PRELIMINARY DATA
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Analysis and Appraisal of a Three Year Aerial Survey of Beaver Habitat in the Southern and Central Areas of the Mackenzie District, N.W.T. 1956, 1957, 1958

by

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Introduction

The history of the method of surveying and estimating beaver populations from the air in the Northwest Territories is discussed by Fuller (1956). The combined surveys of Kelsall (1949) Flook & Stewart (1955) and Fuller (1955) covered a large part of the southern and central Mackenzie in the period 1949-1955. All the areas covered by the above mentioned workers were resurveyed by the writer in the period 1956 to 1958. The area groupings were Fort Simpson, Fort Liard, Wrigley, 1956, Fort Providence, Fort Rae 1957, Fort Providence, Fort Rae, Lac la Martre, Fort Franklin, Fort Smith, 1958. The areas north of those mentioned were covered by Fuller (1955), and Bryant (1957) which gives total coverage for what can be considered the productive beaver areas of the Mackenzie District.

Method of Survey

The surveys were conducted on much the same basis as described by Fuller (1955) in that the same transect lines were followed. The aircraft used in this survey was a De Havilland

"Beaver" piloted by Pat Carey. Warden H. Spreu was the second observer in 1957 for the Providence area and Rae transplant resurvey. A member of the Northern Research Unit, Forestry Branch, Mr. W. Jeffrey, accompanied the writer throughout the 1958 resurvey as second observer recording lakes. During the 1958 resurvey Mr. T. Barry, Canadian Wildlife Service, Warden O. Eliason, and Superintendent of Game, J. Bryant, acted as observers also. The writer recorded the population of beaver in the streams, Jeffrey the lakes, and all the other observers when present did parallel observations on streams as a check with the first observer.

Results of Resurveys

The 1956 resurvey of the Fort Simpson, Fort Liard and Wrigley areas has been reported previously, Novakowski (1956). The 1957 resurvey covered only parts of the Providence area and the Rae transplant area. The balance of the Providence transects were done this year. The complete resurvey of the Fort Providence area is presented in Table I, the Fort Rae, Fort Franklin area in Table II and the Fort Smith area in Table III. These tables show the data as recorded with an analysis of the estimated population abundance designated as flight miles between colonies. This designation varies somewhat from that used by previous writers reporting on the same areas, however, for comparative purposes the data, as presented by the previous writers, were easily adjustable to the new designation.

Prior to the discussion of beaver populations in the various areas resurveyed, it should be established what is or can be considered an abundant, moderate, or poor population. Since we are recording our observations in numerical values a numerical figure or range must, therefore, be the basis for designating various densities.

Rarely is a density figure of one or more active colonies per mile found in the reports for the Northwest Territories. The same is true of reports from North Dakota Hibbard & Mill (1953). It is reasonable, therefore, to consider that an index figure of 1 to 2 miles between colonies indicates an abundant population, 2 to 4 miles between colonies as average and higher than 4 miles between colonies as poor. To weigh the index properly in management perspective, the availability of food (habitat in general) and the accessibility should also be considered.

Fort Providence area

The areas deemed most productive in the Providence area shown in the map of survey transects, Figure 1, are transect number 3 on the west end of Tathlina Lake, number 14 a creek draining into the Kakisa River, number 20 Laferte Creek, number 23 creek flowing into Horn River and number 24 Ferguson Creek. The above includes 5 out of the 27 transect courses flown. Of the balance 6 can be considered moderately productive and 16 are relatively unproductive. As near as can be seen from the air the unproductive areas are so because of limiting habitat as mentioned in the remarks in Table 1. This is a general observation which would require further study

since the writer is somewhat chary of deciding on limiting factors from the air.

The results of the present survey were compared with those in 1951 by Fuller and Flook and in 1954 by Flook and Stewart. This is shown in Table IV. There appears to be a wide discrepancy in results. In all cases the results of the 1958 survey indicate a lower population - the most important decrease being transect number 15 which dropped from 40 active colonies to 3 active colonies. In all creeks with a pronounced gradient some ice scouring action can be expected but the writer doubts whether scouring, overtrapping or disease could have caused such a sharp decline. The area covered in the transect is the most accessible one to the local natives. It is suggested that a check be made on the area as soon as possible in order to determine whether some sharp decrease did occur or whether the observer was at fault.

The only decreases worth considering are those on long transects which were in the past productive. A short stream as surveyed with a good population has less management value than a long stream with a good population. Thus the following transects are considered for possible causes of the decrease observed and their significance discussed:

(a) Transect number 3 - does not appear to be a significant change and decrease noted could well be within observer's margin of error - population still abundant.

(b) Transect number 10 - significant decrease - stream

fast and rocky, hardly favourable for damming. Scouring action during break-up possible. Important that this decrease be verified.

(c) Transect number 12 - again a significant decrease which appears to be real since stream double-checked.

(d) Transect number 15 - previously noted as a significant decrease. This stream is very accessible for trapping. It is also important that this stream be checked.

(e) Transect number 20 - not a significant change since the length of the survey was shorter in 1958 and the most productive area may have been omitted.

(f) Transect number 25 - short former productive river. Easily observable. Decrease must be described as real.

(g) Transect number 26 - also an easily observable stream and decrease must be described as real.

Duplicate observations in Providence area

Since the discussion of the various transects seems to indicate a sharp decrease in the beaver populations in the Providence area there may be some doubt as to the validity of the observations. A certain margin of error must be assumed, however, the wide difference found might indicate that there was a wide difference in the efficiency of the observers involved.

The duplicate observations on some transects in the Fort Providence area involved the writer as first observer and Mr. T. Barry of this

Service as second observer. The results are shown in Table V. The results of the second observer are consistently higher than the first observer though it was his first experience in this type of observing. Regardless, the writer must concede that the second observer did in fact see more colonies and leads to the possibility that each observer has his own built-in error-factor which it may be possible to measure. Statistically the variation found was not significant ($t = 1.62$ D.F. 27).

Fort Rae, Lac la Martre and Fort Franklin areas:

The results of the survey in this area show a very disappointing production, however, this is not surprising since the potential is very disappointing also. The streams are shallow, rocky, bordered by what appears to be somewhat stunted spruce, birch and willow. The writer doubts that much hunting pressure is exerted in the direction of the transects flown as shown in Figure 2, and it is doubtful whether the survey is of any future value in that direction.

Only one stream transect (number 2) and the part of transect number 1 in the vicinity of Windflower Lake showed any promise. The area near Windflower Lake and the lake itself is highly recommended for transplant purposes since it appears to have good drainage and good habitat.

A comparison of the 1958 survey results with that of Fuller (1955) is shown in Table VI. Again a wide difference between population indices is discernable. This difference is sufficient to classify three transects (7, 8, 9) as presently poorly populated from what could have been considered an abundant population in 1955,

though in reality, not many colonies were involved. Nevertheless, the present population indices as found in 1958 must remain as the standing population with a suggestion only that a downward trend is apparent. The conditions on flying were ideal and in mid-September the weather was still good. It is highly probable that feed-bed activity was not in full swing, an eventuality which could not be judged by the writer as far away as Fort Smith prior to leaving for the survey.

Fort Smith - Rocher River area

The data as presented in Table III following flight lines as shown in Figure 3 appears to indicate that not one stream survey could be considered as having an abundant population. Only one stretch of transect number 35 (the lower section of the Konth River) is very productive (1 colony per mile approximately). The country is mostly Precambrian, the drainages not well defined, some stream-beds were dry, others intermittent. It is a predominantly spruce forest with showings of willows on stream margins, some birch and very little poplar. Only one showing of poplar was observed from the air and by ground survey in the whole Konth River drainage.

A comparison of results from the survey by Fuller in 1955 to the 1958 survey is presented in Table VII. A wide discrepancy between indices is again noted and in this case 5 transects (34, 35, 36, 37, 38) which could be considered to have abundant populations in 1955 now have moderate populations (range 2 - 4 miles between colonies).

Duplicate observations in Fort Smith area

On the Fort Smith survey transects 36 to 42 were observed using a second observer to do duplicate counts with the writer. Mr. Bryant, Superintendent of Game, accompanied the writer and the results are shown in Table VIII. Since Mr. Bryant has had previous experience in this work the results of the comparison are somewhat rewarding in that there is almost complete agreement in the results. Statistically there is no significant difference t= 0.89 D.F. 13). However, if the agreement does in reality denote reasonable accuracy of coverage the implication is that actual decreases in population have occurred though no treatment of the nature of this decrease is attempted. Agreement in this case may also indicate agreement at a certain level of efficiency which will be discussed following.

Ground check compared to aerial count

As suggested previously by Fuller (1955) the writer decided to try numerous runs over a part of a transect which had previously been surveyed from the ground. The Konth River between Champagne Lake and Jack Lake was chosen for this work since it is a major section of the writer's beaver study area. The results of the duplications are shown in Table IX. The results shown indicate, at best, an efficiency of less than 50% in finding lodges, approximately 75% efficiency in finding feed-beds and indifferent results for dams. The writer has reason to suspect that dams are the most variable feature in the whole survey method, since many may be

underwater and be out of use for many years, others may have been broken and never repaired due to the lodge being abandoned and still others which were present one year may have been scoured out by ice action due to a fast break-up. This difficulty in apportioning the proper weight to the presence of dams has been mentioned by Swank and Glover (1948). The writer feels very strongly that in future, since the only unit of productivity is an active lodge that only a lodge observed in obvious or recent repair or a lodge plus a feed-bed be the only consideration for an active colony and that the dam counting method be abandoned.

Results of lake surveys

The results of the lakes surveyed have been shown in conjunction with the stream transect results in Tables 1 - III. The Providence area does have a few lake areas (on transects 1, 3, 4, 14, 20) which appear to be quite productive and these would act as a corollary to the stream productivity. The Fort Rae, Fort Franklin transects revealed no productive lake groups and the Fort Smith area had 2 groups (on transects 34 and 35) which when the number of lakes observed is considered could be classed as productive.

Much has been said on the value of lake surveys for beaver management. The writer feels they have at the present time, little value to beaver management for the following reasons.

(a) The ratio of occupied to non-occupied lakes is dependent on the judgement of the second observer in that one could consider a pot-hole a lake while another would not. Pot-holes are, in the writer's opinion, as product-

ive as a larger lake with respect to beaver, however, they can, when numerous, produce a constant source of error to the observer.

(b) The lakes are not judged as to distance on a flight transect (no transect width), therefore, there is a tendency to record everything within sight with somewhat speculative results on the periphery of vision.

(c) Lodges in lakes are rarely trapped since the distance between occupied lodges is prohibitive for dog travel. Thus a statement that 50% of the lakes are occupied has little meaning to management since in a transect path of 100 miles it would require probably 500 to 1,000 miles on the ground to cover them. Trappers presently include the estimated lodge count for their lakes in their total allowable take and then take the allowable quota on the streams to the detriment of the stream beaver.

The Rae transplant area

The 1957 survey of the Rae transplant area is shown in Table X with a description of Fuller's survey in 1955. The data appears to indicate that:

(a) 7 lodges previously reported by Fuller as occupied are now unoccupied.

(b) 2 lodges previously reported by Fuller as not occupied are now occupied.

(c) The present status including positive indications and

possible indications shows approximately a 35 percent success in the transplant operation. This can be considered, in the opinion of the writer, a moderate success in view of the fact that transplants were made into some unfavourable habitat areas. It is also likely that some movement out of the transplant sites may have occurred.

Summary and Recommendations

1. The report deals with the presentation of data of aerial beaver surveys in selected areas in the Fort Providence, Fort Rae, Lac la Martre, Fort Franklin and Fort Smith areas during the autumn of 1957 and 1958.
2. The method of analysis is discussed and a change in indices of population abundance (flight miles between lodges) was advocated by the writer and used in this report.
3. The Fort Providence area shows a decided decrease in the number of active colonies.
4. The transect counts by the writer in the Fort Providence area were duplicated by a second observer, Mr. T. Barry, of this Service. The results appear to indicate a wide variation in the active lodges observed. The difference is not significant t= 1.62 D.F. 27) though a real difference must be assumed on some transects.
5. It is recommended that 3 areas in particular in the Fort Providence area be checked and the lodges counted from the ground.

These are

(a) Transect 15 - Creek draining into Kakisa Lake navigable.

(b) Transect 10 - Middle fork - Kakisa River - navigable.

(c) Transect 20 - Laferte Creek - navigable.

6. Though the Fort Franklin - Fort Rae area appears to be unproductive there is a strong indication that transplanting beaver into the Windflower Lake area would be a success. This programme is highly recommended and it is also recommended that Wood Buffalo Park beaver, taken from unexploited areas, be used for this transplant.

7. The Fort Smith area appears to be quite productive where drainage systems are well established. It is of interest to note that the best populations of beaver for lakes and streams (transects 34, 35, 36, 37) are close to the contact of the Precambrian and Mackenzie Lowlands.

8. A duplicate run using a second observer in the Fort Smith area has shown close agreement between the two observers (t = 0.89 D.F. .13).

9. The survey checking aerial counts against ground counts in the Konth River area has shown that:

(a) 50 percent (or less) efficiency is obtained in lodge counts.

(b) 75 percent efficiency is obtained in feed-bed counts.

(c) Variable efficiency is obtained in dam counts.

The discrepancy between dam counts in duplicate runs is shown in all the tables where this occurred. It is recommended that the dam counting phase of the survey method be eliminated and that the observer confine his efforts to finding the lodge or feed-bed. The time interval (and consequently the flight miles) of the streams surveyed is now known. There is no valid reason why each suspected location of a lodge or a feed-bed cannot be circled by aircraft to make positive identification instead of taking a quick look as the plane flashes by at 100 m.p.h.

10. The Rae transplant can be considered a partial success at present and with a ground check of some of the transplant sites anticipated or completed, the success may be of a greater magnitude than presently determined by aerial survey. It is recommended that the area in the vicinity of the Marion River and James Lake be further stocked. This appears to be excellent habitat and stocking of this area in conjunction with Windflower Lake stocking would not create too much of an alteration of planning.

11. The general conclusion drawn from the surveys done by the writer and especially when compared with surveys in previous years on the same transects appears to indicate that uniformity of surveying is far from being established. It is questionable, to the writer, whether this can ever be established on most of the survey transects unless a great deal more time and money is spent for results which may in the end be of no value. There are numerous streams which meander greatly, numerous streams in which tall trees

obscure the stream itself and there are numerous streams on some transects which are so indistinct as to occupy the time of all the personnel on board the aircraft in frantic map-reading. There are also some streams in which it can be expected that no man, trapper or otherwise, will ever visit or see except by chance from the air and the beaver populations in them become of academic interest only.

It has been felt that once a workable plan has been developed for aerial beaver surveys that the work involved could be transferred to the wardens in whose area transects were being flown. The present plan is, the writer is sure, not acceptable and wasteful of time and money and a suggestion of a more moderate plan is hereby tendered in its place.

Aerial Survey Management Plan for Designated Areas

The prime requisites for laying out aerial survey plans in various areas are:

(a) The stream must be easily observable from the air.

(b) The stream must be navigable for the purpose of ground-checks.

(c) The stream must be favourable beaver habitat.

(d) There must be two types of conditions involved - one stream must be trapped, the other must be untrapped to act as a control.

With this outline the possibilities for each district surveyed are outlined:

Fort Providence

(a) The two streams which are accessible to the trapper easily observable from the air and are navigable are:

Transect number 15 - from Kakisa Lake

Transect number 14 - creek draining into Kakisa Lake from the west.

(b) The two streams which are considered inaccessible but are observable and navigable are:

(a) Transect number 12 - Redknife River

Transect number 10 - Central branch of Kakisa River

To (a) could be added the Laferte River depending on the preference of the local representative. However, the worker could familiarize himself with the location of lodges using a larger scale map (possibly aerial) by circling or by ground survey and could continue the plan on a yearly basis.

Fort Rae, Lac la Martre, Fort Franklin

The only plan recommended in this area is a transplant in the Windflower Lake, the Marion River and the James Lake areas. The necessity of developing a survey plan for the area south of Great Bear Lake would depend upon the exploitation of beaver of this area of which the writer has no knowledge at the present time.

Fort Smith area

The streams considered easily observable, navigable and exploited are:

(a) Konth River Section of transect number 35

(b) Sections of transect number 30 to be determined by the

worker doing the survey.

The streams considered navigable and easily observable but inaccessible are:

(a) Transect number 31 or sections thereof.

(b) Transect number 33 or sections thereof.

The Precambrian area is difficult to ascertain for navigability and in some cases the feasibility of this plan might have to be altered somewhat.

Fort Simpson, Fort Liard, Wrigley area

The transects which are felt to be navigable, observable and exploited are:

(a) Rabbitskin River - transect number 39

(b) Spence River - transect number 41

The transects which are felt to be navigable and observable are:

(a) First south fork of Trout River number 43

(b) River draining Bulmer Lake number 36

If the adoption of the above plan is not acceptable it is further proposed that some of the transects which are unfavourable for observation should at least be eliminated. For that matter a coding system for each transect could be easily drawn up in which accessibility, habitat, present population and observability all could be weighted into the scheme.

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Table I Results of an aerial beaver survey, Fort Providence area, 1957 and 1958 combined

No.	Route, Watercourse or Drainage	Flight Miles	Count Totals L	F	D	Active Lodges	Flight Miles Between Colonies	Lakes Tot.	Occ.	REMARKS
1	Swede Creek	35	1	1	1	2	17.5	40	12	Swede Creek - willow bordered
2	Cameron River	17	0	0	0	0	-	no data		Small outwash plains predominate area
3	Creeks draining into west end Tathlina Lake from south	48	26	29	60	29	1.6	44	11	Begins with poplar and spruce and grades into pure spruce stands
4	Lakes, west end Cameron Hills	26	11	3	10	6	4.3	11	7	Poorly defined -sporadic appearance
5	Creek draining from west end Cameron Hills to Kakisa River	21	5	6	13	7	3.0	1	0	Fast current, rocky bottom - mostly spruce.
6	Hook Lake area at forks of Upper Kakisa River	10	0	0	0	0	-	0	0	Lakes on flight path - muskrat houses plentiful
7	South fork of Upper Kakisa River	11	1	1	1	1	11.0	5	0	Stream shallow and rocky a great deal of burn

L - Lodges
F - Feed-beds
D - Dams

No.	Route, Watercourse or Drainage	Flight Miles	Count Totals L	F	D	Active Lodges	Flight Miles Between Colonies	Lakes Tot.	Occ.	REMARKS
8	Creek south of Lake at 119 5'W, 60 18'N	11	3	2	6	3	3.7	13	2	Poorly defined on top of hills
9	Lakes in vicinity of Alberta boundary	18	5	4	1	4	4.5	20	3	Much spruce and burn - difficult to observe
10	Middle Fork of Upper Kakisa River	25	1	2	10	6	4.2	3	2	Stream rocky and fast- damming in upper reaches.
11	Lakes between North and middle forks of Kakisa R.	20	0	0	0	0	-	13	0	Lakes large, soft bottomed - unfavorable
12	Redknife River	40	9	16	51	22	1.8	13	1	Open type meanders - poplar willow and some brule
13	Creek draining into Mackenzie R. from south below Mills L.	31	7	6	8	5	6.2	5	1	Mostly tall timber
14	Creek draining into Kakisa R. from west, south of Kakisa Lake	30	11	16	40	15	2.0	11	5	Excellent for ground and aerial survey
15	Creek draining into Kakisa L. from south-east	26	2	0	4	3	8.7	-	-	Meandering - willow borders with some spruce

No.	Route, Watercourse or Drainage	Flight Miles	Count Totals L	F	D	Active Lodges	Flight Miles Between Colonies	Lakes Tot.	Occ.	REMARKS
16	Creek southeast of Tathlina Lake	17	0	1	9	5	3.4	5	3	Good beaver stream - easily dammed. Willow borders
17	Lakes north of Swede Creek	67	3	3	5	6	11.2	48	8	Most lakes large and habitat appears unfavorable
18	Creek west of Redrock Point	25	0	0	13	6	4.2	18	1	Meandering, fast where not dammed
19	Creek draining through Birch L. to Mink L.	47	3	5	9	5	9.4	20	0	Indistinct for most of length
20	Laferte Creek	36	11	10	15	18	2.0	9	6	Willow and spruce. Many backwaters
21	Davidson Creek	11	5	2	1	3	3.7	13	1	Lower part of stream choked with burn
22	Horn River downstream from Davidson Creek	11	3	2	0	2	5.5	11	0	Spruce covered flood plain
23	Creek flowing from near source of Ferguson Creek to Horn River	7	3	3	1	4	1.7	7	1	Easily observable

No.	Route, Watercourse or Drainage	Flight Miles	Count Totals			Active Lodges	Flight Miles Between Colonies	Lakes		REMARKS
			L	F	D			Tot.	Occ.	
24	Ferguson Creek	12	7	6	4	7	1.7	9	3	Willow edges - easily observable from air
25	Benner Creek	16	2	2	18	6	2.7	12	0	Willow margins
26	Pine Creek	65	10	8	7	9	7.2	77	1	Willow on banks with some spruce and poplar
27	Sandy Creek	13	1	1	10	2	6.5	9	0	Fast current, spruce and poplar

Table II Results of aerial beaver survey in Fort Rae, Lac la Martre and Fort Franklin areas, 1958

No.	Description of Transect	Flight Miles	Tot. Observed L	F	D	Estimated Active Colonies	Flight Miles Between Colonies	Lakes Tot.	Occ.	REMARKS
1	Rae to height of land west of Windflower Lake	115	2	2	0	2	57.5	66	1	Escarpment unproductive - good habitat in Windflower Lake area.
2	Tributary of Willowlake R. from 63° N. 119° 28'W. to height of land	66	13	15	3	13	5.1	38	0	Narrow slow and deep, willow & poplar. Good habitat.
3	Height of land to Johnny Hoe River	39	8	6	7	7	5.6	23	1	No current, rocky bottom, spruce covered banks.
4	Johnny Hoe River to Johny Hoe River	45	3	2	6	3	15.0	40	0	Shallow stream, much birch.
5	Tributary of Johnny Hoe from West	34	3	2	0	2	17.0	32	1	Rocky and narrow stream, willow birch and spruce - stunted.
6	River flowing to Lac Ste. Therese from East	44	8	5	12	7	6.3	12	1	Narrow and rocky stream - spruce predominates.
7	River flowing to Lac Ste. Therese from East	25	13	2	4	3	8.3	14	0	Spruce bordered stream rocky bottom.
8	Next river north, from canyon to head	27	8	4	3	4	6.9	39	0	Narrow and rocky stream spruce bordered.

No.	Description of Transect	Flight Miles	Tot. Observed L	F	D	Estimated Active Colonies	Flight Miles Between Colonies	Lakes Tot.	Occ.	REMARKS
9	River flowing to bottom of MacVicar Arm from head to north fork	12	0	0	5	2	6.0	10	0	Wide shallow and rocky stream.
10	East shore of MacVicar Arm	40	1	1	1	1	40.0	4	1	Rising ground, dry stream bed in most places.
11	Grizzly Bear Mountain (mainly over summit)	50	2	0	1	2	25.0	11	2	Willow on summit, streams fast on both sides.

Table III Results of aerial beaver survey in Fort Smith area, 1958

No.	Description of Transect	Flight Miles	Tot. Observed L	F	D	Estimated Active Colonies	Flight Miles Between Colonies	Lakes Tot.	Occ.	REMARKS
30	Smith to Hill Island Lake .	107	37	16	32	23	4.7	69	8	Generally wide and deep with flood plains - willow birch and spruce.
31	Hill Island Lake to Loche Lake.	134	23	10	20	17	7.9	56	2	Wide stream some rapids - series of wide flood plains.
32	Loche Lake to Methleka Lake .	67	21	9	6	11	6.1	52	4	Wide flood plain - poor drainage
33	Methleka Lake to 111° 30'.	37	11	8	1	9	4.1	10	2	Narrow and fast stream - willow bordered, some birch.
34	111° 30' to Junction Powell and Kenneth Creeks.	44	21	12	3	13	3.4	45	14	Rocky and narrow stream - flood plains with much willow.
35	Junction Powell and Kenneth Creeks to mouth Konth River.	77	42	30	19	33	2.3	42	20	Easily observable - lower half of Konth - very productive
36	Resdelta to Deskenatlata Lake .	30	16	11	5	11	2.7	105	9	Dried out in first half - well defined last half.

No.	Description of Transect	Flight Miles	Tot. Observed			Estimated Active Colonies	Flight Miles Between Colonies	Lakes		REMARKS
			L	F	D			Tot.	Occ.	
37	Deskenaltata Lake to Taltson River	20	13	9	7	10	2.0	35	8	Scattered showing of stream.
38	Taltson River to O'Connor Lake	34	11	6	11	9	3.8	32	2	Spruce bordered narrow stream.
39	O'Connor Lake to Thubun River	84	24	4	15	15	5.6	62	3	Stream poorly defined.
40	Thubun Lake to Thubun River	34	1	0	6	2	17.0	14	2	Wide flood plain, willow spruce-choked.
41	Thubun River to Snuff Channel	32	5	2	0	2	16.0	48	4	Birch poplar willow scattered showing of stream.
42	Ruis Pierrot	40	6	5	2	5	8.0	49	3	Poplar birch and spruce-choked in spots - unfavorable

Table 1V Comparison of surveys on comparable transects based on number of miles between colonies Fort Providence area

Transect Number	1951 Fuller & Flook		1954 Flook & Stewart		1958 Novakowski	
	Active Colonies	Flight Miles Between Colonies	Active Colonies	Flight Miles Between Colonies	Active Colonies	Flight Miles Between Colonies
1	11	3.8	8	3.8	2	17.5
3	39	1.2	38	1.2	29	1.6
5	15	1.8	15	2.1	7	3.0
8	9	1.2	1	10.5	3	3.7
10	45	0.5	47	0.8	6	4.2
12	46	1.0	38	1.0	22	1.8
13	7	2.9	9	2.3	5	6.2
14	31	1.0	28	0.7	15	2.0
15	33	0.9	40	0.8	3	8.7
16	12	1.4	19	0.6	5	3.4
18	5	5.0	9	2.0	6	4.2
19	24	2.3	18	3.2	5	9.4
20	53	1.1	41	1.3	18	2.0
21	8	2.5	3	3.1	3	3.7

Transect Number	1951 Fuller & Flook		1954 Flook & Stewart		1958 Novakowski	
	Active Colonies	Flight Miles Between Colonies	Active Colonies	Flight Miles Between Colonies	Active Colonies	Flight Miles Between Colonies
22	3	3.7	5	2.1	2	5.5
23	3	1.2	4	1.0	4	1.7
24	11	1.2	17	1.1	7	1.7
25	28	1.1	40	0.9	6	2.7
26	11	4.6	20	2.2	9	7.2
27	2	6.7	3	3.2	2	6.5

Table V Parallel counts of some transects in the Providence area with Novakowski as first observer and Barry as second observer - 1958

Transect Number	Lodges		Feed-Beds		Dams		Active Colonies	
	#1	#2	#1	#2	#1	#2	#1	#2
3	26	22	29	32	60	82	29	31
4	11	33	3	8	10	23	6	10
5	5	13	6	12	13	29	7	11
7	1	2	1	3	1	4	1	2
8	3	6	2	6	6	11	3	4
9	5	10	4	3	1	5	4	4
12	9	20	16	34	51	64	22	32
21	5	6	2	0	1	1	3	3
22	3	2	2	0	0	1	2	1
23	3	3	3	0	1	5	4	4
24	7	10	6	4	4	8	7	6
25	2	6	2	1	18	9	6	5
26	10	13	8	4	7	4	9	7
27	1	1	1	1	10	4	2	2

Table VI Comparison of results of aerial beaver surveys on comparable transects, Fort Rae, Fort Franklin areas

Transect Number	Fuller 1955		Novakowski 1958	
	active colonies	flight miles between colonies	active colonies	flight miles between colonies
1	8	16.1	2	57.5
2	16	3.4	13	5.2
3	13	2.8	7	5.6
4	10	2.4	3	15.0
5	4	6.3	2	17.0
6	13	2.7	7	6.3
7	14	1.6	3	8.3
8	8	1.5	4	6.9
9	5	1.0	2	6.0
10	0	0	1	40.0
11	3	9.7	2	25.0

Table VII Comparison of results of aerial beaver survey on comparable transects in Fort Smith area

Transect Number	Fuller 1955		Novakowski 1958	
	active colonies	flight miles between colonies	active colonies	flight miles between colonies
30	53	2.6	23	4.7
31	17	6.1	17	7.9
32	32	2.0	11	6.1
33	18	2.4	9	4.1
34	49	1.5	13	3.4
35	37	1.0	33	2.3
36	18	1.9	11	2.7
37	22	0.9	10	2.0
38	15	1.8	9	3.8
39	18	5.5	15	5.6
40	19	2.7	2	17.0
41	9	4.7	2	16.0
42	8	2.5	5	8.0

Table VIII Duplicate observations of beaver of streams in Fort Smith area, Novakowski as first observer and Bryant as second observer, 1958.

Transect Number	Lodges		Feed-Beds		Dams		Active Colonies	
	#1	#2	#1	#2	#1	#2	#1	#2
36	16	15	11	11	5	6	18	18
37	13	11	9	7	7	8	10	12
38	11	8	6	5	11	18	20	19
39	24	16	14	11	5	6	15	14
40	1	6	0	1	6	1	2	2
41	5	9	2	4	0	2	2	8
42	6	5	5	5	2	3	5	5

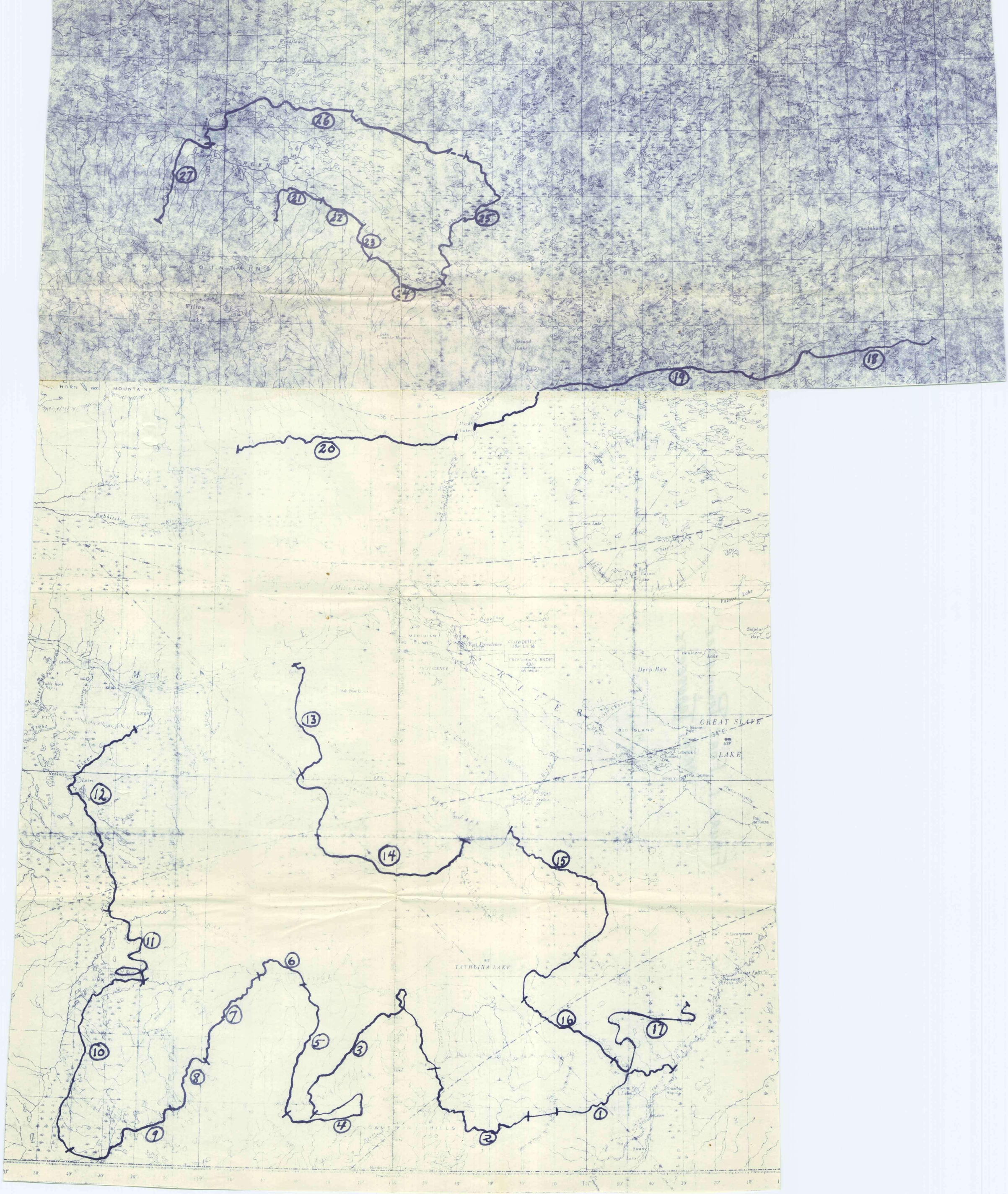
Table IX Duplicate runs on section of transect to check against ground survey, Fort Smith area, 1958

Transect Number	Lodges		Feed-Beds		Dams		Active Colonies	
	#1	#2	#1	#2	#1	#2	#1	#2
Run #1	4	5	1	1	1	3	2	2
Run #2	2	7	2	3	0	1	2	3
Run #3	5	5	3	1	0	1	3	2
Ground survey 1958	15		4		1		4	

Table X Results of Rae transplant survey, 1957

Transplant Number	Area Description	1955	1957	REMARKS
1	Trout Rock area	not occupied	possible	Lodge did not appear to be used
2	Trout Rock area	occupied	not occupied	Lodge broken up
3	Small lake on North Arm, G.S.L.	occupied	occupied	Found in slough next to lake
4	Small long lake North Arm, G.S.L.	doubtful	not occupied	No lodge found - no activity
5	Small lake near Stagg River	doubtful	possible	Lodge appears to be abandoned
6	Stagg Lake	occupied	possible	Two lodges - likely present
7	Small lake east of Stagg Lake	occupied	not occupied	No lodge found - no activity
8	Small lake east of Stagg Lake	not occupied	not occupied	No lodge found - no activity
9	Small lake joined to Stagg Lake	not occupied	not occupied	No lodge found - no activity
10	Small lake in Stagg Lake drainage	not occupied	not occupied	No lodge found - no activity
11	Small lake in Stagg Lake drainage	not occupied	possible	Lodge appears to be abandoned
12	Small lake in Stagg Lake drainage	occupied	not occupied	No lodge found - no activity
13	Stagg Lake	doubtful	possible	Tote roads seen
14	Lake in Stagg Lake drainage	occupied	not occupied	No lodge found - no activity

Transplant Number	Area Description	1955	1957	REMARKS
15	Small lake east of Mosher Lake	not occupied	possible	Lodge in good repair - no feed-bed
16	Small lake in Selmon Lake drainage	"	occupied	Lodge and feed-bed found
17	Small lake in Russel Lake drainage	occupied	not occupied	No lodge found - no activity
18	Small lake north of Selmon Lake	not occupied	"	No lodge found - no activity
19	Small lake in Snare River drainage	"	"	No lodge found - no activity
20	Small lake in Emile River drainage	"	"	No lodge found - no activity
21	Small lake in Snare River drainage	"	"	No lodge found - no activity
22	Enlargement of Snare River	"	"	No lodge found - no activity
23	Large lake in Snare River drainage	"	"	No lodge found - no activity
24	Small lake east of Emile River	"	possible	Some activity noted
25	Small lake in Marion River drainage	"	occupied	Lodge and feed-bed found
26	Large lake in Snare River drainage	"	not occupied	No lodge found - no activity
27	Small lake in Marion River drainage	"	"	No lodge found - no activity
28	Small lake in Marion River drainage	occupied	"	Poor habitat, area of burn
29	James Lake	"	"	Large lake, good habitat


HORN MOUNTAINS
Willow Lake
Lake on the Mountain
Second Lake
Birch Lake
Chedabucto Lake
Rabbitskin River
Deep Bay
GREAT SLAVE LAKE
TATHLINA LAKE
Sulphur Bay
Pte de Roche
Escarpment
Sweetgrass Hills
Redknife Lakes
Trout River
Table Rock
Gorge
Big Island
Indian Village
Pte Desmarais
Providence
Fort Providence
Lobstick I.
Twin Islands
Sweet Lake
Houlene Lake
Fairchild Lake
Mills Lake
Monkey Lake
Pierre Lake
Lac Lois
Thumb Lake
Granite Rapids
Swan Lake
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31
30
GREAT SLAVE LAKE
Gagnon Lake
Walker
NONACHO
LAKE
Rutledge
Lake
Thubun
Lake
Hjalmar
Lake
61° 30'
Salkeld
Lake
Sparks
Lake
Resolution
Resolution Bay
CARIBOU
ILES
LARGE
PARK
60° 30'
Shark
Lake
Imogen
Lakes

GREAT BEAR LAKE

Deerpass Bay

Lac des Maringouins

Cabin

Hills rising to 1500 feet

Kokerab Pt

Reel

Cabin

George Is

Preble Bay

Russel Bay

Fox Pt

GRIZZLY BEAR MOUNTAIN

1500

Jupiter Bay

Alcyone Bay

Cloud Bay

Fort Franklin

Monitou I

Cabins

KEITH ARM

MACKENZIE MOUNTAINS

RIVER

Creek

Mt Clark 4733

Blackwater Lake

Twin Peaks

Keller Lake

Lac Ste Therese

HOE RIVER

Hoe River

124° W.

123° W.

122° W.

121° W.

65° N.

55° N.

(3) (4) (5) (6) (7) (8) (9) (10) (11)

Lac Grandin

FABER LAKE

Caribou Mountain

Clive Lake

Bartlett Lake

Bluefloat Lake

Raccoon

Owl Creek

HORN MOUNTAINS

Willow Lake

Fawn Lake

Second Lake

Birch Lake

Cedarburn Lake

Russell Lake

63°N

119°W

118°W

117°W

116°W

115°W

1

2

3

A

4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29