

Seasonal Use of Roost Sites by Merriam's Wild Turkey Hens and Hen-Poult Flocks in Oregon

Abstract

Characteristics of trees and cover types in which Merriam's wild turkeys (*Meleagris gallopavo merriami*) roosted were described for 36 roosts used by hens during winter, spring, and summer in north-central Oregon from 1981 to 1982. Four of 14 cover types were used for roosting; only mature mixed conifer was used significantly more than it occurred on the study area. Number of roost trees/site, canopy cover, slope, and DBH (diameter of tree at breast height) were roost characteristics that differed among seasons. Ponderosa pines (*Pinus ponderosa*) (\bar{x} DBH = 67.8 cm) were used for roosting most frequently in winter and spring, whereas smaller (\bar{x} DBH = 47.7 cm) Douglas-firs (*Pseudotsuga menziesii*) were used most often in summer. Average number of trees/site ranged from three in spring to six in winter. Roosts were located more frequently on steep slopes during winter, likely an outcome of the restricted distribution of mature mixed conifer cover type in winter habitat. In summary, although hen poult flocks roosted in the same cover type during winter, spring, and summer, seasonal differences in roost characteristics were attributed to flock size and composition.

Introduction

Roost sites of Merriam's wild turkeys have been described for several locations within the original range of this subspecies. Ponderosa pine trees were most commonly reported as roosting habitat in Colorado (Hoffman 1968) and Arizona (Boeker and Scott 1969), but Douglas-fir and white fir (*Abies concolor*) in mixed-conifer stands were used by turkeys in New Mexico (Jones 1981). Large, mature trees were used most often for roosting in these areas. Merriam's wild turkeys have been introduced into several western states; however, little research has been conducted on cover types or trees used by turkeys for roosting in these areas. Mackey (1984) found that Douglas-fir cover type (10 of 17) and trees were used most commonly for roosting from February through August in Washington, and Jonas (1966) reported the ponderosa pine community was most frequently used for roosting habitat in Montana.

Previous research focused most often on the tree or trees used for roosting; little work has been reported on cover types in which roost trees were located. In addition, generally only one tree measurement (DBH) was taken, no information was collected on the age and sex of birds using roosts, and most research described roosts from only one season or combined seasons.

The purpose of this project was to better understand roosting habitat used by adult hen and

hen/poult groups of Merriam's wild turkeys in Oregon, where the birds were introduced in 1961 (Mace 1965). Our objectives were to describe cover types used for roosting, to describe characteristics of trees selected for roosting within cover types, and to test for differences in seasonal use of roost sites. Adult hens were selected for study because adults, although they composed only 28 percent of the female segment of the sample in our study, contributed 91 percent of the broods (Crawford and Lutz 1984). Information about these cover types and roost tree characteristics may be useful to landmanagers interested in managing areas for Merriam's wild turkeys.

Materials and Methods

Twelve adult hens, two in 1981 and 10 in 1982, were trapped from January to April and equipped with radio transmitters (Telonics Inc., Mesa, Arizona) on the White River Game Management Area, Mount Hood National Forest, and adjacent private lands in southern Wasco County, Oregon. Nine of the 12 hens successfully produced broods. We attempted to find roosts twice monthly by selecting one radio-equipped hen and determining the roost location one hour after sunset. We selected a different hen during each roost finding attempt to insure that all hens contributed to roost locations. Cover types on the 135,141-ha study area were mapped from LANDSAT satellite imagery (Murray 1981). Study

area boundaries were based on total annual locations because of considerable overlap of areas used by radio-marked hens throughout the year. Physiographic (percent slope, distance to nearest ridge, and aspect) and vegetative characteristics were used to describe roost sites. Measurements of individual roost trees included diameter at 1.4 m (DBH), percent canopy closure, canopy height, and height to lowest living and dead limbs. Percent slope and all height measurements were estimated with a clinometer. Percent canopy closure was estimated with a sighting tube (James and Shugart 1971) at four randomly selected points within 3 m of roost trees. Presence of stumps within the roost site was used as evidence of logging activity. Percentages of forested and non-forested cover types within 0.33 km of the roost site were determined from aerial photos with a grid of 50 randomly distributed points (Marcum and Loftsgaarden 1980). This area around the roost was within the daily movement range of hen-poult flocks (Crawford and Lutz 1984). Numbers of droppings at bases of trees were used to classify amount of use (light = < 10 droppings, moderate = 10-50 droppings, heavy = > 50 droppings). Seasons of use were winter (16 November-28 February), Spring (1 March-31 May), summer (1 June-15 September), and fall (16 September-15 November).

Chi-square for goodness of fit (Sokal and Rohlf 1969,552) were used to test for differences between expected and observed numbers of roosts in all cover types. If a difference was detected, confidence interval estimates (Neu *et al.* 1974, Byers *et al.* 1984) were calculated for each cover type to identify cover types that contributed to the difference. One-way analysis of variance (Nie *et al.* 1975,422-433) was used to test for differences in physiographic and vegetative characteristics of roosts among seasons. If there were differences in characteristics and the assumption of homogeneity of variance was met, Student-Neuman-Keuls multiple comparison tests (Nie *et al.* 1975,428) with harmonic means (Hull and Nie 1981,307) were used to identify which seasons differed. The 95 percent confidence level was accepted as significant.

Results and Discussion

A total of 39 roost sites was found. Twelve roost sites from each of three seasons (winter, spring,

and summer) were analyzed for seasonal differences. Fall was not included in the analyses because only one roost was located. Fall roosts were difficult to locate because of frequent, long movements by hens during that season. Two roosts were used during more than one season (spring and fall) and were excluded from the seasonal analysis.

The sex and age composition of groups at roosts differed among seasons. Spring roosts were used exclusively by adult hens. Adult hens and poults occupied summer and fall roosts. In winter, roosts were used by adult hens and yearlings of both sexes.

Cover Type Use

Fourteen cover types were classified. Eleven of the cover types on the study area were forested (Table 1). Nonforested habitats (range, irrigated lands, grain) occupied less than six percent of the study area.

Four of the 11 forested cover types on the study area were used for roosting. Mature mixed conifer was selected for roosting in all seasons (92%-winter,75%-spring,59%-summer) and was the only cover type used significantly more than it occurred on the study area (Table 1). Ponderosa pine, ponderosa pine/Douglas-fir/oak (*Quercus garryana*), and ponderosa pine/white oak cover types also were used for roosting.

Cover adjacent to roost sites was primarily ($x = 80\%$, range = 58-96) forested (Table 2). Scott and Boeker (1977) found that adjacent forest cover affected use of roost sites and suggested a maximum distance of 90 m between roost sites and forested cover. Low elevation sites (< 1000 m) on our study area have an 80-year history of small-scale, selective logging activity (Williams 1978,13); however, only 7.5 percent of the roost sites had been logged, in contrast with data from New Mexico (Jones 1981) where 46 percent of the roost sites had been logged. These contrasting results indicated a rather broad range of response by Merriam's wild turkeys to logging near roost sites.

Roost Tree Characteristics

Within the mature mixed-conifer cover type, hen-poult flocks used large (DBH = 59.3 cm), dominant trees most frequently for roosting. Increment borings indicated that trees of this diameter

TABLE 1. Descriptions of forested cover types, percentage of study area occupied by each cover type, and percentage of roosts (N=36) in the cover types used by Merriam's wild turkeys in southern Wasco Co., Oregon, 1981-1982.

Cover type	Cover type description	% available	% of roosts
Oregon White Oak	Found at low elevations (660-750 m) on the eastern edge of the study area. Oak was the dominant species in the shrub, understory, and overstory strata.	24.6	0
Ponderosa pine	Found primarily on the southern portion of the study area on the WSIR between 600 and 1000 m. Both overstory and understory consisted of ponderosa pine.	17.8	2.7
Mature mixed conifer	At elevations below 750 m these stands were restricted to steep north facing slopes. At these elevations, the overstory was composed of Douglas-fir and ponderosa pine. At elevations above 750 m, the overstory was true fir and Douglas-fir.	14.2	75.0 ^a
Ponderosa pine/Douglas-fir/white oak	Found as a transition between ponderosa pine/oak and the mixed conifer stands between 750 and 825 m. Generally there was a widely dispersed overstory with a dense understory of ponderosa pine, Douglas-fir, and oak.	12.5	11.1
Ponderosa pine/white oak	Also found at the eastern edge of the study area; often adjacent to oak stands. The overstory consisted of ponderosa pine and oak was consistently found in the understory.	9.5	11.5
Thinned mixed conifer	Single-story stands with a Douglas-fir or ponderosa pine overstory. These stands occurred from 700-900 m and had been thinned during the past 15 years.	7.8	0
Young mixed conifer	Often due to selective logging that had removed overstory species. The result was a mixture of dense sapling to pole size (Douglas-fir, True fir) stands interspersed with small open areas often seeded to orchardgrass (<i>Dactylis glomerata</i>).	7.7	0
Old clearcuts	These habitats ranged in size from 5 to 75 ha and were the result of logging 10-20 years ago. Habitats consisted of either single-story conifer plantations or dense, multi-layered shrub communities.	0.6	0
Mixed deciduous	These stands were most often in riparian zones and consisted of dense shrub patches interspersed with small, wet meadows.	0.1	0
Recent clearcuts	Found primarily in the mixed conifer stands above 750 m. These habitats were logged within the past 5 years and ranged in size from 5 to 15 ha.	0.1	0
Shelterwoods	Generally located at the upper elevations (>900 m) in mixed conifer stands. The stands consisted of widely dispersed overstory of mature Douglas-fir or true fir and a well-developed mixed conifer understory.	0.1	0
Other	Grain fields, rangeland, and irrigated pastures	5.5	0

^aUse of cover types significantly greater than expected (P < 0.05).

were >300 years old. Merriam's turkeys roosted exclusively in either ponderosa pine (62.3%) or Douglas-fir (37.7%) trees.

DBH of roost trees in Oregon (59.3 cm) was among the highest reported. Mean DBH in other areas ranged from 45 cm in Montana (Jonas 1966) and New Mexico (Jones 1981) to 64.5 cm in Arizona (Boeker and Scott 1969). Differences in sizes of trees used for roosting may be a function of sizes available, but neither we nor these authors determined DBH of trees not used for roosting by turkeys. Although these results indicated regional differences in sizes of trees used for roosting, all roosts typically were composed of large, mature trees in each of the areas.

Seasonal Differences

Very few traditionally used roost sites were identified; only two sites were used during more than one season and 82 percent of all sites were lightly used. All sites used in spring were used lightly, whereas 79 percent of winter and 67 percent of summer roost sites were used lightly. In contrast, Jones (1981) found that all (N = 17) winter roost sites were repeatedly used (i.e., at least moderate use), but only one of 22 summer roost sites was used more than once.

Number of roost trees/site ($F = 11.9, P < 0.001$), DBH ($F = 7.4, P < 0.001$), canopy cover ($F = 11.9, P < 0.001$), and slope ($F = 7.6, P < 0.001$) differed among the three seasons (Table 2). An average of 2.9 (1-10) trees composed spring roosts, whereas winter and summer roost sites consisted of 5.4 (1-9) and 5.9 (1-10) trees, respectively. Roosts were in multi-layered, mature, mixed-conifer cover types. Number of trees used during the seasons was probably related to turkey flock size. Spring flocks often were composed of <5 individuals and summer and winter flocks of >30 individuals. There was a similar trend among roost sites in ponderosa pine in Colorado, although they were larger and averaged 17 trees/site in winter and six trees/site for spring and summer combined (Hoffman 1968). Jones (1981), in New Mexico, found eight trees/site in winter and two trees/site in summer.

DBH of summer roost trees was smaller than the DBH of winter and spring trees. Summer roost sites often were located in sawlog sized trees (Baker 1950) in the mature mixed conifer cover type. Once poults were capable of flying, they us-

ed low tree limbs to move into the tree canopy. Often sawlog sized trees offered branch structure of this type. Branch structure provided by Douglas-fir and Ponderosa pine of this size was likely an important characteristic of roosts used by hens with young poults in summer.

TABLE 2. Characteristics of roost cover types and trees used by Merriam's wild turkey during three seasons in southern Wasco County, Oregon, 1981-1982.

Characteristics	Mean (Standard Error)		
	Winter (N = 12)	Spring (N = 12)	Summer (N = 12)
Cover type			
Trees/site (#) ^a	5.4(0.4)	2.9(0.3)	5.7(0.5)
Forested habitat (%)	76.4(6.4)	87.4(2.2)	77.6(4.7)
Ponderosa pine (%)	52.0	76.0	64.0
Distance to ridge (m)	57.3(5.8)	37.0(4.9)	51.8(4.6)
Tree			
DBH (cm) ^a	63.9(3.1)	71.7(4.3)	47.7(2.1)
Canopy ^a coverage (%)	20.7(2.6)	19.1(3.4)	42.6(5.0)
Slope (%)	24.2(2.6)	16.2(3.2)	12.0(1.5)
Height to 1st living limb (m)	9.8(0.8)	10.3(0.9)	9.7(0.9)
Height to 1st dead limb (m)	5.2(0.7)	5.4(1.4)	4.2(0.9)
Crown height (m)	17.2(1.3)	18.5(1.2)	15.2(0.9)

^aSignificantly different among seasons ($P < 0.05$)

Canopy cover of winter and spring roosts was similar and averaged 20 percent, whereas summer roosts averaged 43 percent. High canopy cover reflected the increased use of smaller sized trees as roost trees during summer. Mackey (1984) reported mean canopy cover of 73.5 percent (all seasons combined) at roosts in Washington. The high canopy cover from Mackey's study likely was related to use of Douglas-fir trees for roosting by turkeys. Mackey proposed that canopy cover may be important for thermal regulation in winter by roosting birds.

Slope at spring and summer roosts was less than at winter roosts. In addition, winter roost sites were found almost exclusively (93%) on north-facing slopes. During other seasons, all aspects were used. Steep, north-facing slopes at winter roosts probably reflected the restricted distribution of mature mixed conifer stands at

lower elevations where turkeys were most commonly found during winter. Most mature conifer stands in less rugged terrain at these elevations had been logged within the last 80 years.

Among seasons, mature mixed conifer was the only cover type used selectively for roosting. Although the same cover type was used during the three seasons, species and sizes of trees used for roosting differed seasonally. These differences appeared related to the ages of birds using the roost. For example, adult and yearling birds used larger ponderosa pine and Douglas-fir trees during winter and spring than adults with poults used during summer.

Literature Cited

- Baker, F. S. 1950. Principles of silviculture. McGraw-Hill Book Co. New York.
- Boeker, E. L., and V. E. Scott. 1969. Roost tree characteristics for Merriam's turkey. *J. Wildl. Manage.* 33:121-124.
- Byers, C. R., R. K. Steinhorst, and P. R. Krausman. 1984. Clarification of a technique for analysis of utilization-availability data. *J. Wildl. Manage.* 48:1050-1053.
- Crawford, J. A., and R. S. Lutz. 1984. Merriam's wild turkey habitat use and movements. Oregon Dept. Fish and Wildl. Final Rep. PR-W-79-R-2.
- Hoffman, D. M. 1968. Roosting sites and habits of Merriam's turkeys in Colorado. *J. Wildl. Manage.* 32:859-866.
- Hull, C. H., and N. H. Nie. 1981. SPSS Update 7-9. McGraw-Hill Book Co., New York.
- James, F. C., and H. H. Shugart, Jr. 1971. A quantitative method of habitat description. *Audubon Field Notes.* 24:727-736.
- Jonas, R. J. 1966. Merriam's turkeys in southeastern Montana. *Mont. Fish and Game Dept. Tech. Bull.* 3.
- Jones, K. H. 1981. Effects of grazing and timber management on Merriam's turkey habitat in mixed conifer vegetation of southcentral New Mexico. New Mexico State Univ., Las Cruces. M.S. Thesis.
- Mace, R. U. 1965. Turkey talk. *Oregon State Game Comm. Bull.* 5:3-6.
- Mackey, D. L. 1984. Roosting habitat of Merriam's turkeys in south-central Washington. *J. Wildl. Manage.* 48:1377-1382.
- Marcum, C. L., and D. O. Loftsgaarden. 1980. A nonmapping technique for studying habitat preference. *J. Wildl. Manage.* 44:963-968.
- Murray, R. J. 1981. Landsat-based vegetation and landuse inventory for five Columbia Basin Counties in Oregon. Environmental Remote Sensing Applications Lab., Oregon State Univ.
- Neu, C. W., C. R. Byers, and J. M. Peek. 1974. A technique for analysis of utilization-availability data. *J. Wildl. Manage.* 38:541-545.
- Nie, N. H., C. H. Hull, J. G. Jenkins, K. Steinbrenner, and D. H. Bent. 1975. SPSS: Statistical package for the social sciences. 2nd edition. McGraw-Hill Book Co., New York.
- Scott, V. E., and E. L. Boeker. 1977. Responses of Merriam's turkey to pinyon-juniper control. *J. Range Manage.* 30:220-223.
- Sokal, R. R., and F. J. Rohlf. 1969. *Biometry.* W. H. Freeman and Co., California.
- Williams, C. K. 1978. Vegetation classification for the Badger allotment, Mt. Hood National Forest. Oregon State Univ. Corvallis. Ph.D. Dissertation.

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