Habitat Use by Eastern Wild Turkey Hens in Southeastern Louisiana

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Abstract: Seventeen female eastern wild turkeys (*Meleagris gallopavo silvestris*) were fitted with transmitters and monitored continuously during March 1984–May 1985. Mean home range for 4 hens that survived the 15-month study period was 677 ha. Adult ($\bar{x}$ = 66 ha) and subadult ($\bar{x}$ = 149 ha) home ranges differed ($P < 0.05$) during spring and may be related to nesting activities. Mean home ranges during summer, fall, and winter were 124, 402, and 254 ha, respectively. Average distance traveled in 24 hours did not differ ($P > 0.05$) between age classes or among seasons. Subadults and adults differed ($P < 0.001$) in their habitat use with the greatest disparity occurring during spring. Intermediate (11- to 20-year-old) pine was the most consistently preferred ($P < 0.05$) habitat. Upland sites were preferred ($P < 0.05$) during nesting. Turkeys concentrated activities in areas surrounding dairy pastures. Intensively used (50% home range) areas generally consisted of intermediate pine, old (≥21-year-old) pine, mixed pine-hardwood, and improved pastures.

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Forests of southeastern Louisiana are part of a vast expanse of timber occupying a portion of the Coastal Plain region (Smith 1981). Historically, the southern pine forests of the Southeast were a mixture of several species of pine (*Pinus*) and hardwood associates. In Louisiana, pine forests were represented by 2 forest types: shortleaf pine (*Pinus echinatus/Quercus/Carya*) in northeast Louisiana, and longleaf pine (*P. palustris*) of southeastern and central Louisiana (Brown 1965). Pine forests in Louisiana have undergone dramatic alteration in the last century; native forests are virtually nonexistent and timber management has evolved into a short-rotation (25–30 years), even-aged, plantation scheme (Smith 1981). The result has been monocultural stands of loblolly pine (*P. taeda*) with a reduction in mast producers.

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Alteration of habitat is a critical factor affecting eastern wild turkey (Bailey 1980). Few studies have focused on wild turkey populations which inhabit regenerating stands of young pine. Coastal Plain habitat use (Speake et al. 1975), home range, and movement (Davis 1973, Taylor 1968) have been monitored. However, most of the information relating to the eastern wild turkey within even-aged pine forests comes from studies by Kennamer et al. (1980*a*, 1980*b*) in Alabama and Holbrook (1984) within the Piedmont of Virginia. Virtually nothing is known regarding the interaction of commercial pine forest management and local dairy farm practices on existing wild turkey populations. Specific objectives of this study included estimating seasonal and overall home ranges, describing daily and seasonal movement and habitat-use patterns, determining seasonal habitat preferences, and defining centers of activity and core area habitats.

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Methods

The study area was 3,040 ha of predominantly commercial timberland within township R6E, T1S in the northeastern corner of St. Helena Parish, Louisiana. Boundaries of the area were determined by constructing the smallest convex polygon (Jennrich and Turner 1969) from peripheral locations of radio-marked individuals (Smith 1985). Approximately 2,338 ha (80%) of the study area was owned by International Paper, Inc. and Crown-Zellerbach, Inc. and managed for loblolly pine production. The remaining 602 ha was privately owned and contained dairy pastureland and hardwood bottomlands.

The area was divided into 13 habitat categories according to the age, species composition, structure, and recent agricultural and silvicultural treatment: road and right-of-way (1.3%); 4-year-old pine plantation (1.0%); 5-year-old pine plantation (1.6%); 6- to 10-year-old pine plantation (20.2%); 11- to 15-year-old pine plantation (8.1%); 16- to 20-year-old pine plantation (0.3%); ≥21-year-old pine plantation (36.6%); mixed pine-hardwood forest (0.4%); hardwood forest (8.9%); deciduous thicket (0.3%); agriculture (0.6%); improved pasture (20.3%); unimproved pasture (0.1%). Hagg (1987) described plant communities within commercial timberlands of the upper Florida parishes, Louisiana.

Prebaiting procedures followed Bailey et al. (1980). Once birds began using the bait regularly, a 12.2- by 18.3-m cannon net was placed 3 m from the baitline (Austin 1965). Captured birds were placed in holding boxes and handled according to procedures described by Austin et al. (1972). Age and sex were determined

according to Williams (1961, 1981). Each bird was weighed, banded, marked with a numbered ALLFLEX button tag (Vet Brand, Inc., Torrance, Calif.) in the patagium, fitted with a motion-sensitive radio transmitter, and released immediately. Following a 2-week period of habituation, birds were located at least 3 times per week (except during nesting when they were monitored daily). Each day was divided into 5 periods. A systematic sampling schedule was implemented such that each bird was located within all time periods (Teitelbaum 1986). The rotating schedule was repeated during each season throughout the study.

Each bird was approached on foot until signal quality and intensity indicated that the bird was within about 100 m. Locations were obtained by visual verification or by triangulation from nearby landmarks.[2] In fragmented habitats (i.e., areas where several habitat types occurred), we recorded additional habitat types that were immediately adjacent to the habitat within which a bird was located. Subsequent analyses determined the relative importance of adjacent habitats.

Observations were plotted on aerial photographs (scale = 1:80,000); a master grid and aerial photo system provided X and Y coordinates. Age and sex, date, time, total number of birds, group composition, habitat type, ecotone (habitats that were within 50 m of the primary habitat category), and activity were recorded. Minimum convex polygon home-range (Jennrich and Turner 1969) estimates were computed (Harestad 1981), and 50% home ranges defined centers of activity and core habitats. A FORTRAN program (Teitelbaum 1986) determined mean distance traveled in 24 hours.

A Bruning randomized dot grid (Forbes 1961) was used to determine area of each habitat; corresponding relative proportions served as an index of availability. Each telemetry location represented an assumed independent observation of habitat use. Multiple contingency table analysis generated a frequency distribution of observations among different habitat categories (Neu et al. 1974) for summer, fall, winter, spring, and nesting (31 April-15 June). Comparisons of use with availability determined preference (Neu et al. 1974).

The Mann-Whitney two-sample test determined if home range differences existed between age classes (Zar 1984). The Kruskal-Wallis test and Tukey-type test (Zar 1984) determined if differences in home-range size existed among seasons. Analysis of variance (ANOVA) determined if differences existed in average distance traveled within 24 hours between age classes or among seasons. A Chi-square multiple contingency table analysis determined if differences in habitat use occurred between age classes or among seasons during 1984 and 1985. Probability of < 0.05 was accepted as indicating statistical significance. When differences did not exist, age classes and seasons were combined for subsequent analysis and comparisons.

[2]We recognized that when we approached the turkeys, we risked altering their behavior. In this study, preliminary observations indicated that we could reliably determine our approximate distance from radio-marked birds and whether they were being affected by our approach.

Results and Discussion

Movement and Home Range

Two adult and 9 subadult hens were captured 11 March 1984, and 1 adult and 5 subadults were captured 19 September 1984. Birds were monitored through 27 May 1985 or until mortality or transmitter failure. Birds with fewer than 16 locations were not included in subsequent analyses. There is a sample-size bias associated with minium convex polygon home-range estimates, but it becomes negligible as N approaches 25 (Jennrich and Turner 1969). Nevertheless, regression analysis indicated that home-range size in this study was independent ($P > 0.50$) of number of locations.

Mean home ranges of 4 hens that survived the 15-month study period and 2 additional hens that survived 12 months were 677 ($s_{\bar{x}} = 0.04$) and 482 ha ($s_{\bar{x}} = 0.03$), respectively. Davis (1973) reported a mean home range of 140 ha in the Coastal Plain of Alabama. The larger home ranges observed in this study may be attributed to the relatively larger proportion of pine (53.7%) and smaller proportion of bottomland hardwoods (7.7%). Speake et al. (1975) reported a similar association; mean home range of hens in areas with 87% hardwood bottomlands was 264 ha, whereas birds found in areas supporting 64% pine forests ranged 644 ha.

Seasonal Home Range—Home range of adult hens differed ($P < 0.05$) among seasons; both spring ($Q = 2.85$, $P < 0.05$) and nesting ($Q = 3.55$, $P < 0.005$) home ranges were smaller than summer, fall, and winter (Table 1). Spring overlapped the nesting season, and nesting activities, especially incubation, limited movements and restricted other activities. Similar seasonal home-range reductions were reported by Everett et al. (1979) and Speake et al. (1975). Speake et al. (1975) suggested that spring home ranges were associated with habitats containing 12%-25% openings. Approximately 20% of our area was comprised of dairy and beef pasture and other forest openings.

The remaining seasonal home ranges of adults were similar ($Q = 1.59$, $P > 0.50$) with the exception of a single adult hen who exhibited large fall (1,014 ha)

Table 1. Mean seasonal and overall home ranges (ha) for subadult and adult radio-marked hens, March 1984–May 1985, St. Helena Parish, Louisiana. ($\bar{x}_L$ = mean number of locations per bird)

	Adult				Subadult			
Season	$\bar{x}$	SD	N	$\bar{x}_L$	$\bar{x}$	SD	N	$\bar{x}_L$
Spring 1984	106.5	76.5	2	31.0	126.7	70.4	7	25.7
Nesting 1984	79.3	61.2	2	21.5	75.6	52.8	7	17.3
Summer 1984	123.9	39.2	8	54.6				
Fall 1984	369.5	313.7	7	61.5	480.7	89.4	3	52.2
Winter 1984	253.6	84.2	5	29.0	254.6	196.0	3	23.6
Spring 1985	46.3	16.2	4	33.0	226.3	17.5	2	30.5
Nesting 1985	30.1	20.4	4	19.0	114.6	36.8	2	18.8
Overall[a]	611.9	345.6	6	185.3	1,020.5	191.7	3	102.3

[a]Derived from radio-marked birds that were observed for ≥3 seasons with ≥85 locations.

and winter (522 ha) home ranges and an unusually large overall range (1,292 ha). Seasonal home ranges of subadults (Table 1) also did not differ ($Q = 2.20$, $P = 0.25$); however, 2 hens dispersed to another portion of the study area during fall, enlarging the home-range estimate for this period (Table 1). The 2 subadults left a portion of the area supporting a high density of turkeys (Teitelbaum 1986). Davis (1973) reported a similar phenomenon in the Coastal Plain of Alabama.

Home ranges of adults and subadults differed during spring ($U_{0.05(2)6,9} = 44$; $U' = 45$) and nesting ($U_{0.05(2)6,9} = 44$; $U' = 53$). This difference was largely due to subadults dispersing to another portion of the area and was apparently associated with nesting. Hon et al. (1979) reported similar findings in Georgia. Overall home ranges (Table 1) did not differ between age classes ($U_{0.05(2)3,6} = 17$; $U' = 15$); the combined overall home-range estimate (adults and subadults) was 748 ha ($s_{\bar{x}} = 118$).

Movements—Mean distance traveled in a 24-hour period did not differ ($F_{1,6} = 3.60$, $P = 0.30$) between adults ($\bar{x} = 326$ m, $s_{\bar{x}} = 16$) and subadults ($\bar{x} = 493$ m, $s_{\bar{x}} = 108$). With one exception (spring 1984), movements of subadults were consistently larger than adults. The largest mean 24-hour movement for adults (457 m) and subadults (738 m) occurred during winter 1984 and nesting 1985, respectively. Mean 24-hour movements during summer ($\bar{x} = 230$ m, $s_{\bar{x}} = 17$), fall ($\bar{x} = 453$ m, $s_{\bar{x}} = 19$), winter ($\bar{x} = 495$ m, $s_{\bar{x}} = 16$), and spring ($\bar{x} = 373$ m, $s_{\bar{x}} = 89$) did not differ ($F_{1,6} = 0.82$ $P > 0.50$).

Movements of hens during winter may be related to food availability. Turkeys in this study relied on dairy farms, especially during late winter when mast was presumably unavailable. Birds moved from pasture to pasture and some moved among dairy farms to utilize undigested grain in dairy cattle feces (Teitelbaum 1986). Movements in spring may be associated with forage availability as birds appeared to include more vegetative material in their diet as spring progressed. Birds were probably moving among pastures as new-growth rye grass and winter wheat became available.

Most movement during spring, however, was probably related to hens, especially subadults, searching for suitable nest sites (Hon et al. 1979). Home ranges and movements of subadults were greater than adults during spring and nesting. It may be that young hens are forced to look for suitable nesting sites outside the traditional range of older hens.

Habitat Use

Turkeys were located in all habitat types but typically concentrated activities in just a few habitats (Table 2). Subadults and adults differed ($X^2 = 89.0$, $P < 0.001$) in their habitat use. Subadults occurred more often than expected in 5-year-old ($X^2 = 31.3$, $P < 0.001$) and 6- to 10-year-old ($X^2 = 5.6$, $P < 0.025$) pine plantations, agricultural areas ($X^2 = 7.8$, $P < 0.01$) and unimproved pastures ($X^2 = 6.7$, $P < 0.01$); adults used mixed pine-hardwood ($X^2 = 10.9$, $P < 0.01$) more often than expected. Whether these differences reflect age-specific preferences, or differences in habitat use between hen family groups and adult hens without young,

Table 2. Frequency of occurrence of radio-marked subadult and adult hens among habitats, March 1984–May 1985, St. Helena Parish, Louisiana. (N = number of locations)

	Subadults				Adults			
Habitat	Spring[a] N	Summer[b] N	Fall N	Winter N	Spring N	Summer N	Fall N	Winter N
Roadways	1		4		5		8	
4 year pine plantation	5		1	3	25			4
5 year pine plantation	26				2	8		1
6–10 year pine plantation	2		6			1	4	1
11–15 year pine plantation	96		14	39	61	118	70	74
16–20 year pine plantation	12			1	1	18		
≥21 year pine plantation	40		41	15	52	95	124	27
Mixed pine-plantation	14		6	2	19	59	32	6
Hardwood forest	30		51	53	66	108	161	63
Deciduous thicket	2			1	5	5	3	
Agricultural areas	13		6	2		4	11	7
Improved pasture	5		9	11	7	21	7	11
Unimproved pasture	8							
TOTAL	254		138	127	243	437	420	194

[a]Represents the sum of locations recorded during spring 1984 and 1985.
[b]There were no radio-marked subadults during summer.

is unclear. Most of the desparity in use, however, occurred during spring and among habitats that were selected for nesting by both age classes (Teitelbaum 1986).

Intermediate pine (11- to 15- and 16- to 20-year old) was the most consistently selected habitat by adults (Table 3) and subadults (Table 4); birds preferred intermediate pine in 9 of 13 seasonal categories. During spring 1984, nearly half (117 of 262) of adult and subadult observations occurred in intermediate pine, yet this habitat represented only 8% of the area. Dense understory and midstory presumably provided good concealment as birds often used this habitat as a travel corridor to other habitats. Intermediate pine also was used often for roosting, particularly those stands that were near hardwood forests and dairy pastures.

Mixed hardwood-pine and hardwood forests also were preferred; mixed hardwood pine was frequently used for roosting. Mature hardwoods may have provided mast during fall and winter; both subadults and adults occurred an average of 38% (328 of 878) of the time in hardwood forests (Table 2). Kennamer et al. (1980*b*) reported that acorns were one of the most important winter food items for turkey populations inhabiting managed pine forests.

With the exception of spring (Table 4), adults and subadults occurred within improved and unimproved pastures less often than expected during all seasons. This conclusion contradicts other findings in the study and is probably a result of an

Table 3. Seasonal habitat use and 95% family confidence interval (C.I.) of radio-marked adult hens, March 1984–May 1985, St. Helena Parish, Louisiana. (E = expected number of locations, N = number of locations)

Habitat	Spring			Summer			Fall			Winter		
	E[a]	N	C.I.	E	N	C.I.	E	N	C.I.	E	N	C.I.
Roadways	3	5	0–11	6	0	0	5	8	0–16	3	0	0
4 year pine plantation	2	25	12–38	4	0	0	4	0	0	2	4	0–10
5 year pine plantation	4	2	0–6	7	8	0–16	7	0	0	3	1	0–4
6–10 year pine plantation	48	0	0	88	1[b]	0–4	85	4[b]	0–9	39	1[b]	0–4
11–15 year pine plantation	19	61[b]	42–80	35	118[b]	92–144	34	70[b]	45–89	16	74[b]	53–94
16–20 year pine plantation	1	1	0–4	1	18	4–30	1	0	0	1	0	0
≥21 year pine plantation	87	52[b]	34–70	160	95[b]	83–100	154	124	97–154	71	27[b]	13–42
Mixed pine-hardwood	1	19[b]	7–31	2	59[b]	38–80	2	32[b]	15–47	1	6	0–13
Hardwood forest	21	66[b]	46–86	39	108[b]	93–117	37	161[b]	130–189	17	63[b]	45–83
Deciduous thicket	1	5	0–11	1	5	0–10	1	3	0–8	1	0	0
Agricultural areas	2	0	0	3	4	0–10	3	11	1–21	1	7	0–15
Improved pasture	49	7[b]	0–14	89	21[b]	8–33	85	7[b]	0–15	39	11[b]	2–21
Unimproved pasture	0	0	0	0	0	0	0	0	0	0	0	0

[a]Determined from the relative proportion of each habitat on the study area.
[b]Significant $P \leq 0.05$.

Table 4. Seasonal habitat use and 95% family confidence interval (C.I.) of radio-marked subadult hens, March 1984–May 1985, St. Helena Parish, Louisiana. (E = expected number of locations, N = number of locations)

Habitat	Spring			Fall			Winter		
	E[a]	N	C.I.	E	N	C.I.	E	N	C.I.
Roadways	3	1	0–4	2	4	0–10	2	0	0
4 year pine plantation	3	5	0–11	1	1	0–4	1	3	0–8
5 year pine plantation	4	26[b]	12–40	2	0	0	2	0	0
6–10 year pine plantation	51	2[b]	0–6	28	6[b]	0–13	26	0	0
11–15 year pine plantation	21	96[b]	74–118	11	14	4–24	10	39[b]	24–55
16–20 year pine plantation	1	12[b]	3–22	0	0	0	0	1	0–5
≥21 year pine plantation	93	40[b]	24–56	51	41[b]	26–57	46	15[b]	4–26
Mixed pine-hardwood	1	14[b]	4–24	1	6	0–13	1	2	0–7
Hardwood forest	23	30	16–44	12	51[b]	34–68	11	53[b]	37–70
Deciduous thicket	1	2	0–6	0	0	0	0	1	0–5
Agricultural areas	2	13[b]	3–23	1	6	0–13	1	2	0–7
Improved pasture	52	5[b]	0–11	28	9[b]	1–17	26	11[b]	2–20
Unimproved pasture	0	8	2–16	0	0	0	0	0	0

[a]Determined from the relative proportion of each habitat on the study area.
[b]Significant $P \leq 0.05$.

invalid assumption regarding availability of dairy pastures and other openings. Abundance was used as an estimate of availability. Large forest openings, however, are not completely available to numerous wildlife species because of their predisposition to avoid large, open areas, where escape cover is not available (Johnson 1980). The mean size of pastures was 11.2 ha ($s_{\bar{x}} = 2.9$); 40% of the pastures were >20 ha. Turkeys concentrated activities near small ($\bar{x} = 7.2$ ha) dairy pastures, and were rarely observed in large forest openings.

During nesting, birds generally used upland habitats more frequently, presumably to avoid flooding (Kimmel 1984). Twenty-nine percent (89 of 305) of the locations occurred within intermediate pine. Nests were located within old pine (≥21-year-old), agricultural areas, unimproved pasture (old field), 4-year-old plantation, and 5-year-old plantation. One adult and 4 subadults nested in 1984, and during 1985 1 adult and 1 subadult nested.

Center of Activity and Core Area Habitats

Use of a single habitat may not be entirely the result of the attributes of that particular habitat, but also may be influenced by spatial orientation of different habitats. The influence of edge on the density of wildlife populations has been documented (Giles 1978). In the southeast, the number and distribution of forest openings apparently influenced movements and home range of wild turkey populations, especially during spring (Speake et al. 1975). In southeastern Louisiana where numerous dairy and cattle farms are interspersed among large tracts of pine, turkey populations may respond to a group of spatially associated habitats rather than specific characteristics of single habitats.

Using 50% home ranges (Harestad 1981) to define centers of activity and core area habitats (i.e., habitats found within the center of activity), we observed that birds spent most of their time using the same 4 habitats. Moreover, these habitats were invariably adjacent to one another. Centers of activity ranged from 3.3 to 39.8 ha ($\bar{x} = 14.4$ ha) and were comprised of intermediate pine, old pine, mixed hardwood-pine, and improved pasture. Hardwood strips were often present along dairy pastures. Hens concentrated activities around improved pasture and used other habitats that were nearby. At the same time, hens selected improved pastures (core area) which were near habitats that provided for other needs.

Habitats such as intermediate pine received heavy use probably because of association with other habitats. A frequency analysis of ecotone observations revealed that hardwood forests and intermediate pine were habitat associates (i.e., when a bird was observed in intermediate pine it was <50 m from hardwood forests) in 27% (208 of 770) of the total observations ($X^2 = 1601$, $P < 0.001$).

Within intensively managed pine, the composition and juxtaposition of habitats may influence habitat use as well as density (Giles 1978), movement (Speake et al. 1975), and ultimately reproductive success. The importance of dairy farms and pasturelands is unclear; conventional habitat-use and home-range analyses suggest that hens do not prefer improved pastures. However, improved pastures were the center of activity of all radio-marked birds, suggesting that the dispersion of

dairy farms may play a key role in the relative success of eastern wild turkey. Moreover, it appears that relatively inexpensive and easy management can be implemented, manipulations that would benefit wild turkey with little interference of current timber management.

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