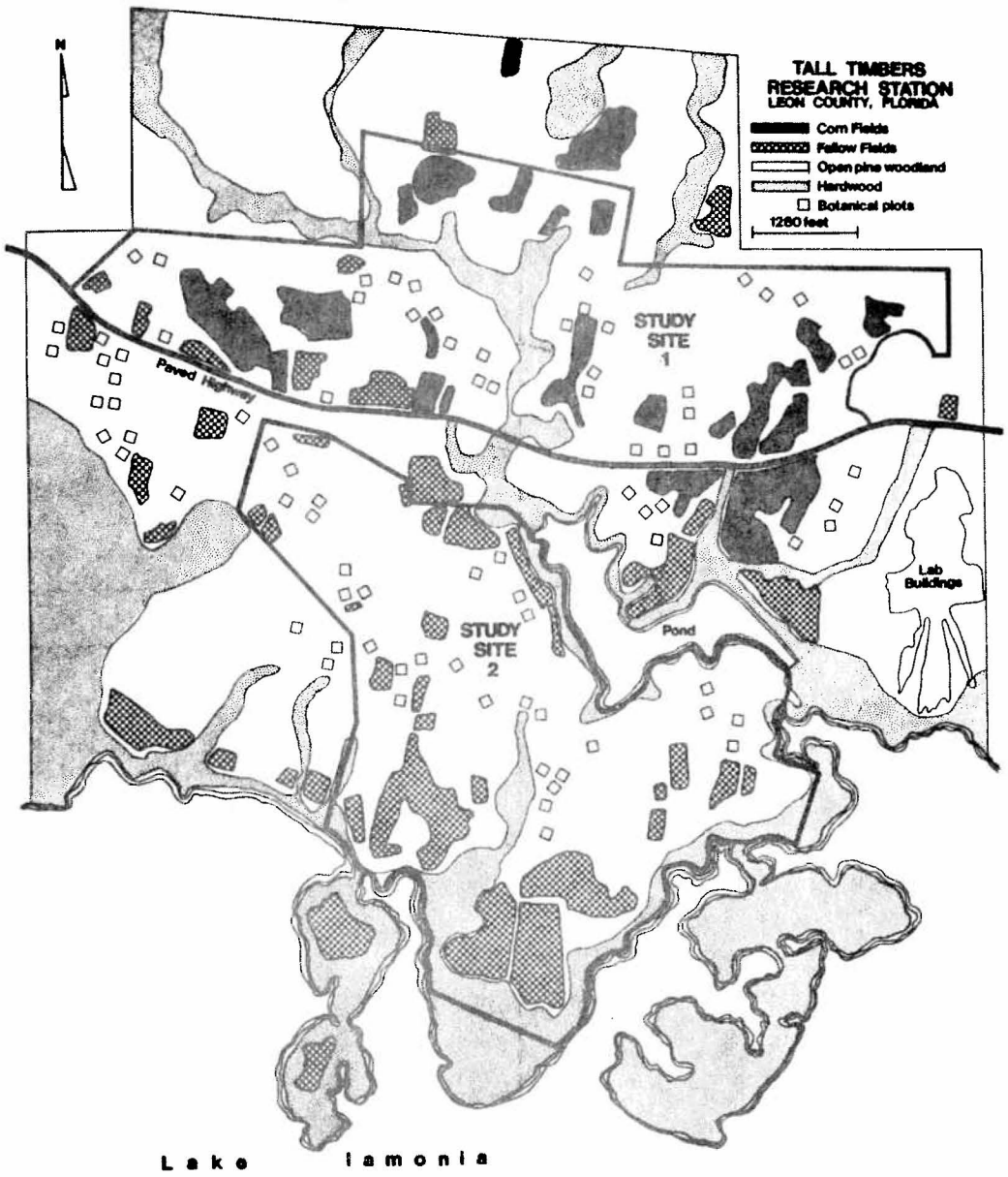

Figure 1. Study Site 1---80.2 acres in 17 corn fields averaging 4.7 acres each and 19.1 acres in 7 fallow fields averaging 2.7 acres each. Study Site 2---102.1 acres in 23 fallow fields averaging 4.4 acres each.