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"A STUDY OF NESTING TURKEYS IN THE EDWARDS PLATEAU OF TEXAS"*

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ABSTRACT

Project personnel contacted ranchers, farmers, highway maintenance crews, farm and ranch laborers, Game Management Officers, and other interested persons to receive prompt reports of nests of Rio Grande turkey (*Meleagris gallopavo intermedia*) found incidentally during the 1968, 1969, 1970, and 1971 nesting seasons. One hundred and twenty-one turkey nests were found during the four year period in the Edwards Plateau of Texas. Upon locations, nests were observed by project personnel and data recorded on nesting forms. Laying began in late February and continued through late August. Laying was started in the latest nest the eighth day of August. Average clutch size was 10.37 eggs in 71 nests observed after incubation began. Forty-seven nests produced 414 poults from 462 eggs leaving 2 fully developed embryos unhatched and 45 infertile eggs in the nests. Seventy-four nests either did not begin or did not complete incubation; of which, 40 were destroyed by varmints or avian predators, 13 were destroyed by snakes, 8 were destroyed by human disturbances, and 13 were deserted for unknown reasons. Nine nesting hens were attacked or killed by predators in the immediate vicinity of the nest site. The incomplete nests contained 785 eggs, an average of 10.61 eggs per nest, indicating they were near or in the process of incubation when destroyed or deserted. Most of the successful nests hatched May 15-June 15. Types of nest cover were woody species, grasses, forbs, and brushpiles. One hundred-one nests (83%) were in cover over 18 inches in height. Twenty nests were found in cover less than 18 inches high. Eighty-seven percent of the successful nests were in cover 18 inches or more in height. No nests were found over one mile from water. Nest sites averaged 325 yards from an available water source. Successful and unsuccessful nests averaged 330 and 321 yards from an available water source respectively. No hens were known to conceal their nests upon departure. Two nests of eggs were observed during the actual hatching period. In each case the hen and poults departed the nest site about 24 hours following the hatch. One hen was observed to actively and

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successfully defend her hour-old poults against a potential nest predating snake. Additional notes are presented on nest description, location, predation, and other nesting characteristics.

INTRODUCTION

Infrequent, isolated, and unrelated reports of Rio Grande turkey nests in the Edwards Plateau of Texas have been insufficient to determine the nesting habits and characteristics of this major game species.

The primary purpose of this study was to determine the laying and hatching success of turkeys. Additional data was collected on nesting and hatching dates, nest predation, nest cover, and the availability of water to the nesting hen.

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STUDY AREA

The study was conducted in the 22 county project area of the Edwards Plateau Region of Central Texas during the nesting seasons of 1968, 1969, 1970, and 1971.

The average annual rainfall from 1952 to 1971 at the Kerr Wildlife Management Area, which is near the center of the study area, was 24.46 inches.

Livestock ranching is the principle economic endeavor in the area. The primary types of livestock are beef cattle, sheep, and angora goats. Few ranching and/or farming operations have large numbers of hogs or poultry.

Walker (1951) stated that the soils of the region are thin and vary from gray to black in color. They are principally lithosols, shallow and rocky, and suitable primarily for livestock production (Stoddart and Smith, 1943). Cropland occupies little of the area and where found, is located along the larger stream valleys, or on the more level uplands (Walker, 1951). The Central Mineral Region of the area contains coarse sandy soils and sandy loam soils of igneous origin, reddish-brown in color (Walker, 1949).

According to Walker (1951) the major pattern of the regions' vegetation consists of shin oak (*Quercus breviloba*) in association with live oak (*Quercus virginia*), cedar (*Juniperus ashei*) present in stands varying from occasional trees to heavy brakes, and thickets of mesquite (*Prosopis chilensis*). Other woody species common to the area include post oak (*Quercus stellata*), black jack oak (*Quercus marylandica*), elm (*Ulmus sp.*), hackberry (*Celtis sp.*), black persimmon (*Diospyros texana*), pecan (*Carya pecan*), cottonwood (*Populus palmeri*), walnut (*Juglans sp.*), Spanish oak (*Quercus texana*), and sycamore (*Platanus occidentalis*). Understory species include catclaw (*Acacia sp.*), tassajillo cactus (*Opuntia leptocaulis*), prickly pear (*Opuntia atropina*), bee brush (*Lippa ligustrina*), green briar (*Smilax bona-nox*), agarito (*Berberis trifoliata*), evergreen sumac (*Rhus virens*), and prickly ash (*Xanthoxylum sp.*). Grasses include curly mesquite (*Hilaria belangeri*), the bluestems (*Andropogon spp.*), needle grass (*Aristida sp.*), Texas winter grass (*Stipa leucotricha*), hairy gramma (*Bouteloua hirsuta*), rescue grass (*Bromus catharticus*), buffalo grass (*Buchloe dactyloides*), and many others. Forbs found in the area include bitterweed (*Actinea odorata*), Texas bluebonnet (*Lupinus texensis*), croton (*Croton spp.*), filaree (*Erodium cicutarium*), ragweed (*Ambrosia psilostachya*), verbena (*Verbena spp.*), pepper grass (*Lepidium lasiocarpum*), plantains (*Plantago spp.*), Russian thistle (*Salsola pestifer*), and cone flower (*Rudbeckia bicolor*).

The area has been open to legal turkey hunting during the fall season for at least 30 years. Spring gobbler hunts were initiated in 1970 and have since spread to about one-third the region. Harvest, however, is light, probably less than 10%

of the annual population. The average estimated turkey population of the area was near 200,000 turkeys annually during the study period.

METHODS

Ranchers, farmers, highway maintenance crews, farm and ranch laborers, Game Management Officers, and other interested persons were contacted prior to and during the nesting seasons of 1968, 1969, 1970, and 1971 to receive prompt reports of turkey nests.

Nests were checked to determine the date and sequence of events affecting the nest. The egg-laying and incubation period criteria of Mosby and Handley (1943) were used to date nesting data when necessary. The major type of nesting cover was recorded on the nest forms. The height of the nest cover and the distance to the nearest available source of water was recorded. Efforts were made to classify nest predator types according to criteria given by Mosby and Handley (*op. cit.*) and Davis (1958).

The total number of eggs laid, hatched, deserted, and/or destroyed was recorded. Deserted eggs were broken to determine fertility based on embryonic development.

RESULTS AND DISCUSSION

Nesting Chronology

Walker (1950) estimated that the laying periods began in April in the Edwards Plateau of Texas and that the peak hatching period was during May and June.

One hundred and twenty-one turkey nests were located and studied (Table 1). Laying began in the earliest nest on 25 February, and in the latest nest on 8 August. The peak hatching period of successful nests occurred during the first week in June (Fig. 1) based on a 2-week laying period and a 28-day incubation period.

Drought conditions and downpour type rainfall in localized areas negated the possibility of correlating nesting success with rainfall during the study period. Nesting success and poults survival was highest, however, in 1968 following an abnormally wet winter and spring.

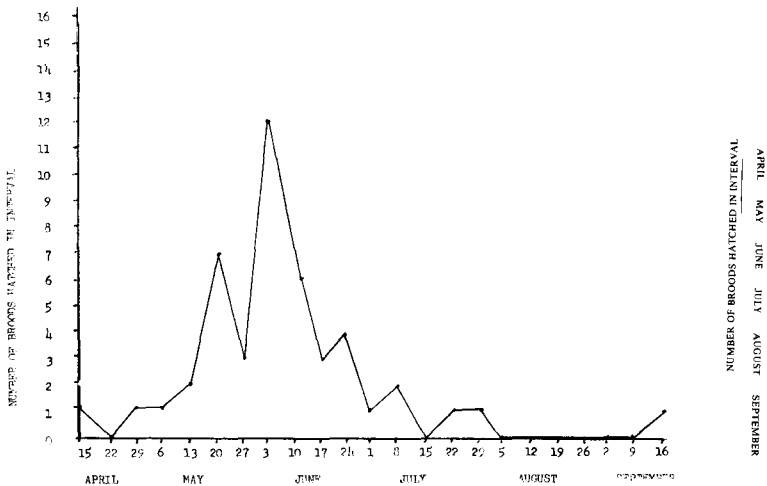


Figure 1. Edwards Plateau Turkey Nesting Phenology by Weeks, 1968-71.

Table 1. Edwards Plateau Turkey Nesting Study, 1968-71

Year	# Nests Studied	# Nests Completed Incubation	# Nests Destroyed by Predators	# Nests Destroyed by Man	# Nests Deserted	# Eggs Laid	# Eggs Hatched	# Eggs Infertile (after full incubation)	# Eggs Starting Incubation	# Eggs Destroyed	# Eggs Deserted	Embryo Unhatched
1968	18	12	6	0	0	202	105	21	179	76	0	0
1969	30	12	13	3	2	300	103	7	166	160	30	0
1970	59	19	27	5	8	630	181	10	341	351	86	2
1971	14	4	7	0	3	115	25	8	48	81	1	0
TOTAL	121	47	53	8	13	1247	414	46	734	668	117	2

Clutch Size

Walker (*op. cit.*) estimated the average clutch size of the Rio Grande turkey to be eleven eggs.

Seventy-one nests were observed to reach the incubation stage. The others were destroyed or deserted before the stage of nest development could be determined. The 71 completed clutches contained 734 eggs for an average of 10.3 eggs per nest.

Forty-seven nests completed incubation producing 414 poults from 462 eggs (9.83 eggs per nest), leaving two fully developed embryos unhatched in the nests.

The 74 incomplete or unsuccessful nests contained 785 eggs, an average of 10.6 eggs per nests, indicating these clutches were near completion when destroyed or deserted.

Predation

Walker (1949) considered predation to be a factor contributing to the low turkey population in the Edwards Plateau. He concluded, however, that it was not the major factor limiting turkey populations.

Seventy-four nests were destroyed by predators or deserted prior to completion of the clutch or during incubation.

Natural predators destroyed 53 of the 74 unsuccessful nesting attempts. Eight nests were destroyed by human disturbances and 13 nests were deserted for unknown reasons.

Based on tracks, signs, and actual observations, known nest predators included the following: coachwhip snake (*Masticophis flagellum*), bullsnake (*Pituophis catenifer*), and other snakes, rock squirrel (*Citellus variegatus*), raccoon (*Procyon lotor*), bobcat (*Lynx rufus*), striped skunk (*Mephitis mephitis*), western rooster skunk (*Conepatus mesoleucus*). The only positive avian nest predator was the common crow (*Corvus brachyrhynchos*) observed eating eggs from one of the nests.

Nine nesting hens were attacked or killed by predators in the immediate vicinity of their nests based on bones, feathers, and blood left at the site.

On May 25, 1970, Fish and Wildlife Technician Calvin Van Hoozer and the author were observing a nest on the C. P. Porter ranch near Junction, Kimble County, Texas which contained the hen and 12 poults which were about two hours old. The hen suddenly rose, sounded the alarm putt, and ran directly to a coachwhip snake about 15 feet from the nest. The three and one-half foot snake was apparently approaching the nest when the hen attacked, but had not been noticed by the observers. She pecked and stomped the snake on the ground, and shook him violently in the air with her beak. The snake immediately attempted to flee; however, the hen continued her vigorous attack. The snake finally reached safety in a brushpile about 30 feet from the attack site. The hen perted several times, then returned to the nest site. The poults remained unmoving, prone, and hidden in the shallow nest cavity. The entire episode lasted about 50 seconds.

It is worthwhile to report that the study area maintains a high population of armadillos (*Dasypus novemcinctus*), however, no nests were found to be destroyed or disturbed by them during the four-year period.

Nesting Cover

The numbers of nests found in various cover types were 32 woody plants, 30 grasses, 25 weeds, 16 brushpiles, 13 vines and briars, 2 alfalfa, 1 net wire fence, and 2 open or no cover. Woody species utilized included cedar, mesquite, live oak, shin oak, persimmon, and algarito. Grasses commonly used as nesting sites included Johnson grass (*Sorghum halepense*), domestic oats, and Texas winter grass. The most frequently utilized forbs were wild gourd (*Cucurbita foetidissima*), ragweed, and thistle.

One hundred-one nests were found in cover 18 inches or more high. The remaining 20 nests were in cover less than 18 inches in height. Of the 47 successful nests, 41 (87.2%) were in cover at least 18 inches high. This obvious preference by nesting hens is an important management implication, especially in this region which is often subjected to heavy continuous grazing by domestic livestock and where indiscriminate land clearing practices are common.

Nest Locations and Available Water

Much of the study area had only scattered sources of water prior to the arrival of man and his machinery. Windmills, water troughs, and dirt stock tanks now dot the area and provide water not only for man and his livestock, but also wildlife.

Of the 121 nests studied, 102 were within a quarter-mile of available water, a distance the hen could traverse quickly and easily. The nests averaged 325 yards from water. No nests were over one mile from a source of water. Only four nests were over one-half mile from water.

If the humidity in the nest site is reduced for long periods, turkey eggs may fail to hatch due to lack of moisture (Beasom, 1970). There is speculation that some nesting hens frequently carry moisture to the nest site. They accomplish this by emerging the lower part of their body and feathers in water troughs and water tanks before returning to the eggs. This instinctive behavior would apparently provide some moisture and humidity necessary for high hatching success. This is purely speculation at this point, however, the behavior was observed during the study.

Concealment of Eggs

Concealment of eggs by the laying hens was not observed during this study. In most cases, sufficient debris was available near the nest site.

The purpose for egg concealment is often discussed and theorized. Mosby and Handley (1943) state that concealment did occur and that the purpose might be for concealment from predators by the Eastern turkey. Williams (1968) found no evidence of egg concealment by the Florida turkey. It is doubtful that the purpose of concealment from predators would have been served in this study area since most predators probably located nests by scent rather than sight.

Hatching Period

Baily and Rinell (1967) define the hatching period as the time lapsing from the hatching of the first poult until the hen leaves the nest with her brood. They reported of the Rio Grande turkey that the hen never remained on the nest longer than one day from the time that the eggs began to pip. They also reported that a clutch hatches in less than 24 hours.

Two nests which had been located were observed during the hatching period. The first hatch observed occurred on May 25, 1970, on the C. P. Porter ranch in Kimble County, Texas. The nest was located on a steep slope and was found on 1 May and contained 12 eggs.

The first poult "kicked" out of its egg at 1:45 PM and tumbled down the slope about six inches from the nest. It immediately climbed back into the nest and under the hen. At 1:55 PM the second poult kicked out of its egg shell. At 2:03 PM the third poult hatched with the now familiar kick. The hen was observed to purposely move the egg half-shells back underneath her with her beak. The hen remained directly over the eggs. She would occasionally rise about halfway, reach underneath her body, and roll the unhatched eggs with her beak. The hatching rate became difficult to determine at this stage. A poult was observed to hatch at 3:10 PM and fell about eight inches from the nest, similar to the first poult that hatched. The poults could be heard peeping and were observed walking around the hen on the edge of the nest cavity. At 3:12 PM the hen began

preening her feathers and later settled down completely until the episode with the coachwhip snake as described previously occurred at 4:52 PM. It is believed that the last egg hatched at 3:10 PM based on the observations of dry, fluffy poults and the activity of the hen. The hen and poults remained on the nest the rest of that day and night, and the next morning. At 1:05 PM the next day the hen stood and immediately proceeded up the steep slope behind the nest. The 12 poults followed easily. They proceeded slowly, resting frequently. In one hour the group had moved about 70 yards from the nest.

The second hatch was observed on June 1, 1971, in a bar-ditch of highway 1221 adjacent to the Rudder ranch, Menard County, Texas. The nest was found on 20 May and contained 11 eggs. At 3:35 PM, 1 June, I approached the nest within three feet and the hen flew off a short distance feinting the crippled bird act. The first egg hatched as I looked on, and another egg was pipped. I retreated immediately and the hen returned to the nest at 3:45 PM. Due to heavy cover around the nest it was impossible to determine the rate of hatching. The last egg apparently hatched about 4:20 PM when the hen half stood and began stretching and preening feathers. Several dry poults were observed under and near the hen during the next hour. The hen and poults remained on the nest site until 5:45 PM the next day. The group departed the nest site quickly. Within 15 minutes they were 100 yards away from the nest and headed for heavy woods nearby. Eight eggs had hatched the remaining three eggs were infertile.

It is believed that the eggs hatched in one hour and twenty-five minutes in the first nest and in forty-five minutes in the second nest. The first hen and poults left the nest 23 hours and 20 minutes after the hatching period began. The second hen and poults left their nest 26 hours and 10 minutes after the hatching period began.

In both cases the hens were observed to retrieve the egg half-shells that had gotten out of the nests and placed them underneath their bodies with their beaks. Both hens were observed to roll the unhatched eggs underneath their bodies with their beaks. In both cases the poults were observed moving about the nest site easily soon after they had hatched.

Incubation of Infertile Eggs

Incubation of nests containing fertile and infertile eggs are common. However, one nest of 11 eggs, all of which were apparently infertile, underwent the full incubation period. The nest was located April 8, 1969, on the Edward Dunbar ranch in Kimble County, Texas and contained four eggs. The clutch was completed 16 April. The expected hatching date was 14 May. Continuous observations were made 14, 15, and 16 May in an effort to observe the hatch. The hen departed the nest about noon 16 May and did not return. The eggs were rotten and showed no evidence of embryonic development.

Fully Developed Embryos Fail to Hatch

During 1970, in separate nests, two eggs underwent full incubation and embryo development but failed to hatch. The nests contained 11 and 17 eggs. They hatched 4 poults and 16 poults respectively. Predators took 6 eggs from the first nest. In both cases the unhatched embryos were apparently fully developed, but had made no visible effort to pip the egg shell.

Nesting Disturbances

Extreme care was taken not to disturb the hens or nest sites during the study any more than absolutely necessary to collect the needed data. Observers did not touch the nest cover or eggs until the hen had made her final departure. However, it is not known if our activities near the nest sites increased nesting desertions or predation. Hens were not intentionally scared off the nests during incubation. This however, did occur, but no desertions could be attributed to it.

It is possible, although unknown, that hens scared off nests during the early laying stages did not return. It is also possible, but unknown, that predators followed the human scent to the vicinity of the nest site. Schranck (1971) used 14-foot poles to place eggs in simulated nests to avoid making trails during a waterfowl nesting study in North Dakota. It was necessary to approach most of our nests within five feet, therefore, the predator trail possibility should not be ignored.

Other disturbances were common. Turkeys commonly nest in the abundant cover of highway rights-of-way. One nest found in May, 1968, was one foot from the edge of the highway pavement. The nest was in a wild gourd vine about one and one-half feet deep at the nest site. Vehicles passed by regularly at high speeds and it seemed that the hen would have been literally blown off the nest. However, she hatched 7 of 8 eggs, the other being infertile, on June 24, 1968.

On May 1, 1970, a nest containing 9 eggs was found on the golf course near Sonora, Texas. Golfers regularly walked within about 15 feet of the nest. The nest was in the "rough" and in good cover of live oak sprouts and ragweeds about a foot deep. The nest was checked several times and the incubating hen was present each time. On 26 May a golf ball was observed laying less than one foot from the nest, within easy reach of the hen. All eggs hatched on May 27, 1970.

The perseverance of some nesting hens was noteworthy. One hen completed her clutch of 12 eggs on May 7, 1971, on a steep slope road-bed embankment in southeastern Kimble County. Six days later she was sitting on only seven eggs and two eggs were about a foot down hill from the nest. On 17 May she was found sitting on four eggs on a nest site about three feet down the embankment from the original nest cavity. There was no evidence of the other eggs or shells. On 1 June one egg hatched and the hen and poult departed the next day. Two of the remaining eggs were infertile and the other egg contained a partially developed embryo.

Late Hatches

Due to the breeding potential of gobblers late nests often contain more infertile eggs than earlier nests (Mosby and Handley, 1943).

Of 462 eggs that underwent full incubation, 46 (9.9%) were determined to be infertile. The five nests that hatched after 5 July contained 48 fertile eggs and 10 infertile eggs (17.2%). The earlier nests contained 368 fertile eggs and 36 infertile eggs (8.9%). The latest nest hatched 7 of 10 eggs on 16 September.

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**THE EFFECTS OF A SPRING "GOBBLERS-ONLY"
HUNTING SEASON ON WILD TURKEY
REPRODUCTION AND POPULATION SIZE**

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REPRODUCTION POPULATION SIZE¹**

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ABSTRACT

A wild turkey (*Meleagris gallopavo silvestris*) population was established near Auburn, Alabama by releasing 26 wild-captured birds during 1965 and early 1966. From March 1965 through June 1972 dynamics of the population were studied. Continued observation on the population, most individual of which were marked, was the primary method of study. A total of 2,362 positive identifications of individually marked turkeys was made.

Direct count estimates of spring-breeding populations and late-summer populations were made each year from 1965 through 1971, excluding 1969, on the 7,293 acre study area. Late summer counts gave hen-poult ratios and estimates of total reproductive success.

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