The Effects of Changes in Vegetation Cover on Furbearer Populations and Trapping Activities in the Liard Valley

Brian G. Slough

Yukon Department of Renewable Resources, Box 2703, Whitehorse, Yukon Y1A 2C6

Director, ~~Fish & Wildlife~~ Branch

Supervisor

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TABLE OF CONTENTS

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INTRODUCTION

The Liard Valley near Watson Lake has some of the highest resource development potential in the Yukon. The area supports subsistence hunting, trapping activities, and for the past 15 years, logging of the mature spruce stands. Continued logging activities and the potential for agricultural and other developments raise the prospect of extensive changes in vegetation cover in the Liard Valley. The effects of these changes on furbearer populations are not known, but given the importance of this area for trapping, information on the relationship between vegetation cover and furbearer populations is needed for resource analysis and land use planning purposes.

A partially logged area in the Liard valley, selected as the study area, was surveyed for beaver and terrestrial furbearers firstly to document baseline populations and habitat utilization, and secondly to determine the effects of logging on the furbearers. Trapping activity was documented through an analysis of fur harvest data and interviews with local trappers.

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STUDY AREA

The study area, selected for its representation of the present and potential resource uses of the Liard Valley, is northwest of Upper Liard, Y.T. (Figure 2.3—1). The 300 km^2 area is bounded by the Alaska Highway (S), the Liard River (E), the Rancheria River (N), and the $129^{\circ}15'$W meridian of longitude (W).

Biophysical information is available for the area on soils and agricultural capability (Canada Department of Agriculture, not presented here), forest cover (Yukon Forest Service, Canada Department of Indian Affairs and Northern Development) and fur harvest (Fish and Wildlife Branch, Yukon Department of Renewable Resources). Reid (1975) described the forest ecology of the area.

Fur Harvest

The study area is occupied by portions of three trapping concessions (Figure 1). These concessions are readily accessible and are regularly trapped by the three trappers and two or three assistant trappers. Concession-specific historical harvest data is classified as confidential information, however the harvest characteristics of the concessions have been generalized for the following discussion. In decreasing order of economic importance, the harvested furbearers include marten, lynx, beaver, mink, red fox, red squirrel, otter, wolf, muskrat, ermine, and coyote. Coyotes and wolverine are rare in the area and fisher are not present. The value of the annual harvest has exceeded $10,000. This total is primarily composed of the values of marten (55%), lynx (32%) and beaver (7%). The maximum sustainable harvest is likely much higher than the present harvest level.

Vegetation

A history of fires has created a mosaic of forest types of varying seral stages. Most forest stands are 90 to 110 years of age (range 50 - 130 years). The most recent burns are about 25 to 30 years of age. The dominant upland tree species is lodgepole pine (*Pinus contorta*). White spruce (*Picea glauca*), trembling aspen (*Populus tremuloides*), and white birch (*Betula papyrifera*) are co-dominant, occupying the most favourable sites (well-drained till) (Reid 1975). Lodgepole pine and black spruce (*Picea mariana*) form extensive pure and mixed stands over much of the compact till uplands. White spruce dominates the alluvial sites along the Liard and Rancheria rivers, where it, along with balsam poplar (*Populus balsamifera*), often forms pure stands. Black spruce and tamarack (*Larix laricina*) occur in open stands on low positions often indicating permafrost. Seepage and riparian sites are dominated by willows (*Salix* spp.). Sedge (*Carex* spp.) fens are present on ponds and drainage ways.

Cut over areas are being pioneered by willows and mixedwood stands of aspen, birch and balsam poplar. The regeneration of white spruce on rich alluvial soils is extremely poor. There have been no attempts at reforestation or site treatment to favour the regeneration of coniferous species.

Logging

The area has a history of small scale logging operations including selective logging in the 1960's and 70's, and clear-cut logging in the mid 1970's and mid 1980s. The 1988-89 development plan of Hyland Forest Products Ltd. calls for the harvest of 150,000 cubic metres of wood, most of which will be obtained from alluvial mature white spruce. The historical clear-cutting also took alluvial white spruce and the selective cutting took upland white spruce.

METHODS

Beaver Food Cache Survey

Beaver food cache surveys provide a census of all active beaver colony sites (Slough and Jessup 1984). Colonies are surveyed before freeze-up and after leaf-fall, when visibility of caches is optimal. Beaver colonies are discrete social units, usually averaging 5 animals.

The surveys were flown on October 6, 1987 in a Bell Jet Ranger helicopter, at 100 k.p.h., 100 metres above ground level. One observer/navigator and two other observers accompanied the pilot. All active sites were recorded on a 1:250,000 topographic map. Siteability is close to 100% using this method.

Winter Track-Count Surveys

Track-counts are commonly used to describe animal distribution, abundance and population trends (Slough and Jessup 1984). They provide an index of relative abundance of furbearer species which is comparable between geographic areas and habitat types within an area. There have been attempts to convert track-count densities to animal numbers (Formozov 1965), however spatial and temporal activity patterns by species (and even by individual members within species) are not consistent enough to allow conversion from tracks/km-day (number of fresh tracks of each species/distance surveyed (km) x days since last snowfall) to animal numbers. Activity patterns will vary depending on habitat and weather conditions, intra- and inter-specific densities, etc. Track-counts do, however, give us an acceptable index of the relative use of habitats by furbearers.

Track-count methodologies vary considerably depending on information requirements, sampling design, etc. In this study, the division of sampling units (transects) was based on forest cover types as characterized by major trees/shrubs. The classification of cover types closely followed that of the Yukon Forest Service forest cover maps (Scale 1:50,000). Cover types used in the analysis include stands dominated by either lodgepole pine, white spruce or black spruce. There were also transects completed in a 25-30 year old burn (which had also been selectively logged), and clear-cuts dating from the 1970's and 80's. The proportion of sampling intensity (km-days) in each of the 5 types (pine, white spruce, black spruce, burn, clear-cut) was determined by proportional occurrence in the study area and was 90%, 3%, 4%, 1% and 2% respectively. Transects were snowmobiled or snowshoed. Results were analyzed according to the procedure outlined by Neu et al (1974) to evaluate a species preference or avoidance of a given cover type. The following conditions must be met for a species to qualify for the statistical procedure: a) the goodness-of-fit X^2 is significant at $\alpha = 0.05$; b) there is at least one observation expected for each habitat unit; and c) the average expected observation is ≥ 5. Snowshoe hare runways are converted to individual hare tracks by multiplying their number by 7 (an average figure chosen by the author for Yukon conditions).

Table 2-3-1 Beaver Food Cache Survey Results

Survey Unit	Active Beaver Colonies (km/active colony)	
	1983	1987
Liard River side Channels (23 km)	12 (1.9)	11 (2.1)
Rancheria River side channels (21 km)	21 (1.0)	25 (0.84)
Tributary streams and lakes (55 km)	23 (2.4)	37 (1.5)
Total 99 km	56	73

RESULTS AND DISCUSSION

Beaver Food Cache Survey

The results of the aerial beaver-food cache survey are presented in Table 2-3-1 and Figure 2-3-1. A total of 73 colonies were located on the 99 km survey. The same transects, surveyed in 1983 using a similar intensity, revealed 56 active colonies. The densities of 2.4 to 0.84 km/active colony are considered representative of good to excellent beaver habitat (Slough & Jessup 1984). The densities on the Rancheria side channels and Tributary streams and lakes are the highest recorded to date in the Yukon.

When a beaver colony vacates a site or is trapped out, it leaves an "inactive" site. Inactive sites are difficult to spot along heavily vegetated watercourses, however these were counted on the "Tributary" sample unit, where visibility was good. The colony site occupancy rate of 61%,

$$\frac{\text{active colonies}}{\text{active + inactive colonies}} = \frac{37}{37 + 24} \times 100\% = 61\%$$

is also indicative of high quality habitat.

The principal food species are willow and balsam poplar in the Rancheria and Liard floodplains, and willow and aspen in the other wetlands. A relatively stable number of beaver is able to coexist with riparian willows in a cutting (by beaver)-abandonment cycle. In other words, as sites are abandoned due to overcutting, old sites where willows have regenerated are re-occupied. Aspen is the preferred food of any found in North America, however, aspen stands represent only transient beaver habitat, albeit of the highest quality. Aspen is a pioneer species following fire. Beaver establish new colony sites as dispersing individuals "discover" the aspen. The exploitation of aspen occurs very quickly as large numbers of beaver colonies become established in these areas. When aspen is cut, it regrows by suckering. Repeated cutting of suckers ultimately destroys the stands and leads to permanent colony site abandonment. The Dodo Lakes area has a low colony site occupancy rate (4/13 x 100% = 31%) reflecting overexploitation of aspen in this area. Moderate beaver trapping pressure is an excellent management tool to prolong the life of colonies exploiting aspen.

Winter Track-count Surveys

The total distance sampled between January 28 and March 13, 1988, was 261.8 km, representing 1537.9 km-days. Poor track-survey conditions were caused by blowing snow and above freezing temperatures resulting in melting of tracks and crusting of the snow surface, compounded by long periods (up to 22 days) between snowfalls. Smaller species such as red squirrel and ermine do not leave track impressions on crusty snow, and older tracks of all species may be erased by several days of above freezing conditions. The conversion factor of 7 snowshoe hare tracks/runway may underestimate hare abundance during extended periods without snowfall. Ideal track-count conditions include periods of 2 or 3 days after fresh snowfalls, with concurrent below freezing and calm conditions. Such conditions typically occur during the survey period, however, abnormal conditions persisted throughout this study.

Tracks of 9 furbearer species were encountered (weasel, *Mustela erminea*; mink, *Mustela vison*; marten, *Martes americana*; wolverine, *Gulo gulo*; otter, *Lutra canadensis*; red fox, *Vulpes vulpes*; wolf, *Canis lupus*; lynx, *Lynx canadensis*; and red squirrel, *Tamiasciurus hudsonicus*). Tracks of a key prey species, the snowshoe hare (*Lepus americanus*), were also recorded. Fisher (*Martes pennanti*) and coyotes (*Canis latrans*), both rare in the area were not encountered.

Table 2-3-2 shows the relative abundance indices of the above species, as well as the utilization-availability of habitat units by those species (marten, red squirrel and snowshoe hare) which met the conditions for the statistical procedure. Recognizing the possible deficiencies noted in the data, the following interpretation of the data has been tempered by caution.

The track densities noted are typical for the boreal forest fauna. There is also a healthy diversity of species present. Marten is the most common economic upland furbearer. The marten density appears to be moderate by Yukon standards. It has apparently been influenced minimally by trapping activities in 1987/88 or in previous years. The traplines are well managed by the trappers and the harvest is compensatory (ie. not additive) to natural mortality. Marten showed a distinct preference for the white spruce dominated cover types as did the red squirrel and snowshoe hare (Table 2-3-2). These three species utilized the edges of clear-cuts but seldom ventured more than 10m from cover (Glen Stockman, pers. comm.). Marten will cross openings to 100m in width (literature summarized by Stordeur 1986). Red squirrel showed some preference for forest/clear-cut edges (Glen Stockman, pers. comm.).

Table 3.3-3. Relative Abundance Indices of Furbearers and Utilization-Availability of the Habitat Units.

Habitat Units

Species	Lodgepole Pine Tracks	Lodgepole Pine Tracks/Km-day	Lodgepole Pine Util.*	Black Spruce Tracks	Black Spruce Tracks/Km-day	Black Spruce Util.	White Spruce Tracks	White Spruce Tracks/Km-day	White Spruce Util.	Burned Tracks	Burned Tracks/Km-day	Burned Util.	Logged Tracks	Logged Tracks/Km-day	Logged Util.	Total Tracks	Total Tracks/Km-day
Weasel	33	0.024		5	0.075		2	0.047		2	0.143		2	0.074		44	0.029
Mink	12	0.009			--		1	0.023		1	0.071		4	0.148		18	0.012
Marten	256	0.185	<	15	0.225	=	31	0.769	>	3	0.214	=	4	0.148	=	309	0.201
Wolverine	18	0.013			--		1	0.023			--			--		19	0.012
Otter	11	0.008		3	0.045		5	0.117		10	0.714		12	0.444		41	0.027
Red Fox	42	0.030		12	0.180		7	0.163			--		2	0.074		63	0.041
Wolf	67	0.048		12	0.180		9	0.210			--			--		88	0.057
Lynx	12	0.009		2	0.030		1	0.023			--			--		15	0.010
Snowshoe Hare**	(163)1985	1.431	<	(16)159	2.382	>	(23)228	5.315	>	6	0.429		58	2.148	=	2436	1.584
Red Squirrel	1110	0.800	<	122	1.828	>	241	5.618	>	31	2.214		93	3.444	>	1597	1.038
Total Transect Length (km)		204.5			25.5			18.3			3.5			10.0			261.8
Total km-days		1387.25			66.75			42.9			14.0			27.0			1537.9

* Utilization: - avoided, + preferred, = utilized proportional to occurrence ($\alpha = 0.05$). Tested by technique of Neu et al (1974).

** Snowshoe hare runways are in parentheses (). One runway = 7 tracks.

Impact of Logging

Urquhart (1983) reviewed the literature on timber harvesting impacts, including disturbance, selective cutting, clear cutting, fuelwood cutting and post-logging practices, on northern furbearers. In the absence of specific studies of the effects of disturbance, he conjects the following based on known behavioral patterns:

Canids (wolves, fox and coyotes) in general are able to capitalize on industrial developments by utilizing roads, refuse sites, etc. Most mustelids (marten, fisher, mink), except weasels and wolverines, avoid clearings including linear clearings such as roads, cutlines and cleared rights-of-way. Lynx and squirrels are likely inclined to avoid active disturbances. Beavers and muskrats are relatively immune to disturbance from logging activities. In the present study, marten apparently avoided an area within 1 km of active logging roads (G. Stockman, pers. comm.).

Selective cutting appears to have few detrimental effects on furbearers (also G. Stockman, pers. comm.). and can in fact enhance habitats for a number of species by creating a diversity of vegetation communities.

The impacts of clear cutting on furbearers, especially marten and small mammals, are well documented. In Yukon, clear-cuts will be avoided by all but the small mammal community for 10-15 years. Initial occupation by other species would be on a seasonal basis with winter use being the last to become established. Clear-cuts would not provide suitable winter habitat for marten and red squirrel for 25-100 years. The effect of clear-cutting on beaver is negligible and may in fact be positive as deciduous trees and shrub species often colonize clear-cuts.

Stordeur (1986) reviewed the literature on forest management practices as they specifically relate to marten. Several studies have shown that timber harvesting adversely affects marten by removing cover (also found by Mowat 1986 and Snyder and Bissonette 1987). The total effect depends on how much cover is removed, the size of the disturbed area, the intensity of the disturbance and the moisture regime of the site. The xeric stages of succession following logging often support little cover or marten prey species. As succession progresses to more mesic conditions, larger vole populations and good cover become established. Small disturbed areas usually require less time to re-establish these conditions than large areas do.

In Russia, Grakov (1972) found that marten populations were significantly decreased when more than 25% of mature or overmature timber was removed. Soutiere (1979) and Steventon and Major (1982) reported that marten population densities were reduced by 75% in a commercial clear cut forest (50% clear cut, 25% selectively cut) in Maine. Marten use was not affected by a partially harvested (40%) forest. Clear cuts remained unsuitable for 15 years (also found by Mowat (1986) for central B.C.). Soutiere (1979) recommends that harvesting methods maintain a residual stand of 20-25m^2/ha basal area as marten do not hunt in openings, and rarely cross openings greater than 100m in width. Other disadvantages of clear-cuts are low vole populations, low overhead cover, low availability of resting sites (eg. stumps, fallen logs, tree crowns), reduced sub-nivean access (leaning trees, fallen logs, etc.) greater snow accumulation and greater snowpack.

The present study found that marten used the edges of clear-cuts, avoided the centers, and preferred white spruce dominated cover types over all others.

There was no evidence of post-cutting site treatment or forest management designed to favour the regeneration of white spruce or other conifers. The sites were essentially left as unproductive willow/alder or other hardwood sites. The local trappers agreed that the existing clear-cuts were unsuitable for furbearers and that they had been abandoned in an irresponsible way, reducing the overall productivity of their traplines. Although minor in areal extent, the clear-cuts consumed a high proportion of the best marten habitat; the alluvial white spruce. Marten remain moderately abundant in the ubiquitous upland pine forests.

Management Recommendations

1. Selective cutting is preferable to clear-cutting.

2. Smaller cuts and narrow strip clear-cutting permit marten and other wildlife to make greater use of the cuts.

3. Forested blocks should not be isolated, but connected by forested corridors.

4. Although marten will make greater use of clear cuts if logging slash, shrubs or herbaceous vegetation are left undisturbed, the use will be minimal and concentrated only on the extreme edges. Site treatments favouring the rapid regeneration of white spruce should be applied. These treatments include light scarification (vs. heavy or no scarification) and the burning of landing site debris and piled logging debris (vs. broadcast burning).

5. Extended cutting cycles are superior to short ones (eg. 20 years vs. 5 years).

6. 4 to 5 cut cycles are preferable to standard 2-cut cycles.

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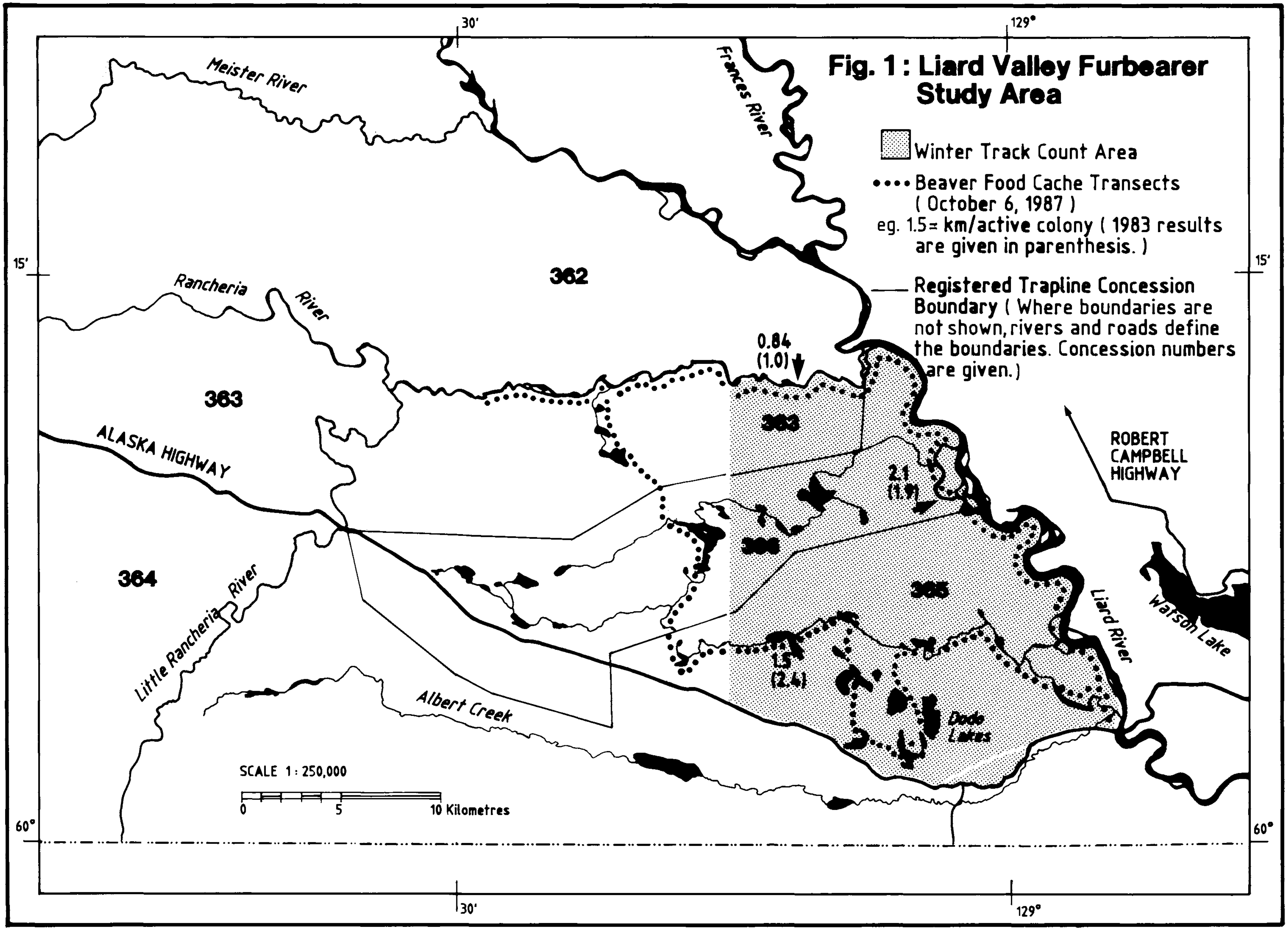

Fig. 1 : Liard Valley Furbearer Study Area
Winter Track Count Area
Beaver Food Cache Transects (October 6, 1987) eg. 1.5= km/active colony (1983 results are given in parenthesis.)
Registered Trapline Concession Boundary (Where boundaries are not shown, rivers and roads define the boundaries. Concession numbers are given.)
30'
129°
15'
60°
Meister River
Frances River
Rancheria River
362
363
364
365
ALASKA HIGHWAY
Little Rancheria River
Albert Creek
0.84
(1.0)
2.1
(1.9)
1.5
(2.4)
Dodo Lakes
ROBERT CAMPBELL HIGHWAY
Liard River
Watson Lake
SCALE 1 : 250,000
0
5
10 Kilometres