

# Minnesota Forestry Research Notes

No. 238  
October 15, 1972

AERIAL PHOTO MEASUREMENT OF BIG SAGEBRUSH

(Artemisia tridentata) CROWN DENSITY<sup>1/</sup>

M. P. Meyer, R. L. Eng and P. Schladweiler<sup>2/</sup>

A study of sage grouse (Centrocercus urophasianus) movements and habitat use conducted during the winters of 1965-66 and 1966-67 near Winnett, Montana, showed that the area utilized by a wintering flock may extend over several square miles (Eng and Schladweiler, 1972). Although crown cover of sagebrush was measured by line intercept (Canfield, 1941) at many points of known sage grouse use, it became evident that to compare use of sagebrush with availability some method other than ground measurements would be desirable to map large areas into crown classes.

The Winnett study area was photographed in August 1967 at an altitude of approximately 2,000 feet resulting in a photo scale of 1:4,000 (Figure 1). Crown density stratification of the sagebrush on the aerial photographs was undertaken initially on the basis of optical estimates without any kind of photo interpretation aid. This was not a matter of choice -- density scales were not available for the particular vegetation conditions under analysis. It soon became apparent, however, that some sort of density gauge would be

---

<sup>1/</sup>Project financed jointly by the Minnesota Agr. Expt. Sta., the Montana Agr. Expt. Sta. and the Montana Fish and Game Department.

<sup>2/</sup>Professor, University of Minnesota College of Forestry, St. Paul; Professor Montana State University Department of Zoology and Entomology, Bozeman; and Game Research Biologist, Montana Fish and Game Department, Bozeman. The assistance of Minnesota College of Forestry student John Adams in compiling the density scale is gratefully acknowledged.

required, even though an experienced interpreter was involved. Not only did the interpreter periodically experience difficulty in assigning specific density classes with any degree of confidence, but he often experienced dissatisfaction with previous density class "calls" upon viewing them several days, or even hours, later.

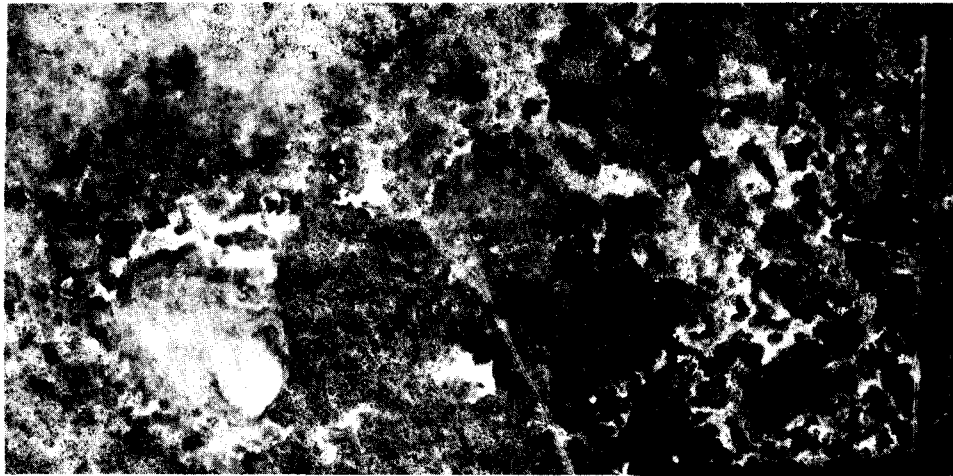


Figure 1. Portion of 1:4,000 scale (1" = 333') aerial photo of Pike Creek study area in eastern Montana. Note variations in distribution patterns and density of sagebrush.

The density scale developed for this study (Figure 2) portrays 1-acre blocks having within them randomly arrayed 18" diameter (ground-equivalent) black dots at the following density levels: 5%, 15%, 25%, 35% and 45%. On the basis of ground observations, the 18" crown diameter was considered to be about average for the sagebrush plants in the study areas.

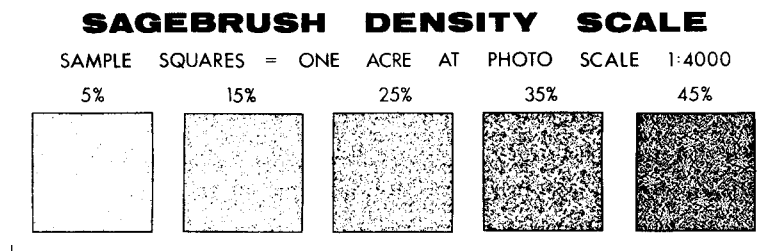


Figure 2. Sagebrush density scale. Each dot has a ground-equivalent diameter of 18" at a photo scale of 1:4,000.

Comparison by the interpreter of the crown density scale with density classes previously photo-interpreted without a density scale indicated there had been consistent errors in his estimates. On the average, the interpreter found his unaided density estimates to be approximately 10% higher than what he judged the same areas to be when using the density scale.

The density scale was employed to delineate the crown density of sagebrush on four square miles of the study area. Since previous investigations had shown approximately 20% crown density to be a significant breakpoint in seasonal habitat selection, only two photo canopy coverage classes were employed - less than, and greater than, 20%. Only units of 5 acres or more were delineated.

Actual ground measurements of canopy coverage (feet of sagebrush intercepted per 100 feet of transect) were obtained at 36 points throughout the four square miles. Measurements were taken to the nearest 0.1% along two 50-foot lines which bisected points of known sage grouse use. Each point was given a written location to the nearest .05 mile from reference points visible on aerial photos. Thus, a comparison was permitted between actual measurements of canopy cover and a class assigned through use of the density scale.

Three of the 36 measurements were discarded since their location fell immediately on a line between two assigned classes. Of the remaining 33, 20 (60.6%) were in agreement with the assigned classifications of 5-19% or 20+%. Of the 13 points where actual ground measurements fell in a different class than photo density scale assignments, 6 were incorrectly assigned to the lower density class and 7 to the higher. The average differences in measured canopy from the 20% separation point was 5.7% and 4.3% for those assigned under and over, respectively.

It would appear that this density scale would expedite the classification of large areas of sagebrush to canopy cover classes. The discrepancies observed between assigned classes and actual measurements could easily occur in the present study since changes in canopy of less than 5 acres were not delineated on the photographs, whereas the ground measurements encompassed areas less than .2 of an acre. Figure 1 illustrates very dramatically the great variation which existed in sagebrush density and spatial distribution. Even so, the density differences were evenly distributed on both sides of the separation point suggesting that the errors were compensating.

#### Bibliography

- Eng, R. L. and P. Schladweiler. 1972. Sage grouse winter movements and habitat use in Central Montana. J. Wildl. Mgmt. 36(1):141-146.
- Canfield, R. H. 1941. Application of the line interception method in sampling range vegetation. J. Forestry 39(4):388-394.