

THE BREEDING POTENTIAL OF THE WILD TURKEY HEN¹

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ABSTRACT

A literature review revealed that little data-based information on the breeding potential of the wild turkey (Meleagris gallopavo) is available. A nine-year study in which the emphasis was on nesting attempted to supply some of this information. We observed 155 nests and found that most hens, including yearlings, attempted to nest each spring and most adult hens renested if they lost their first clutch early in incubation. Clutch sizes and hatchability were not greatly different in first and second nests or between age classes, but yearling hens did not as often attempt to renest as did adults. The incubation period was less than 27 days. It is concluded that the breeding potential of the wild turkey, in respect to laying, is probably greater than generally supposed.

INTRODUCTION

Breeding potential is the "maximum or unimpeded increase rate of a species in an 'ideal' environment" (Leopold 1933). In practical terms, its components are the major innate factors that determine how heavily a species may be harvested, the maximum rate at which transplanted stock will multiply, and how quickly decimated populations can recover former numbers. In the last few years, we have seen indirect evidence that the wild turkey has a higher breeding potential than was once thought. Small numbers of transplanted wild turkeys have multiplied rapidly; sparse populations have shown quick response to protection and management; and the nation-wide harvest steadily rises. Direct measurement of the turkey's breeding potential is scant or lacking, however. The lack of direct field data may account for the general idea that the wild turkey has a relatively low breeding potential.

We conducted a nine-year study of turkey reproduction in southern Florida and measured clutch sizes each year for adults and yearlings, determined hatching rates and, whenever possible, documented reneating following failure of a first attempt. Field data of this kind have not been reported before for the wild turkey.

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METHODS

All books and technical literature containing general accounts of the wild turkey or dealing with turkey reproduction were searched for information about the age at which hens first nest, clutch sizes, tendencies to renest after a nesting failure, and hatching rates of eggs. These are the major aspects of breeding potential of the female of the species.

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Information from available sources was compiled during the first year of the study to identify the various aspects of turkey breeding potential that needed special attention. It was evident that adequate information on the breeding parameters of the hen was not available. Consequently, in our studies we gave emphasis to that aspect of the turkey's life cycle.

Field studies were conducted from 1968 through 1976 on Lykes' Fisheating Creek Wildlife Management Area in Glades County with radio-tracking equipment on a frequency band at 151 MHz (Williams et al. 1969). Wild turkey hens were captured with rocket or cannon nets (Austin 1966) or orally administered drugs (Williams et al. 1973a), banded and handled as previously described (Austin et al. 1973). Hens (*M. g. osceola*) were identified individually by their unique radio channels and/or different pulse rates, which permitted data to be collected with respect to age class and previous nesting history for each hen. A total of 155 nests were found.

The 60,000 acre (24,300 ha) area was in southern Florida where freezing temperatures are rare and brief. Annual rainfall of about 55 inches (140 cm) comes mainly in summer. Feeding and roosting by turkeys occurred mainly along Fisheating Creek; nesting occurred mainly in the ecotone between palmetto prairies, oak scrub, and the open glades that parallel the creek. This habitat has been described in detail by Williams et al. (1973b).

Transmitter packages weighed between 55 and 75 g, including batteries. Repeated field observations, examination of turkeys recaptured, and all other information indicated that the transmitters did not hinder normal behavior of the birds. The transmitter package was about the same weight as a single turkey egg at the time of laying.

When radio signals indicated a nest location, care was taken to mark the area in such a way that the nest could be found quickly after the hen left. Nests were checked at intervals while the hens were away to detect predation, to count eggs, note hatching, and record hatching success. Some nests were observed from nearby blinds during the laying and hatching processes. Hens were rarely flushed from their nests and then only by accident.

A few entire finished clutches were removed very early during incubating behavior to check for renesting.

The t-test was used to compare means. Percentages were compared by the Chi-square test.

RESULTS AND DISCUSSION

Data in the Literature

Most general accounts about the wild turkey say something about some parameter of breeding potential. Authors that report original data are shown in Table 1. Most authors make no statement about breeding potential, or generalize without giving data or any other basis for their statements, or cite other authors. The best known writers that only repeat other writers are: McIlhenny (1914), Davis (1949), Latham (1956), Schorger (1966), Hewitt (ed. 1967), Bailey and Rinell (1968), Donohoe and McKibben (1970), and Lewis (1973).

Information on breeding potential can be found in a few papers dealing primarily with other aspects of turkey biology. Leopold (1944, p. 160) writing on heritable wildness states that yearling hens nest "freely" but does not give a basis for the statement. Bailey and Rinell (1967), in an account of the events in the annual cycle of the wild turkey, report having seen yearling hens with broods. Watts (1968), writing on social behavior of Rio Grande turkeys said that in one year it "appeared that all year-old hens attempted to nest" but he did not say how he knew. Ellis and Lewis (1967), writing about turkey mobility, mention nesting by yearling hens without reservation or explanation. Speake (et al. 1970) reported a yearling hen that raised a brood. According to our study (data discussed later), these statements are accurate in reference to nesting by yearling hens.

Audubon (1831) is frequently quoted on turkey reproduction, but it is not possible to determine the basis of his statements. Bent (1932) makes a few broad statements about turkey reproduction, but says nothing explicit about the parameters of breeding potential. Blakey (1937) mentions certain aspects of productivity based on other writings including a citation of Alexander Wilson et al. (1832) to the effect that hens "reach maturity at four

Table 1. Information in the turkey literature about breeding potential.

Author	Juvenile Hens Nest?	Hens Renest?	Clutch Size				Hatchability	
			First Nest		Second Nest		First Nest	Second Nest
			Ad	Juv	Ad	Juv		
Mosby & Handley 1943	—	Yes	>11	>11	—	—	95.7%	Very Low
Wheeler 1948	No	No		11 ^a			9 poults per hatch ^a	
Dalke et al. 1946	—	—		11.07 ^a			53.4% ^{a, b}	
Ligon 1946	No	Yes	10	—	—	—	—	—
McDowell 1956	—	—		12.3 ^a			93.0% ^a	
Burget 1957	—	Yes	—	—	—	—	—	—
Jonas 1966	Yes	—	—	—	—	—	—	—

^aWheeler (1948), Dalke et al. (1946), and McDowell (1956) did not mention first or second nests in reference to clutch size or hatchability.

^bThe wording (p. 50) suggests *hatching success* was meant rather than *hatchability*.

years." (It is not clear what that means.) Blakey's (1937) experience seems to have been primarily with penned turkeys of mixed strains.

There is little agreement in the literature (Table 1) about the turkey's breeding potential. The information that is available is not convincing (even if correct) because so many writers on the subject have failed to provide supporting evidence for their statements. (This is a problem in much of the wildlife literature. Writers often seem to be addressing the general public, as well as technicians, and frequently convey, presumably for the benefit of the non-technical reader, information without giving supporting evidence.)

Data From This Field Study

We detected nearly all of our radio-instrumented hens nesting, adult and yearling alike. Of the 15 or more hens monitored each spring, only one or two were not found nesting each year. These few may also have had nests that were destroyed by predators before we could find them. Thus, we do not believe that there was a significant segment of the hen population on the study area that did not nest each year.

Yearling hens nested in our study (Table 2), but seldom renested after losing a first nest. Full clutches laid by adults were no larger than those of yearlings. The slight difference (Table 2) was not statistically significant. The largest clutch (15 eggs) in our study was laid by a yearling. There was no statistical significance between the number of eggs in first and second clutches.

It is a common belief (Bent 1932, p. 331 for example) that more than one hen sometimes lay in the same nest. We did not detect this in any of the 155 nests observed and probably would have, had it occurred. We wonder how this could have been detected by the early writers who did not have the advantages of radio-telemetry and who rarely had the opportunity to observe wild turkey nests.

The Chi-square test indicated statistical significance to the greater hatchability of yearling's eggs (89.3%) compared to those of adults (83.1%). The mean hatching rate for first nests of both age classes was 84.4 per cent.

Hatchability in second nests of adults was only slightly lower (81.4%) than for their first nests (83.6%). The difference was significant only at the 0.14 level of confidence. There were too few second nests of yearlings to warrant analysis of them.

Table 2. Number of eggs in first and second clutches of adult and one-year-old hens by years based on 80 full clutches, with number of observations (n)

Year	First Nest		Second Nest		Mean
	Adult	One-year-olds	Adults	One-year-olds	
1968	9.8 (n = 10)	9.7 (n = 3)	11 (n = 1)	—	9.8 (n = 12)
1969	9 (n = 3)	10.33 (n = 3)	—	—	9.7 (n = 6)
1970	9.4 (n = 10)	9.5 (n = 2)	11.0 (n = 3)	—	9.7 (n = 15)
1971	10.3 (n = 6)	8.7 (n = 7)	—	—	9.5 (n = 13)
1972	10.3 (n = 6)	10.3 (n = 3)	9.0 (n = 1)	—	10.2 (n = 10)
1973	11.3 (n = 10)	15 (n = 1)	10.2 (n = 5)	7.0 (n = 1)	10.9 (n = 17)
1974	10.6 (n = 8)	10.0 (n = 3)	8.1 (n = 3)	—	10.14 (n = 14)
1975	10.2 (n = 9)	9.5 (n = 2)	11.0 (n = 1)	12.0 (n = 1)	10.3 (n = 13)
1976	10.5 (n = 4)	10.0 (n = 2)	11.0 (n = 1)	—	10.4 (n = 7)
Means	10.23 (n = 64)	9.85 (n = 26)	10.20 (n = 15)	9.5 (n = 2)	

The term *incubation* is ambiguous because it may be used in reference to either the embryonic development in the egg itself or used in reference to the incubating behavior ("setting") of the hen without regard for what may be going on within the eggs. (A hen can "set" on infertile eggs.) We suggest that *incubating behavior* be used for reference to the hen. We monitored this closely and found that the time that hens set on their nests averaged less than 27 days. This period was as short as 25 days in two nests that hatched and as long as 28 days in a few other cases.

The period of continuous¹ incubating behavior of the hen is actually longer than the period of time required for embryonic development of any single egg because of the slight asynchrony of hatching within the clutch. Thus, our data suggest that the total period from the beginning of the hen's incubating behavior through the time the last egg hatches, is shorter than the 28 days usually given it.

Most authors (Table 1) except Wheeler (1948) state that hens sometimes reneest after losing their first nests. We found that most hens reneested if their first nest was lost while laying or soon after the clutch completion stage. We could not make that observation on every hen that lost her nest because further monitoring was not always possible due to transmitter termination, infrequent contact, or other observational deficiency that prevented us from knowing definitely that particular hens did not reneest without our knowledge. We attempted to correct that uncertainty by deliberately robbing nests and carefully tracking the hens thereafter to definitely know whether they reneested or not.

Nine nests were robbed within one day to one week after incubating behavior began and each hen was tracked closely. Seven of these were known to reneest that year. Four other hens that deserted their nests as a result of being accidentally flushed during their laying periods were closely tracked thereafter. All four were known to reneest. One of these hens nested three times and another four times—both were finally successful in bringing off broods after which they did not lay again. No laying hen that lost her nest failed to reneest,

¹ *Continuous* incubating behavior begins when the hen stays overnight on her nest. During the laying period hens sit on their nests intermittently, as long as eight hours at a time.

to our knowledge. Altogether, 23 renesting attempts were detected in this study. In summary, hens that lost their clutches during the laying period or early during incubating behavior, usually renested.

We know of no case of a turkey renesting after losing a brood. Our monitoring was sufficient to have detected that in our study if it had occurred at any meaningful level. This is a limitation on the breeding potential of the species.

As would be expected, no hen ever renested in the same nest after it was destroyed by a predator or after it was deliberately robbed in this study. The locations of second nests and the movement of hens in relation to them has been reported (Williams et al. 1975).

CONCLUSIONS

There is no general consensus in the literature about breeding potential parameters. Opinions on the subject vary considerably among writers and few, if any, data are given to support most statements.

Our data indicate that the turkeys on our study area had a somewhat higher breeding potential than is generally supposed for the species, due primarily to elements that have not been measured in field studies before, namely: 1) nearly all of the hens attempted to nest; 2) yearling hens nested freely; 3) most adult hens renested when they lost a nest during laying or early in incubating behavior; 4) clutch size was not much smaller in one-year-olds than in adults; 5) hatchability was at least as good in nests of yearlings as it was for adults; and 6) second clutches of adults were as large as first clutches. The only finding in our study that supported the often pessimistic assessment of turkey breeding potential was that one-year-old hens fell short of adults in their tendency to renest after losing their first nest.

LITERATURE CITED

- Audubon, J. J. 1831. Ornithological biography. Vol. 1. Edinburgh.
- Austin, D. H. 1966 (1965). Trapping turkeys in Florida with the cannon net. Proc. Annu. Conf. Southeastern Assoc. Game and Fish Commissioners 19:16-22.
- Austin, D. H., T. E. Peoples, and Lovett E. Williams, Jr. 1973 (1972). Procedures for capturing and handling live wild turkeys. Proc. Annu. Conf. Southeastern Assoc. Game and Fish Commissioners 26:222-236.
- Bailey, R. W. and K. T. Rinell. 1967. Events in the turkey year. Pages 73-91. In O. H. Hewitt /Editor/. The wild turkey and its management. The Wildlife Society, Washington, D.C. 589 pp.
- Bailey, R. W. and K. T. Rinell. 1968. History and management of the wild turkey in West Virginia. West Virginia Dept. Natural Resour. Bull. 6. 59 pp.
- Blakey, H. L. 1937. The wild turkey on the Missouri Ozark range: preliminary report. U.S.D.A. Bur. Biol. Surv. Leaflet BS-77. 32 pp. Mimeo.
- Bent, A. C. 1932. Life histories of North American gallinaceous birds. U. S. Natl. Mus. Bull. 162. 490 pp.
- Burget, M. L. 1957. The wild turkey in Colorado. Colo. Dept. Game and Fish. 68 pp.
- Dalke, P. D., A. S. Leopold, and D. L. Spencer. 1946. The ecology and management of the wild turkey in Missouri. Missouri Conserv. Comm. Tech. Bull. 1. 86 pp.
- Davis, H. E. 1949. The American wild turkey. Small-Arms Technical Pub. Co., Georgetown, South Carolina 319 pp.
- Donohoe, R. W. and Charley McKibben. 1970. The wild turkey in Ohio. Ohio Game Monog. 3, Ohio Dept. Natl. Resour. 32 pp.
- Hewitt, O. H. (Editor). 1967. The wild turkey and its management. The Wildl. Soc., Washington, D. C. 589 pp.
- Jonas, R. 1966. Merriam's turkey in southeastern Montana. Montana Fish and Game Dept. Tech. Bull. 3, 36 pp.
- Leopold, A. S. 1944. The nature of heritable wildness in turkeys. Condor 46:133-197.
- Leopold, A. 1933. Game management. Charles Scribner's Sons, New York and London. 481 pp.

- Lewis, J. C. 1973. *The world of the wild turkey*. Lippincott Co., Philadelphia and New York. 158 pp.
- Latham, R. M. 1956. *The complete book of the wild turkey*. Stackpole Co., Harrisburg, Pennsylvania 265 pp.
- Ligon, J. S. 1946. *History and management of Merriam's wild turkey*. New Mexico Game and Fish Commission, Albuquerque. 84 pp.
- McDowell, R. D. 1956. Productivity of the wild turkey in Virginia. *Comm. Game and Inland Fisheries, Tech. Bull.* 1. 44 pp.
- McIlhenny, E. A. 1914. *The wild turkey and its hunting*. Doubleday, Page, and Co., Garden City, N.Y. 245 pp.
- Mosby, H. S. and C. O. Handley. 1943. *The wild turkey in Virginia: its status, life history and management*. Virginia Comm. of Game and Inland Fisheries, Richmond. 281 pp.
- Schorger, A. W. 1966. *The wild turkey: its history and domestication*. Univ. Oklahoma Press. Norman. 625 pp.
- Speake, D. W., L. H. Barwick, H. O. Hillestad, and W. F. Stickney. Some characteristics of an expanding turkey population. *Proc. Annu. Conf. Southeastern Game and Fish Commissioners* 23:46-58.
- Watts, R. C. 1968. Rio Grande turkeys in the mating season. *Trans. N. A. Wildl. and Natl. Resour. Conf.* 33:205-210.
- Wheeler, R. J., Jr. 1948. *The wild turkey in Alabama*. Alabama Dept. Conservation, Montgomery, 92 pp.
- Williams, L. E., Jr., D. H. Austin, N. F. Eichholz, T. E. Peoples, and R. W. Phillips. 1969 (1968). A study of nesting turkeys in southern Florida. *Proc. Annu. Conf. Southeastern Assoc. Game and Fish Commissioners* 22:16-30.
- Williams, L. E., Jr., D. H. Austin, and T. E. Peoples. 1975 (1974). Movement of wild turkey hens in relation to their nests. *Proc. Annu. Conf. Southeastern Association of Game and Fish Commissioners* 28:602-622.
- Williams, L. E., Jr., _____, _____, and R. W. Phillips. 1973a. (1970). Capturing turkeys with oral drugs, pages 219-227. *In* G. C. Sanderson and Helen C. Schultz (eds.), *Wild turkey management*. *Proc. Natl. Wild Turkey Symp.* 2. 355 pp.
- Williams, L. E., Jr., _____, _____, and _____ . 1973b (1970). Observations on movement, behavior, and development of turkey broods, pages 79-100. *In* G. C. Sanderson and Helen C. Schultz (eds.), *Wild turkey management*. *Proc. Natl. Wild Turkey Symp.* 2. 355 pp.
- Wilson, Alexander, C. L. Bonaparte, and William Jardine. 1832. *American ornithology; or the natural history of the birds of the United States*. 3 vols. London and Edinburgh. (Original source not seen—cited from Blakey 1937).