

known mortality was only 6.1% of the total number released, the actual mortality in Kentucky was believed to be much greater. It would have required a small army of field personnel to adequately conduct an intensive mortality search on the study areas alone. It was conceivable that many of the birds left the immediate vicinity of the release sites very soon after liberation and died elsewhere. Mammal and bird predation were factors of considerable importance, but they were not believed to be the primary causes of failure to establish. Rather high initial losses appear to be inherent in stocking programs where unconditioned pen-reared stock are involved. Attractive habitat to the species appeared to be lacking in many cases, as evidenced by almost immediate dispersal from some sites. On the other hand, certain standing grain fields, grain-stubble fields, and some dense hay fields involving combinations of wheat, oats, rye, barley, Korean lespedeza, alfalfa, red top, fescue, and ragweed held some birds from the release date in the summer until late in the fall.

Since this was a migratory subspecies in its native habitat it was reasonable to expect it to move south in the fall. This it apparently did as revealed by a number of band returns from birds shot in states to the south. By late November and December it was almost impossible to find a bird residing on the study areas. However, a true migration did not materialize since no evidence was found to indicate that the birds returned in the spring in reasonable numbers. Only two birds were observed in the spring following releases the previous summer. One, observed by project personnel, had no visible identification marker and its origin was unknown. It could have come from another state making a spring release. The other bird reportedly carried a colored neck tag and was assumed, if the observation was authentic, to have been a bird released by this project.

Birds dispersing from Kentucky apparently did not take hold elsewhere as no establishment of this subspecies is known anywhere in the United States.

Values rendered by this study are summarized as follows:

1. Facts regarding Japanese coturnix survival in Kentucky were obtained which can be used to counter pressures for continued stocking in the future.
2. Additional knowledge regarding the life history of this exotic was acquired.
3. A large savings of Department monies was realized by confining coturnix introductions to a research project where relatively small numbers of release stock were involved and intensive follow-up studies were conducted.
4. Methods and techniques used may provide a pattern useful to the design of a future study of this nature.

## **EVALUATION OF MANAGEMENT TECHNIQUES BY MEANS OF A THREE-YEAR QUAIL CENSUS**

By ELLIS A. CARTER

### INTRODUCTION

The John A. Kleber Wildlife Management Area in Owen County, Kentucky was purchased with funds from a donor for whom the Area is named. The Area, which was first mapped in 1954, comprises 678 acres of rolling hills, and is rather rough and rocky, not more than 10% of the total acreage being suitable for cultivation, and even this is not fertile land. Fringe areas and steep hillsides are wooded, primarily oak and cedar, and brush and undergrowth are prevalent in many sections.

It was specified by the donor that the Area be set aside as a controlled Management Area for wildlife, and hunting has not been permitted since acquisition of the land in late 1953.

Since 1954, the Department of Fish and Wildlife Resources has made plantings in marginal sections to provide winter food, and natural brush cover has been allowed to flourish to a controlled measure. Small fields are mowed regularly to provide open space with grass cover.

The Kleber Area is managed, not to hold quail, but to encourage use of lands adjacent to the Area while providing late winter food.

Although quail are important as a game species in the Bluegrass section of Kentucky, they are outranked by rabbit and squirrel, and the habitat existent at Kleber is third rate with respect to quail.

Development of the Area has necessarily progressed by degrees with new fields planted or cleared of brush each year, while previously improved sections were maintained.

Since natural brush cover is abundant, plantings were primarily of a seed producing type, including Bicolor Lespedeza, Japonica, Maize, Dwarf Cane, Sorghums, Virginia Mix, Sunflower, and others.

Annual plantings made earlier had reached peak productivity in 1958 and 1959, and have been allowed to decline slightly since that period, while more emphasis has been placed on perennials, which provide late winter food for game birds but have less tendency to hold quail through an entire season.

Since hunting was not permitted on the Management Area, but is permitted, in season, on adjacent lands, a study to determine the extent of the use of the Kleber Area by quail was initiated in late October, 1959. It was hoped that the existing quail population could be determined fairly accurately, as well as the extent of movements across the borders. Studies also were to include comparisons of evident quail population, before, during, and after the annual statewide hunting season, and the utilization of food plots provided for quail usage.

#### PROCEDURE

The first year, a man-and-dog census crew was set up, consisting of four two-man teams, with at least one bird dog, to obtain as much data as possible regarding the quail population. Later, at times, only one man was available to cover one of the four sections of approximately 170 acres, into which the Kleber Area was tentatively divided. Each section was to be covered in detail three days during each of the early, mid-season, and late census periods. This meant nine census coverages, a program which was adhered to the first year. The second and third years the mid-season census was dropped, and only two days were worked on the spring census, for a total of five census days per year.

Blank data cards were made up and distributed to the crews to be completed for each covey or single flush. Information on the cards was to include the date and time of each flush, the number of birds and the direction of flight. The time of flush was considered important in preventing confusion about a second covey rise, and the direction of flight and area marked down was pinpointed for later posting on maps. Each crew carried, or was acquainted with, a map on which the 75 fields or sections were numbered, so that the origin of flush and field where marked down was easily noted on the card by number. Other information such as cover type, roosts, dead birds and predator sign was also recorded on the cards.

Census sections were alternated between crews, so that no one team covered the same section on successive dates. Three of the regular census takers were bird hunters and dog owners, and all concerned were interested in quail or dogs, or both, so that the census might be of interest to the census takers and therefore possibly more conclusive.

Although the terrain and undergrowth were very rough in some sections, census personnel were cautioned to cover all likely habitat as well as possible, and never to assume any portions were void of quail. Covey flushes on adjacent sections were compared as to time of flush in order to avoid registering a second covey rise in a nearby field.

In some instances, continuity of terrain led to censusing of lands outside the border of the Management Area, and these flushes were recorded, though not listed as part of the Area bird population. In some cases a previously flushed covey was not recorded for this reason, but was often found on the Area on a subsequent census day. Inconsistent findings, especially near the boundaries, were considered good evidence of marginal coveys, which would, at times, be available to the hunter. Many of the perennial plantings, such as Bicolor Les-

pedeza, had been located near a boundary so that a covey could make use of available food plots and get range outside the Kleber Area.

Data recorded on cards in the field were transferred to maps in the office immediately, and any questions regarding the data were directed to the team responsible, and cleared up as soon as possible.

### RESULTS

Eleven distinct coveys were flushed during the first three-day period of the Fall census in 1959. In addition to these, six coveys were found which were believed to range primarily off the Area, though they were found on the Area at least once during the three-day census period. Due to the large number of flushes at this time, it was difficult to pin-point a covey range, as the ranges actually overlapped in some cases. Coveys were flushed in essentially every cover type on the Area, lending credence to census methods. Inconsistent findings, we hoped, were partly due to marginal coveys which ranged both within the Management Area and outside the boundary.

The pre-season average of ten birds per covey increased by mid-season as the families or small coveys joined together, and groups of three or four birds were less evident. By Spring the number of resident coveys had dropped to six. This count immediately followed a severe winter, during which four to sixteen inches of snow remained on the ground at all times from February 13 to March 27 in 1960, and the Spring census was not conducted until April. Such weather conditions are not common in this state. Quail were easily found in at least one Japonica plot during the heavy snows but were not easily found in other areas.

#### SUMMARY OF KLEBER QUAIL CENSUS FINDINGS

<i>Season</i>		<i>1959-60</i>	<i>1960-61</i>	<i>1961-62</i>
Fall	Resident coveys .....	11	7	9
	Marginal coveys .....	6	1	1
	Average no. birds .....	10.2	13	11
Mid-Season	Resident coveys .....	8	..	..
	Marginal coveys .....	4	..	..
	Average no. birds .....	11.5	..	..
Spring	Resident coveys .....	6	5	7
	Marginal coveys .....	1	..	..
	Average no. birds .....	7.8	7	4

Seven resident coveys plus one marginal covey were found in the Fall of 1960, a decrease, which, however, was consistent with a decrease in quail throughout Kentucky for that year. This number is still much greater than the maximum of three coveys which were known to be existent in 1954. The average number of birds per covey, thirteen, was greater in the Fall of 1960, so that there was only a small decrease in the total bird population. The census was done in mid-November, somewhat later than in 1959, and fewer but larger coveys might have been expected.

In 1960-61 and in 1961-62, only two census days were employed in the Spring census, or a total of five census days during the year, the mid-season census having been eliminated entirely. This was partly because it was not absolutely necessary, and partly because of a shortage of man-and-dog power. This might possibly have caused a low count, though average covey size should not have been greatly affected. Even so, at least 34 quail were carried over the winter and into the Spring of 1961.

An increase of two coveys was noted in the Fall of 1961, though this amounted to only about eight birds, as the average dropped to eleven birds per covey. More coveys were carried over the winter than for either of the two previous seasons, but the covey size was smaller, so that only 28 quail were accounted for in the Spring of 1962. The average covey size seemed to depend to a large extent on the weather and the progress of season changes on the date of the census. Consistent methods as regards these two factors were almost impossible.

Ten quail were trapped live and removed from the Area in the Fall of 1959, and two were removed the following Spring. Approximately four were frozen or otherwise killed in traps in addition to these.

Thirteen roosts were noted and recorded in the Fall of 1959, and seven were noted in the Spring of 1960, while ten were seen in the Spring of 1962. Others were seen during the course of other activities on the Management Area but were not recorded because of the possibility of duplication. No special emphasis was placed on discovery of roosts, and undergrowth in many instances made them difficult to find. No dead birds were found, and evidence of predators was almost nil.

Hunting is permitted on most of the adjoining lands, and birds from the Management Area have helped to provide a fairly good measure of the sport. As a result, hunting pressure on these lands has increased significantly during the past several years, taking a toll from marginal coveys. However, no measure of the hunting pressure or the kill on adjoining property is available at this time.

#### SUMMARY AND CONCLUSIONS

The quail population of the Kleber Wildlife Management Area encompassed eleven coveys in the Fall of 1959, compared with three coveys in 1954. It decreased to seven coveys in the Fall of 1960, probably due, in part, to severe snows, but increased to nine coveys in the Fall of 1961.

Six coveys were found in the Spring of 1960 and five in 1961, while seven coveys were found in the Spring of 1962, though the average number of birds was smaller. Increased hunting pressure on lands adjoining the Area has come about at least partly as a result of marginal quail from Kleber. This would tend to account for a decrease of 18 birds from the Spring of 1960 to the Spring of 1962, and is very possibly due to perennial plantings near the borders of the Area which help provide late winter food but do not tend to prevent egress of quail into adjoining lands.

#### ACKNOWLEDGMENTS

The writer wishes to extend grateful thanks to James Durell, who was technical consultant throughout the study, and to Sam Parrent and James McElmurray, who contributed valuable advice and assistance in all aspects of the census. Many others provided time, footwork and dogs, without which this paper would not have been possible.

### BREEDING CHARACTERISTICS OF SOUTHEASTERN MISSOURI COTTONTAILS \*

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The purpose of this paper is to describe breeding characteristics of cottontails in southeastern Missouri during the 1962 season, with special reference to synchronous breeding. This phenomenon has previously been suggested by Schwartz (1942) for north-central Missouri cottontails, and fully documented by Conaway and Wight (1962) and Wight and Conaway (1962), also for cottontails of northern Missouri.

\* Contribution from the Missouri Cooperative Wildlife Research Unit, University of Missouri, Columbia; and the Gaylord Memorial Wildlife Laboratory (University of Missouri and Missouri Conservation Commission, cooperating), Puxico, Missouri. Thanks are due the Conservation Department. Olin Mathieson Chemical Corporation, East Alton, Illinois, for special assistance; and to T. S. Baskett, C. H. Conaway, J. P. Rogers and N. R. Holler for advice and assistance in collecting.