Relationship of Wild Turkey Gobbler Movements and Harvest Rates to Management Area Boundaries

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Abstract: We monitored 122 radio-equipped wild turkey (*Meleagris gallopavo*) gobblers on Tallahala Wildlife Management Area (TWMA), Mississippi, during all seasons, 1986–89. Gobblers that had ≥50% of telemetry locations off the area were considered off TWMA. Percent off of the area was greater ($P < 0.1$) in spring than summer 1986. An average of 34% of gobblers was off TWMA during the spring hunting period, 1986–89. We detected no difference in harvest rates between gobblers on and off TWMA. Managers should consider harvest on adjacent private lands when planning for public hunting areas.

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An important problem in wild turkey management is dispersal from managed areas (Brown 1980). Artificially defined boundaries may have no relationship to an animal population (Caughley 1977). If spatial movements are not limited by physical features, it may be illogical to assume wild turkeys will be confined to a certain area. However, management efforts are usually limited to discrete areas within artificial boundaries. Many studies have reported turkey home range size and mobility (Davis 1973, Fleming 1975, Speake et al. 1975, Everett et al. 1985, Wigley et al. 1986, Exum et al. 1987, Kelley et al. 1988), but few have related movements to management area boundaries. We studied seasonal movements and harvest rates

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of wild turkey gobblers related to boundaries of the Tallahala Wildlife Management Area in central Mississippi.

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Methods

Study Area

The study area was the Tallahala Wildlife Management Area (TWMA), a 14,140 ha tract in the Strong River District of the Bienville National Forest, and adjacent private lands. The area lies in Jasper, Newton, Scott, and Smith counties, within the Hilly Coastal Plain Province and the Blackland Prairie soil resource area (Pettry 1977), 16 km southeast of Newton, Mississippi. Topography is gently to moderately rolling with slopes from 0%–15%. Principal drainage is south through Cedar, Quarterliah, and Tallahala creeks. Climatic conditions are mild with a mean annual temperature of 18 C and a mean annual precipitation of 144 cm. There are 200–230 frost free days/year. A severe drought occurred July 1987—June 1988 (Seiss 1989).

The study area was 98% forested. Mature pine (*Pinus* spp.) stands, pine-hardwood stands, and pine regeneration areas comprised 67% of the area; loblolly pine (*P. taeda*) was the dominant species. Hardwood-pine stands, bottomland hardwood stands, and hardwood regeneration areas comprised the remaining 33% of the area. Dominant upland hardwoods were southern red oak (*Quercus falcata*), post oak (*Q. stellata*), and hickories (*Carya* spp.). Dominant bottomland hardwoods included water oak (*Q. nigra*), white oak (*Q. alba*), cherrybark oak (*Q. pagoda*), sweetgum (*Liquidambar styraciflua*), and hickories (Kelley 1987).

Silvicultural practices in pine stands included clearcutting ($\bar{x}$ = 18 ha), mechanical site preparation, and planting or regeneration by the seed tree method (Palmer 1990). Pine release at age 5–7 years was accomplished using herbicides. Precommercial thinning was done by roll-chopping in plantations established by seed tree regeneration. Mature pine stands were commercially thinned at approximately 10-year intervals and prescribe burned on a 6-year rotation. Hardwood stands were regenerated ($\bar{x}$ = 7 ha) by coppice using clearcuts or the shelterwood method.

Areas adjacent to TWMA, which were used by radio-equipped gobblers, were 81% forested. Mature pine stands, pine-hardwood stands, and pine regeneration comprised 63% of forested areas. Hardwood-pine stands and bottomland hardwood stands comprised the remaining forested areas. Improved pasture (8%), old fields (8%), and agricultural fields (4%) comprised the remaining areas adjacent to TWMA.

Silvicultural practices varied among adjacent areas, but were generally comparable to those on TWMA. Public hunting access was restricted on adjacent areas.

Data Collection and Analysis

Gobblers were captured by cannon-netting (Bailey 1976) or drugging with alpha-chloralose (Williams 1966). Each gobbler was aged (Williams 1981), fitted with a "back-pack" style transmitter (Wildl. Materials, Carbondale, Ill.), and marked with patagial wing tags (Knowlton et al. 1964) and metal leg bands.

Gobbler locations were determined by triangulation (Cochran and Lord 1963) from permanent telemetry stations ($N = 278$) located on roads throughout the study area. Telemetry was conducted with hand-held 3-element directional yagi antennae and TR–2 receivers with TS–1 scanners (Telonics, Inc., Mesa, Ariz.). Number of telemetry locations/gobbler varied from 1–2/week (Sep–Dec, 1986–1988) to >7/week (throughout most of the study). Accuracy tests were performed by individuals who collected the majority of the telemetry data. Transmitters were placed throughout the study area by individuals not performing accuracy tests. Fixes taken from telemetry stations were compared to actual transmitter locations to obtain a degree of error (Mech 1983).

Telemetry locations were determined using the program TELEBASE (Wynn et al. 1990). Locations were separated into the following seasons: spring (1 Feb–31 May), spring hunting (15 Mar–1 May), summer (1 Jun—30 Sep), and fall-winter (1 Oct—31 Jan), 1986–1990. Gobblers were determined to be on or off TWMA by plotting locations onto a map of the area. Forest Service boundaries were used to delineate the study area. Percent of telemetry locations off (PCTOFF) the area was determined for individual gobblers. Correlation was used to determine if distance of initial capture location to TWMA boundaries was related to PCTOFF. A gobbler was considered off the area for a season if ≥50% of its locations were off the area. Gobblers not monitored throughout a season (except those harvested during spring hunting season) were excluded from analysis. Seasonal differences in proportion of gobblers off the area were tested for each year using chi-square tests of homogeneity. If significant, individual binomial comparisons, protected for simultaneous inference, were performed to compare between seasons (Zar 1984).

Hunters were required to check in gobblers harvested on TWMA (95% checked in, Gribben 1986) and radio-equipped birds that were harvested off the area. Harvest locations were reported for all gobblers. Harvest rates were compared for radio-equipped gobblers on TWMA (PCTOFF <50) and off TWMA (PCTOFF ≥50) during the spring hunting season using a 2-sample test for equality of percentages (Zar 1984). Gobblers (1986–89) were grouped into 5 categories based on PCTOFF (0–20, 21–40, 41–60, 61–80, 81–100). Correlation was used to determine if mean PCTOFF/group was related to mean group harvest rate. All statistical procedures were protected at the 0.10 level of significance.

Self-service permit stations (6) were located throughout TWMA. Hunters were required to complete a permit (name, address, and date), display the permit on their vehicle while hunting, and to deposit the permit at a self-service station. At least

Table 1. Number of wild turkey gobblers and average number of telemetry locations/gobbler used in analysis, Tallahala Wildlife Management Area, Mississippi, 1986–1989.

Year	Season[a]	Gobblers (*N*)	Locations/gobbler $\bar{x}$	Locations/gobbler SD
1986	Spring	21	36.5	12.8
	Summer	19	45.3	16.2
	Fall–winter	13	19.0	3.4
1987	Spring	24	30.4	12.3
	Summer	11	34.7	5.6
	Fall–winter	—	—	
1988	Spring	21	24.0	8.5
	Summer	9	51.3	11.7
	Fall–winter	17	19.3	4.4
1989	Spring	32	93.4	36.3
	Summer	19	67.9	24.2
	Fall–winter	16	82.3	39.6

[a]Spring: 1 Feb–31 May. Summer: 1 Jun–30 Sep. Fall–winter: 1 Oct–31 Jan.

85% of the hunters completed and returned permits (Palmer et al. 1990). Hunter effort on TWMA was determined from the number of permit cards returned.

Results

During 1 February 1986 through 31 January 1990, 12,073 locations were taken on 122 gobblers (Table 1). Telemetry system error was 5.4°. PCTOFF was greater ($P < 0.10$) for spring than the summer season in 1986. No other significant differences in PCTOFF were found between seasons (Table 2). An average of 34% of the gobblers

Table 2. Average percent of wild turkey gobblers off Tallahala Wildlife Management Area, Mississippi, based on telemetry locations, 1986–1989.

	Spring			Summer			Fall–winter		
Year	% Gobblers off area[a]	$\bar{x}$ % locations off area/gobbler %	SE	% Gobblers off area	$\bar{x}$ % locations off area/gobbler %	SE	% Gobblers off area	$\bar{x}$ % locations off area/gobbler %	SE
1986	28.6	31.0	5.5	0.0	11.1	2.4	15.4	32.8	6.3
1987	20.8	27.4	4.6	45.5	42.5	13.0			
1988	19.0	32.9	5.9	22.2	27.2	11.2	23.5	21.6	6.4
1989	43.8	40.4	6.1	21.1	23.9	6.2	31.2	27.0	6.6
$\bar{x}$	29.6	33.6	2.9	19.0	23.8	3.9	23.9	26.6	3.7

[a]≥50% of telemetry locations/gobbler off TWMA.

was located off TWMA ≥ 50% during the spring hunting season, 1986–1989. Distance of initial capture location to the TWMA boundaries was related to PCTOFF during 1986 and 1989 ($P = 0.09$ and $P = 0.01$, respectively), but not during 1987 and 1988 ($P = 0.14$ and $P = 0.64$, respectively).

During spring hunting season 1986–1989, 37 radio-equipped gobblers (8 subadult, 29 adult) were harvested. Harvest rates of gobblers on TWMA (PCTOFF < 50) during the spring hunting season did not differ ($P = 0.46$) from those off the area (Table 3), and harvest rate was not correlated to PCTOFF ($P = 0.59$). However, 54% of gobblers considered off TWMA (PCTOFF ≥50) were actually harvested within the area boundaries, while only 29.2% considered on TWMA were harvested off the area ($P = 0.17$). All years combined, 65% (5 subadults, 19 adults) of all radio-equipped gobblers checked in during the study were harvested on the area.

Discussion

Several studies in the southeast have reported gobbler home ranges to be largest during spring (Wigley et al. 1986, Exum et al. 1987, Kelley 1987), but few have noted how these increased movements may affect the birds spatial position with respect to managed areas. Speake et al. (1975) reported that 44% of the hens in an Alabama study emigrated beyond the boundaries of a management area during the spring to adjacent lands with more openings. Percent of gobblers off TWMA was relatively large ($x = 30\%$) during spring seasons, 1986–89. During 1989 spring hunting season, 44% of the monitored gobblers ($N = 32$) were off TWMA.

Gobblers captured near TWMA boundaries would seem to have a higher probability of being located off TWMA. However, distance of capture location to TWMA boundaries was not related to PCTOFF during 1987 or 1988. Even in 1989, when PCTOFF was highly correlated to distance of capture location, many individual gobblers made extraordinary movements from TWMA during the spring.

Table 3. Location (off or on study area) and fate of radio-equipped gobblers, Tallahala Wildlife Management Area, Mississippi, 1986–1989.

Location	Year				
	1986	1987	1988	1989	$\bar{x}$
Off area[a]					
Harvested	3 (2[c])	4 (2)	1 (0)	5 (3)	3.3 (1.8)
N Gobblers	9	10	7	17	10.8
% Harvested	33.3	40.0	14.3	29.4	35.4
On area[b]					
Harvested	8 (5)	7 (7)	4 (3)	5 (2)	6.0 (4.3)
N Gobblers	20	21	23	20	21.0
% Harvested	40.0	33.3	17.4	25.0	29.0

[a]Gobblers with ≥50% telemetry locations off TWMA during spring hunting season (15 Mar–1 May).
[b]Gobblers with <50% telemetry locations off TWMA during spring hunting season (15 Mar–1 May).
[c]Harvested on TWMA.

Davis (1973) concluded that gobbler movements during spring were related to breeding behavior and noted that gobblers may follow hens into spring ranges. However, radio-equipped hens on TWMA, monitored concurrently with this study, rarely left the area during spring (Palmer 1990).

Gobbler use of fields during spring has been reported (Barwick and Speake 1973, Everett et al. 1985, Exum et al. 1987). Exum et al. (1987) noted that use of fields during spring was probably related to breeding behavior and food availability. Although TWMA was mostly forested with no improved fields, the large alluvial bottomland forests were very open with groundstory structure similar to fields (Palmer 1990). Fields were available on some private lands adjacent to TWMA. However, few radio-equipped gobblers used these fields. We do not believe that use of fields explained dispersal of gobblers from TWMA.

Harvest rates did not differ between gobblers on and off TWMA. Turkey hunting occurred on private lands surrounding TWMA. While hunting pressure on these areas was not quantified, we believe (based on personal observations and communication with local land owners) that pressure off TWMA was considerably less than on the publicly hunted area. Palmer et al. (1990) reported that turkey hunter success increased as hunting pressure declined, but reduced pressure below a point may result in a reduced harvest. This may explain why most gobblers (including 54% of those spending most of the hunting season off TWMA) were harvested on the area. However, the percent of locations off TWMA during hunting season did not affect the probability of a gobbler being harvested. Therefore, harvest rates on and off TWMA did not adequately explain gobbler dispersal from the area.

Human disturbance during hunting season may affect gobbler behavior, but Everett et al. (1978) and Williams et al. (1978) concluded that hunting pressure did not have a significant effect on wild turkey movements. We do not believe hunting pressure was a major factor affecting gobbler movements during this study. Hunter effort was relatively constant between years and averaged 502 man-days/year on TWMA (Palmer et al. 1990) while spring PCTOFF varied annually. Also, dispersal movements were generally observed before the hunting season and seemed to be associated with the break-up of winter gobbler flocks. These observations suggest that spring movements may be affected by social pressure. In 1989, when the largest percent of gobblers (44) was off TWMA during spring, the estimated population size was lowest (Lint 1990). However, PCTOFF was highly correlated with distance to capture location during 1989. Therefore, a greater proportion of gobblers being captured near the TWMA boundaries, rather than a decrease in population size, may best explain the large PCTOFF during spring 1989.

Exum et al. (1987) noted that turkeys use "traditional areas" each year. They suggested that juvenile birds learn to use these areas by following adult birds. During the present study, several gobblers which were monitored >1 year used specific areas seasonally. We believe use of traditional areas may explain some gobbler movements off TWMA during the spring hunting season. Turkey populations on TWMA were considerably higher during the early 1980s than throughout this study (pers. commun., W.E. Smith, manager, TWMA). With higher populations, gobblers

may have temporarily dispersed from TWMA in the spring due to social pressure and then returned to these areas during subsequent years.

Our analysis did not adequately explain why PCTOFF varied among seasons, and factors affecting dispersal from TWMA were not clearly determined. Future research should concentrate on monitoring social behavior prior to and during periods of increased turkey movement. Also, research should consider movements of gobblers captured adjacent to a management area and address how they relate to area boundaries.

Harvest records are often used to monitor population trends (Lint 1990). To obtain a better estimate of total harvest, managers should consider harvest on adjacent private lands. Also, managers of public areas should attempt to involve owners of adjacent lands in wild turkey management plans.

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