Great Basin Naturalist

Volume 49 | Number 3 Article 10

7-31-1989

Habitat use by breeding male sage grouse: a management approach

Kevin L. Ellis
Brigham Young University

Jimmie R. Parrish
Brigham Young University

Joseph R. Murphy
Brigham Young University

Gary H. Richins
Brigham Young University

HABITAT USE BY BREEDING MALE SAGE GROUSE: A MANAGEMENT APPROACH

Kevin L. Ellis[1,2], Jimmie R. Parrish[1], Joseph R. Murphy[3], and Gary H. Richins[4]

ABSTRACT.—Radio telemetry was used to study habitat use of breeding male sage grouse (*Centrocercus urophasianus*) at a lek in northeastern Utah during 1983 and 1984. Objectives were to determine if grouse day-use areas differed significantly in sagebrush characteristics from adjacent nonuse areas and to establish a simplified method for use by land managers in identifying grouse use areas. We determined that male grouse used areas of greatest sagebrush height and cover. Our methods provide a means for land managers to identify habitat associated with a lek that is suitable for male sage grouse day use in the event sagebrush alteration is planned within 3 km of a lek.

The dependence of sage grouse (*Centrocercus urophasianus*) upon big sagebrush (*Artemisia tridentata*) for cover and food is well documented (Patterson 1952, Eng and Schladweiler 1972, Wallestad and Pyrah 1974, Wallestad and Schladweiler 1974). Modifications of sagebrush habitat used by sage grouse often lead to reduced bird numbers (Rogers 1964, Klebenow 1970, Martin 1970, Wallestad 1975), most likely because sage grouse are specific in their habitat requirements and cannot tolerate serious alterations of use areas (Patterson 1952). For these reasons, and because of the continuing decrease in sagebrush rangelands (i.e., 2.5 million ha between 1952 and 1977), sage grouse numbers continue to decline (Braun et al. 1977).

The objective of this study was to determine if areas used by breeding male sage grouse when not involved in lekking (i.e., day-use areas) differed significantly in sagebrush characteristics from adjacent unused sites.

Study Area

The lek studied was 8 km north of Duchesne, Duchesne County, Utah, at an elevation of 1,548 m (Ellis 1985). The terrain has little slope, and the region is dominated by big sagebrush and cactus (*Opuntia* spp.) interspersed with stands of mustard (*Brassica* spp.). Mean annual rainfall is 22.4 cm, and mean annual temperature is 6.8 C (range 0.6–37.8 C). The average frost-free period is 113 days. Oil production and winter livestock grazing are the major land uses of the region.

Methods

Roosting male sage grouse were captured on the lek at night 19 March–16 May 1983, and 21–24 March 1984, using techniques described by Giesen et al. (1982). Captured individuals were aged, measured (Beck et al. 1975), and fitted with radio transmitters (150–152 MHz) attached to either poncho collars (Amstrup 1980) or necklaces (Biotrack, Sautary, England). Telemetry equipment consisted of a mobile dual 4-element Yagi null-peak antenna system attached to a Telonics TR–2 receiver and a TDP–2 advanced digital data processor. Radio-tagged grouse were monitored 2–4 days per week and were typically located one to three times during the monitoring day between 2 April and 25 May 1983 and between 2 April and 17 May 1984. Tracking began 0.5–1.0 hr after grouse departed the lek and terminated 2 hr before sunset. Locations of birds were based on triangulation from three locations at distances 100–400 m apart. All angles were adjusted for previously determined bias (Springer 1979) and plotted on a 7.5-min. USGS topographical map. Each 2.56-km^2 section of the study area was divided into 36 equal cells (0.071 km^2/cell) (Fig. 1), and each radio location was classified into the cell that encompassed the majority of the error

[1]Department of Zoology, Brigham Young University, Provo, Utah 84602.
[2]Present address: Colorado Division of Wildlife, 151 East 16th Street, Durango, Colorado 81301.
[3]Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah 84602.
[4]Deseret Generation and Transmission Cooperative, 8722 South 300 West, Sandy, Utah 84076.

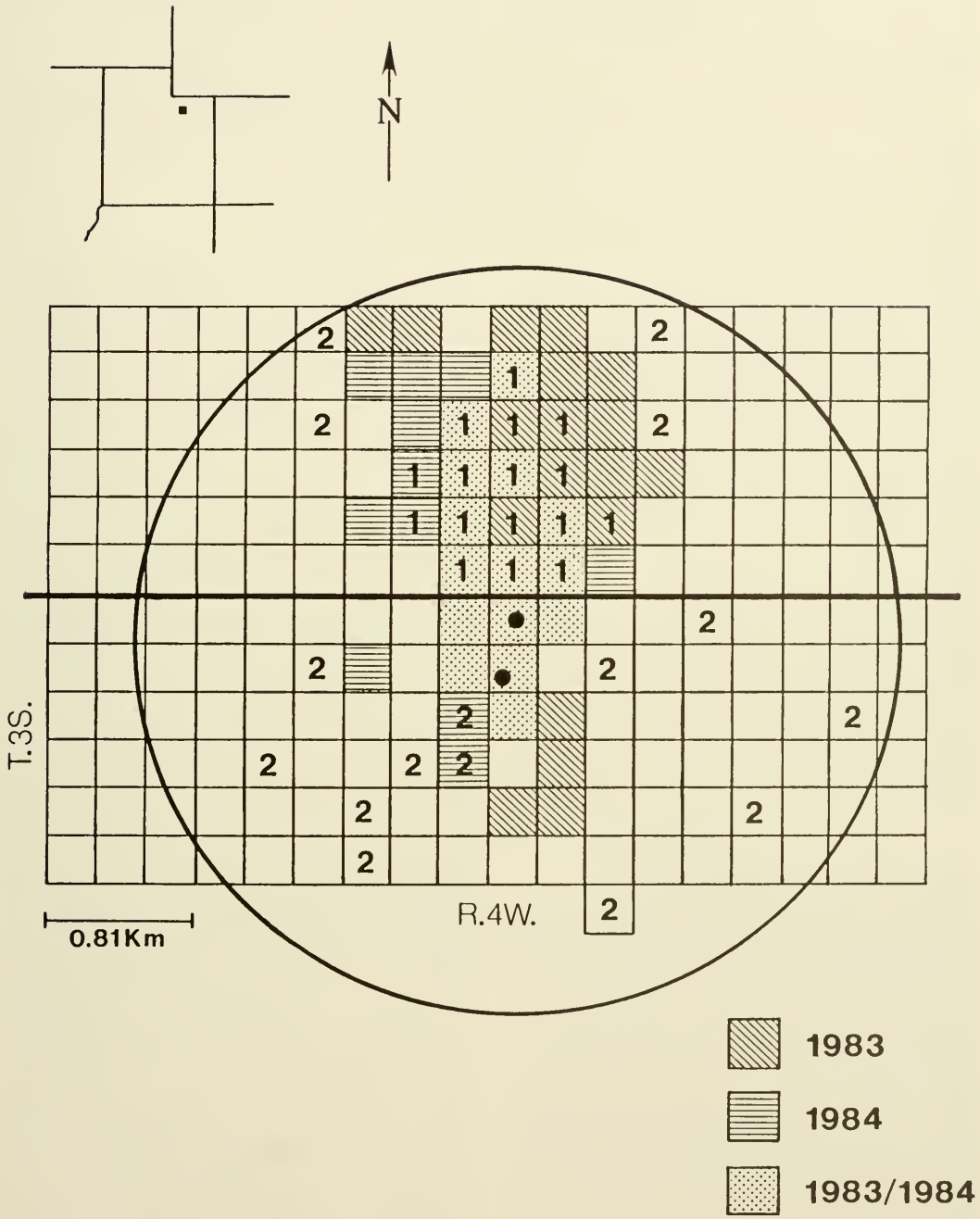

Fig. 1. Distribution of radio-tagged male sage grouse in relation to lek centers at an area in northeastern Utah. Lek centers are represented by black dots. 1 = location of use area vegetation transect. 2 = location of nonuse area vegetation transect.

polygon (Springer 1979) for that location. In addition, radio-tagged grouse were flushed at random intervals to visually determine whether individuals were associated with other males from the lek.

On this basis, grouse use was calculated for each cell and categorized as day-use or nonuse areas (Ellis et al. 1987). Sixteen point-center-quarter vegetation sites (Seber 1973) were selected within the day-use area, and 16 were selected at random in the nonuse area for analysis and comparison of sagebrush characteristics. Sites within the nonuse area were selected with the stipulation that each site could not be farther from the central area of the lek than the farthest radio location plotted during the study. Sagebrush cover (percent), height (cm), and density were measured along four transects extending 30.8 m in each of the cardinal compass directions from the center of each vegetation site (64 transects each in the use and nonuse areas). Only live sagebrush plants were measured along each transect. Percent cover was transformed for analysis using angular transformation (Sokal and Rohlf 1969). Sagebrush characteristics recorded along individual cardinal transects were pooled to provide an estimate for each vegetation site. Pooled estimates were tested for similarity using computer-generated, paired t-tests.

RESULTS AND DISCUSSION

Eight male sage grouse (7 adults, 1 juvenile) were monitored for 27 days between 2 April and 25 May 1983, and 10 adult males were monitored for 19 days between 31 March and 16 May 1984, yielding a total for both years of 252 radio locations. Dispersion flights from the lek to day-use areas were in a northeasterly direction and 0.5–0.8 km in distance (Fig. 1). The longest flight recorded was 2.1 km. Radio-tagged males were generally accompanied by 15–30 other males when flushed and were reluctant to fly on days with high winds or rain.

Sagebrush cover and height were significantly greater in day-use areas although sagebrush density was virtually identical in both day-use and nonuse areas (Table 1). Sagebrush cover in day-use areas ranged from 26.88 to 36.45% and from 8.58 to 36.15% in nonuse areas. Sagebrush height in day-use areas and nonuse areas ranged from 40.50 to 69.73 cm and 20.30 to 56.18 cm, respectively. Breeding male sage grouse appear to prefer day-use areas that have greater plant size than adjacent areas (Wallestad and Schladweiler 1974, Schoenberg 1982). On the basis of multivariate statistical analyses of sagebrush characteristics, Schoenberg (1982) concluded that sagebrush plant size was the most important habitat factor separating use from nonuse areas. Our results support the conclusion that breeding male sage grouse prefer day-use areas with sagebrush plants that are taller and greater in diameter than plants in adjacent areas.

TABLE 1. Characteristics (mean ± S.D.) of live sagebrush plants measured in 1983 and 1984 in sage grouse use areas of northeastern Utah, and t-test results of comparisons between use areas.

Area[1]	Cover[2]	Height[3]	Density[4]
Day-use	30.50 ± 2.88	53.20 ± 10.50	13.83 ± 2.32
Nonuse	25.99 ± 6.82	40.50 ± 10.80	13.56 ± 4.51

[1] N = 16.
[2] P = .02, t = 2.44, DF = 20.2.
[3] P = .002, t = 3.36, DF = 30.0.
[4] P = .84, t = 0.21, DF = 22.4

Alteration of sagebrush habitat in the vicinity of a lek may cause population declines or abandonment of an area by breeding sage grouse (Rogers 1964, Martin 1970, Wallestad 1975, Braun et al. 1977). In situations where sagebrush alteration or destruction is unavoidable within 3 km of a lek we suggest that the viability of that lek could be maintained if the land-use manager were able to either (1) protect the historical breeding male day-use areas and associated lek, or (2) in the event that these areas cannot be preserved, provide protection of adjacent areas with similar sagebrush stands within a 3-km radius of the lek. Recognizing that the land-use manager, in most cases, has neither the facilities nor the time to perform the complicated procedures (i.e., multivariate statistics) often used by researchers, we make the following recommendations to those considering sagebrush alteration in the vicinity of a lek:

1. When possible, protect all sagebrush within a 3-km radius of a lek as suggested by Braun et al. (1977).

2. If alteration is unavoidable within 3 km of a lek, identify day-use areas. This can be

accomplished by making 10–15 periodic visits to the lek, during the breeding season, and observing the departure of the strutting males. Once the day-use area has been located, make a walk-through inspection looking for signs of heavy grouse use in the area (i.e., droppings, dusting sites, feeding sites). This will allow a more specific definition of the use area. Once the core use area is identified, protect it and try to provide for a buffer around it if possible. Our data indicated that in both years the core day-use area was a minimum of 0.25 km^2 in size. Because grouse often walk to day-use areas, it is recommended that a continuous strip (i.e., travel lane) no less than 200 m be maintained between the lek and the designated day-use areas.

3. After day-use areas are identified and it is concluded that they cannot be protected, the manager should determine their basic physical sagebrush characteristics. Preservation of statistically similar adjacent stands along with an adjoining travel lane may provide male grouse with the necessary habitat to continue using the lek. Any planned alterations should be done after males have moved to summer or fall ranges.

Acknowledgments

Financial support for this study was provided by Deseret Generation and Transmission Cooperative, Utah Division of Wildlife Resources, and the Department of Zoology at Brigham Young University. Appreciation is extended to C. M. White, B. J. Ellis, C. N. Ellis, M. Richins, N. Bingham, J. A. Roberson, and L. K. Swenson for assistance. The manuscript was improved by comments from T. D. Beck, E. D. Bailey, F. S. Guthery, and an anonymous reviewer.

Literature Cited

Amstrup, S. C. 1980. A radio-collar for game birds. J. Wildl. Manage. 44: 214–217.

Beck, T. D. I., R. B. Gill, and C. E. Braun. 1975. Sex and age determination of sage grouse from wing characteristics. Colorado Dept. Nat. Res., Div. Game, Fish and Parks, Game Inf. Leafl. 49. 4 pp.

Braun, C. E., T. Britt, and R. O. Wallestad. 1977. Guidelines for maintenance of sage grouse habitats. Wildl. Soc. Bull. 5: 99–106.

Ellis, K. L. 1985. Distribution and habitat selection of breeding male sage grouse in northeastern Utah. Unpublished thesis, Brigham Young University, Provo, Utah. 32 pp.

Ellis, K. L., J. R. Murphy, and G. H. Richins. 1987. Distribution of breeding male sage grouse in northeastern Utah. West. Birds 18: 117–122.

Eng, R., and P. Schladweiler. 1972. Sage grouse winter movements and habitat use in central Montana. J. Wildl. Manage. 36: 141–146.

Giesen, K. M., T. J. Schoenberg, and C. E. Braun. 1978. Methods for trapping sage grouse in Colorado. Wildl. Soc. Bull. 10: 224-231.

Klebenow, D. A. 1970. Sage grouse versus sagebrush control in Idaho. J. Range Manage. 23: 396–400.

Martin, N. S. 1970. Sagebrush control related to habitat and sage grouse occurrence. J. Wildl. Manage. 34: 313–320.

Patterson, R. L. 1952. The sage grouse in Wyoming. Sage Books, Inc., Denver, Colorado. 341 pp.

Rogers, G. E. 1964. Sage grouse investigations in Colorado. Colorado Dept. Game, Fish and Parks Tech. Publ. 16. 132 pp.

Schoenberg, T. S. 1982. Sage grouse movements and habitat selection in North Park, Colorado. Unpublished thesis, Colorado State University, Fort Collins. 84 pp.

Seber, G. A. F. 1973. The estimation of animal abundance and related parameters. Griffin, London, United Kingdom. 506 pp.

Sokal, R. R., and R. J. Rohlf. 1969. Biometry: the principles and practice of statistics in biological research. W. H. Freeman and Co., San Francisco, California. 776 pp.

Springer, J. T. 1979. Some sources of bias and sampling error in radio triangulation. J. Wildl. Manage. 43: 926–935.

Wallestad, R. O. 1975. Male sage grouse responses to sagebrush treatment. J. Wildl. Manage. 39: 482–484.

Wallstad, R. O., and D. Pyrah. 1974. Movement and nesting of sage grouse hens in central Montana. J. Wildl. Manage. 38: 630–633.

Wallstad, R. O., and P. Schladweiler. 1974. Breeding season movements and habitat selection of male sage grouse. J. Wildl. Manage. 38: 634–637.