# WEIGHT AND AGE CHARACTERISTICS AS CRITERIA FOR HARVEST OF BOBWHITES IN NORTH CENTRAL TEXAS[1]

*by*

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## ABSTRACT

Bobwhite age and weight data were collected from 5 study areas in North Central Texas to determine characteristics contributable to optimal harvest. A total of 24,324 bobwhites were aged and 12,735 were weighed and examined during December and January (hunting season), 1962-67. The peak in nesting as shown by molt patterns occurred prior to July 15 each year. The mean weight of all birds was 176.2 - a standard error of .5 grams. Weights increased through December and began to decline during the final 3 weeks of January. Average weights of January-killed birds did not decline below the average weight for the study period.

It is submitted that bobwhite weight and physical condition can be utilized as criteria for harvest and subsequent management of the species. The harvest beginning date should coincide with the average date on which 90 percent of juvenile birds reach the 150 gram acceptable size. This date during the period in North Texas was November 25. Bobwhite weight and physical condition were shown to remain well within acceptable limits during late winter indicating that these factors are not prime considerations for determining the season closing date.

## INTRODUCTION

This study was instituted by the Texas Parks and Wildlife Department in November 1962 to determine characteristics of bobwhite quail *(Colinus virginianus)* populations contributable to better harvest. Bird weight and body condition during the open hunting season were prime considerations of the study.

Five areas representing the major habitat types in North Central Texas were selected for the study.

Quail weights during the study could not have been collected without the diligent assistance of game biologists and Game Management Officers headquartered throughout the study area.

Bobwhite sex and age characteristics have been studied in North, East, and South Texas and in other states. Bobwhite weight patterns have also been studied in these same areas of Texas, although weight characteristics have not received thorough treatment.

[1]This study is a contribution of Texas Pittman-Robertson Projects W-73-R and FW-14-C.

Errington (1931) set the premise that northern bobwhites in excellent condition and weighing 200 grams, could decline 20 percent to 160 grams and still maintain good physical condition. He surmised that a 30 percent decline to 140 grams forcast serious mortality unless food supplies increased and that adults weighting 125 grams (37.5 percent decline) were weak in flight and were doomed.

Lehmann (1953) reported that from a sample of 2,000 bobwhites killed in December and January in South Texas, the average weight was 162.4 grams and that birds weighting less than 130 grams had so deteriorated physically as to be seldom encountered.

Reid and Goodrum (1959) reported an average weight of 163.9 grams from a sample of 413 fall and winter collected birds in Louisiana, eastern Texas and western Flordia. The average weight of 42 spring, summer, and fall adult birds was 155 grams for the same area. Perkins (1952) found that birds lost 24 grams between mid-winter and mid-summer in Louisiana.

Stoddard (1931) reported an average weight of 164.9 grams for bobwhites killed in southern Georgia and northern Florida. Murray and Frye (1957) found that the eastern bobwhite in northern Florida averaged "about 180 grams" while the Florida subspecies of the southern part of the state was much smaller and averaged "about 140 grams".

Season changes in weight were reported by Lehmann (1953) and Reid and Goodrum (1959). Lehmann found the the October-December change in 1950 was +11.9 grams in males and +8.5 grams in females, with average weight for December of that er being 162.1 grams. Reid and Goodrum reported that the year to year change in average winter weights was never greater than +6.9 grams (412 birds) and that there was no conspicuous relationship between quail weights and winter foods consumed by bobwhites.

Bobwhite sex and age data have been collected widely during past years. Petrides and Nestler (1943) determined that birds 21 weeks or less could be aged by molt patterns. This aging technique has been used extensively to determine annual production in bobwhite populations.

This study indicated a direct correlation between winter populations and juveniles per adult hen in the population. Haugen (1956) reported from Alabama that during the 1955-56 season, when juveniles made up 83.5 percent of the population, a ratio of 10.0 juveniles per adult hen was evident, twice as many as raised per adult hen during the drought of 1954 in Alabama. Jackson (1951) reported from Wise County, Texas, 7.6 juveniles per adult hen in 1948-49 and 19.75 per adult hen in 1949-50 (extremely high) a year of near normal rainfall. Lay (1952) found 5.3 and 11.8 juveniles per adult hen in southeast Texas during years 1947-48 and 1949-50 respectively.

## STUDY AREAS

Five multi-county study areas were selected to represent the major vegetative types of North Central Texas which are: (1) Blackland Prairies, (2) Cross Timbers and Prairies, (3) Rolling Plains, and (4) Intermediate vegetative associations associated with each type (Figure 1). The study areas were located within 15 separate counties. Land use between areas showed much variation. Area 1, with highest rainfall and partially within the Blackland Prairies, had intermittant farming mixed with small-pasture cow-calf operations. Area 2 land use consisted of large-pasture cow-calf operations, but lay as an intermediate area between West Cross Timbers and Grande Prairie. Areas 3 and 5 were intermediate areas between West Cross Timbers and Rolling Plains where very large cow-calf operations are the rule. Area 4 land use consisted of some farms and livestock operations utilizing mixed herds of cattle, sheep and goats.

Climatological information for each study area are given in Table 1.

FIGURE 1. Map showing location of study areas and their relation to the ecological areas of Texas.

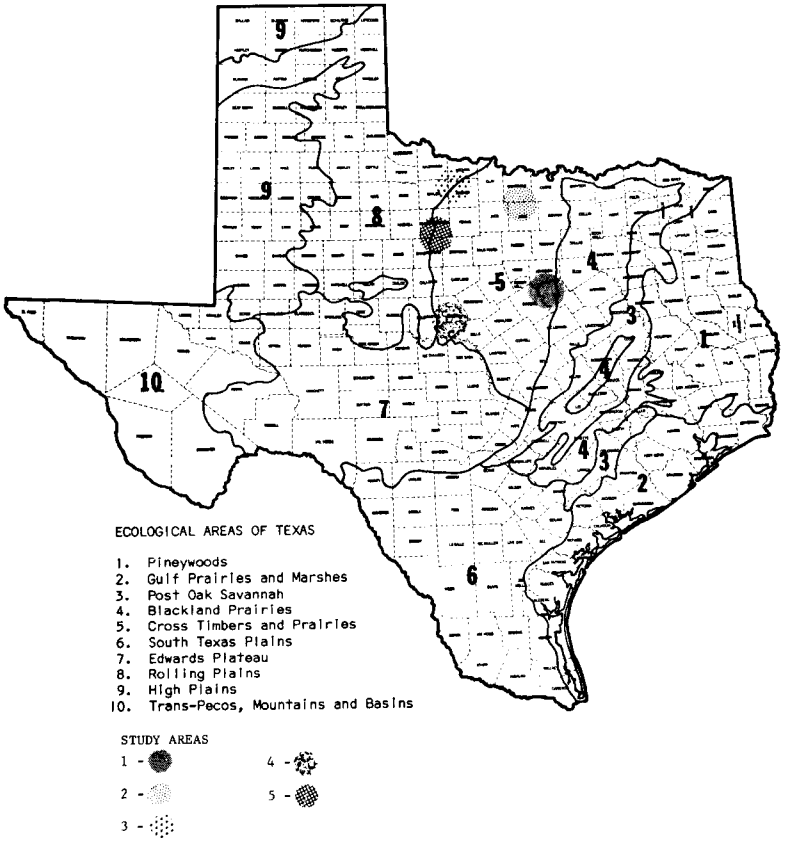


TABLE 1

CLIMATOLOGICAL DATA FOR SELECT COUNTIES WITHIN STUDY AREAS

| County | Frost-Free (Area) | Date Last Days | Annual Frost | Precipitation |
|---|---|---|---|---|
| Hill | 1 | 247 | Mar. 19 | 37.04 |
| Wise | 2 | 220 | Mar. 31 | 29.32 |
| Baylor | 3 | 214 | Apr. 3 | 24.95 |
| Coleman | 4 | 235 | Mar. 26 | 26.82 |
| Shackelford | 5 | 224 | Mar. 30 | 25.95 |

Quail food availability will not be treated *per se*, but the study of a winter season collection of quail crop contents from the study areas in 1962 will be discussed to show variability in species use and percent volume. A total of 407 crop contents were studied as to frequency of occurance and percent volume of species between 2-week periods from December 1 to January 27.

Crops from Hill County toward the southeast, contained 47 species with none being more than 10 percent total volume. The major items were corn, acorns, sunflower, Johnson grass and browntop panic. To the contrary, crops from Baylor County, toward the northwest, showed 22 species with broomweed *(Amphiachyris dracunculoides)* and western ragweed *(Ambrosia psilostachya)* making us 73.45 of total volume. The same two species made up 82.58 percent volume in Throckmorton County of Area 5 toward the west. Acorns, ragweed, bumelia, and tickclover made up 79.50 percent volume of the 22 different food items taken from Wise County quail crops collected toward the northeast on the edge of the Grande Prairie resource area. Birds were consistently heavier from Areas 3 and 5 where broomweed and western ragweed normally make up a large portion of total food volume. Broomweed and ragweed contain 23 and 17 percent protein respectively. Fat content is 25 and 19 percent (Table 2). Considering the total volume taken, these 2 species may well be a determining factor in the heavier weights from Areas 3 and 5. Generally, other quail food items of high quality such as trailing wild beans, prairie acacia, deervetch and bundleflower are not readily available on the predominately overgrazed quail ranges.

Variations in quail densities were consistent with habitat quality. Acres per quail ranged from 50-75 on poor quality range of Area 4, to 5-10 on the other areas. Table 3 shows quail density, harvest, and turnover on combined acreage from all study areas.

## METHODS

Bobwhites were collected during the open hunting season. Birds were examined and weighed to the nearest gram. Mutilated birds were excluded from weight data which were recorded on prepared forms. Collections were made to simulate normal quail hunting activity and no specific daily time periods were used.

Biologists and game wardens who assisted in the collection were trained in the art of aging and weighing birds to the satisfaction of the project leader. Each worker received written instructions and reprinted literature on the subaect after field training.

Molt patterns and ages were determined by the method described by Petrides (1943). Care was taken to collect samples which would represent each of 4 periods so that weight changes could be determined. These periods were: 1) December 1-14, 2) December 15-28, 3) December 29-January 11, and 4) January 12-31 (Figure 2).

Quail wings were collected from hunters on and adjacent to study areas. Wings were collected in specially marked envolopes to separate sex.

## RESULTS AND DISCUSSION

During the 5-year period, 24,324 bobwhites were sexed and aged and 12,735 were weighed and examined. Collections were made to simulate actual hunting conditions. A study of hatching dates, quail weights, and population increase and decrease related to physical condition indicates that many factors other than population totals should be considered in harvesting bobwhites.

Bobwhites during mid-winter are heavier by approximately 10 grams in North Central Texas than in other areas of the State and in other southern states (Table 4). Stoddard's report of 164.9 grams, Lehmann's findings of 162.4 grams, and Reid and Goodrum's report of 163.9 grams as average weights compare somewhat below the 176.2 gram average for this study.

TABLE 2

NUTRITIONAL ANALYSIS OF QUAIL FOOD ITEMS AVAILABLE ON STUDY AREAS[1]

| | Protein % | Fat % | Fiber % |
|---|---|---|---|
| Yellow Corn *(Zea mays)* | 8.8 | 3.8 | 2.5 |
| Millet *(Panicum miliaceum)* | 11.0 | 3.5 | 8.5 |
| Milo Maize *(Sorghum subglabrescens)* | 11.0 | 3.0 | 2.5 |
| Oats *(Avena sativa)* | 12.0 | 4.5 | 12.0 |
| Wheat *(Titicum aestivum)* | 15.0 | 2.0 | 3.0 |
| Ragweed *(Ambrosia* sp.) | 16.8 | 19.0 | 36.0 |
| Dove weed *(Croton* sp.) | 19.8 | 20.1 | 15.3 |
| Broomweed *(Amphiachyris dracunculoides)* | 22.9 | 25.4 | 16.6 |
| Sun Flower *(Helianthus annuus)* | 18.1 | 19.3 | 12.4 |
| Spanishclover Deervetch *(Lotus americanus)* | 45.2 | 7.5 | 10.0 |
| Trailing Wild Bean *(Strophostyles helvola)* | 26.2 | 0.3 | 8.0 |
| Small Wild Bean *(S. pauciflora)* | 26.7 | 0.7 | 9.7 |
| Budleflower *(Desmanthus illinoensis)* | 35.9 | 1.3 | 10.9 |
| Tickclover *(Desmodium* sp.) | 22.0 | 22.0 | 12.4 |
| Prairie acacia *(Acacia angustissima)* | 29.5 | 2.2 | 11.0 |
| Johnsongrass *(Sorghum halepense)* | 15.2 | 5.6 | 10.8 |
| Acorns *(Quercus* sp.) | 7.4 | 7.7 | 4.0 |
| Woollybucket Bumelia *(Bumelia lanuginose)* | 9.3 | 24.8 | 13.5 |
| Winter Greens | 23.2 | - | - |
| Grasshopper Eggs | 19.3 | 23.8 | 6.7 |

[1]Data supplied by Red Chain Feed Laboratory, Ft. Worth, Texas

The concensus of quail hunters contacted through public hearings and personal contacts is that birds weighing less than 150 grams (5.3 oz.) are not acceptable to the average hunter. Figure 2 indicates considerable leeway for manipulation seasons in North Texas considering this premise of minimum acceptable weight. The regression curve with one unit extrapolation shows that 90 percent of juvenile birds reached 150 grams approximately one week prior to period 1, and continued to increase to 162 grams during the third period. It should be noted that during the first period, the confidence limits of the tenth percentile of juvenile weights includes 150 grams. A random sample taken during early December could be expected to contain up to 10 percent juveniles weighing less than 150 grams. This also implys that game managers and sportsmen alike can occassionally expect to find up to 10 percent of bagged quail weighing less than 150 gram minimum acceptable weight at the end of the study period and had declined only 2 grams during the final 2-week period.

Juvenile birds weights show wide variations prior to November 25 (Figure 2). As older and very young birds began to reach an equal size as related to normalcy, the 95 percent confidence narrows to acceptable limits near that date.

TABLE 3

BOBWHITE DENSITY, HARVEST, AND TURNOVER ON COMBINED SAMPLE ACREAGES OF THE STUDY AREAS

1962-1967

| | PRE-SEASON[1] | | | | | POST-SEASON[2] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Acres Censused | Quail Found | Coveys Found | Quail Per Covey | Quail Per 1,000 Acres | Quail Found | Coveys Found | Quail Per Covey | Quail Per 1,00 Acres | Per[3] Cent Killed | Per[4] Cent Change |
| 1962-63 | 20,320 | 2,537 | 200 | 12.68 | 125 | 1,346 | 136 | 9.90 | 66 | 35.28 | -46.95 |
| 1963-64 | 16,471 | 2,176 | 159 | 13.69 | 132 | 985 | 99 | 9.95 | 60 | 28.54 | -54.73 |
| 1964-65 | 15,221 | 1,222 | 92 | 13,28 | 75 | 886 | 88 | 10.07 | 58 | 19.23 | -27.50 |
| 1965-66 | 16,581 | 2,153 | 144 | 14.95 | 130 | 1,081 | 105 | 10.30 | 65 | 34.97 | -49.79 |
| 1966-67 | 16,581 | 2,166 | 160 | 13.54 | 131 | 1,045 | 105 | 9.95 | 63 | 42.11 | -51.75 |

[1]October - November
[2]February - March
[3]Known harvest of Fall population
[4]Fall to late Winter including hunter harvest

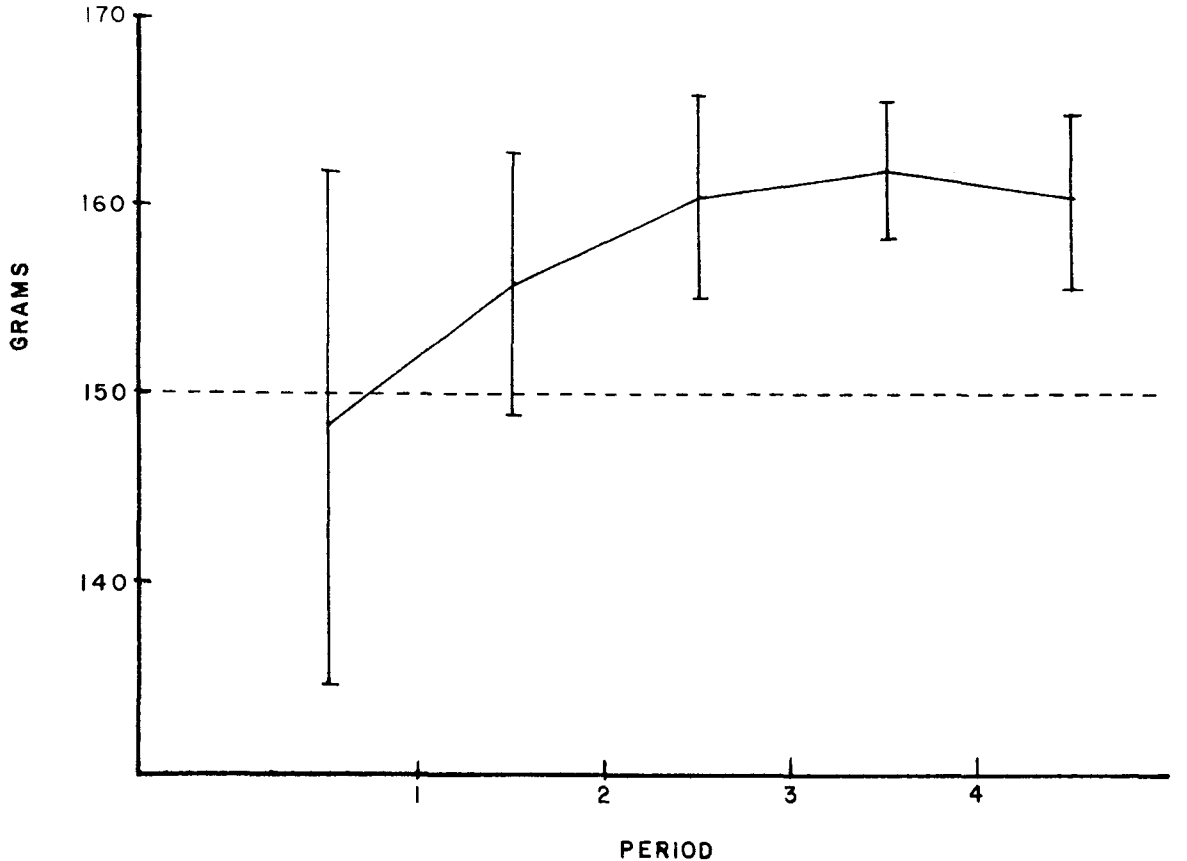


FIGURE 2. Tenth percentile regression curve showing juvenile weights during the study period. Verticle lines represent 95 percent confidence limits. One unit prior to period 1 was extrapolated to determine the time when 90 percent of juveniles reach 150 grams.

TABLE 4

MEAN WEIGHTS OF BOBWHITES COLLECTED FROM ALL AREAS DURING DECEMBER AND JANUARY

| | | 1962-63 | 1963-64 | 1964-65 | 1965-66 | 1966-67 |
|---|---|---|---|---|---|---|
| Adults | Mean | 180.2 | 178.0 | 177.1 | 179.3 | 179.9 |
| | Number | 833 | 756 | 725 | 637 | 836 |
| Juveniles | Mean | 175.3 | 172.8 | 173.4 | 176.7 | 176.2 |
| | Number | 1,702 | 1,434 | 1,454 | 2,040 | 2,320 |

TABLE 5

FREQUENCY DISTRIBUTION OF JUVENILE WEIGHTS BELOW 150 GRAMS COLLECTED NOVEMBER 9-16, 1968

| | Area[1] | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 4 | 5 | Total |
| Weight Intervals | | | | | |
| 140-149 | 13 | 3 | 7 | 11 | 34 |
| 130-139 | 5 | 2 | 3 | 4 | 14 |
| 120-129 | 2 | 3 | 0 | 0 | 5 |
| 110-119 | 4 | 1 | 0 | 0 | 5 |
| 100-110 | 3 | 1 | 2 | 0 | 6 |
| Total Juveniles Weighed | 167 | 43 | 117 | 296 | 623 |

[1] Area 3 omitted from this study.

A supposition that 90 day-old birds are ready for harvest may not be valid from a physical acceptability standpoint. Since the peak of hatch (90 percent) in North Cental Texas occurs by July 15, one must assume that few birds are less than 90 days old on October 15. However, extrapolation of data presented here indicates a high percent of unacceptable birds are on the ground in mid-October. As an example, 16 percent of a total of 167 birds collected November 9-15 in Hill County (Area 1) in 1969 weighed less than 150 grams. During the same period, a sample of 43 birds from Wise County (Area 2) contained 23 percent less than 150 grams (Table 5).

Peaks of hatching varied between years within the study areas, but all occurred before July 15. As averages for the combined areas, a low of 89.9 percent of a high of 95.6 percent of juveniles were hatched before July 15 (Table 6).

Areas of higher rainfall appear to have later hatching peaks. Gehrken (unpublished) reported that 47 percent of quail killed at Blacksburg, Va. during a 4-year study were hatched after July 31. Haugen (1956) reported that during drought in Alabama, peak of hatch was in June and that in the wet year of 1955, the peak was in August. As related to this study, there appeared to be a geographical East to West correlation to peak of hatch, the western portion being earlier (Table 7). This hatching peak is important from a harvest standpoint and should be considered in setting season opening dates.

During the study period, less than 2 percent of all birds weighed less than the minimum acceptable limit of 150 grams. Of the 12, 735 birds weighed, only 184 were lighter than 150 grams and only 55 (.4 percent) weighed less than 140 grams. Lehmann (1953) reported an average quail harvest in South Texas to contain 14 percent birds less than 150 grams and 2 percent less than 130 grams, indicating additional geographical variations in hatching and growth rates.

Bobwhites physical characteristics showed that quail began the December-January season in good condition. The lowest average juvenile weight for the first 2 weeks of December (160 grams) occurred on Area 2 after a rare late hatch in 1964. During the other 4 years, juvenile weights for this same period ranged from 164 to 183 grams between study areas. Variation in weight according to year and age class is shown in Table 4.

Quail weights continued to increase during the period December 1-January 11. Availability of early winter foods and continued growth of young birds apparently contributed to these weight increases. Weights generally began to decline after January 12 and continued this decline through the end of the study period. During January 1966, both adult and juvenile quail suffered weight losses in Area 3 from severe snow storms and icy conditions, but average weights remained above 165 grams.

It is submitted that bobwhite weight and physical condition can be utilized as criteria for harvest and subsequent management of the species. The harvest beginning date should coincide with the average date on which 90 percent of juvenile birds reach an acceptable size. This date during the study period in North Texas was November 25. Bobwhite weight and physical condition were shown to remain well within acceptable limits during late winter indicating that these factors are not prime considerations for determining the season closing date.

TABLE 6
BOBWHITE HATCHING AND PRODUCTION DATA

| | 1962-63 | 1963-64 | 1964-65 | 1965-66 | 1966-67 |
|---|---|---|---|---|---|
| No. Sexed and Aged | 5,743 | 4,685 | 4,283 | 5,589 | 4,024 |
| Juveniles Per Adult Hen | 5.5 | 4.7 | 4.3 | 7.1 | 6.7 |
| Juveniles in Population | 70.9 | 69.7 | 66.4 | 77.1 | 73.8 |
| Percent Hatched Before July 15 | 89.9 | 95.6 | 89.9 | 93.3 | 89.9 |



TABLE 7
GEOGRAPHICAL DISTRIBUTION OF AREAS AS RELATED TO PERCENT OF HATCH PRIOR TO JULY 15

| Area | Longitude West | 1962-63 | 1963-64 | 1964-65 | 1965-66 | 1966-67 |
|---|---|---|---|---|---|---|
| 1 | 97° 24′ | 95.48 | 92.20 | 85.58 | 68.57 | 77.77 |
| 2 | 97° 33′ | 85.96 | 90.76 | 60.97 | 82.81 | 79.22 |
| 3 | 98° 37′ | 90.22 | 99.57 | 98.94 | 98.91 | 100.00 |
| 4 | 98° 59′ | 90.48 | 98.86 | 97.56 | 90.91 | 99.32 |
| 5 | 99° 10′ | 100.00 | 98.86 | 96.05 | 97.05 | 96.92 |

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# POTENTIALITIES OF THE WOODCOCK AS A GAME BIRD RESOURCE IN THE SOUTHEASTERN UNITED STATES[1]

*by*


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## ABSTRACT

The American woodcock is a neglected game bird in most southeastern states. Reasons for disregarding this species include: a belief that woodcock are sparse in areas other than Louisiana and southwestern Mississippi; little knowledge pertaining to woodcock habitat; the practice of only hunting woodcock incidentally to other game; and a consensus that quail dogs cannot be used for hunting woodcock. During field activities associated with a range-wide study of parasitism in woodcock, surprisingly high populations were revealed in South Carolina, Georgia, Florida, Alabama, Arkansas, and southeastern Mississippi. Woodcock habitat was characterized and suggestions were



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