

IMPACT OF MANAGED PUBLIC HUNTING ON WILD TURKEYS IN ALABAMA^a

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Abstract: Legal harvest, illegal kill, crippling loss, and movement of wild turkeys (*Meleagris gallopavo silvestris*) related to multiple species hunting were studied on 2 state wildlife management areas in Alabama using 125 radio instrumented birds. During spring 1978 hunts an estimated 35.7% of the gobblers were killed and 7% were crippled and died on 1 area while 20% were harvested and 20% were crippled and died on the second area. Illegal kill of instrumented birds was 7.8% over a 2-year period on 1 area and 9% for a 7-month period on the second area. Multispecies hunting on state game management areas as carried out in Alabama was not a major factor limiting turkey populations.

Movements of turkeys were closely monitored before, during, and after squirrel, (*Sciurus* sp.), deer (*Odocoileus virginianus*), and turkey hunts on both areas; no permanent movements out of established ranges were noted that could be attributable to hunting pressure.

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As the human population of the United States continues to increase, more demand will be placed on wildlife resources for recreational activities. Public hunting areas will come under increasing pressure, as more private land holdings become posted and are no longer available to many urban hunters. Williams et al. (1971) indicated that in view of increasing demands for outdoor recreation, more knowledge is needed concerning the possible effects of human disturbance on populations of wild turkey.

The wild turkey has often been considered to have relatively low tolerance to man and his activities. Wheeler (1948) said that persistent human intrusion and disturbance will cause turkeys to abandon an area. Stoddard (1963) stated that turkeys avoid areas where they are frequently disturbed by people. Raybourne (1968) believed that an increase in minimum home range and daily movements of turkeys in Virginia resulted from increased vehicular disturbance during the hunting season. Fleming and Speake (1976) thought that disturbance associated with deer hunting in Alabama caused increased turkey movements. Wright and Speake (1975) found that turkeys did not frequent areas around often used foot trails or around campgrounds in the summer on the recreational area at "Land-Between-The-Lakes", Kentucky. In contrast, turkeys are known to tolerate normal farming operations and observations by researchers as long as the turkeys are not molested (Speake et al. 1969).

Realizing that the impact of public hunting on turkey populations has not been adequately measured and reported, the Alabama Cooperative Wildlife Research Unit

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and the Game and Fish Division of the Alabama Department of Conservation and Natural Resources began a study in September 1975 to determine factors limiting wild turkey populations on state owned wildlife management areas. Included as part of the study was an investigation of the rate of legal harvest and crippling losses, losses to illegal hunting, and the effects of disturbance by managed hunting.

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MATERIALS AND METHODS

Study Areas

The Thomas Wildlife Management Area, in Colbert and Franklin Counties in northern Alabama, is on the intersection of the Coastal Plain and the westward extension of the Appalachian Plateau. In 1945, a state wildlife sanctuary of 3,019 ha was established. The timber on this state owned portion has not been cut since 1945 and the area has about 2% in openings maintained as game food plots. The forest is primarily mature oaks (*Quercus* sp.) and hickories (*Carya* sp.). Additional lands were later leased from Pratt Thomas and the Tennessee River Pulp and Paper Company, bringing the area to its present size of 12,275 ha. The privately owned portion, 8,502 ha, was almost entirely converted to even-aged stands of loblolly pine from (*Pinus taeda*) from 8 years to 6 months after site preparation. Site conversion on such a large scale has restricted the range of wild turkeys to the state-owned lands and adjacent private lands outside of the management area.

Soils of this area are of the Hartselles-Rockland, limestone-Hector series and the Flomaton-Smithdale-Rockland limestone series (Hajek et al. 1975). The topography is steep with narrow ridges and deep ravines; the area is well watered with numerous springs and five small creeks.

The state-owned portion was stocked in 1945 with 39 wild-trapped turkeys (26 hens, 13 gobblers) from the state game sanctuary in southern Alabama. Turkey hunting was first allowed in the spring of 1961 on a gobbler-only basis but was suspended in 1970 after several years of population decline. Based on sightings of marked and unmarked birds, we estimated the fall wild turkey population to be 1 bird per 52 ha in 1976 and 1 per 34 ha in 1977. The hunting season was reopened in the spring of 1978 for gobblers-only.

The Scotch Wildlife Management Area is in the Coastal Plain in Clarke County in southern Alabama. The lands were leased from the Scotch Lumber Company in 1953 by the State of Alabama for public hunting. The forest on the 8,219 ha area is dominated by pine, with hardwood-pine type along the stream bottoms. The timber is managed on a long term rotation. Three clearcut areas from 4 years after planting to recently site-prepared occupy 470 ha. Only 0.29% of the area is in permanent openings and these are used as wildlife food plots.

The loamy, well-drained, upland soils are of the Troup-Smithdale and the Arundel-Cantucho associations (Hajek et al. 1975). Four main streams and numerous springs provide water. Wild turkeys on the area are native birds and no restocking has been necessary. Except for annual fluctuations, turkey populations have remained stable at about 1 bird per 16 ha (J. R. Davis, pers. comm. 1978). Our population estimation is about 1 bird per 18 ha based on observations of marked and unmarked birds.

Capture, Marking, and Radio Tracking

Between January 1976 and April 1978, we captured 89 wild turkeys (51 hens and 38 gobblers) on the Thomas Wildlife Management Area in north Alabama and instrumented these birds with radio-transmitters. We also captured and instrumented 36

turkeys on the Scotch Wildlife Management Area in southern Alabama between September 1977 and April 1978. Turkeys were captured with rocket-projected netting (Dill 1969) and chemically treated baits (Alpha chloralose), as described by Williams et al. (1970). After capture, we leg-banded and instrumented all birds with radio-transmitters in the manner of Williams et al. (1969). Transmitters, receivers, and antennas were manufactured by Wildlife Materials Incorporated^a, Carbondale, IL, and are described in detail by Everett et al. (1978). The transmitter package was made up of 1 transmitter powered by batteries and recharged by a solar cell and another powered by a battery only. The solar-cell-powered component, used to monitor location and activity, operated continuously. The other transmitter in the package was used as a mortality detector and operated only after the turkey's body temperature dropped below 70 F. A portable receiver with a one-quarter wave-length hand-held antenna was used to determine routine locations. When an instrumented bird could not be located from the ground, we made an aerial search.

Instrumented birds were usually found 2 or more times each week throughout the year and their locations were plotted by triangulation (Cochran and Lord 1963). During critical periods, such as immediately before and after hunts, turkeys were located daily. When a mortality signal was received, the turkey was found as quickly as possible to determine the cause of death.

Data Analysis

We used a modified version of the method described by Mohr (1947) to designate *minimum home range*. By plotting locations of each radio-tagged turkey on habitat maps for the period from 1 October through 1 March in 1976-77 and in 1977-78, we observed a grouping of points over a defined area. The outside points of this area were connected and the area within was considered to be the minimum winter home range of that turkey. In a few cases, scattered points were observed which did not "fit" within the defined area. The dates for the radio locations of these scattered points were compared to the dates of squirrel, deer, and turkey hunts in the management area to determine if there was any correlation between hunting activities and unusual movements by the turkeys. Except for the spring turkey hunt, any movement outside of the minimum home range during squirrel or deer season was considered to be caused by the disturbance of hunting activities. The linear distance that the turkey moved from its minimum home range was then measured and recorded. Turkey movements for March and April 1978 were compared with movements of 64 instrumented birds for the same period during 1976 and 1977. Five of the birds had been tracked the previous 2 years when there was no turkey hunting and were again tracked during the 1978 hunting season.

Estimation of Hunting Pressure

On the Thomas Wildlife Management Area we estimated hunting pressure only on the 3,019 ha state-owned tract because the instrumented birds did not use the other sections of the management area. Since permits were not issued daily, we estimated the number of hunters. Vehicles were excluded from woods roads by gates during all hunts except the gun deer hunts. Since only 3 public roads service the area, the number of vehicles present could be readily determined.

For squirrel hunts, the number of vehicles on the area were counted and multiplied by a factor of 2 hunters per vehicle for an opening-day estimate. For the other days of the season, estimates were from observations by the area manager. For the turkey season, we made daily estimates using the same method as for the opening day of the squirrel hunts. For archery deer hunts the same method was employed as for the squirrel hunts. All vehicles on the main roads and on the woods roads were counted during gun deer hunts and 5% of this number was added for unobserved vehicles. The number of vehicles was

^aUse of name does not constitute an endorsement.

then multiplied by an average of 2.5 hunters per vehicle. Estimates of the average number of hunters per vehicle are based on actual counts of hunters in vehicles observed on the management area.

On the Scotch Wildlife Management Area, estimates of the number of hunters for squirrel, deer archery, and turkey seasons were made by Area Manager Paul Huggins and District Biologist J. R. Davis. Figures for gun deer hunters were based on the actual number of permits issued each day of each hunt.

RESULTS AND DISCUSSION

Legal Harvest

Twenty-five radio-tagged turkeys were transmitting on the Thomas study area at the time of the 1978 spring hunt; 14 of these were gobblers. Five instrumented gobblers (35.7%) were harvested; 9 untagged gobblers were also harvested. Assuming that instrumented and uninstrumented gobblers had an equal chance of being harvested, we made a population estimate of 39 (± 22) gobblers on the area, or 1 per 93 ha. One gobbler per 259 ha was harvested during the 10-day hunt.

On the Scotch Wildlife Management Area, 29 gobblers, or 1 per 286 ha were harvested in spring 1978. During the turkey season, 5 instrumented gobblers and 10 hens used the area. One of the gobblers was killed, indicating a harvest rate of 20%.

Bailey and Rinell (1967) suggested that a legal harvest of 1 turkey per 259 ha constituted reasonably good hunting. Gardner et al. (1972) found that 1.8 and 1.2 gobblers were killed per 259 ha during 2 spring seasons on an area of private land in central Alabama 5 years after turkeys were stocked. The average spring harvest for 15 years on some of the best turkey hunting territories on a private hunting club in south Alabama was 6.3 gobblers per 259 ha (Speake et al. 1975). The length of the spring season at Thomas in 1978 was 10 days whereas the other seasons mentioned were about 30 days.

Illegal Kill

On the basis of our August-September sightings of instrumented and uninstrumented birds on the Thomas Wildlife Management Area, approximately 30% of the turkey population was instrumented in 1976-77 and 23% was instrumented in 1977-78. Of the radio-tagged turkeys on Thomas, only 4 (7.8%) are believed to have been illegally killed during the 2-year period. One instrumented gobbler was located moving at noon during the first gun deer hunt in 1976 but had "disappeared" by the next morning. An aerial search of the study area and surrounding lands did not reveal its whereabouts. The killing of turkey hens is illegal in Alabama. One hen was found shot following a deer drive just outside of the management area. Only one case of a hunter shooting at turkeys on a deer hunt was reported. Following the hunt, all instrumented turkeys were accounted for. Two other hens were believed to have been poached following the 1978 spring turkey season. One hen's transmitter was found next to a public road with its bindings cut and the other hen's transmitter was found with lead shot embedded in it. Even though poaching is hard to measure, the use of transmitters that indicated mortality and activity plus the frequent use of aircraft enabled us to estimate this loss.

Of 22 instrumented birds on the Scotch Wildlife Management Area, only 2 (9%) were recorded as possible illegal kills from October 1977 through April 1978. A sub-adult hen disappeared on 1 November 1977, during the squirrel season. Previous radio locations indicated that her movements were along a hardwood stream bottom, which was choice squirrel habitat and known to be under heavy hunting pressure during that time. An adult hen disappeared on 11 April 1978, during the spring turkey season. Radio locations were taken from this turkey at 1650 h on 10 April, but radio contact could not be established on the afternoon of 11 April. An aerial search was made after each of these incidents, but no radio contact could be established.

Several estimates of poaching losses appear in the literature. Mosby and Handley (1943) estimated that 10% of the turkey population in Virginia was killed annually by illegal hunting. Powell (1967) stated that the illegal kill in some parts of Alabama was as high as 10%. Wright and Speake (1975) believed that illegal losses of radio-instrumented turkeys as high as 20% occurred in Kentucky. Fleming and Speake (1976) considered that illegal kill was an important factor in population losses from an area of private land consisting of about 26 different ownerships in central Alabama. On the basis of our sample it does not appear that illegal kill is an important limiting factor on state game management areas in Alabama.

Crippling Losses

Twenty-five radio-instrumented turkeys (14 gobblers, 11 hens) were on the Thomas area during the 1978 spring turkey hunt. We estimated that 36% of the gobblers on the area were radio-tagged. Even though several gobblers were reported by hunters as "missed" during the turkey season, no crippled radio-tagged gobblers were found. One instrumented gobbler, however, was found dead after the hunt in an area where several turkeys were reported to have been shot at and lost. Scavengers had destroyed any evidence of gunshot wounds which might have been present.

On the Scotch Wildlife Management Area 1 of 5 instrumented gobblers was shot and later found during the 1978 spring gobbler season. Lead shot was embedded in its sternum, so there is evidence for an approximate 20% crippling loss of gobblers on this area.

Bailey and Rinell (1967) state that the turkey is an extremely hardy bird and may recover from being shot. Mosby and Handley (1943) estimated that 10% of the number bagged in Virginia may be lost to crippling, while Bailey and Rinell (1967) believed such losses in West Virginia run as high as 20 to 30% of the harvest. Our samples show a similar loss under Alabama conditions.

Movements Associated with Squirrel Hunts

During the 1976 squirrel season, 26 radio-tagged turkeys had established their winter range on the Thomas study area. On opening day of the first segment of the season, about 1 hunter per 60 ha used the study area and during the remainder of the season an estimated 1 hunter per 172 ha per day used the area (Table 1). Four turkeys were noted to have moved out of their minimum home ranges. The farthest movement was about 1.6 km. During the second segment of the season, no unusual movements were noted for the 26 turkeys.

During the 1977 season, 25 radio-tagged turkeys had established ranges on the Thomas study area. Opening day pressure was about 1 hunter per 60 ha and about 1 per 172 ha per day for the rest of the first segment of the season (Table 2). Two turkeys were noted to have moved out 0.8 km and 1.0 km from their ranges in 1 day. No unusual movements were noted in the second part of the season, when the average hunting density was 1 hunter per 725 ha per day.

Movement by radio-tagged turkeys out of their home ranges during both the 1976 and 1977 hunting season coincided with squirrel hunting and with high hunter densities. It appears that such hunting caused disruption of normal turkey activities. These movements were only temporary displacements, since all the birds had returned to their home ranges within five days.

There were 7 radio-tagged turkeys on the Scotch study area, none of which moved out of their minimum home ranges during the squirrel season when hunting pressure was less than 1 hunter per 2,961 ha (Table 3).

Movements Associated with Archery Deer Hunts

In 1976 on the Thomas study area with an estimated 1 hunter per 45 ha on opening day and 1 per 181 ha during the remainder of the first hunt (Table 1), only 1 of the 26

Table 1. Hunting seasons and average hunter density estimates on the Thomas Wildlife Management Area, 1976-77.

<i>Type of hunt</i>	<i>Hectares/ hunter/ day</i>
<i>Squirrel</i>	
October 15-31	172
December 10-20	725
<i>Deer-archery</i>	
November 1-18 (either sex)	181
November 19-December 20 (bucks only)	907
December 21-January 22 (either sex)	302
<i>Deer-gun</i>	
November 19-20	5
December 3-4	8
December 13-14	20
January 4-5	25

Table 2. Hunting seasons and average hunter density estimates on the Thomas Wildlife Management Area, 1977-78.

<i>Type of hunt</i>	<i>Hectares/ hunter/ day</i>
<i>Squirrel</i>	
October 15-31	172
December 10-January 1	604
<i>Deer-archery</i>	
November 1-17 (either sex)	181
November 18-December 18 (bucks only)	907
December 19-January 21 (either sex)	302
<i>Deer-gun</i>	
November 18-19	5
December 16-17	8
December 29-30	11
January 13-14	22
<i>Turkey</i>	
April 1-10	112

instrumented birds moved 1.3 km out of its range. During the bucks-only hunt (Table 1), no unusual movement was noted, but during the third hunt of the season 2 instrumented turkeys made movements of 2.5 and 1.6 km when subjected to a hunter density of about 1 hunter per 302 ha.

The 1977-78 archery deer season was also in three segments (Table 2). On opening day of the first hunt there was about 1 hunter per 45 ha and an average of 1 per 181 ha per day the remainder of that hunt. Two of the 25 radio-tagged turkeys moved 2.7 and 0.8 km from their ranges. No erratic movements were noted during the bucks-only hunt. One turkey moved 2.7 km out of its winter range in the last hunt of the season, when hunter density was about 1 hunter per 302 ha per day.

On the Scotch Wildlife Management Area, archery season was open for both deer and turkey gobblers. Most of the hunter pressure was during the first hunt and during the

Table 3. Hunting seasons and average hunter density estimates on Scotch Management Area, 1977-78.

<i>Type of hunt</i>	<i>Hectares/hunter/day</i>
<i>Squirrel</i>	
October 16-January 10	2961
<i>Deer-archery</i>	
October 15-29	727
December 15-January 10	727
<i>Deer-gun</i>	
November 22-23	48
December 16-17	52
December 27-28	34
January 12-14	37
<i>Turkey</i>	
March 20-April 25	259

last 5 days of the second hunt. An average of 1 hunter per 727 ha per day used the area during the archery season. Radio locations did not show any movements out of ranges due to hunting pressure.

Archery hunting by its nature is quiet and should create little disturbance. Hunters on both management areas used the game food plots extensively. The frequent presence of hunters around these plots is probably responsible for turkeys leaving the immediate vicinity while still remaining within their winter ranges. Our radio-location data verified the fact that turkeys did not move far to escape harrassment by bow hunters, and all 6 of the turkeys that left their ranges during 2 years of bow hunting at the Thomas study area returned within 4 days.

Movements Associated with Gun Deer Hunts Thomas Wildlife Management Area

Four 2-day deer hunts for antlered bucks only were held each year of the study at the Thomas Wildlife Management Area (Tables 1 and 2). On the first hunt in 1976, with an estimated 1 hunter per 5 ha, 3 of the 26 instrumented turkeys moved 1.3, 2.4, and 1.5 km from their established ranges. On the second hunt, with the hunter density at 1 per 8 ha, 2 of the turkeys moved 0.6 and 1.5 km. No unusual movements were noted on either of the last 2 hunts, when the hunter density was 1 per 20 ha and 1 per 25 ha, respectively.

Three of 25 radio-tagged turkeys on the first hunt of the 1977-78 season moved 1.5, 1.6, and 1.9 km outside of their home ranges. Hunter density was about 1 per 4.5 ha on opening day. During the second hunt, with 1 hunter per 5 ha 1 turkey moved 2.3 km; on the third hunt, with 1 hunter per 11 ha, 1 turkey moved 1.8 km outside of its winter range. On the last hunt, with about 1 hunter per 22 ha no unusual movement of turkeys was noted.

The extremely high density of hunters on the first hunts of the year might have been expected to cause every turkey to move out of its normal range, but this did not occur. Although erratic movement was noted, all instrumented birds returned to their ranges within 5 days. Radio-locations of turkeys during hunts indicated that the turkeys often flew into trees. We have observed the same reaction on other occasions. When a radio-tagged turkey was flushed into the trees, it would often remain there for up to several hours unless flushed again and then it would frequently fly to another tree some distance away and remain until purposely flushed again or until disturbances ceased.

Scotch Wildlife Management Area

Deer hunting with dogs has a long tradition in the south and most deer hunting is done this way in the southern part of Alabama. Wheeler (1948) concluded that dog disturbance, especially during the day, upset turkeys, causing them to fly into trees and remain there as long as dogs remained in the area. Fleming (1975) noted that during such a hunt, a flock of turkeys was displaced approximately 0.8 km from the periphery of its normal range and moved to the side of a road opposite from where the deer hunt was occurring.

Organized deer hunting with dogs was conducted on the Scotch study area. Certain designated areas were selected to be hunted, according to the number of hunters attending each hunt. Because of this, all sections of the study area were never hunted at 1 time. There were 2 such hunts on the study area during the 1977-78 season and no section was hunted on consecutive days. Hunters were placed by management area personnel on deer stands located 0.16 km apart along roads.

During the deer-dog hunts, there were 7 radio-tagged turkeys on the study area. One adult gobbler had established a winter range, part of which was off the study area. During a deer-dog hunt on land adjacent to the study area, the gobbler moved 1.4 km from the hunted area to an unhunted area, but this movement did not displace the turkey from its established range. In another example, 2 adult gobblers were located in an area that was not being hunted; these turkeys moved a straight-line distance of 1.1 km after several packs of dogs ran through the area from adjoining lands which were being hunted. Although this movement was not outside of their established ranges, it does indicate that the sound of barking dogs disrupts the daily activities of turkeys.

The entire area was open during 4 stalk deer hunts. The highest density of hunters was 1 per 34 ha; the lowest density was 1 per 52 ha. During the season, 7 radio-tagged turkeys were on the area but none of them was displaced from its established range during hunts.

Movements Associated with Turkey Hunts

Thomas Wildlife Management Area. The Thomas study area was used by 25 instrumented turkeys during the 10-day spring gobblers-only turkey hunt; of these, 14 were gobblers. On opening day there was about 1 hunter per 42 ha and the season average was 1 per 112 ha per day. Difficulty was encountered in assessing the effect of hunting on spring movements because the 1978 season corresponded with the spring breakup of flocks—a time during which erratic movements were frequent, as we observed in 1976 and 1977 when there was no hunting. The average daily distance measured between locations for March and April 1976 for 13 turkeys was 0.47 km, in 1977 for 29 turkeys the average was 0.35 km, and in 1978 for 22 turkeys it was 0.21 km. Apparently hunting caused no abnormal movement.

Hunter density on every day of the hunt was so high that most gobbling turkeys could be heard by several hunters. Hunters reported several instances in which more than 1 hunter would try to call the same turkey. The gobbler would usually be “spooked” and escape. Even though this was the first hunt in 7 years, the birds were not easy to “call”.

Scotch Wildlife Management Area. During the 37-day spring turkey hunt, 15 radio-tagged turkeys were on the study area and of these 5 were gobblers. About 1 hunter per 259 ha per day used the area during the season. During the first week in April, 4 hens moved away from ranges they had occupied in March. These movements are believed to have been spring range shifts, not associated with hunting pressure. These hens remained in the new territories throughout the nesting season. Six other hens made no range shifts or other unusual movements.

One gobbler of 5 moved out of its established winter range and it was killed soon thereafter. It could not be determined whether this shift was due to hunting pressure or

was a seasonal range shift. Apparently only minor turkey movements were caused by hunting pressure.

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