

Wild Turkey Use of Loblolly Pine Plantations for Nesting and Brood Rearing

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Abstract: Wild turkey (*Meleagris gallopavo*) hens were monitored by telemetry from January 1987 through August 1988 in Kemper County, Mississippi. Thirty-nine of 52 hens reached incubation. Nesting success was 46% in 1987 and 36% in 1988. In 1987, all 12 located nests were in loblolly pine (*Pinus taeda*) plantations. Eleven hens nested in 17- to 19-year-old plantations; 1 hen nested in a 9-year-old plantation. In 1988, 21 located nests were in plantations and 1 hen was in a mature pine-hardwood forest. Most hens (81%) nested in plantations age 13–20 years old. Plantations used for nesting had been commercially thinned an average of 4 years (3–6 years) and had been control burned an average of 3 years (1–7 years) before being used. Hens with 1- to 14-day-old poults used mostly plantations (81%) 14–20 years old in both 1987 and 1988. These plantations had been thinned and burned 3–4 years prior.

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To increase wood production, many pine (*Pinus* spp.) plantations are being established in the South. There are about 1.2 million ha of pine plantations in Mississippi (Kelley 1990). Large block, even-age, short rotation (30–35 years) pine plantation management was thought to be detrimental to wild turkeys (Markley

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1967, Mosby 1975). Stoddard (1963) thought that short rotation forestry did not fit in with a game (wild turkey) program. However, Exum et al. (1987) reported wild turkey use of slash pine (*P. elliottii*) plantations in south Alabama. Documentation of wild turkey use of large tracts of midrotation-aged pine plantations for nesting and brood rearing is limited (Kennamer et al. 1980, Campo 1983, Holbrook et al. 1985, 1987, Bidwell et al. 1989).

An important part of the wild turkey life cycle is nesting and brood rearing. Managers should know what habitats are used for nesting and brood rearing and how silvicultural practices might affect these activities. The purpose of this study was to investigate wild turkey hen use of managed loblolly pine plantations for nesting and brood rearing.

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Methods

Study Area

The study area was in the Interior Flatwoods land resource area, Kemper County, Mississippi (Pettry 1977). In 1967, Weyerhaeuser Company purchased a 34,000-ha tract of mature pine-hardwood forest and during the 20 years preceding this study converted much of the tract to loblolly pine plantations. Following clear-cutting and site preparation, genetically improved, 1-year-old pine seedlings were hand-planted. Plantation size averaged 100 ha (65–202 ha). Some plantations were treated with herbicides at age 3–4 years to release pine saplings and most plantations were fertilized (urea, 181 kg/ha) at age 8–10 years. Some plantations were pre-commercially thinned at age 7–9 years, which reduced stocking from about 1,500 trees/ha to 750–1,000 trees/ha. Control burning in winter began at plantation age 9–10 years. Commercial thinning began at age 14–16 years and reduced stocking to about 300–450 trees/ha. A sawlog rotation of 30–35 years is planned. Site index for loblolly pine is 19.8 m at age 25 years (McKee 1972).

The study area consisted of 20,200 ha in the central part of the larger tract of which 45.2% was pine plantations, 27.4% was mixed pine-hardwood forests, 16.3% was in hardwood forests and streamside management zones, and 11.1% was in non-forest habitats (pasture, cropland, old field) (Smith 1988, Burk 1989).

Hen Capture and Telemetry

Wild turkey hens were captured during July–August 1986 and 1987 and January–March 1987 and 1988 by cannon-netting at bait sites on spur roads in plantations. An 170-g battery-powered transmitter with an activity switch (Wildlife Materials,

Inc., Carbondale, Ill.) was placed "backpack-style" on each hen. Hens were aged, marked with black (white numbers) patagial wing tags (cattle ear tags, Allflex, Vet Brand, Inc., Torrance, Calif.), and released at their capture site.

Permanent telemetry stations ($N = 116$) were established on roads throughout the study area. There were many company and several county roads which permitted personnel to get close (<0.5 km) to radio-equipped hens. Hen locations were determined by triangulation (Cochran and Lord 1963) from 2 telemetry stations nearest the turkey. The time limit 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 for telemetry. Angles <25 degrees or >155 degrees were generally not accepted. Accuracy tests produced a mean estimated error polygon of 0.26 ha (Burk 1989).

All hens were located 3 times/day and 3 days/week from late February through late August. Hens found in the same location for 2 consecutive days in the nesting season were considered to be incubating and were checked daily. On day 12-14 of incubation, the hen (nest site) was approached to about 50 m and several azimuths were taken surrounding the hen so the nest site could be found later (Campo 1983). Upon hatching, nest abandonment, predation, or 30 days after incubation began, the nest site was located and nesting effort (number of eggs laid and hatched) data were recorded. Characteristics of plantations used for successful nesting, i.e. hatched eggs, were compared to plantations used for unsuccessful nest attempts by a 2-way analysis of variance for unbalanced data using the statistical software BDLSTAT (Leopold 1986).

Upon hatching, hens assumed to have poults (hatched eggs in nest) were located 3 times/day for the first 14 days post-hatch. Speake (1980) reported that poults suffer the highest mortality during the first 2 weeks post-hatch. On the 14th day post-hatch, the hen and brood were flushed or observed to confirm that the hen had poults. Hens with at least 1 poult were used to delineate brood habitat. Brood range size was calculated by the minimum convex polygon method (Mohr 1947) using the program MCPAAL.

A base map and stand file containing all plantations, other habitats, and plantation or other habitat characteristics, such as age and silvicultural treatments, were developed in the Mississippi Remote Sensing Center using Weyerhaeuser stand maps set in Mississippi State Planer Coordinates. Telemetry data were separated into data-base files by brood hen. Point files (X-Y coordinates) were created by the program TBASE (Wynn et al. 1990), a modified TELEM program (Koeln 1980).

To estimate available habitat for nesting and/or brood rearing, a line was drawn which encompassed the telemetry fixes and home ranges of all hens. A 2-sample test for equality of percentages (Zar 1984) was used to compare ($\alpha = 0.05$) hen use to random expected use of habitats.

While traveling on the study area we also recorded observations of hens with broods and their associated habitat type(s).

Results

Seventy-four hens were captured; 52 were alive with functioning transmitters during the 2 reproductive periods we studied. Fourteen of 17 hens (82%) incubated in 1987, and 25 of 35 (71%) incubated in 1988. We located 12 nests in 1987 and 22 in 1988. Exact location of some nests was not determined because they were destroyed by predators before the 12th day of incubation. Nest success was 46% (5 of 14) in 1987 and 36% (9 of 25) in 1988.

In 1987, 11 of 12 nests were in pine plantations age 17–19 years old (\bar{x} = 17.6 years). One nest was in a 9-year-old plantation that had not been burned, but had been precommercially thinned at age 7 years (Table 1). The 11 older plantations had been burned at least once, an average of 3.8 years (2–6 years) before being used for nesting by radio-equipped hens. Commercial thinning had occurred an average of 4.5 years (3–6 years) prior to their being used for nesting by radio-equipped hens. One 18-year-old plantation, thinned 5 years and burned 6 years prior, was used for nesting by 3 hens at the same time.

In 1988, 19 of 21 nests were in plantations 10–20 years old (\bar{x} = 16.6 years). One nest was located in a 1-year-old plantation and 1 nest was in a 6-year-old plantation. The older (>13 years) plantations had been burned at least once, an average of 2.7 years (0.3–7 years) prior to their being used for nesting by radio-equipped hens. Thinning had occurred an average of 4.3 years (1–7 years) prior to being used for nesting. One hen nested in a 17-year-old and renested in a 19-year-old plantation in 1987, and nested in an 18-year-old plantation in 1988. These plantations had been burned 2, 4, and 3 years ago and had been thinned 4, 6, and 5 years ago, respectively. One hen nested in a mature pine-hardwood forest.

Use of plantations for nesting was greater than expected ($P < 0.05$) in both years. The 5 nest sites we were not able to find also were located in plantations.

Characteristics (age, years since treatment) of plantations used for successful and unsuccessful nesting attempts were not different ($P > 0.05$) in 1987 or 1988. Number of years since burning was significant at $\alpha = 0.10$, indicating with a larger sample size, years since burning may play a role in nesting success. Nests appeared to be more successful when years since burned was between 3.5 and 4.0.

Five hens had broods at 14 days post-hatch and brood ranges averaged 102 ha

Table 1. Characteristics of pine plantations used for nesting by wild turkey hens in Kemper County, Mississippi, 1987 and 1988.

Year	N nests	\bar{x} Stand age in years	\bar{x} Years since treatment		\bar{x} No. times burned
			Thin	Burn	
1987	12	16.9 (9–19)	4.5 (3–6)	4.2 (2–6)	1.3 (1–2)
1988	21	15.4 (1–20)	4.3 (1–7)	2.7 (0.3–7)	1.4 (1–3)

(50–169 ha) in 1987. Distance from nest sites to brood range averaged 0.44 km (0.12–0.91 km). Most brood habitat use was in plantations (81%), followed by pine-hardwood forest (17.5%), hardwood forest (1.3%), and non-forest (0%). Use of habitat types was as expected, i.e. not different ($P > 0.05$).

Five plantations were used differently ($P < 0.05$) than expected (2 $>$ and 3 $<$), although their silvicultural treatments were not different ($P > 0.05$). Plantations used as brood range averaged 15.6 years old, had been burned an average 2.9 years ago, and had been thinned an average of 4.1 years ago (Table 2). Six plantations used by hens with broods also had been used for nesting.

In 1988, 9 hens had broods at 14 days post-hatch, and brood ranges averaged 118 ha (38–255 ha). Brood habitat use was mostly in plantations (81%), followed by pine-hardwood forest (8.1%), hardwood forest (8.2%), and cut-over hardwood forest (2.7%). Eighty percent of the plantations were used as much as or more than expected ($P < 0.05$). Four plantations used as much as or less than expected had not been thinned. Use of hardwood forest and streamside management zones was as expected. Use of pine-hardwood forests was as much as or less than expected for 1 stand and as much as or more than expected for 2 stands.

Ninety-two percent (1987) and 86% (1988) of observations of hens with poults of all ages were associated with plantations. Remaining observations of broods were associated with streamside management zones, a pine-hardwood cutover, or fields.

Discussion

Pine plantations accounted for 45% of the study area, and all nests except 1 were in plantations. While all hens were captured on spur roads in plantations, many hens, 36% (1986–1987) and 54% (1987–1988), left the plantations in the fall and spent the winter in Sucarnoochee Creek bottom, a large complex of mature hardwood forests and soybean and old fields on the southern edge of the study area. However, these hens returned to plantations in early spring for nesting and brood rearing (Smith 1988, Burk 1989). Movement of hens to plantations, away from other habitat types in their winter ranges, indicated a selection for plantations. Smith and Teitelbaum (1986) reported that during the spring, turkey hens preferred intermediate (11- to 20-year-old) pine plantations in southeastern Louisiana.

Table 2. Characteristics of pine plantations used for brood ($N = 14$) habitat by wild turkey hens in Kemper County, Mississippi, 1987 and 1988.

Year	No. plantations	\bar{x} Stand age in years	\bar{x} Years since treatment		\bar{x} No. times burned
			Thin	Burn	
1987	19	15.6 (12–19)	4.1 (3–6)	2.9 (1–6)	1.5 (1–2)
1988	30	15.6 (1–20)	4.3 (1–7)	2.9 (0.3–7)	1.4 (1–3)

Wild turkeys nest in a variety of habitats, including old fields, cut-overs, pine plantations, and other forest types (Speake et al. 1975). In our Mississippi study area, hens rested almost exclusively in pine plantations. In southern Alabama, where 73% of a study area was in slash pine (*P. elliottii*) plantations, Exum et al. (1987) found 70.8% (34 of 48) of the turkey nests in plantations. Plantation age in Alabama varied from 6 months to 44 years, with a similar percent of nests in <8 years old, 8–12 years old, and >12 years old. Most older plantations had been burned but not thinned (Exum et al. 1987).

Hens nested in plantations that had been thinned and burned at least once. However, time since thinning (1–7 years) and burning (3 months–6 years) varied widely. Stoddard (1963) thought that for nesting, hens preferred brushy clumps in open woodlands that had escaped fire for 2–5 years. Exum et al. (1987) found that hens preferred plantations that had not been recently burned: 51% of nests were in plantations that had never been burned, 38% in plantations burned 3–4 years previously, and only 11% in plantations burned 1–2 years prior.

Nest success rates of 46% (1987) and 36% (1988) for nests that reached the incubation stage in this study were similar to the overall (3 years) 45.8% reported for slash pine plantations in Alabama (Exum et al. 1987). Everett et al. (1980) reported an overall nest success rate of 56%, with annual rates of 33%, 72%, and 38% for 3 consecutive years. Mosby and Handley (1943) reported a nesting success rate of 33% in Virginia and Williams et al. (1968) reported a success rate of 37% in Florida.

Wild turkey hens use a variety of habitat types for brood rearing, including bottomland hardwood forests (Phalen et al. 1986) and fields (Speake et al. 1975). In our study, hens primarily used pine plantations for brood rearing. Some hens nested and attempted to raise their poults in the same plantation. Few telemetry fixes of hens with broods <14 days old were near spur roads or on edges of plantations; most fixes were in plantations. Plantations used for brood habitat had been burned about 3 years (3 months–7 years) and thinned about 4 years (1–7 years) prior to being used. Exum et al. (1987) reported that hens with poults younger than 9 weeks old almost exclusively used slash pine plantations >10 years old. Hens with broods utilized areas burned within 1–2 years and almost entirely avoided areas not burned for more than 2 years. They reported a brood range size of 173 ha for hens with broods 1–4 weeks old. In mature bottomland hardwood forests, Phalen et al. (1986) reported an average brood range size of 103 ha (1984) and 146 ha (1985) for poults age 1–14 days. Our brood ranges for poults 1–14 days old averaged 102 ha (1987) and 118 ha (1988).

Site and stand conditions, including tree crown features, found in slash pine plantations are not comparable to those in loblolly pine plantations. Therefore, age or condition of plantations used for nesting or brood rearing by turkeys should be designated by species of pine.

Loblolly pine plantations were the habitat type used by wild turkey hens for nesting and brood rearing. These midrotation-aged plantations had been burned and thinned at least once. Hens accepted a wide range of time (years) since the silvicultural

tural treatments. A 3- to 4-year burning rotation appears to be adequate for maintenance of nest and brood habitat.

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