Flook, D.R.
Aerial game inventory, Elk Island National Park - February 1960. Edmonton, 1960.
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1. Aerial game surveys - Elk Island National Park. 2. Elk Island National Park. I Title

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has map tracings

Aerial Game Inventory, Elk Island Park
February, 1960

Transect Sampling, February 6.

The first aerial census of big game mammals in Elk Island Park was attempted February 17, 1959 by Bell 47-G-2 Hellcopter. That was described in a report dated March 9, 1959. That survey was flown at 250 feet from the ground. Transects were flown at one-half mile intervals and animals counted on a strip 344 feet wide. Thus the sample transects viewed constituted 13.0 percent of the entire area.

Inspection of the data from the 1959 survey showed great variation among the number of elk counted on transects of equal lengths. Because of that, and the limited number of transects, the writer considered that the sampling intensity was not adequate for a precise population estimate. It had been noted that many animals were flushed off the transect as the helicopter passed over them at 250 feet. It was therefore thought that transects could not be located closer together without affecting the count through animals being flushed onto the adjacent strip, resulting in them being counted more than once. Also, to increase the number of strips flown by helicopter would result in excessive cost.

In order to increase sampling intensity in 1960 it was decided to increase the width of strip surveyed from 344 feet to 666 feet (about one-eighth mile), by increasing the height flown from 250 feet to 400 feet and by increasing the maximum angle of sight from 54 degrees to 59 degrees. The interval between transects would remain at one-half mile.

A survey was flown February 6. Earl Lozo who piloted the 1959 survey, piloted the operation using an Associated Helicopters Bell 47-G-2. As the area had been blanketed in fog for several days, it was decided to fly the survey as soon as the fog cleared February 6. However there was a very heavy deposit of hoarfrost on the tree canopy which tended to hide the ground and combined with bright sunlight to cause darkly contrasting shadows which made observations difficult. The results of the February 6 survey are tabulated in Appendices 1 and 2.

As the area of transects sampled north of Highway 16 is 11.6 square miles and the area of that portion of the park is 51 square miles in size, sampling intensity was 22.7 percent. For the Isolation area the transects sampled totalled 5.4 square miles in area. As that area of the park is 23 square miles in size, sampling intensity was 23.5 percent.

Population estimates calculated from the sample transect data are presented in Table 1.

Table 1. Population Estimates Calculated from Feb. 6 Sample Transect Data

	Moose	Elk	Bison	Deer	Coyotes
N. of Highway 16	26	62	44 (exclusive of feed lot)	0	13
Isolation Area	30	0	196	21	0

It can be seen on inspection of the sample transect data in Appendices 1 and 2 that there was great variability in numbers of animals seen among different transects of equal lengths. From wardens' observations it seemed likely that the calculated population levels were much lower than actual. That was no doubt partly due to animals on the strips having been missed due to the difficult conditions of observing caused by hoarfrost and shadows described earlier. It is the writer's opinion that the low estimate was only partly due to low observing efficiency, and it was largely contributed to by sampling error.

To calculate fiducial limits to population estimates for the entire areas it would be necessary to have the transects divided into segments of equal length. The data were not gathered in that way. However, transects 11 to 20 were adjacent and of equal lengths. It was therefore attempted to statistically analyse the data collected from them, and calculate fiducial limits to the population mean estimated for the block sampled by them. That block consists of 30 square miles, or 58 percent of the park area north of Highway 16. To make the analyses it was necessary to assume that elk distribution was random although results of the complete count made later showed that such was not the case. Statistics for the count of elk on transects 11 to 20 were as follows:

Number of transects $n = 10$

Total elk seen on transects $SX = 9$

Mean number of elk seen per transect $\bar{x} = 9/10 = 0.9$

As eight of the transects contained no elk observations, the distribution seemed more nearly to fit the Poisson type than the normal. Therefore (Snedecor, P. 441), the variance, s^2 was equal to the mean, $\bar{x} = 0.9$

Therefore the standard error of the mean,

$$s_{\bar{x}} = \sqrt{\frac{s^2}{n}} = \sqrt{\frac{0.9}{7}} = \sqrt{.13} = .361$$

Determining the fiducial limits at the 95 % probability level, the estimate of the mean was as follows:

$$m = \bar{x} \pm t s_{\bar{x}} \text{ or } m = 0.9 \pm 2.262(.361) = 0.9 \pm 0.8 \text{ or } 0.1 \text{ to } 1.7$$

On that basis, at the 95% probability level, the number of elk in the 30 square mile block sampled by transects 11 to 20 could be estimated to lie between 4 and 68 elk.

It is thus apparent that the confidence limits which would be set to an estimate of the elk population in the block sampled by transects 11 to 21 were so broad that the estimate would be of little use. It seemed likely that if statistics could have been calculated for data collected from the whole park, the precision of the population estimates would have been found inadequate.

It had been observed during the February 17th survey that the animals were not much disturbed by the helicopter flying 400 feet above them. When they were flushed, they seldom ran very far. That fact led me to consider flying a complete count of the game in the park.

Complete Count, February 25th and 26th

February 25th and 26th a complete count of the large mammals of the park was attempted. A Helio Courier fixed-winged aircraft was chartered from Courier Flights Limites, Edmonton. That aircraft is capable of cruising within a range of 35 mph. to 120 mph., which makes it well adapted to game surveys.

The plane was piloted by the owner, A.J. Mallandaine. Park Warden R. Jones occupied the front right-hand seat and assisted the pilot in navigating. It was considered very important to follow the set course closely so as not to duplicate or omit any strips. Lawson Sugden, who has had considerable experience in aerial game surveys in B.C., ably counted game on the left side of the aircraft while I observed on the right side.

Fifty-seven east-west lines were flown across the park at one-quarter mile intervals. Each observer used a map pasted on cardboard with flight lines marked, to plot all animals observed. Although most of our attention was directed to searching for animals in the one-eighth mile strip, any animals seen farther out were plotted also. In this way some animals or groups of animals were first recorded while the adjacent strip was being surveyed. They were later observed but when their location was checked on the map it was noted that they had already been recorded. Because the pilot could not help but drift a few hundred feet off course occasionally, the observers found it essential to a successful survey to plot observations on the map so as not to duplicate or omit observations. In several cases animals or groups of animals had been observed by both observers when flying in different directions. By comparing the locations on the two maps after the survey, duplications were omitted.

A strip beneath the aircraft was hidden from the view of the observers by the fuselage. The angle inside which the ground was hidden was 15 degrees on either side. Therefore the width of the hidden strip totalled about 214 feet, or about 16 percent of the one-quarter mile strip. In many cases animals which could not be seen because the aircraft passed directly over them, were seen from the adjacent transect and recorded. Taking into consideration all factors of error, including animals missed beneath the plane, and those not seen for other reasons, it was the considered opinion of the two observers that the animals missed did not exceed the following:

Bison	5%
Moose	10%
Elk	15%
Deer	25%

February 25th, after completing the flight lines on the isolation area we circled the two large herds of buffalo on Flying Shot Lakes to count them accurately. The buffalo in the Mud Lake feed lot were not counted from the air, but the ground count of 374 was supplied by Mr. Webster. The latter is believed to be accurate.

The isolation area was surveyed February 25th under conditions of light overcast. The park proper north of Highway 16 was surveyed February 26th, beginning at the highway with Transect 42. There was a light overcast when we began, but from Transect 31 to 1 the sky was clear. There was a fresh snow cover on the ground for the survey and no frost or snow deposits on the trees. Although shadows were a little troublesome during the northern part of the survey, observing conditions were fairly good.

All animals observed are plotted on the accompanying map. The population counts and densities are presented in Appendix 2.

Costs of Operations

Surveying the sample transects February 6th entailed 5 hours, 20 minutes flying in a Bell 47-G-2 helicopter at a rate of $108 per hour for a total cost of $576.00.

The complete game count made February 25th and 26th entailed 8 hours, 35 minutes flying in a Helio Courier at a rate of $45 per hour for a total cost of $386.25.

Table 2. Observed Game Populations and Densities, Aerial Survey, February 25, 26, 1960

Species	Park Area Proper		Isolation Area	
	No. of Animals Counted	Average Density, Animals per sq.mi.	No. of Animals Counted	Average Density, Animals per sq. mi.
Moose	83	1.6	61	2.7
Elk	233	4.6	8	0.3
Bison	414	8.1	256	11.1
Deer	7	0.1	102	4.4
Coyotes	24	0.5	2	0.1

Summary

An aerial game census of Elk Island Park was attempted February 6, 1960, by Bell Helicopter sampling one-eighth mile strips of the park at one-half mile intervals. The results of that survey indicated that the sampling intensity was not adequate to produce precise population estimates.

A complete game count was attempted February 25th and 26th, using a Helio Courier fixed-winged aircraft. The results of that survey are presented in Table 2. In the cases of moose and elk they are considered sufficiently accurate for management purposes. In the case of buffalo, ground counts in the early winter supply accurate information on numbers. However information on late winter distribution is useful. It was the considered opinion of the observers that the

animals missed did not exceed: buffalo - 5 percent; moose - 10 percent; elk - 15 percent; deer - 25 percent, although in each case it is possible that none were missed, particularly of buffalo and moose.

Edmonton, Alberta.
May 24, 1960

Donald R. Flook

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Appendix 1. Animals Observed on Feb. 6, on Sample Transects North of Hwy. 16.

Transect No.	Length (miles)	Moose	Elk	Bison	Deer	Coyotes
1	4			2		
2	4					
3	4					
4	4					
5	4					
6	4		5			
7	4	1				
8	4					
9	5					
10	5	1				
11	6					
12	6					1
13	6	2		1		
14	6		3	5		
15	6		6			
16	6					1
17	6					1
18	6					
19	6			2		
20	6					
21(portion N. of Hwy.)	3	2				
Totals		6	14	10		3

Appendix 2. Animals Observed Feb. 6., on Sample Transects Isolation Area.

Transect No.	Length (Miles)	Moose	Elk	Bison	Deer	Coyotes
21(portion S. of Hwy.)	3					
22	6			3	1	
23	6	1				
24	6			3		
25	6	3		27	2	
26	6	2				
27	6					
28	6	1		13	2	
T otals		7		46	5	

Appendix 3. Game Observations Feb. 26, Aerial Count, North of Highway 16.

Interval Between Flight Lines	Moose	Elk	Bison	Deer	Coyote
1-2	2			2	
2-3		27	2		
3-4		1	1		
4-5	3				
5-6	2				
6-7	2	1			
7-8					
8-9					
9-10					
10-11					
11-12					
12-13					
13-14					
14-15				1	
15-16	8	12			
16-17	5	35	1		3
17-18	8	25			
18-19		26			
19-20					
20-21	6				2
21-22	1	5			
22-23	6	9			1
23-24	2	7	2		
24-25	6	1			1
25-26	5	4	2		
26-27	5	6	1		
27-28	3	3			
28-29	1	13	4		1
29-30	2				
30-31		4	1		4
31-32					9
32-33	3		2		
33-34	3	3	1		
34-35		1	1 alone & 37* in feed lot		
35-36		21	8		
36-37	4	20	2		
37-38	4		8		3
38-39	1	9	4		
39-40					
40-41				4	
41-42	1				
42-43					
Totals	83	233	414	7	24

* Herd in feed lot not counted from the air.
Count supplies by Mr. H.R. Webster.

Appendix 4. Game Observations Feb. 25, Aerial Count Isolation Area

Interval between flight lines	Moose	Elk	Bison	Deer	Coyotes
41-42	2		30	1	
42-43	4		5	10	
43-44	4	8	3	5	1
44-45	5		80	2	
45-46	4		5	1	
46-47	13		97	10	
47-48	7			9	
48-49	5		22	5	
49-50	3		1	5	
50-51	2		4	1	
51-52	4		2	13	
52-53	3			6	
53-54			1	15	
54-55	2		1	16	
55-56	3			3	1
56-57			5		
Totals	61	8	256	102	2

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DATE LOANED	BORROWER'S NAME