of the long-time and indirect effects of these poisons upon soil organisms, beneficial insects, wildlife, domestic stock or upon humanity itself.

It is of interest to note that the imported fire ant has been with us for forty years, yet apparently relatively little Federal concern or basic research has been undertaken until recently. Certainly, little or no preparation had been made in advance for this gigantic and drastic "eradication" program.

DeWitt ‡ has shown that we can expect that there may be serious indirect consequences. From laboratory experiments he found that these highly toxic chlorinated hydrocarbons not only are extremely lethal in minute quantities but that these poisons are accumulative and that young birds hatched from parents that had ingested minute sublethal doses of poison show a much higher mortality after hatching and that sterility or partial sterility often follows in those young that do survive. He found that one two-hundred-thousandth (1/200,000) of an ounce of dieldrin per day in the food of pheasants resulted in eggs of low hatchability and chicks subject to abnormally high death rates. Because of size difference there is every reason to conclude that the effects of similar dosages of the poison is even more damaging to quail.

There is no reason to expect that the indirect effects of these dangerous poisons will be any less damaging to man or his domestic livestock. One of America's foremost blood authorities has concluded that there is a close parallel between blood cancer and the application of poisonous chlorinated hydrocarbon sprays. The risks are too high for such foolhardy irresponsibility as we are witnessing in the present fire ant control program.

A total of approximately 700,000 acres was treated by September, 1958. This large-scale application of such lethal and relatively non-specific control methods that have been so inadequately investigated is indefensible. Until much more is known about the good and bad effects of the ant and the dangerously poisonous insecticides used in control, it would be in the public interest to halt the control program and especially the indiscriminate aerial applications. The remaining fire ant funds should be transferred to research.

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PROGRESS REPORT ON ALABAMA BOBWHITE QUAIL WING STUDY *

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Sound game management is dependent upon accurate information about annual production. Data on production of bobwhite quail *(Colinus virginianus)* may be obtained from study of wings of birds bagged during the hunting season. A trained person can determine (1) whether the bird is an adult or a "bird of the year" and (2) the approximate date of the hatch, provided the bird isn't over 150 days old (Petrides and Nestler 1943, 1952). Such data may be useful in adjusting the length of the hunting season and for explaining changes in populations. Data obtained on chronology of the hatch may provide clues to reasons for failure or success of the hatch and should yield sound information regarding the best time to open the hunting season. Previous studies on determination of young quail in the harvest have been published by Stoddard (1931), Leopold (1945), Hendrickson (1945), Thompson and Kabat (1949), Bennitt (1951), Herndon (1953), Robinson and Baker (1953), Haugen (1955, 1956), Legler (1955), and Stanford (1955).

During 6 consecutive years beginning with the 1952-53 hunting season, personnel of the Alabama Cooperative Wildlife Research Unit have studied statewide quail production from wings contributed by hunters. From 1952 to 1957 a total of 40,616 quail wings was examined. Wings were received from cooperators in each of the 67 counties of the State. Only a small percentage of the wings was collected by Unit personnel on special study areas. The wing study increased in scope and importance and the findings increased in reliability during the first 4 years, or developmental period of the investigation. Cooperators eventually totalled 526 (Table I).

TABLE I

EXTENT OF COOPERATION IN BOBWHITE WING STUDY

Hunting Season	*1952 1953*	*1953 1954*	*1954 1955*	*1955 1956*	*1956 1957*	*1957 1958*
No. active coopertors	....	143	398	520	526	427
No. quail wings received	1,553	3,335	7,037	11,387	8,320	8,984
No. envelopes received	....	543	1,220	1,833	1,304	1,283
Avg. No. wings per envelope	....	6.2	5.8	6.2	6.4	7.0

PROCEDURES

In the fall of 1952, a special quail wing envelope was designed to facilitate the study (Figure 1). This envelope was designed to make it easier for hunters to cooperate. The clasp-type envelope was 7 x 10 inches in size and of good quality manila paper. It was a self-addressed, business reply type envelope. Complete instructions to cooperators were printed on the back. In the later years of the study, an annual supply of 10,000 envelopes was purchased complete with printing as in Figure 1.

The major supply of envelopes was mailed to reach the cooperators about 3 to 4 days before opening of the quail season in November. Early experience showed that more wings were received from the first week's hunting than during any other week of the season (Table 2). This made it important that all possible effort be made to contact these prospective hunters just before the opening of the season. Included with the supply of envelopes was a mimeographed final report on the previous year's results along with comments on prospects for the coming season. Whenever reprints of published articles on quail were available, a copy was enclosed.

A roster of active cooperators was established through continued effort over the years. Assistance in this effort was received from secretaries of sportsmen's clubs, state game biologists, conservation officers, Soil Conservation Service employees, current cooperators, and Vocational Agriculture teachers and ther Future Farmers of America members.

The greatest increase in wing receipts occurred in the fifth year when supplies of 40 to 50 envelopes were sent to each Vocational Agriculture teacher in the State with instructions to distribute them through their students. This arrangement for distribution was made with approval of the State Leader of Vocational Agriculture. Because enough wings were received by January 1 of the fifth and sixth years, cooperators were asked to stop sending them in after this date.

* A contribution of the Alabama Cooperative Wildlife Research Unit, the Alabama Polytechnic Institute, the Alabama Department of Conservation, the Bureau of Sport Fisheries and Wildlife, and the Wildlife Management Institute, cooperating.

Acknowledgment is hereby made to Mr. Frank Fitch, former Assistant Leader, for his work on this study during 1952 and 1953, and to Mr. Fred E. Schultz formerly of the Alabama Polytechnic Institute for his help in statistical analysis. The authors are very appreciative of the cooperation of hunters who sent in wings.

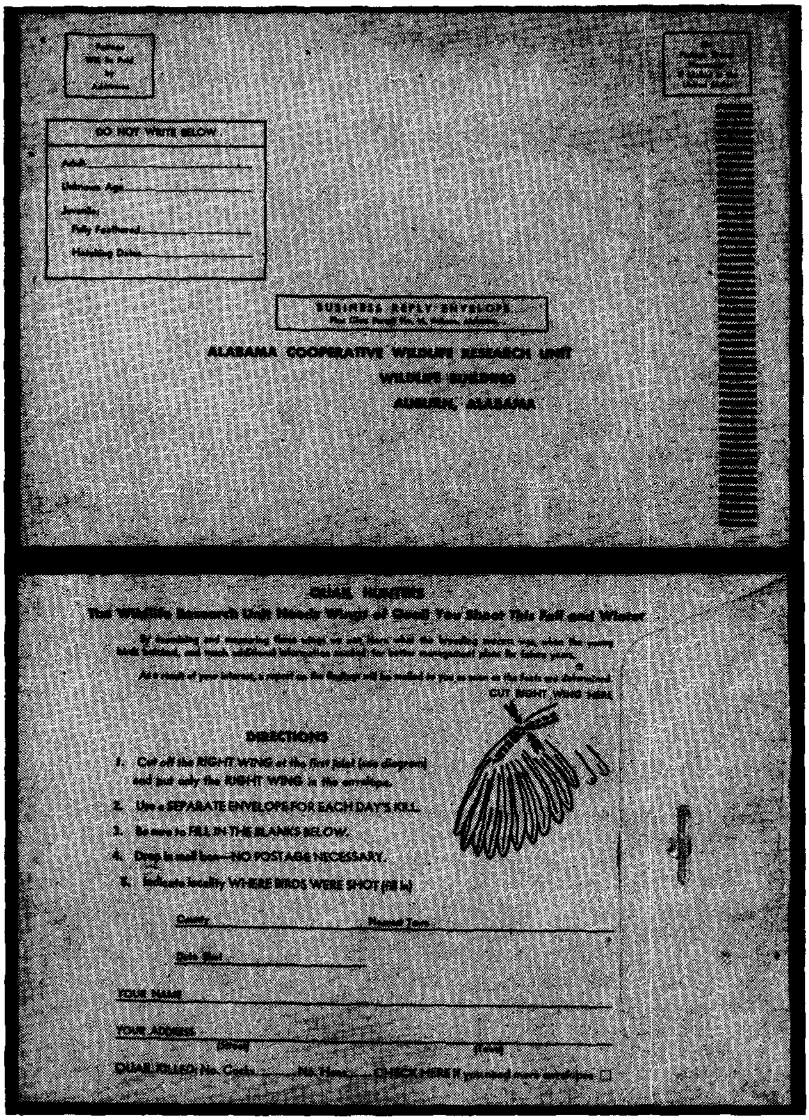

Figure 1. Each quail wing return envelope was printed on front and back as shown to make it possible for cooperators to send in wings from each day's kill with the least effort. A separate envelope was used for wings from each day's kill.

Wing receipts increased from 1,553 the first year the special envelope was used to a peak of 11,387 wings in the 4th season of the study (1955-56). By statistical analysis of that "bumper crop" of wings, the minimum number of wings needed for an adequate sample was determined. In subsequent years, cooperators were notified not to submit any more wings as soon as a sufficient supply had been received for each of the soil regions in the State.

TABLE II

WEEKLY DISTRIBUTION OF SUPPLY OF BOBWHITE WINGS SENT IN BY COOPERATORS

Season	*Percentage of Wings Collected by Weeks of the Season*													*Total on Which Based*
	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	
1952-53	18.2	10.8	6.8	4.5	4.0	5.5	4.5	6.8	5.9	7.9	9.4	12.0	3.5	1,553
1953-54	12.3	5.8	8.1	7.4	4.9	10.6	7.8	7.5	9.1	9.2	7.0	5.7	4.7	3,335
1954-55	16.1	11.0	8.1	10.7	8.9	7.5	5.6	5.5	7.8	4.2	5.0	4.4	5.3	7,037
1955-56	12.3	11.0	10.5	8.5	9.9	9.6	5.6	4.7	6.0	7.8	5.9	8.1	..	11,387
1956-57	28.7	17.9	10.2	11.1	9.5	14.4	8.2*	..	..	..	..	..	..	8,320
1957-58	26.9	21.4	10.1	10.2	10.3	12.1	9.0*	..	..	..	..	..	..	8,984

* Sample considered adequate and cooperators asked to stop sending in wings.

Envelopes containing wings were sorted on arrival according to major soil provinces, of which there are 7 in Alabama. This was done because it was anticipated that productivity might vary with soil type.

A card file showing the name and address of each cooperator was maintained. Each card also showed the number of envelopes sent to, and returned by the cooperator. When records indicated he had only one envelope left, he was sent a new supply of at least 3 envelopes. The first time a cooperator sent in wings each season, a colored pin was placed on a map in the county in which the birds were bagged. This provided a means for showing geographic distribution of cooperators.

Wings received were found easier to study if examined while fresh and flexible. When dried and stiff, they were difficult to spread open for study. Hatching dates were estimated on the basis of the replacement of wing primaries as described by Petrides and Nestler (1943, 1952). Young of the year were distinguished from old birds on the basis of shape of the outer two primaries (Stoddard 1931), and by the color and quality of the wing coverts (Leopold 1939) and (Haugen 1957).

Hatching dates were figured only for birds killed in the first week of the season because after that time many of the young birds had reached 150 days of age and their hatching dates could not be estimated. For quick estimation of hatching dates, a modified dating slide rule of the type described by Kabat *et al.* (1950) was used. The modified aging-rule was graduated to convert feather length directly to hatching date (Figure 2). The divisions on the rule were based on feather replacement schedules as determined by Petrides and Nestler (1943, 1952). In using the device, the length of the latest primary being replaced was estimated to the nearest one-eighth of full length size and the approximate hatching date determined on the slide rule.

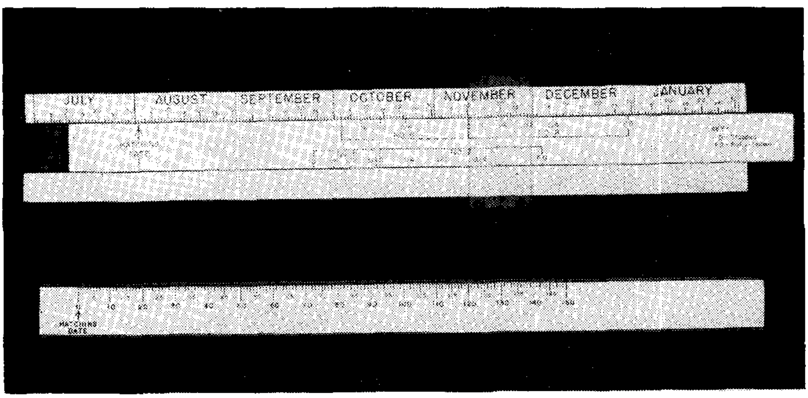

Figure 2. A special slide rule of the type shown above was prepared so as to speed up the operation of determining hatching dates. It was made from an artilleryman's slide rule.

The percentage of juvenal quail in the population was estimated from examination of all wings available. When the percentages for each week were graphed, the fluctuations were of such magnitude as to cast doubt on the weekly comparisons. Fluctuation in percentage because of small numbers of wings was minimized by combining and handling the data on an accumulative basis through each week in the season. This approach gave a dependable comparison of percentage of young from the various areas (Table 3, Figure 4).

Data from the Tennessee Valley Region show that for estimation of the percentage of young little accuracy was gained by examining more than about 800 wings. Additional wing data did not alter the percentage by more than about 1 per cent either up or down (Table 3, Figure 4).

Figure 5 was prepared to illustrate relationship of the size of wing sample to three hypothetical percentages of young, on of 70 per cent young, the second 80 per cent, and a third 90 per cent young. As an example, the curve for 80 per cent young was prepared by calculating the value of

$$\frac{2\sqrt{\text{per cent young x per cent adult.}}}{\text{size of sample}}$$

This calculated value is two times the standard error of the percentage. Values were calculated for each of the wing sample sizes of 100, 200, 400, 600, 800, 1,000, 1,200, 1,400, 1,600, and 2,000. The values when plotted and joined, as shown in Figure 5, indicate the degree of dependability of percentage figures in relation to various sample sizes. It is obvious that percentages of young based on fewer than about 800 wings have a probability of being highly inaccurate. The point at which the line first swings steeply upward which occurs at about the 800-wing level of sampling, is the point at which further accuracy is gained only with excessive effort. On the 80 per cent curve, it is apparent that if it is desirable to have results accurate at the 95 per cent probability level and if an accuracy to within ± 2½ per cent is sufficient, sampling can stop as soon as 800 wings from the area under study have been checked for age. In this study the wings came from several hundred localities well distributed in every one of the 67 Alabama counties. The collection of wings, therefore, is believed to represent as near a random sample of the quail range in the seven soil provinces and of the State as is practicable in this type of study where cooperators must be depended upon to provide the wings.

TABLE III

PERCENTAGE OF QUAIL OF THE YEAR IN THE HARVEST BY WEEKS OF THE SEASON, 1955-1956—AREA—TENNESSEE VALLEY

Harvest by Weeks				*Accumulative Harvest to Date*				
Week	*Adult*	*Juv.*	*%Juv.*	*Adult*	*Juv.*	*Accum. Total*	*%Juv.*	*2 Std. Errors* +/—
1	20	161	88.95	20	161	181	88.95	4.66
2	30	213	87.65	50	374	424	88.21	3.14
3	32	144	81.82	82	518	600	86.33	2.80
4	33	158	82.72	115	676	791	85.46	2.50
5	37	192	83.84	152	868	1,020	85.10	2.22
6	11	119	91.54	163	987	1,150	85.83	2.06
7	3	30	90.91	166	1,017	1,183	85.97	2.02
8	16	95	85.59	182	1,112	1,294	85.94	1.94
9	6	50	89.29	188	1,162	1,350	86.07	1.88
10	28	97	77.60	216	1,259	1,475	85.36	1.84
11	36	187	83.86	252	1,446	1,698	85.16	1.72
12	40	143	78.14	292	1,589	1,881	84.47	1.68
13	..	...	....	...	....	....	....	...
Total	292	1,589		292	1,589	1,881		

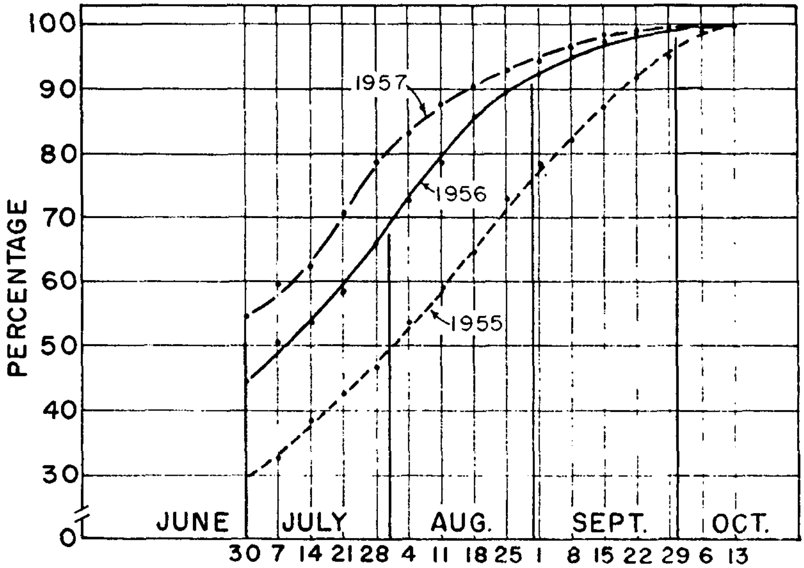

Fig 3 Progress of the successful hatch of bobwhites in Alabama as graphed on an accumulative basis for the reproductive seasons of 1955, 1956, and 1957

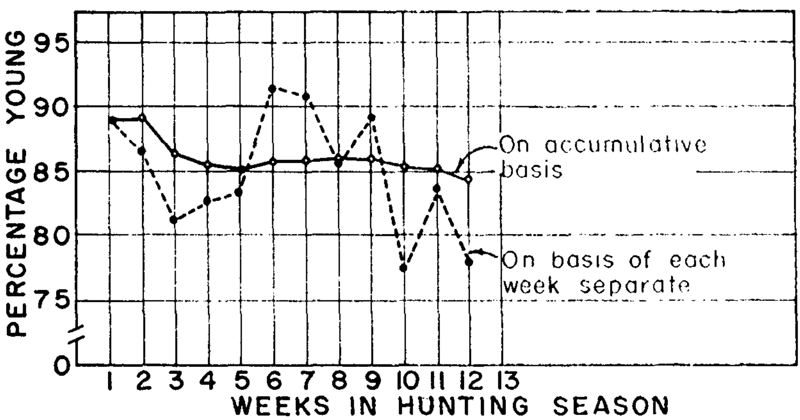

Fig. 4 Comparison of graphs of weekly percentage of young quail in the harvest, to the accumulative percentage of young in the harvest. Tennessee Valley Area of Alabama, 1955-56 Season. Data from Table 4.

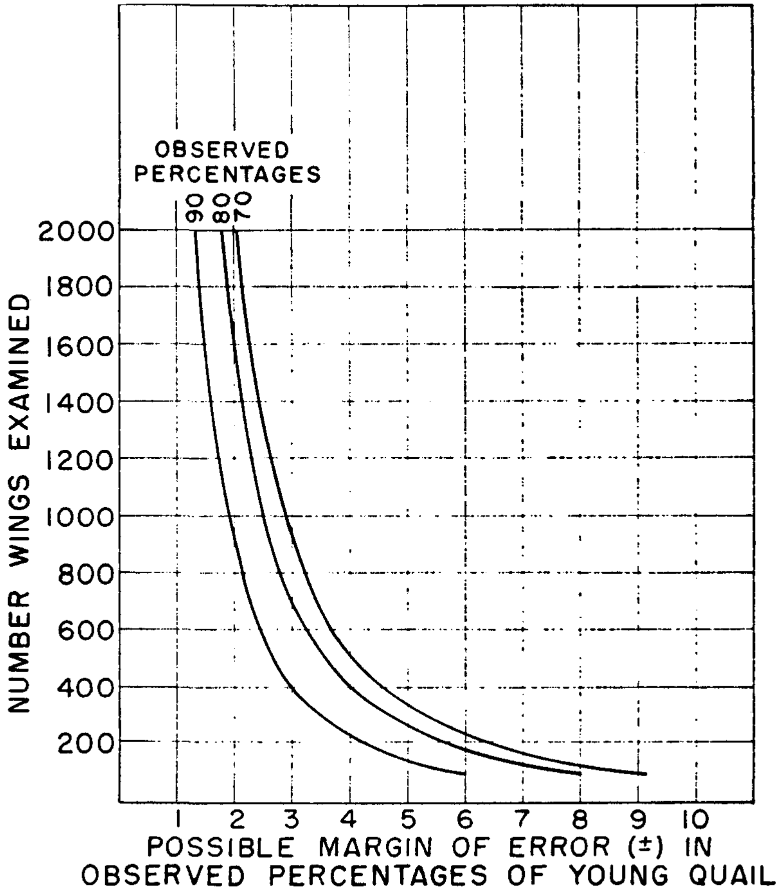

Fig. 5. Relationship of possible margin of error (±) (at the 95% level of confidence) in observed percentages of young quail to the number of wings examined. Example If 80% young is determined from 1000 wings, we can be 95% confident that the true percentage of young in the population is 80 ± 2.5, or in 19 out of 20 random samples of 1000 wings each from this same population, the observed percentage would be between 77.5 and 82.5%.

PRELIMINARY RESULTS AND CONCLUSIONS

Results from the 1956-57 season show that the supply of 8,320 wings was received at a postage cost of $0.013 per wing. The postage costs consisted of $42.78 for sending out envelopes, and $68.82 for incoming postage due on envelopes containing wings sent in by cooperators. A total of 40 man-hours of labor were required in order to send out the original mass of envelopes. Daily handling of the incoming envelopes and the sending out of additional envelopes requested by cooperators required about 4 hours a day or a total of about 140 man-hours of labor.

During the 6-year period, the percentage of young quail wings in the samples varied from 70.0 to 83.5 per cent (Table IV), with an average of 77.6 per cent for all 6 years. Percentages of young in 1952 and 1953 were approximately average at 75.8 and 77.7. Production of young in 1954 was poor, as indicated by only 70 per cent of the kill that fall. Production of the year following poor breeding success was 83.5, the highest percentage of young in the 6-year period. On the basis of number of young per adult, production in 1955 amounted to 5.06 in comparison to only 2.34 in 1954. In other words, there were only half as many young quail per adult in the fall of 1954 following one of the driest summers in Alabama history as in 1955 after a summer of near normal rainfall.

When the hatching dates were grouped by weeks and graphed on an accumulative basis (Figure 3), the curve provided a good insight into the chronology of the hatch. The hatching curve for quail in Alabama could not be figured back any further than to about July 1. This is true because the hunting season usually opens late in November by which date nearly all birds hatched in June had passed 150 days of age. These older birds had completed their post-juvenal moult, and therefore, their hatching dates could no longer be determined.

TABLE IV

PROPORTION OF JUVENAL BOBWHITES IN THE WING SAMPLES

Season of Collection	*1952 1953*	*1953 1954*	*1954 1955*	*1955 1956*	*1956 1957*	*1957 1958*
Percentage juveniles	75.8	77.7	70.0	83.5	80.2	78.7
No. Juveniles per adult	3.13	3.49	2.34	5.06	4.05	3.69

It is generally thought that a good crop of young quail is dependent on the successful hatching of a high percentage of first clutches of eggs. It is reported by some authorities that the first clutches of eggs are larger and that the percentage of fertility of these eggs is higher than in late clutches. Also, there is the possibility that the more time a hen is forced to devote to nesting and renesting activity, the more chances there are for her to fall victim to predation.

The abundant quail production in Alabama during 1955, which was the largest recorded during this study, proved an exception to the above concept in that it resulted from the latest hatch observed during the study (Figure 3). Normally about 50 per cent of the hatch is completed by July 1, whereas only about one-third of the hatch was completed by July 1 in 1955. Since the best quail production year (1955) followed the poorest (1954), there is no foundation for believing that the population of birds that wintered over to serve as the breeding population for the best year was any larger than normal. In fact, the breeding population was probably smaller and probably consisted of a larger than usual percentage of 2-year-old birds for breeding purposes. Could it be that the delay of about 3 weeks in the peak of the hatch in the best year may have resulted in preserving more young quail for the hunter as a result of less time for forces of depletion to cut back the number of young? Or was it an increase in survival of young in a habitat not fully stocked as a result or failure in production during the preceding drought year? It is also possible, however, that this was an example of the inversity principle in action.

It is estimated that about 10 years of quail-wing study are needed for interpreting changes in degree of production from year to year and to determine the percentage level for typical production in the State.

Since a quail-wing study does not yield information on quail population density, it would be highly desirable to have statewide quail population estimates or indices to the population, concurrent with any production study.

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THE EFFECT OF FOOD PLANTINGS, CLIMATIC CONDITIONS, AND LAND USE PRACTICES UPON THE QUAIL POPULATION ON AN EXPERIMENTAL AREA IN NORTHWEST FLORIDA

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Ten years ago farm game habitat development projects in the southeast were primarily concerned with the distribution of bush lespedeza planting material to farmers. With the discovery of bicolor lespedeza, it was felt that the solution to restoring and maintaining high quail populations on southeastern agricultural lands had been found. The program of wholesale distribution of this new wonder plant to farmers became the leading project of many state game departments. Not too much thought and attention were devoted to follow-up studies to learn the actual effect of the program upon quail populations. Results were being assumed rather than measured.

The Florida Game and Fresh Water Fish Commission was anxious to test the merits of this new plant. Plans were to develop an experimental area of typical agricultural land with bush lespedeza plantings and census the bird population annually. In 1948, a 5,500-acre area was set up in Jackson County, Florida. The land was typical northwest Florida corn and peanut farmland. The landowners agreed to let the Commission make the desired number of plantings on their farms. The area was essentially square in dimension. Topography is gently to moderately rolling. Although the area is rather intensively farmed, there is