COMPARISON OF AN AERIAL AND GROUND CENSUS OF MOOSE

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Introduction

In March, 1952, the Parks and Recreation Division of the B.C Forest Service conducted an aerial census of the moose in Wells Gray Park (Lat. 52°N, Long. 120°W). The method employed and the results obtained have been reported in detail (Edwards, An Aerial Moose Census, B.C. Forest Service Res. Note No. 23, 9 pp, illus., 1952) and are summarized in this paper. During the same month of the aerial census a ground party of two men on snowshoes counted moose on the same moose range.

The writer believes that wildlife census methods can yield data containing large errors, and that before any method is accepted as reasonably accurate it should yield results similar to those obtained from an entirely different method. Accordingly these two censuses were conducted more or less concurrently.

While it would be useful to compare the costs of the two methods, this aspect has not been analyzed. In both the aerial and ground operations considerable time and effort were expended in gathering data not strictly classifiable as census data. In addition, it appears premature to calculate costs when the relative sampling efficiency of each method is not fully known.

Census Conditions

Topography and vegetation often affect that success of census methods. Flat terrain and an open vegetation cover provide ideal conditions for visual counts. The Wells Gray moose range has favourable conditions for such counts. This range is contained in the relatively flat bottom-lands of a broad intermountain valley, while its vegetation consists mainly of open stands of willow and aspen with little coniferous admixture. In winter leafless vegetation and snow-covered ground contribute to good visibility both on the ground and from the air.

Aerial Census Method

The aerial method used attempted to provide counts on narrow strips of known width and length. The pilot was instructed to fly uniformly at 200 feet from the ground, but under some flying conditions 300 feet was considered to be a more accurate average. Observers on both sides of the plane counted only moose within 30 degrees from the vertical, or at an elevation of 200 feet the total strip width was 232 feet. The 30 degree angle was established by each observer lining up a piece of cellulose tape fixed to the window with a cord tied and taped to the wing strut. When these were in line, animals below that line were within the census strip.

Lengths of strips were determined by flying between known points, or in a few cases by estimating ground speed and timing the counting period.

Three census flights were undertaken, each flight sampling the entire winter range with approximately a six percent sample. Use of a DeHavilland “Beaver” airplane enabled a minimum counting speed of about 80 miles per hour with lowered flaps.

Aerial Results

The aerial census sampled 60 square miles of range. Population figures calculated from the data of each flight were rather variable, due no doubt to sampling errors. The figures obtained were 2148, 2328, and 1764.

Since the ground count was restricted by snow conditions to the northern two-thirds of this range, aerial data from this part of the range must be used for comparison.. Data from three aerial counts are summarized here

	March 11	March 12	March 13
Square miles sampled	1.8	2.6	2.6
Moose seen	85	123	92
Moose per square mile	47	47	36

As in the figures for the entire 60 square miles, data for the southern two-thirds of the range are quite variable. Further calculation would place the moose population on these 40 square miles at 1880, 1880, and 1440. If the figures from the three flights are combined to obtain a single population figure there is a suggested moose population of 1720 animals.

Ground Census

During the month of the aerial census a ground crew counted moose on short sample strips scattered over the 40-square-mile area. The men employed were excellent woodsmen but were not familiar with sampling techniques except as they applied to strip cruising in forestry. There were therefore instructed to walk in straight lines between points separated by known distances, counting only those moose seen within 200 feet of their line of travel. The range offered good visibility through open stands of leafless bushes with the result that this simple type of “moose cruise” seemed to offer excellent possibilities for success.

Lack of accurate maps for the area necessitated that strips be chosen between points of known location as determined by previous land surveys. This resulted in most strips being located on the valley bottomlands where surveyed lots were more numerous. Since these may have contained slightly denser stands of moose than did the rest of the range, census figures may be too high by a small margin.

This ground crew censused 17 miles of strip 400 feet wide, or about 1.3 square miles. They saw on this area 73 moose, eight of which were concentrated about a haystack at the edge of a strip. These eight are omitted from the rest of the calculation on the grounds that they represent an abnormal concentration. These figures give, then, 50 moose per square mile or about 2000 in the 40 square miles sampled.

Aerial Census Accuracy

A previous paper (Edwards, op. cit.) has discusses the inaccuracies of the aerial method. Among these are the possibility of misjudging aircraft height and therefore width of sampling strip, effect of sloping ground upon strip width, and difficult of seeing moose in an area dotted with charred logs and stumps when the ground is passing rapidly because of low flight. Related to this last, and probably the most serious factor affecting accuracy, is effect of eye fatigue. It was found that counting efficiency dropped through a census period of one hour. This efficiency drop was most marked when counting from the left side of the aircraft used. The left observer was placed behind the pilot and used a narrow window. The right observer was beside the pilot and was able to count both directly down and by looking well ahead along the strip. Looking down for long periods upon a narrow strip was fatiguing at both windows, but the narrow left window was more tiring. No matter which observer occupied this window, the left observer obtained consistently lower counts than did the other. Right window counts ranged from 33 to 100 percent greater on the three flights. In all flights 387 moose were seen on the counting strip, 236 from the right window and only 151 from the left.

Further study is needed to evaluate this variation and its cause, but is seems probable that in 220 miles of counting that anything but observer efficiency could account for such a peculiar discrepancy. It would appear that roughly 85 moose were missed from the left window and that the total count should therefore be increased by about 22 percent.

Comparison of Aerial and Ground Figures

The ground census showed that about 2000 moose were inhabiting 40 square miles of winter range. The aerial figures when taken at face value suggest a population of about 1720 moose. These two figures are reasonably close for general purposes, but are sadly dissimilar in view of the care taken to approach absolute accuracy as closely as possible in both census operations.

It is difficult to detect inaccuracies in most census methods. Those described above may contain many. The most important inaccuracy detected is that caused by eye fatigue in aerial counting, and this has been at least partially evaluated. It has been shown that the aerial figures might be increased by 22 percent for greater accuracy. This correction, when applied to the aerial figures from the 40-square-mile range, increases the population figure from 1720 to 2098. This figure is very close to the ground census figure of 2000.

From the close agreement of the population figures obtained by the two methods it is concluded that both methods probably yield reasonably accurate figures. It is hoped, however, that further work will verify this accuracy.

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