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SUMMER NOCTURNAL ROOST SITES OF BLUE GROUSE IN NORTHEASTERN OREGON

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Key words: Blue Grouse, Dendragapus obscurus, *nocturnal, Oregon, roost.*

Avian habitat studies frequently focus on diurnal habitat use because of ease of observation and high levels of activity associated with breeding and foraging. Nocturnal habitat use may be critical for all birds but has received far less attention. Thus, there is a need to better understand nocturnal habitat use, especially by crepuscular and diurnal birds, and factors that may contribute to this use.

Blue Grouse (*Dendragapus obscurus*) are associated primarily with true fir (*Abies* spp.) and Douglas-fir (*Pseudotsuga menziesii*) forests in mountainous regions of western North America (Johnsgard 1983). Breeding season habitat associations often include nonforested and shrub or steppe regions. These birds are diurnal with increased activity in the morning and evening hours. Pekins et al. (1991) determined that both diurnal and nocturnal winter roosts of Blue Grouse were located in conifers. Blue Grouse shifted from eating conifer needles in winter to ground-layer vegetation in summer and fall in northeastern Oregon (Crawford et al. 1986). Blue Grouse summer habitat studies have dealt with diurnal activities (Mussehl 1963, Bendell and Elliot 1966, Zwickel 1975), but nocturnal observations are minimal. Johnson (1929) witnessed a brood fly into a tree, apparently to roost overnight, and Blackford (1958, 1963) observed ≥ 3 adult males flying into "roost trees" in spring, where they presumably stayed overnight. Blackford (1963) also observed a male displaying on the ground approximately 1 h after dark. Zwickel (1992) suggested that ground roosting may occur, particularly on breeding ranges where trees are unavailable or before chicks are able to fly. In the course of monitoring radio-equipped Blue Grouse during summer, we identified 20 independent nocturnal roost sites. Our objective here is to describe these roost sites.

Study Area and Methods

The study area is located in northeastern Oregon, 30 km north of Enterprise in the Wallowa-Whitman National Forest in Wallowa County. Elevation ranges from 900 to 1500 m, with ridge slopes as great as 35°. North-facing slopes are dominated by stands of Douglas-fir and ponderosa pine (*Pinus ponderosa*), and common shrubs are mallow ninebark (*Physocarpus malvaceus*), snowberry (*Symphoricarpos albus*), and big huckleberry (*Vaccinium membranaceum*). Bunchgrass meadows, predominantly bluebunch wheatgrass (*Agropyron spicatum*) and Idaho fescue (*Festuca idahoensis*), occur on south-facing slopes. Cattle graze parts of the area during summer months, resulting in variable grass cover.

Grouse were captured in walk-in traps and fitted with poncho- or necklace-mounted radio transmitters, 15 to 18 g (Advanced Telemetry Systems, Inc., Isanti, MN, and Telemetry Systems, Inc., Mequon, WI), from June through August 1993. Radio-equipped juvenile birds were ≥ 500 g, capable of flight, and ≥ 1 mon of age. Each radio-equipped bird was located at night once between 5 July and 3 August 1993. In addition to radio telemetry, a spotlight was used to verify the location of the bird. The exact roost site was identified by the presence of fresh fecal droppings. When 2 or more grouse were observed roosting together (<10 m apart) only 1 roost site was counted for use in analyses to ensure independence of locations.

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RESULTS AND DISCUSSION

Twenty-five radio-equipped Blue Grouse and 38 birds without radios were located at 20 independent nocturnal roost sites (Table 1). The radio-equipped birds consisted of 12 adults and 13 juveniles; sexes and ages of the other birds were unknown. All roost sites were on the ground. Males usually roosted alone, whereas hens and juveniles frequently roosted together. Sixteen of 20 independent roosts, including birds of all sex and age groups, were in grass of a relatively consistent height; the others were in forbs ($n = 2$) and shrubs ($n = 2$). Twenty-three of 25 radio-equipped birds were within 50 m of potentially useful roost trees. An adult female and a juvenile female roosted 75 and 100 m from trees, respectively, both easy flight distances for grouse. Adult males usually roosted closer to trees than other birds.

During daytime, radio-equipped birds were seldom located in trees (<1% of 614 observations, July–August 1991 through 1993; E. Pelren unpublished data). However, almost all birds flushed during the day landed in trees, and conifer needles were found in crops of birds taken from the study area in August and September 1981 and 1982 (Crawford et al. 1986). Crawford et al. also found plants such as prickly lettuce (*Lactuca serriola*), yellow salsify (*Tragopogon dubius*), wild buckwheat (*Eriogonum* spp.), and snowberry (*Symphoricarpos albus*), as well as short-horned grasshoppers (*Acrididae*) in at least 30% of 145 Blue Grouse crops in this area. Douglas-fir needles were found in only 16% of the crops. This greater use of ground-cover forage and invertebrates corresponded with observed diurnal and nocturnal use of ground habitat by Blue Grouse in summer. Blackford (1963) suggested that selection of roosting sites may result from foliage preference and feeding habits. Motion sensors on grouse transmitters indicated that some birds continued foraging on moonlit nights, which implied that benefits of feeding outweighed energy loss associated with movement or increased risk of predation.

Pekins et al. (1991) suggested Blue Grouse selection of conifers as roosts in winter may be based primarily on thermal properties of the sites. Higher temperatures during summer make thermal considerations less relevant to survival than during winter. The lowest temperature we noted at a nocturnal roost site was 4°C, well above the lower critical temperature of –10°C to –15°C (Pekins 1988).

Hines (1986) found that 96% of juvenile and adult Blue Grouse mortalities were the result of predation. In winter, Blue Grouse in trees may be less conspicuous or available to predators than those on the ground (Bergerud and Gratson 1988), and Pekins (1988) observed snow roosting only occasionally, after heavy snowstorms. However, lack of snow and increased presence of grasses, forbs, and shrubs in summer, along with cryptic coloration of Blue Grouse, provide ground-layer camouflage superior to that available in winter. Food availability may outweigh any increased risk of predation and account for use of nocturnal ground roosts by Blue Grouse in summer where selection of ground roosts occurs.

TABLE 1. Characteristics of 20 Blue Grouse nocturnal roost sites, northeastern Oregon, July–August 1993.

	Adult male	Adult female	Juvenile male	Juvenile female
No. of roost sites	6	6	3(8[a])	5
No. of other birds	1	16[b]	7	9[c]
Plant cover at roost				
Grass	4	6	3(8[a])	3
Forb	1	0	0	1
Shrub	1	0	0	1
Plant height (m) at roost				
Median	0.50	0.45	0.50[a]	0.75
Range	0.25–1.20	0.25–1.00	0.30–0.75[a]	0.30–1.30
Distance (m) to potential roost tree				
Median	4.5	37.5	50.0[a]	20.0
Range	1.0–40.0	15.0–75.0	3.0–75.0[a]	5.0–100.0

[a]Includes data for 5 radio-equipped juvenile males that were with radio-equipped adult or juvenile females.
[b]Does not include 2 radio-equipped juvenile males that were with radio-equipped adult females.
[c]Does not include 3 radio-equipped juvenile males that were with radio-equipped juvenile females.

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