Relationships of Gobbler Population Size to Harvest Characteristics on a Public Hunting Area in Mississippi

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Abstract: Wildlife managers on public hunting areas are accountable for hunter success rates, annual harvest, and wildlife population size. Understanding the effect of changes in numbers of wild turkey gobblers (*Meleagris gallopavo*) on harvest characteristics is needed. Population size and harvest characteristics were studied for 9 years on a 14,140-ha public hunting area in central Mississippi. Male wild turkey population size averaged 82, hunter effort averaged 455 hunter-days per season, and an average of 35 male turkeys was harvested per season. Hunter success rates averaged 7.7%, 2.1%, and 5.6% for all males, subadults (jakes), and adults (gobblers), respectively. For male turkeys released in the winter capture period (7 Jan–4 Mar) and subsequently harvested that spring (15 Mar–1 May), harvest rates averaged 22.1%, 15.0%, and 35.4% for all males, jakes, and gobblers, respectively, from 1984 to 1992. Hunter effort was not correlated with male harvests ($P = 0.198$). Population size was correlated with hunter success rate ($P = 0.053$) and number harvested ($P = 0.072$). The population declined during the study and it became increasingly difficult for a hunter to be successful, and, in turn, hunter effort eventually decreased.

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With the increase in wild turkey populations over the past 30 years, greater demands have been placed on this species by hunters (Mosby 1973, Wunz 1982,

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Palmer et al. 1990). As turkey hunting pressure increased, open access to private land has become limited throughout the Southeast and more turkey hunters are utilizing public hunting areas. Wildlife managers know that turkey populations may fluctuate widely. However, little information is available concerning how turkey population dynamics may relate to environmental factors and harvest on public hunting areas. The objective of this study was to examine relationships between male wild turkey population size and harvest characteristics on a public hunting area in Mississippi.

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Methods

Study Area

The study area was Tallahala Wildlife Management Area (WMA), a 14,140-ha tract of the Bienville National Forest and adjacent lands, in Jasper, Newton, Scott, and Smith counties, Mississippi. Mature pine (*Pinus* spp.) stands, pine-hardwood stands, and pine regeneration areas comprised 67% of the area. Loblolly pine (*P. taeda*) is the dominant species. Bottomland hardwood and hardwood regeneration stands comprised the remaining 33%. There was a legal hunting season for male turkeys on the WMA each spring (15–20 Mar to 1 May); there was no fall turkey season.

Data Collection and Analysis

Males were captured by cannon-netting (Bailey 1976) or drugging with alpha-chloralose (Williams 1966) from 7 January to 4 March and 1 July to 25 August 1983–92. Each male was aged (Williams 1981) as a subadult (jake) or adult (gobbler) and marked with 2 patagial wing tags (Knowlton et al. 1964) and 2 numbered metal leg bands. Male population size was estimated immediately before the beginning of each spring hunter harvest using Buckland's (1980) modified Jolly-Seber model. Because of the number of turkeys known to die through harvests and telemetry (Godwin et al. 1991), we believed the Buckland capture-recapture model was most appropriate for use in our study because it incorporates data on turkey deaths (Lint 1990).

Six self-service permit stations were located throughout Tallahala WMA. Hunters were required to pick up and fill out a new permit (name, address, and date) and display it on their vehicle each day of hunting. Palmer et al. (1990) reported a return rate of >85% on permit cards on Tallahala WMA. The number of permit cards returned was used to estimate hunter effort (hunter-days) per season. Hunters were required to bring all harvested gobblers to Tallahala WMA headquar-

ters. Lint et al. (1992) derived the effective study area size for Tallahala WMA. Although turkeys killed outside the WMA were also brought to headquarters, only those harvested on the area were used in analyses. Gribben (1986) reported a 95% check-in rate for harvested gobblers on Tallahala WMA.

Hunter success rate was calculated as the percent harvested per hunter-days. Harvest rate was defined as the percent of the number of tagged males harvested per the number of males tagged and released during the preceding winter capture period. Correlation analysis was performed to examine relationships among population size estimates, hunter effort, harvest, harvest rate, and hunter success rate. Number harvested, harvest rate, and hunter success rate for jakes (sub-adults), gobblers (adults), and all males (jakes and gobblers) were used in the analyses. Tests for significance were made at alpha = 0.10 level.

Results

The male segment of the turkey population was relatively high in 1984–88 (Table 1). Following relatively high reproduction in 1987, population estimates increased in 1988. A population decline began in 1989 and poor reproduction occurred through 1991. Hunter effort varied from 321 hunter days in 1991 to 594 days in 1989, and harvest ranged from 16 birds in 1992 to 53 birds in 1987.

Hunter effort ($r = 0.14$, $P = 0.725$) was not correlated with male population size. However, population size was correlated with hunter success rate for all males ($r = 0.66$, $P = 0.053$) and gobblers ($r = 0.60$, $P = 0.089$). Harvest (all males: $r = 0.63$, $P = 0.072$; gobblers: $r = 0.59$, $P = 0.092$) was correlated with population size. Percent jakes in the harvest was not correlated with total male population size

Table 1. Male wild turkey population estimates, harvest, and hunter effort and success, Tallahala Wildlife Management Area, Mississippi, 1984–1992.

				All males		All males		Gobblers	
	Population		Effort		Hunter		Hunter		Hunter
Year	N[a]	CV(N)[b]	(Permits)	Harvest	success[c]	Harvest	success	Harvest	success
1984	123	0.18	476	59	12.4	14	2.9	45	9.5
1985	78	0.15	443	49	11.1	12	2.7	37	8.4
1986	98	0.12	497	50	10.1	14	2.8	36	7.2
1987	78	0.26	593	53	8.9	17	2.9	36	6.1
1988	102	0.24	406	21	5.2	5	1.2	16	3.9
1989	62	0.19	594	20	3.4	2	0.3	18	3.0
1990	78	0.72	415	28	6.7	13	3.1	15	3.6
1991	72	0.40	321	21	6.5	9	2.8	12	3.7
1992	49	0.53	346	16	4.6	0	0.0	16	4.6
$\bar{x}$	82.2		454.6	35.2	7.7	9.6	2.1	25.7	5.6
SD[d]	22.3		96.5	17.1	3.1	5.9	1.2	12.6	2.3

[a] N = Wild turkey gobbler population size, Buckland (1980) estimate.
[b] CV(N) = Coefficient of variation of N.
[c] Hunter success = N harvested per 100 hunter-days (effort).
[d] SD = Standard deviation of average ($\bar{x}$).

Table 2. Male wild turkeys marked and released in winter capture period and subsequently harvested, Tallahala Wildlife Management Area, Mississippi, 1984–1992.

	All males			Jakes			Gobblers		
Year	Released	Marked in harvest	Harvest rate	Released	Marked in harvest	Harvest rate	Released	Marked in harvest	Harvest rate
1984	14	3	21.4	9	2	22.2	5	1	20.0
1985	53	22	41.5	9	4	44.4	44	18	40.9
1986	40	16	40.0	21	6	28.6	19	10	52.6
1987	20	3	15.0	7	1	14.3	13	2	15.4
1988	37	7	18.9	7	0	0.0	30	7	23.3
1989	25	4	16.0	7	1	14.3	18	3	16.7
1990	7	1	14.3	6	0	0.0	1	1	100.0
1991	14	1	7.1	9	1	11.1	5	0	0.0
1992	4	1	25.0	2	0	0.0	2	1	50.0
Total	214.0	58.0	199.3	77.0	15.0	134.9	137.0	43.0	318.9
$\bar{x}$	23.8	6.4	22.1	8.6	1.7	15.0	15.2	4.8	35.4
SD[a]	16.5	7.5	11.7	5.2	2.1	15.0	14.4	6.0	29.8

[a] SD = Standard deviation of average ($\bar{x}$).

($r = 0.31$, $P = 0.417$). Number harvested was correlated with hunter success rate (all males: $r = 0.94$, $P < 0.001$).

Number of males captured/marked and released during the winter period that were subsequently harvested the following spring varied from 1 in 1990 and 1992 to 22 in 1985 (Table 2). Male harvest rate ranged from 14.3% to 41.5%. Hunter success for gobblers was correlated with total male harvest rate ($r = 0.64$, $P = 0.067$).

Discussion

Hunter effort declined during the study, but there was no immediate response in effort due to changes in wild turkey population size. However, a lag in response may have existed. As in other studies (Lewis 1975, Williams and Austin 1988), we found no relationship between hunter success rates and hunter effort. Hunter effort was not correlated with harvest for all males, jakes, or gobblers. However, studies have reported direct relationships between total hunter effort and harvests (Degraff and Austin 1975, Williams and Austin 1988). Although Palmer et al. (1990) stated that, on Tallahala WMA, increased hunter effort will increase harvests while decreasing hunter success per hunter, we found, with 3 years of additional data collection, hunter success rate and harvest were not related to hunter effort. We found number harvested and hunter success rates for all males and gobblers were related to population size. Additionally, jake harvest was not related to population size or hunter effort.

As the male segment of the population declined on Tallahala WMA, hunter success rate decreased. Characteristics of the low population size that reduced success were fewer male wild turkeys available and reduced gobbling levels. Both of these factors reduced the likelihood of hunter-turkey interactions. After 4 consecutive years of lower population size, hunter effort decreased.

In New York, Porter et al. (1990) hypothesized that density-independent elements, and not fall hunter harvest, regulated wild turkey populations in most years. Supporting studies conducted on our study area indicated density-independent factors (e.g., weather, mast production) may have influenced population numbers (Lint 1990) through low recruitment and increased susceptibility to predation (Seiss 1989, Palmer 1990).

Our results suggest harvest and hunter success rate are directly related to population size. We hypothesize that despite effort expended by hunters in the spring season, success was regulated by population numbers that were influenced by external factors. Population size estimates increased from 1987 to 1988 then dropped in 1989. These estimates corresponded well with field observations made (telemetry on nesting hens, ancillary observations, bait site-use) when reproduction in 1986 and 1987 was relatively high (Seiss 1989). However, reduced turkey physiological condition from environmental factors, drought and mast failure, and increased nest predation during 1988, decreased the population size in 1989. Palmer et al. (1990) hypothesized that gobbling was reduced during the period of poor physiological condition. Additionally, telemetry and population research conducted on the area simultaneously with this study (Seiss 1989, Lint 1990, Palmer 1990) indicated that due to the period of drought and low mast, bait site-use decreased, nesting and reproduction decreased, predation increased, disease increased, weights of harvested gobblers were lower, and average incubation date for hens was latest in 1988.

Although habitat may be provided and managed and harvest regulations established, it seems wild turkey population numbers will fluctuate greatly among years due to density-independent factors. However, habitat management and harvest regulation help maintain wild turkey populations during critical periods of poor physiological condition. Additional management techniques were employed on Tallahala WMA that may have helped to lessen impacts on wild turkeys during these critical periods. These techniques included the 1986 establishment of a walk-in hunting area on the study area which prohibited motorized vehicles during the spring gobbler season (Steffen et al. 1988), and the closure of gates on Forest Service roads to limit access during turkey nesting and brood rearing.

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