A STUDY OF A WILD TURKEY POPULATION IN THE ATCHAFALAYA RIVER BASIN OF LOUISIANA

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ABSTRACT

Population level and habitat selectivity of an introduced population of the wild turkey, *Meleagris gallopavo* L. was investigated during 1969 and 1970 on a 17,000 acre area of bottomland hardwoods.

A cover type map was developed to give reconnaissance evaluation of forest types and detailed analysis of vegetative plots furnished a more complete characterization. Five environment types were subsequently revealed; hardwood or glade bottoms, swamp bottoms, clearings, a small live oak grove, and a limited stand of willows. Vegetative analysis indicated that sweetgum, hackberry, and water oak were dominant tree species in the forest overstory. Poison ivy, peppervine, Virginia creeper, blackberry, and rattan were major species in the understory.

Fifty-five turkeys were trapped and marked with colored patagial wing streamers. Of 202 subsequent sightings, the majority were collected in openings and adjacent hardwood bottoms. The maximum dispersal recorded for any one turkey from the point of capture was 8 miles and the mean movement was calculated at 1.39 miles. Little correlation was detected between seasonal movements and habitat usage.

An average estimate of 120 turkeys, or one turkey for each 108 acres was derived through three censusing methods.

INTRODUCTION

Historical abundance and subsequent reduction of the wild turkey, *Meleagris gallopavo* L., in the United States have been well documented. According to Wright (1914) turkeys were plentiful prior to 1540 in what is now the southeastern and southwestern states. Turkeys were numerous in the early 1800's in the northern Mississippi valley (Schorger, 1942) and Audubon found them "tolerably abundant" in his travels throughout the southeast and midwest during the same period (M. Audubon, 1897). By 1925, however, the numerical status and geographic distribution of this avian species had significantly diminished due to habitat depletion, exploitation, and disease proliferation (Aldrich, 1967; Hollis, 1950; Schorger, 1966).

Reintroduction of wild trapped birds has since proven to be an important ameliorative procedure in turkey management. As trapping methods improved, the ability to capture wild turkeys progressed concomitantly and opened the possibility for re-establishment of this exceptional game bird over much of its original range. To successfully implement restocking programs, however, it is imperative that conditions of preferred habitat be elucidated. This knowledge can be obtained by studying either an endemic population or one that has been satisfactorily stocked (Leopold, 1944).

Investigations of turkey habitat have recently been conducted in several localities. Ellis and Lewis (1967), in Missouri, concluded that open water, reduc-

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tion of poaching, and artificial winter feeding were integral parts of a program to manage turkeys on less than 10,000 acres. Supplementary feeding of shelled corn and milo maize was considered by Thomas, et. al. (1966) to limit pronounced shifts between summer and winter ranges in Texas. Taylor (1969) studied movements of stocked turkeys in northcentral Louisiana and has shown that birds heavily utilize openings and hardwood bottoms as feeding, roosting, and loafing sites.

Forty-three eastern wild turkeys, *M. g. silvestris*, were released during 1965 and 1966 on a 17,000 acre area in the Atchafalaya river basin near Lottie, Louisiana. This introduction has resulted in a huntable population and we, therefore, initiated a study in the summer of 1969 to determine subsequent population and habitat selectivity of turkeys inhabiting this area.

METHODS

Capture and Marking

To determine population size and define habitat utilization turkeys were trapped and artificially marked from August 15, 1969 until February 8, 1970. All trapping was accomplished with a 60 x 40 foot rocket projected net on pre-established bait sites. When trapped, turkeys were immediately twisted in the net to avoid feather loss and prevent injury. Birds were then individually extracted, aged, sexed, marked, banded, and released at the capture site. Age determination was restricted to either immatures (hatching year) or matures (after hatching year) based upon size of the bird or on feather development (McDowell, 1956; Mosby and Handley, 1943). Sexing was by distinction of breast feather coloration (Taber, 1963) and overall size and appearance (Latham, 1956).

Each turkey was marked for future identification with bright colored patagial wing streamers similar to those described by Knowlton, Micheal, and Glazener (1964). Streamers were of plasticized nylon fabric cut into 1½ x 6 inch strips and were affixed to each wing just below the anterior patagial tendon with aluminum button tags (Figure 1). Every bird within a trapped group received the same colored streamer to enable study of movements and flocking configurations.

Population Enumeration

Approximations of the number of turkeys on the study area were derived through the Peterson, Schnabel, and Moran-Chapman methods of population estimation. We utilized a ratio of marked to unmarked birds from visual observations (Peterson, 1896) in application of the Peterson index. The Schnabel method is also based on sightings of marked individuals and is referred to as a multiple census denoting the characteristic accumulation of data over a given period of time (Schnabel, 1938). Sightings were assembled concurrently with marking procedures and the consequent ratios summed.

Moran (1951) and later Chapman (1955) developed a procedure whereby the number of individuals recaptured or sighted could be plotted graphically against the number previously captured and the population estimate derived from the resulting regression line. The slope of the line indicated the probability of sighting a turkey and the point of intersection on the X axis gave the population estimate. All sightings over a nine month period were applied to this indicator.

Habitat Analysis

Vegetative profiles of the study area were developed to evaluate turkey habitat preferences and utilization. A cover type map was produced by examining 1/5 acre plots in accordance with a method introduced by Wight (1939). We also examined plots along a compass line, at five chain intervals, for a more detailed analysis of vegetative composition and structure. Location of compass lines was

Figure 1. Location and type of streamers applied to turkeys.

determined by information from the type map and from data collected on turkey movements.

According to Oosting (1948), nested plots are the most productive sample in stratified vegetation. Plots analyzed in the present study consisted of two concentric circles and a centrally located quadrat. The outer circle was 1/5 of an acre and all trees 9 inches diameter at breast height (dbh) and above were identified and recorded. The inner circle was 1/20 of an acre and all trees 1 to 4 and 5 to 8 inches dbh were recorded. The quadrat sample was a milacre (43.56 square feet) and all vegetation up to a height of 5 feet was recorded.

Data from detailed samples were analyzed for each vegetative species. Three quantitative and one qualitative characteristics were obtained (Table 1). Relative frequency, relative density, relative dominance, and an index of importance were ascertained for each species in relation to its respective habitat type. Plants were sampled according to three strata and the analysis of data

corresponded with this partitioned approach. We designated the strata as ground level (quadrat sample), subordinate layer (1/20 acre sample), and dominates (1/5 acre sample). Ground level was analyzed for both summer and spring sampling periods while the remaining two strata were evaluated as a total of both periods since their complexities were unaffected by seasonal changes.

Curtis and McIntosh (1951) applied a summation index, which they termed an importance value, to each species sampled. This value gives an indication of the position or rank of a species in relationship to other plant groups. The same index has been adopted for this study and was calculated for all three strata.

Habitat Utilization

Sightings of marked and unmarked turkeys were obtained to gather data on the type and extent of habitat being utilized. Information was collected on sex composition, date and location of the observation, and streamer coloration. Data on turkey mobility, including distance from the capture site, and movements in relation to feeding activities were also compiled. Movements were analyzed in respect to the distance (maximum and mean) travelled from the point of capture and in relation to seasonal shifts. Correlations were then attempted between mobility during a respective season and habitat preferences.

Flocking behavior and the effect of streamers on unmarked birds were recorded. Egress from or immigration into a flock by marked birds was noted as was autumnal assemblage and vernal dispersal.

RESULTS AND DISCUSSION

Population Characteristics

Twenty-four bait sites were established during the seven month period from August 15, 1969 to February 8, 1970. Sixteen sites were sufficiently utilized to warrant trapping attempts and nine attempts were successful. We marked fifty-five turkeys with wing streamers; although 5 birds were trapped twice for a total trapping effort of 60 birds. An average of 3.75 turkeys were captured per attempt, or 6.66 for each successful attempt.

Sex, age, and hen poult composition of the trapped sample is given in Table 2. Females constituted 56 percent of the entire sample and 55 percent of the nonadult sample. Powell (1963) examined fall hunting samples of 1,807 birds in Florida and reported that of adults, females were preponderant (55 percent) and occurred at a level of 57 percent in the immature portion of the sample. However, Gainey (1954), also in Florida, found that of 682 trapped turkeys 68 percent of the total sample and 81 percent of the immature sample were females.

The age composition in the current study was 8.16 juveniles per adult. Immatures, thus, represented 89.1 percent of the sample, a figure considered unrealistically high and probably caused by differential trapping of subadults. Young birds were less successful than adults in outjumping the net, they were considerably less wary, and less able to escape once they were entrapped in the net. A more normal age ratio for turkeys seems to be 60:40 in favor of subadults (Mosby, 1967).

For the same reasons indicated above, that immatures were more susceptible to capture, the ratio of hen to poults in the sample was considered nonrepresentative of the population. There were 4 hens and 49 poults captured, or 12.25 subadults for each hen. Additional data from direct observations on 11 hens suggests that a ratio of approximately 6 poults per hen occurred on the study area.

Population Enumeration

A total of 297 observations; 126 with markers, 171 without, were collected in a seven week period for use with the Peterson method. An estimate of 129.7

turkeys for the area was calculated. We recorded 202 color sightings over a nine month period and applied these to the Schnabel estimation. A gradual or smooth estimate was obtained after 179 successive sightings and an estimate of 114.46 turkeys was determined. The number of turkeys sighted (both marked and unmarked) for 21 observational periods was averaged (Y) and plotted against the number of birds previously marked (X) for use with the Moran-Chapman method. A regression line was then applied and the population obtained from the point of intersection on the horizontal axis. The X intercept was 115.91 and can be interpreted as the population estimate since the probability of sighting a turkey, as implied in the procedure, is a linear relationship to the number of birds formerly marked.

Since the Schnabel method accumulated ratios on all sightings it was perhaps the single most accurate estimator available with the type of data collected, however, an average of these three methods (120 turkeys) would probably be a conservative approximation of the population during the sampling period. If 120 turkeys occurred on the area then the density was approximately one turkey for each 108 acres, or 6 birds per square mile.

Habitat Analysis

The most extensive forest continuum revealed by the cover type map was the hardwood bottoms. This area was characterized by three tree species; although others occurred at varying frequencies. Sweetgum, *Liquidambar styraciflua*, hackberry, *Celtis laevigata,* and water oak *Quercus nigra,* were the principal trees while green ash, *Fraxinus pennsylvanica,* sycamore, *Platanus occidentalis,* pecan, *Carya aquatica,* Nuttall oak, *Quercus nuttallii,* and American elm, *Ulmus americana,* were secondarily distributed. The understory of the bottoms was composed primarily of poison ivy, *Toxicodendron radicans,* peppervine, *Ampelopsis arborea,* and blackberry, *Rubus* spp. As a fairly contiguous community this area was considered a sweetgum, hackberry, and water oak association.

Four other habitat types occurred on the study area. Swamp bottoms were typified by bald cypress, *Taxodium distichum,* tupelogum, *Nyssa aquatica,* willow, *Salix nigra,* pecan, and green ash. The only understory species occurring with any frequency in the swamp bottoms was buttonbush, *Cephalanthus occidentalis.* Pipeline rights of way and roadways provided the main openings. Rights of way were usually planted to oats, rye grass, and wheat, The remaining two vegetative types, a small live oak grove, *Quercus virginiana,* and a homogenous stand of willow were considered too small to appreciably benefit turkeys.

The most significant value we obtained through acute evaluation of 133 sample plots (55 in August, 1969 and 78 in May, 1970) was the importance index which was developed for 18 species in the overstory (Table 3) and for 17 species in the understory (Table 4). A species with an importance value of 8.00 or over was considered dominant in its respective stratum and a value of from 4.00 to 7.99 was considered indicative of subdominance. Three species, sweetgum, hackberry, and water oak were dominant and nine were subdominant in the overstory and four species, poison ivy, peppervine, Virginia creeper, and blackberry were dominant and eleven subdominant in the understory (See Tables 3 and 4).

The importance values reported here are indications of relative rank of the species recorded. Physiological, climatological, and edaphic characteristics were not evaluated in this study and, therefore, were not considered in ranking species for their importance.

Turkey Movements and Behavior

Over the nine month period we collected 202 color sightings on the 55 tagged

turkeys (Table 5). The streamers were easily recognized at several hundred yards with 8 x 50 binoculars; very little fading was evident throughout the observational period. An average dispersal of 1.39 miles from the capture site was determined and a maximum movement was recorded at 8.00 miles. This information is similar to that obtained by Taylor (1969) in northcentral Louisiana. He found, through telemetric investigation, that turkeys moved an average of 1.29 miles from the point of capture.

Three of the nine groups trapped were observed during each seasonal period and all groups were sighted during the winter and spring. From data collected, there appeared to be an increase in overall movement from autumn to spring which is evident from examination of mean and maximum movements (Table 6). There may be several factors responsible for an expansion of turkey range during winter and spring months: (a) most of the birds trapped were subadults and their range may have increased as they matured; (b) during autumn and winter turkeys rely heavily upon mast produced by oaks, pecan, and hackberry and movements would be confined to areas possessing these species, however, with spring vegetative resurgence turkeys would be more capable of expanding their ranges; (c) as mating and nesting seasons approach movements may intensify and thereby be reflected in subsequent sightings, and; (d) increase in movements may have been a reaction to pressure applied by spring gobbler season.

Observations on turkey movements indicated that four of the five habitat types occurring on the study area were utilized. Sightings were recorded predominantly in openings. Pipeline rights of way, roadways, and fields were preferred for feeding, resting, and courtship activities. Several observations were also collected from the adjacent hardwood and swamp bottoms; areas turkeys used as roosting sites. The only habitat type not used was the willow stand where attraction to turkeys must be minimal.

There was little correlation established between habitat usage and seasonal movements. A slight northern shift was indicated during the winter and spring, perhaps in relation to spring hunting pressure or an attempt to locate more isolated, suitable habitat. One hen and two of her poults moved approximately eight miles from the point of capture. This sighting was the only verification of dispersal from the study area.

Observations indicate that flocking characteristics in turkeys are an intricate and complex mechanism. Some flocks were unstable, variously changing in composition and size while other flocks remained isolated and did not exchange members. Of 202 sightings, a little over half (106) were of intermixed flocks. These flocks were either marked birds consorting with unmarked turkeys or an association of two or more color marked groups into one flock. Juveniles of both sexes remained with adult hens throughout their first winter. Separate flocks of immature males, as reported by Bailey (1967), were not detected in this study. During the winter adult males seemed to stay in small groups of two to four individuals while mature females were always seen with young of the year.

There were no instances recorded of marked birds being ostracized or excessively dominated by unmarked or differently marked turkeys. Marked birds were observed strutting in courtship display before young females and two marked adult males were believed to have participated in breeding during the spring of 1970 since they were seen courting adult females. It appears, then, that addition of colored patagial streamers had little effect on turkey social status and behavior. Watts and Stokes (1971) also found this to be true of color marked turkeys in Texas.

Conclusions

There has been an increase in population approximating 300 percent from the time turkeys were originally introduced in 1965 and 1966 until 1970. This in-

crease strongly suggests that basic habitat requisites such as food, cover, water, dispersed openings, and isolation have been supplied by this bottomland hardwood area. This is also persuasive evidence that further reintroductions in similar habitats are warranted.

From vegetative analysis, cursory fecal examination, and general observations certain vegetative species were considered important sources of turkey food. Fruit of hackberry, water oak, pecan, swamp dogwood, peppervine, poison ivy, blackberry, and several species of grasses were used considerably by birds on the area. Planting of fields and pipelines to oats, rye grass, and wheat as well as providing a supplemental food source of whole corn during the winter was considered instrumental in maintaining the population level and physical condition of turkeys on the study area.

Turkeys did not demonstrate any pronounced shift between summer and winter ranges although they did exhibit a definite predilection for openings as feeding and loafing sites and hardwood bottoms as roosting locations.

The first brood captured, on August 22, consisted of an adult hen and eight ten-week old poults. These birds readily used the bait (whole wheat) for two weeks prior to being trapped. Had trapping efforts been initiated earlier in the summer it is probable that more young sibling groups would have been captured. The authors suggest that future studies in similar habitat employ early summer trapping to augment usual winter emphasis.

ACKNOWLEDGEMENTS

The authors are grateful to Dr. Bryant A. Bateman, former professor of forestry and wildlife management, Louisiana State University for his advice and guidance. Special gratitude is also expressed to Mr. H. B. Fairchild, Mr. John Kean, and Mr. John Barton for providing the research location. We would also like to thank the Louisiana Agricultural Experiment Station for financial support.

Table 1. Vegetative characteristics measured on sample plots.

Characteristics	Derivation
Frequency	$\frac{\text{Number of plots in which a species occurred}}{\text{Total number of plots sampled}}$
Relative frequency	$\frac{\text{Frequency of species A}}{\text{Total frequency of all species}} \times 100$
Relative density	$\frac{\text{Total number of an individual species}}{\text{Total number of all individuals}} \times 100$
Relative dominance	$\frac{\text{Total basal area of each species}}{\text{Total area sampled}} \times 100$
Importance value:	
Ground level	$\frac{\text{Relative density} + \text{relative frequency}}{2}$
Upper strata	$\frac{\text{Relative density} + \text{relative frequency} + \text{relative dominance}}{3}$

Table 2. Sex, age, and hen-poult compositions derived from trapped sample.

Sample Characteristics	Sex Composition		Age Composition		Hen-Poult Composition	
	Males	Females	Adults	Subadults	Hen	Poults
Total number trapped	24	31	6	49	4[1]	49
Percent	43.6	56.4	10.9	89.1	8.1	91.9
Subadults trapped	22	27	–	–	–	–
Subadult percentage	44.9	55.1	–	–	–	–
Total sample ratio	1 :	1.29	1 :	8.16	1 :	12.25

[1]All hens trapped were with broods.

Table 3. Importance values of tree species by vegetative strata.

Species	Subordinate Layer (1/20 acre plot)	Dominant Layer (1/5 acre plot)
Liquidambar styraciflua	10.64a	17.37a
Celtis laevigata	10.40a	13.69a
Quercus nigra	5.08b	8.64a
Fraxinus pennsylvanica	4.93b	3.19
Ulmus americana	4.15b	3.08
Acer negundo	7.67b	1.00
Nyssa aquatica	1.89	5.26b
Taxodium distichum	1.22	5.42b
Acer rubrum	5.88b	1.14
Carya aquatica	1.85	2.97
Quercus pagoda	1.03	3.02
Quercus nuttallii	1.61	2.56
Platanus occidentalis	.61	1.81
Salix nigra	1.24	.99
Cornus drummondii	4.47b	--
Ilex decidua	4.05b	--
Crataegus sp.	1.65	--
Forestiera acuminata	1.37	--

a/Considered dominant species in respective stratum.
b/Considered subdominant species in respective stratum.

Table 4. Importance values for plant species in the understory (ground level) by sampling period.

Species	Milacre Plot		
	Summer	Spring	Total
Toxicodendron radicans	14.62a	13.89a	12.95a
Ampelopsis arborea	12.52a	10.54a	10.07a
Parthenocissus quinquefolia	6.43b	14.03a	9.91a
Rubus sp.	12.80a	7.81b	8.81a
Berchemia scandens	6.31b	8.14a	6.32b
Eupatorium perforliatum	14.43a	.14	5.98b
Campsis radicans	6.85b	5.73b	5.59b
Smilax sp.	5.93b	4.49b	4.36b
Iva annua	--	7.00b	3.82
Menispermum canadense	3.02	4.67b	3.41
Gramineae	4.09b	3.49	3.40
Vitis rotundifolia	5.21b	3.08	3.35
Quercus nigra	--	--	3.12
Pteridium aquilinum	.58	4.67b	2.56
Viola sp.	2.79	2.57	2.32
Liquidambar syraciflua	--	--	2.02
Polygonum sp.	1.04	1.67	1.26

a/Considered dominant species in the understory.
b/Considered subdominant species in the understory.

Table 5. Observations on marked turkeys from August 23, 1969 to June 1, 1970.

Group Number	Number Marked	Number of Sightings	Distance from Capture Site	
			Range	Mean
			- miles -	
I	9	46	0 - 8.00	1.72
II	2	20	0 - 3.60	1.44
III	13	29	0 - 3.63	1.09
IV	7	10	0 - 2.75	1.98
V	6	17	0 - 3.50	2.56
VI	5	38	0 - 4.75	1.01
VII	4	23	0 - 4.00	0.88
VIII	6	9	0 - 2.50	1.27
IX	3	10	0 - 0.94	0.68
Total	55	202	0 - 8.00[1]	1.39[2]

[1]Maximum distance during the study period.
[2]Overall mean for the study period.

Table 6. Mean and maximum dispersal of turkeys from capture site.

Trapping Period	Total Number Marked	Number of Sightings	Mean Movement	Maximum Movement
Autumn	24	27	1.23	2.56
Winter	49	92	1.28	4.75
Spring	55	83	1.50	8.00

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