Turkey Habitat Use and Nesting Characteristics in Ponderosa Pine

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ABSTRACT: Turkeys (Meleagris gallapovo) selected nest sites that provided good horizontal concealment. Rock or rock outcrops were selected most frequently for nest concealment on first-nest attempts. Renest attempts showed a selection preference for shrubs as nest cover; most of these were located in meadows. Nesting success doubled for renests versus first nest attempts. Turkeys selected habitats (as described here by USDA Forest Service, Wildlife Habitat Relationships (WHR) criteria and site summaries from stage II inventories) in a nearly random pattern. Adult turkeys selected pole-size-class pine (Pinus ponderosa) greater than 40 percent canopy cover (pine 3B and 3C) 60 percent of the time year round. Broods up to age four weeks selected the edges of large meadows. Aspen (Populus tremuloides)/birch (Betula papyrifera) habitats were used during periods when soft mast items were available.

INTRODUCTION

In the last ten to 20 years, state and federal game and land'managers as well as sport hunters have focused their attention on wild turkeys. Merriam's turkeys (Meleagris gallapovo merriami) are an indicator species of ponderosa pine (Pinus ponderosa) forest types on the Nebraska National Forest. Turkeys are also an important game species in the Black Hills--in 1985 over 4,600 permits to hunt Merriam's turkeys were sold and this number is expected to increase in the future.

Historically, wild turkeys were not present in the Black Hills. From 1948 to 1951, 25 Merriam's turkeys were transplanted from Colorado and New Mexico; by fall of 1952 the estimated population was approximately 1,000 (Peterson and Richardson 1975). Whereas, considerable information exists on the habitat needs of other subspecies of wild turkeys, little information is available on Merriam's turkeys. Merriam's turkeys prefer ponderosa pine habitats (Jonas 1966, Bryant and Nish 1975, Scott and Boeker 1977), although Douglas Fir (Psuedotsuga menziesii), Garry oak (Quercus garryana), and pinyon-juniper (P. edulis - Juniperus spp.) habitats are also used (Scott and Boeker 1977, Mackey 1982). Within ponderosa pine forest types, open stands of pine pole-size timber (zero to nine inches dbh) and meadow/snowberry (Symphoricarpos albus) – forest ecotones were preferred habitats of Merriam's turkeys (Rose 1956, Jonas 1966). Petersen and Richardson (1975) suggested that slash piles were the preferred nesting habitat in the Black Hills of South Dakota.

This study wa s initiated to (1) determine seasonal habitat use patterns, and (2) describe nesting habitats of Merriam's turkeys in portions of the Black Hills. Cooperating agencies were: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station; USDI Fish and Midlife Service, Wyoming Cooperative Fish and Wildlife Research Unit; National Wild Turkey Federation, South Dakota Department of Game, Fish and Parks; and Black Hills National Forest.

METHODS

The study area was located in the Black Hills between Pactola Reservoir on the north, Horse Creek Road on the south, West Nugget Gulch on the west and Range 5E on the east. Vegetation was dominated by the ponderosa pine (Pinus ponderosa)/Snowberry (Symphoricorpos albus), and ponderosa pine/bearberry (Arctostaphylos uva-ursi) habitat types; quaking aspen (Populus tremuloides)/beakeci filbert (Corylus cornuta) habitat type occurred primarily in drainage bottoms (Hoffman and Alexander 1987).

Habitats within this area were delineated using Forest Service Stage II site inventory information in conjunction with key wildlife habitat inclusions such as meadows, riparian areas, and quaking aspen stands identified from 1:24,000 aerial photographs. The type of habitat in each of the delineated sites was classified using Forest Service R-2, Wildlife Habitat Relationships (WHR) criteria (USDA Forest Service 1983, Buttery and Gilliam 1984). Structural stages of the dominant timber type were defined as follows:

[1]Final Environmental Impact Statement, Nebraska National Forest, Chadron.

1 = grass-forb,
2 = shrub-seedling (dbh less than one inch),
3 = young trees or pole timber (dbh one to nine inches), and
4 = mature trees sawtimber (dbh less than nine inches).

Canopy cover classes were assigned to each site and were based on the tree basal area:

A = 0 tc 40 percent (0 to 50 square feet per acre),
B = 40 to 70 percent (50 to 100 square feet per acre), and
C = 70 to 100 percent (less than 100 square feet per acre).

Utilization of these habitats by radioed turkeys was recorded by season--spring (March-May), summer (June-August), fall (September-November) and winter (December-February).

Thirteen wild turkey hens were trapped and fitted with backpack radio transmitters weighing about 90 grams (attached with bungee cord) on February 22 and 23, 1986. Radio-locations to determine habitat utilization patterns were deferred for one week so the birds could adjust to the radio packages (Nenno and Healey 1979). Three radio-locations, one during each period of the day corresponding to morning, mid-day, and evening, were taken weekly for each bird. Each location was obtained from the intersection of two to five vectors collected using a handheld direction-finding antenna and plotted in the field on a 1:2400 U.S. Geological Survey contour map of the study area.

Each location of a radioed bird was considered as an independent sample for these analyses. Utilization of habitats within the study area was compared to expected use obtained from estimates based on proportional area for each type of habitat using a chi-square statistic (Neu et al. 1974, Byers et al. 1984). Only habitats with non-zero utilization values were included in the chi-square goodness of fit test. These results represent preliminary analyses of one year's data; therefore, a conservative approach was taken in the determination of the Bonferroni confidence intervals: the number of habitats (K) was set at 11, even if no use or some habitats occurred during that period. The effect of this is to widen the confidence limits around samples where fewer than 11 habitats were used.

The number of nest attempts was estimated based on several criteria, the primary one being locations of hens incubating nests; however, the behavior and movement patterns of hens were also indicative of nest initiation. Hens initiating nests showed restricted movements and localized in an area usually within approximately 0.25 miles (0.4 km) of a nest site. Behavioral criteria were used to determine one nest for an adult hen. Following an unsuccessful nest attempt, hens typically moved with larger daily movements until another attempt was initiated. Then the pattern of localized restricted movements would begin again.

RESULTS

Rock outcrops and rock slides were selected by all but two turkeys for which initial nests were found (Table 1) and one of these two was located in slash adjacent to a rock slide. Nesting success increased from 30 percent for initial nests to 67 percent for renests. One third-nest attempt was successful. A shift in the habitats selected for renest was noted. All renests located had shrubs for the immediate nest cover and all. successful renests were located under shrubs in meadows.

The chi-square goodness-of-fit tests for all seasons were significant ($P \leq 0.05$), Indicating that utilization of habitats differed from that expected if turkeys selected habitats at random (Table 2). However, very few meaningful differences were noted when individual confidence intervals were calculated for all habitats. During the spring, grass/forb, and pine 4A and 4B (mature forest 0-40 and 40-70% canopy cover) habitats were selected less frequently than expected. During the summer, grass/forb habitats were selected more than expected while pole-size timber with 40 to 70 percent canopy cover (pine 3B) was selected less than expected. Broods selected grass/forb habitats during the first four weeks post hatching. In the fall, aspen (Populus spp.)/birch (Betula spp.) 3B and 3C, and spruce (Picea engelmannii) habitats were not used; aspen/birch 3A was selected more than expected. During the winter, turkeys were never located in any aspen/birch stands, open pole-size pine (3A) or spruce habitats, and little use of grass/forb habitats was noted. Otherwise habitats were selected in proportion to availability.

Table 1. --Summary of nesting habitats for Merriam's turkeys in ponderosa pine forest types of the Black Hills.

Bird Number [1]	Habitat	Nest Cover
9	Aspen/birch 3C	Rock
1	Pine 3C	Rocks
6	Aspen/birch 3A	Shrubs/slash
5	Aspen/birch 3A	Rocks
12	Pine 4C	Slash
7R	Pine 4C	Unknown [2]
13R	Meadow	Shrubs.
7R	Meadow	Shrubs
9R	Meadow	Shrubs
4	Off study area - (pine)	Slash
4R	Off study area - (aspen/birch)	Shrubs

[1] R indicates a renest. [2] Nest not located.

DISCUSSION

Nests

Nest sites selected by turkeys were substantially different from those reported by Petersen and Richardson (1975) who reported that turkeys in the Black Hills preferred to nest in slash. In this study, rocks and rock outcrops provided good horizontal cover for nests. Shrubs also provided good nest cover as they developed phenologically. Coinciding with

Table 2. --Seasonal habitat use patterns of Merriam's turkeys in the ponderosa pine forest type of the Black Hills.

Habitat		Proportional area	Spring (N = 327) Number obs.	Spring (N = 327) Expected obs.	Summer (N=99) Number obs.	Summer (N=99) Expected obs.	Fall (N=99) Number obs.	Fall (N=99) Expected obs.	Winter (N=59) Number obs.	Winter (N=59) Expected obs.
Grass/forb		.077	9	25.2*	27	7.6*	5	7.6	1	4.5*
Aspen/birch	3A	.023	16	7.5	3	2.3	12	2.3*	0	1.4
	3B	.020	5	6.5	3	2.0	0	2.0	0	1.2
	3C	.010	8	3.3	2	1.0	0	1.0	0	0.6
Ponderosa pine	3A	.035	3	11.4	9	3.5	4	3.5	0	2.1
	3B	.234	96	76.5	10	23.2*	29	23.2	11	13.8
	3C	.426	151	139.3	32	42.2	34	42.2	33	25.1
	4A	,017	17	54.6*	8	1.7	1	1.2	0	1.0
	4B	.088	9	28.8*	5	8.7	6	8.7	6	5.2
	4C	.066	12	21.6	0	6.5	8	6.5	8	3.9
Spruce		.022	1	0.6	0	0.2	0	0.2	0	0.1
Chi square[1]			83*		94*		46*		10.2*	

[1]Only categories with values greater than 0 were included in calculating the chi-square value; therefore, the degrees of freedom vary among seasons. Asterisk (*) indicates significance $P < 0.05$.

development of shrubs was a shift in nest site location from rocks to shrubs in meadows. Horizontal cover, chronological development of vegetative cover, and condition of woody and herbaceous vegetation in the understory were reported to be important to nest site selection by turkeys in Minnesota (Lazarus and Porter 1985). Nest sites of eastern turkeys in Florida and Oklahoma were located in clumps of vegetation that provided both overhead and horizontal cover for the nest (Williams et al. 1968, Logan 1973). Shrub patches selected as nest sites in this study provided excellent concealment of the nest.

Habitat Selection

During the first four weeks, poults are postulated to require high amounts of dietary animal protein usually obtained from insects and other invertebrates (Hurst and Stringer 1975, Hurst and Poe 1985). Insect abundance was greater in open areas with high herbaceous cover than under the forest canopy (Martin and McGinnes 1975, Healy 1985). Hens with broods less than four weeks old in this study showed a distinct preference for large wet meadows and did not select smaller openings within other habitats. In contrast, Merriam's turkey broods in Washington selected oak and oak-pine habitats with small openings (Mackey 1986). Turkey broods from New Mexico in mixed conifer, quaking aspen, and oak habitats selected small clearings created by logging (Schemnitz et al. 1985). In 1986 both large and small meadows within the study area had good populations of insects, particularly grasshoppers. Broods older than four weeks selected habitats with high herbaceous cover under some tree cover.

Jonas (1966) noted high use of pole-size-class (structural stage three in this study) stands of ponderosa pine by Merriam's turkeys. Pbnderosa pine 3B and 3C habitats comprised about 65 percent of the study area and were highly used by turkeys; however, their selection of pine 3B and 3C habitats did not differ from random. Aspen stands were used seasonally by Merriam's turkeys in Utah (Bryant and Nish 1975). The aspen/birch stands selected (3A) in this study tended to be intermittent patches of aspen/birch with small openings in drainages rather than homogeneous open stands. We suspect that selection of open quaking aspen stands during the fall may have been due to ripening of several types of soft mast. The limited use of the larger size classes of ponderosa pine (4A, 4B, 4C) were not expected. Pine seeds make up a large proportion of turkey diets during fall and winter periods (Petersen and Richardson 1975) and, presumably, the large, more mature trees would produce more mast. However, the data pertaining to availability of food items in these habitats and how food availability relates to habitat selection patterns have not been analyzed to date.

What appears to be lack of preference and/or avoidance of habitats by turkeys in this study may be attributable to the methods used to describe habitats and the level of resolution for habitat description. The methods used to describe these habitats are those used for implementing Wildlife Habitat Relationships models to estimate impacts to wildlife from forest management activities, and for forest planning. Site (stand) description data were collected from areas of ten to 80 acres (4-32 ha), usually about 40 acres (16 ha). Site boundaries were determined from aerial. photographs using watershed characteristics and apparent differences in stand characteristics among adjacent sites. Summaries for sites did not include trees less than five inches dbh if the majority of basal area was from trees larger than five inches dbh; trees determined to be culls

were excluded, as were trees of species other than the dominant cover type. Vegetation within sites was extremely variable. While the site average indicated a pole-size ponderosa pine with 40 to 70 percent canopy cover (3B habitat), generaily the site contained several smaller stands of dog-hair pine, more open stands, and more closed canopy stands as well. Thus, many different microhabitats were contained within macrohabitats delineated on the map. These vegetation mapping methods were selected because of their application to National Forest planning procedures and habitat models. Whether turkeys are using habitats in a nearly random manner or if the habitat descriptions need modification will require further research and analysis.

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