

DUST-BATHING SITES SELECTED BY RUFFED GROUSE

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AN opportunity to study the preferences of Ruffed Grouse (*Bonasa umbellus*) for dust-bathing sites occurred near Highlands, Macon County, North Carolina. During June 1968, grouse commonly dust bathed along an abandoned logging road which wound northeastward for 2.5 km from Wildcat Cliffs. The straight-line distance traversed was 1.4 km.

The trail exposed many possible dusting substrates—litter and duff areas, decaying logs and stumps, silty sediments, clay banks, gravelly areas where intermittent watercourses crossed the trail, and numerous bare soils obviously different in texture, structure, and color. The hilly topography and the winding trail also presented variations in site factors in addition to substrate types.

The trail provided virtually the only opening in dense second growth, mesic vegetation in various intermediate stages of succession (Fig. 1). Important species of the discontinuous canopy included red maple (*Acer rubrum*), cherry birch (*Betula lenta*), tulip poplar (*Liriodendron tulipifera*), and white pine (*Pinus strobus*). The dense understory was characterized by thickets of great rhododendron (*Rhododendron maximum*) interspersed with less abundant species such as flowering dogwood (*Cornus florida*). In many places the old road was reduced to a narrow trail winding through brambles (*Rubus* sp.). Ferns and herbs such as galax (*Galax aphylla*) covered much of the ground away from the trail. Mean elevation of the study area is 1200 m. Annual precipitation averages 200 cm, and the mean June temperature is 19°C. Odum (1950) gave a succinct description of the avifauna and plant communities of the Highlands Plateau, which includes this study area.

In a monumental study of Ruffed Grouse in New York, Bump et al. (1947: 271) found that dust baths were located in any spot offering suitable material and receiving the sun's rays during some portion of the day. The material utilized was varied, the primary requirement being looseness and dryness. Dry, rotten wood of old stumps and logs was most frequently used with fine, dry earth a close second. In northern New York fine sand was commonly favored. Dust bathing by Ruffed Grouse is generally believed to be a maintenance activity for feather care and riddance of ectoparasites (Edminster, 1954:204; Forbush and May, 1955:137).

METHODS

Two grouse were flushed from dust bathing sites when I first walked the trail during midafternoon on 1 June. Two grouse were flushed from different dusting sites on 6 June, and locations and general site characteristics were noted for 20 dusting scrapes, some ap-



FIG. 1. Typical dust-bathing site of Ruffed Grouse near Highlands, North Carolina, June 1968. A fresh dusting scrape is located in front of the binoculars.

parently older and used more than others. Grouse scrapes were easily identified by their size and often by presence of grouse feathers and droppings. There was no evidence of dust bathing by any other species larger than the Brown Thrasher (*Toxostoma rufum*). Existing scrapes were obliterated by more than 9 cm of rain on 8 June. Cloudy, humid weather and light rains on 9 and 12 June kept the soil surfaces damp and no dusting scrapes were found along the trail on 12 June. However, 13 and 14 June were warm and sunny with low humidity. I anticipated that most grouse would use the newly dried soils on the afternoon of 14 June, after a week without dusting, and 14 new scrapes were found and examined in detail on 15 June during 09:00–13:00.

Aspect, exposure, adjacent vegetation, and distance to closest dusting scrape was noted for each of the 14 scrapes. Maximum depth and rim-to-rim distances of longest and shortest axes were measured. At each scrape 200 cc of substrate was collected from the rim and surface of the dusting depression. Each of the 14 samples was oven-dried, weighed, and shaken for 30 minutes through six sieves in the U. S. Standard Sieve Series, after which each separate was weighed. The seven separates approximated the classification of soil particles established by the Department of Agriculture (Lyon et al., 1952:46), except the silt and clay separates were combined. Bulk density, particle density, and color were also recorded for each sample.

A large rock was placed in each scrape after the substrate sample was collected. The trail was checked for new scrapes on 16 June, and a final check of new and old scrapes was made on 22 June.

TABLE I
TEXTURES OF SOIL USED BY RUFFED GROUSE FOR DUST BATHING NEAR HIGHLANDS,
NORTH CAROLINA, 15 JUNE 1968

Sample	Percent of sample in each soil separate						
	Gravel	Very coarse sand	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt and clay
Coarsest of 14	8	18	30	25	12	4	3
Average of 14	6	9	24	29	19	8	5
Finest of 14	3	8	21	27	21	12	8

RESULTS

The dimensions and locations of the 14 dusting scrapes were similar. The average size of the scrapes was $30 \times 25 \times 3.2$ cm. Extreme rim-to-rim distances were 45 and 18 cm, and depths ranged from 1 to 5 cm. In three cases, the distance between scrapes was less than 2 m; all other intervals were more than 40 m. Five scrapes were overhung by brambles, and all others were less than 2 m from thick cover. Four scrapes were in relatively straight sections of the trail, while 10 were on the outside (greater) curve of a bend in the old road. Two sites had an east aspect, and 12 had west or southwest aspects with less than 15° slope.

Textures of soils in the dusting scrapes were remarkably similar. Approximately 90 per cent of each sample was comprised of various classes of sands (Table 1). The coarsest sample contained 8 per cent gravel (particles greater than 2 mm in diameter), and the finest sample contained 8 per cent silt-clay (particles less than 0.05 mm diameter).

The bulk densities of the 14 samples averaged 1.2, and the particle density averaged 2.6. Both figures were in the lower range of normal values for sandy soils (Lyon et al., 1952:56-59). Bulk densities would have been higher in undisturbed areas adjacent to the dusting scrapes.

Soil colors were compared with Chapman's (1914:26-27) color chart. Closest matches for the 14 samples were 5 ochraceous buff, 3 brownish gray, 3 ashy, and 1 each grayish brown, brownish ashy, and pearl gray. Colors in the chart of Palmer (1962:4-5) did not match soil colors as well; smoke gray, buffy brown, and cinnamon were chart colors resembling the soil colors.

Approximately 24 hours after the collection of the soil samples and the placing of a large rock in each scrape, the trail was rechecked, and seven new scrapes were found. Three were within 2 m of an old scrape, and four were 8, 20, 20 and 70 m from an old scrape. All were at sites similar to those sam-

pled. When the trail was last checked 6 days later, 11 grouse dusting scrapes were identified excluding the 14 sampled and destroyed earlier. All were similar in appearance and location to those described earlier.

DISCUSSION

Four factors were evidently important in determining location of dust bathing sites: (1) sand substrate, (2) exposure to the sun, (3) proximity of dense cover, and (4) maximum visibility for the grouse of clear routes of approach to the site. Thus, the typical scrape was on the north and outside of a curve in the trail, which provided the best view in both directions. The site was overhung by brambles or adjacent to similar escape cover. The substrate was sand, and the site sloped slightly providing a south aspect. Obviously these factors maximized protection from predators while dust bathing and provided dry, loose dusting material. In this area of high rainfall and frequent heavy dew, many substrates, such as rotting logs and litter, were seldom dry enough for dusting material.

Soil colors at dusting sites were generally similar to colors predominating in Chapman's (1914:273) description of Ruffed Grouse. One-third of the samples were ochraceous buff, the color Chapman used to describe throat, breast, and some variegating of the back. However, the data were insufficient to persuasively indicate that grouse selected dusting material of certain colors.

Although the sample of sites reported here is small, they were remarkably uniform. During June cursory examination of more than 20 other grouse dusting sites in other parts of the Highlands Plateau agreed with the detailed examination of 14 sites described.

Some unanswered questions include (1) what determines frequency of dust bathing by an individual bird, (2) does more than one bird use the same scrape, and (3) how important are suitable dusting sites in the habitat requirements of the species?

SUMMARY

Site factors and soil characters associated with dust bath locations of Ruffed Grouse were investigated near Highlands, North Carolina. Important factors were those which combined to provide dry, loose substrate and safety from predators.

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PUBLICATION NOTES AND NOTICES

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This is the third in the series, after "Birds of Europe" (1966) and "Bird of Australia" (1967), reproducing the lithographs of Gould with text by Rutgers. Comments made in the review of the first book (see *Wilson Bull.*, 79:255-256, 1967) and in the notice of the second (*Wilson Bull.*, 80:247) are applicable to this volume which is practically identical in format and presentation.—O.S.P.

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A Spanish language edition of Smithe's "Birds of Tikal," 1966 (for review see *Land, Wilson Bull.* 80:244-246, 1968). All profits from the sale of this edition go to the Asociacion Tikal, a non-profit organization which supports local interest in conservation and archaeology in Guatemala.