Wild Turkey Gobbler Habitat Use and Home Range in Loblolly Pine Plantations

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Abstract: We studied wild turkey (*Meleagris gallopavo*) gobbler habitat use and seasonal home range size by radio telemetry in an area dominated (45%) by loblolly pine (*Pinus taeda*) plantations (PP) in Kemper County, Mississippi, 1986–1988. In 1986, gobbler habitat use was more than expected for PP (fall) and pine-hardwood forests (spring). Use was less than expected for pine-hardwood forests (fall) and fields (summer). Use was as expected for PP, pine-hardwood, and hardwood forests and fields for the other seasons. In 1987, PP were used less than expected for all seasons. Use was more than expected for hardwood forests (spring and fall), pine-hardwood forests (summer and winter), and fields (spring). In spring and summer of 1988, use was as expected for PP for pine-hardwood and hardwood forests. Seasonal home range sizes averaged 656 ha (412–1,127 ha) in spring (Mar-May) and 701 ha (506–925 ha) in summer (Jun-Aug) 1986–88, and averaged 897 ha (837–946 ha) in fall (Sep-Nov) and 877 ha (409–1,345 ha) in winter 1986–1987.

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Ideal wild turkey habitat has been described as mature (mast bearing) hardwood and pine-hardwood forests that have an open understory with food producing shrubs and vines, interspersed with grassy openings and abundant water (Mosby and Handley 1943, Wheeler 1948, Holbrook 1973, Davis 1976). Areas dominated by large-block, even-aged, short-rotation (25–30 years) pine plantations (PP) were perceived to be poor turkey habitat (Stoddard 1963, Davis 1976).

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Habitat use and home ranges of wild turkey gobblers have been reported for various habitats in the Southeast (Speake et al. 1975, Wigley et al. 1986, Exum et al. 1987, Kelley et al. 1988, Smith et al. 1989). Our objectives were to determine gobbler habitat use and seasonal home range size in an area where large PP were the dominant habitat type.

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Methods

The original study area comprised 9,700 ha (66% in PP) in Kemper County, Mississippi. The study area was increased to include all the area utilized by radio-equipped turkeys. The expanded study area included 20,200 ha of which 45.2% was PP, 27.4% mature pine-hardwood forest, 16.3% mature hardwood forests (including streamside management zones), and 11.1% croplands or pastures in the Sucarnooche Creek bottom which bordered the study area on the southwest (Smith 1988, Burk 1989).

PP size averaged 26 ha (0.4–129 ha) and most (69%) PP were between 12 and 19 years old. The remaining PP were <12 years old. PP with similar ages were combined for silvicultural treatment purposes (e.g., control burn) and formed larger management units. Most PP were commercially thinned and control burned at least once during the last 5 years. Weyerhaeuser Company spur roads (gated) and county roads were interspersed throughout the study area.

Gobblers were captured by cannon-net at permanent bait sites ($N = 24$) on spur roads in PP in January-March and July-August 1986–1988. Each gobbler received color-coded and numbered patagial wing tags (cattle ear tags), leg bands, and 107-g transmitters (Wildlife Materials, Inc., Carbondale, Ill.). Transmitters were fitted "back-pack" style and usually had a motion switch. Gobblers were aged (Williams 1981) and released at their capture site.

Permanent telemetry stations ($N = 116$) established on roads throughout the study area allowed personnel to get close to radio-equipped gobblers. Gobbler locations were determined by triangulation (Cochran and Lord 1963) from 2 stations. Maximum time between consecutive fixes was 12 minutes; however, most intervals were <5 minutes. A hand-held 3-element directional yagi antenna and a TRX-1000S receiver (Wildlife Materials, Inc., Carbondale, Ill.) were used. Angles <25° or >155° usually were not accepted; however, some locations that exceeded these restrictions were accepted if the gobbler was seen (e.g., at the edge of a road). Accuracy tests of the telemetry system were conducted (Burk 1989).

Gobblers were located 3 times per day, 3 days per week from February to August and 2 times per day, 3 days per week from September to January. The order in which gobblers were located was changed regularly to ensure random sampling (Smith 1988).

A base map containing all PP and other stands by type was digitized from Weyerhaeuser Company information and ground surveys. Stand types were PP, pine-hardwood forest, hardwood forest (including SMZs), and non-forest (cropland, pasture). Telemetry data were placed into individual gobbler database files by season: spring (Mar-May), summer (Jun-Aug), fall (Sep-Nov), and winter (Dec-Feb). Point files (x,y coordinates) were created in Mississippi State Planer Coordinates by the program TBASE (Wynn et al. 1990), which is a modified TELEM program (Koeln 1980).

Random locations were generated onto the base map using the program RANDPLOT (Wynn et al. 1990) to determine random availability of each stand utilized by a radio-equipped gobbler. RANDPLOT was run separately for each season and each gobbler to report random locations for the different utilized stands and number of telemetry fixes for the respective season. A 2-sample test for equality of percentages was performed at the 95% confidence level (protected) on the habitat types to determine if gobbler use was less than, equal to, or more than expected. Only stands that were utilized were included in the analyses (Smith 1988).

Seasonal home ranges were determined by the minimum convex polygon method (Mohr 1947) using the program MCPAAL (v. 1.2). Harmonic mean transformations (Dixon and Chapman 1980) at the 80% contour level also were calculated. Individual gobbler point files were pooled by season within years to determine seasonal habitat use.

Results

Thirty-seven gobblers (24 adults and 13 juveniles) were captured. Legal harvest, other mortality, and transmitter failure reduced the sample size (Table 1). Telemetry error polygons averaged 0.26 ha.

During spring 1986 most (68%) gobbler locations were in PP, but use was as expected; however, use of pine-hardwood forests was more than expected (Table 2). In summer, most (61%) gobbler locations were in PP, but most habitats were used as expected, except fields which were used less than expected. Gobbler locations were more than expected in PP and less than expected in pine-hardwood forests in fall. All habitats were used as expected in winter.

During 1987, PP were used less than expected in all seasons. Pine-hardwood forests had the highest percentage of gobbler locations in each season and use was more than expected in summer and winter. Gobbler locations in hardwood forests were more than expected in spring and fall. Gobbler use of fields was more than expected in spring. During 1986–1987, gobblers used 151 PP with 90% used as expected or more than expected.

In spring and summer of 1988, most (73% and 64%, respectively) gobbler

Table 1. Radio-equipped wild turkey gobblers monitored for habitat use and home range analyses, Kemper County, Mississippi, 1986–1988.

Year and Season[a]	*N* turkeys used habitat analysis	*N* telem. locations[b]	*N* turkeys used home range analysis
1986			
Spring	7	296	5
Summer	4	150	2
Fall	4	144	3
Winter	6	93	1
1987			
Spring	7	256	5
Summer	3	90	1
Fall	3	56	3
Winter	2	71	1
1988			
Spring	12	1118	12
Summer	6	223	6

[a] Spring (Mar-May), summer (Jun-Aug), fall (Sep-Nov), winter (Dec-Feb).
[b]Locations used for both analyses.

Table 2. Habitat use by radio-equipped wild turkey gobblers, Kemper County, Mississippi, 1986–1988.

Year and Season[a]	*N* telem. locations	Habitat type[b]			
		PP	MF	HF	NF
		percent of locations			
1986					
Spring	296	67.6	27.4[c]	4.7	0.3
Summer	150	61.3	22.7	13.3	2.7[d]
Fall	144	42.4c	32.6d	17.4	7.6
Winter	93	25.8	43.0	11.8	19.4
1987					
Spring	256	23.4[d]	34.0	22.7[c]	19.9[c]
Summer	90	41.1[d]	58.9[c]	0.0	0.0
Fall	56	32.1[d]	42.9	12.5[c]	12.5
Winter	71	28.2[d]	50.7[c]	5.6	15.5
1988					
Spring	1,118	73.3	22.6	3.8	0.3[d]
Summer	223	64.5	33.2	2.2	0.0[d]

[a]Spring (Mar-May), summer (Jun-Aug), fall (Sep-Nov), winter (Dec-Feb).
[b]PP = pine plantation, MF = mixed forest (pine-hardwood), HF = hardwood forest (including SMZs), NF = non-forest (soybean field, pasture)
[c]Used more than expected ($P < 0.05$)
[d]Used less than expected ($P < 0.05$)

locations were in PP, but use was as expected. Use of pine-hardwood and hardwood forests was also as expected. In the spring, gobblers used PP ≤2 years old and 3–10 years old less than expected, and used PP >10 years old more than expected. In the summer, gobblers used PP ≤-2 years old less than expected and used the other age classes as expected.

Home range (HR) size averaged 656 ha (412–1,127 ha) in spring and 701 ha (506–925 ha) in summer 1986–1988 (Table 3). HR size averaged 892 ha (837–946 ha) in fall and 877 ha (409–1,345 ha) in winter 1986–1987. One gobbler that survived 4 consecutive seasons had an annual home range of 2,641 ha. Using the 80% harmonic mean method, average HR size was reduced by 55% (1986), 46% (1987), and 48% (1988).

Discussion

Gobbler use of PP varied by year and season. Gobbler use of PP was equal to or more than expected in all seasons in 1986, but was less then expected in all seasons in 1987. In spring and summer of 1988, use of PP was similar to 1987. A major shift in habitat use, reduced use of PP, and increased use of mature forests and fields was observed in the spring of 1987. Several factors could have affected gobbler habitat use.

Results may have been affected by sample size, but all gobbler home range and habitat use studies in the Southeast have had low sample sizes (Kennamer et al. 1980, Holbrook et al. 1985, Wigley et al. 1985, Exum et al. 1987, Smith et al. 1989).

Table 3. Average seasonal home ranges (ha) for wild turkey gobblers, Kemper County, Mississippi, 1986–1988.

Year and Season	Minimum convex		80% Harmonic	
	$\bar{x}$	SD	$\bar{x}$	SD
1986				
Spring	412	236	215	59
Summer	673	896	248	331
Fall	946	448	422	277
Winter	409	—	248	—
1987				
Spring	429	192	228	164
Summer	925	—	435	—
Fall	837	312	367	52
Winter	1345	—	524	—
1988				
Spring	1127	443	478	184
Summer	506	213	266	118

[a]Spring (Mar-May), summer (Jun-Aug), fall (Sep-Nov), winter (Dec-Feb).

Abundance of acorns in SMZs, hardwood forests, and pine-hardwood forests may have affected gobbler habitat use. From general observations, acorn production was high in these habitats in 1986–87 and low in 1987–88. Many gobblers were located in bottomland hardwood forests and adjacent soybean fields in the Sucarnooche Creek bottom in fall through spring 1986–87. Presence of SMZs in or adjacent to PP probably influenced gobbler habitat use directly by providing acorns and indirectly as travel corridors to other habitats. Gobbler use of SMZs on our study area was more than expected in 27 of 30 cases (10 seasons and 3 SMZ widths) from 1986–88 (Burk et al. 1990).

Each year we and deer hunters observed gobblers feeding on wheat and rye grass food plots planted on roadsides in PP. Also, some illegal piles (bait) of corn were present in some PP, and we had bait sites (corn) on many spur roads in PP during the capture periods. We do not know if these food sources influenced gobbler habitat use (Smith et al. 1990).

The entire area was leased for deer hunting. Hunting pressure was high including deer hunting with dogs; however, we doubt if this activity affected gobbler habitat use. Turkey hunting pressure was light in the PP and was moderate on the private lands in the Sucarnooche Creek bottom.

Gobbler habitat use in late winter through early spring may have been affected by hen movements. Many (36%–56%) of the total of radio-equipped hens in the same study area moved from PP to the creek bottom in the fall and returned to PP in late winter. Perhaps gobbler movements, thus habitat use, were affected by hen movements. There is some evidence for the existence of traditional wintering areas (Kulowiec and Haufler 1985). Sucarnooche Creek bottom might be such an area.

Comparisons of gobbler habitat use in our area with gobbler habitat use in other areas, even those with available PP, must be made with caution. Habitat use and HR data are affected by different PP type (e.g., slash pine, P. *elliotti*, PP age(s) and size, silvicultural treatments (e.g., thinning), percent of area in PP and other habitats, sample sizes and sampling intensity, and types of analyses. However, trends in gobbler use of PP have been observed. Gobblers used seedling and young sapling age (0–5 years old) PP (Holbrook et al. 1985, Holbrook et al. 1987, Wigley et al. 1986). Older sapling or small pole (5–15 years old) PP were not generally used (Kennamer et al. 1980, Wigley et al. 1986, Smith et al. 1989). PP age 3–10 years were not desirable wild turkey habitat, but gobbler use of PP >14 years old was higher than expected for all seasons in south Alabama (Exum et al. 1987). PP ≥ 16 years old were preferred in summer in Arkansas (Wigley et al. 1986), and PP ≥ 21 years old were preferred in Louisiana (Smith et al. 1989). In our study, gobblers used many PP (>10 years old) equal to or more than expected. These PP had been precommercially thinned and control burned at age 7–9 years old and had later been commercially thinned and control burned. These treatments enhanced turkey habitat conditions (Hurst 1981).

Wild turkey HR size in the Southeast has varied greatly and is influenced by many variables (Brown 1980). Seasonal HR sizes in our study were comparable to

those in other studies (Everett et al. 1979, Wigley et al. 1985, Exum et al. 1987, Kelley et al. 1988, Smith et al. 1989).

HR size may be a function of habitat quality (Porter 1977, Everett et al. 1979, Exum et al. 1987), suggesting that gobblers may move over larger areas in poor habitat(s) to meet their requirements (e.g., food) (Dalke et al. 1946). However, Everett et al. (1979) reported large winter HR sizes even when there was an abundant acorn crop in northwest Alabama. Gobblers have moved relatively long distances even when good habitat was available (Davis 1973, Godwin 1990). Gobblers are not sedentary but are highly mobile (Wigley et al. 1986, Kelley et al. 1988). HR size and movements might also be affected by social order (age class), dispersal, density, and hen movements (Davis 1973, Smith 1988).

HR size and movements were smaller, and turkey densities were higher in an area with a diversity of habitats (forests) and many openings (Barwick and Speake 1973, Speake et al. 1975). HR sizes were much larger in areas dominated ($\geq$90%) by forests with few openings (fields) (Everett et al. 1979, Wigley et al. 1986, Kelley et al. 1988). HR sizes may have been decreased by the presence of permanent and temporary fields (pastures) in an area composed mostly of PP (Smith et al. 1989). Differential use of habitats by hens and gobblers might also affect habitat use and HR size (Godwin 1991). Relationships of HR size, habitat use, and factors affecting them have not been adequately documented.

Our study area, with a preponderance of PP, has a huntable turkey population, and virtually all of the reproductive effort (nests, brood ranges) is conducted in PP (Smith et al 1990). The importance of pine-hardwood and hardwood forests, including SMZs, to wild turkey density has not been determined. Also, habitat spatial complexity might be a factor (Holbrook et al. 1987, Exum et al. 1987). Songer et al. (1989) reported that gobbler use of juxtaposition and edge surrogates was equal to availability, but significant differences were found for interspersion. Given we do not know the amount, combination, or distribution or mature forests necessary for maintaining a high density turkey population, forest managers should retain hardwood and pine-hardwood forests in areas dominated by PP.

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