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ANALYSIS OF POTENTIAL FOR AN ECOLOGICAL RESERVE IN THE TELKWA MOUNTAINS, BRITISH COLUMBIA, TO PROTECT MOUNTAIN CARIBOU

by

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INTRODUCTORY TOPICS

This study was initiated and sponsored by the Ecological Reserves Branch of the B.C. Department of the Environment, and the Fish and Wildlife Branch of the B.C. Department of Recreation and Travel Industry. The former provided a $5,200 grant to Dr. Theberge, through Reserves Program Director Dr. J.B. Foster. This was administered by the University of Waterloo. The latter provided logistic help in the field and aircraft time, through the office of the Regional Wildlife Biologist for the Skeena Region, Dr. D.F. Hatler.

The authors were chosen for this study because of combined experience in land-use planning for parks and reserves, and past caribou research. Theberge had experience in the assessment of caribou - resource extraction - park boundary problems at Kluane National Park, Yukon Territory; Oosenbrug had completed his MSc. thesis "Range Relationships and Population Dynamics of the Burwash Uplands Caribou Herd, Yukon Territory", which was done under Theberge's supervision at the University of Waterloo.

Also participating in the study was Mr. D. Harvey, a graduate of the Department of Geography, Waterloo, who worked in the field with S. Oosenbrug forming one team. John and Mary Theberge formed a second team. Dave Hatler and Mr. Keith Hodgson (Wildlife Technician, Skeena Region) participated in aerial censusing and pick-ups for field parties.

Objectives of the Study

This study was undertaken to assess portions of the Telkwa Mountains for merits and drawbacks in designating an ecological reserve under the B.C. Ecological Reserves Act, to protect primarily mountain caribou (Rangifer tarandus caribou). The Telkwa Mountains lie directly south of Smithers, British Columbia (more detail later).

In order to accomplish this objective, sub-objectives were:

1. To determine past and present numbers of caribou, their movements and distribution within the Telkwa Mountains;

2. To evaluate in a general way the long-term capacity of the area to support caribou;

3. To identify the extent of, and ways to minimize potential resource conflicts with primarily mining, logging and private land which establishment of the reserve might create;

4. To identify any other ecological values pertinent to reserve status that became evident in the course of the study.

Behind the objective and sub-objectives of the study was the question: Do the Telkwa caribou represent a viable herd, living in a place which is relatively accessible to facilitate scientific study, living within a reasonably confined (for caribou) and identifiable area, and living in an area where ecological reserve status will not take away major mineral, timber or

privately held values or rights? If so, ecological reserve status is desirable.

Why the Telkwa Mountains?

The annual big game surveys of the Fish and Wildlife Branch, and the land classification studies of the B.C. Environmental Land-Use Secretariat have resulted in a general knowledge of the distribution and abundance of caribou in B.C. This has been summarized in map form ("Preliminary Copy Caribou Distribution and Relative Abundance, Nov. 1976") of the Fish and Wildlife Branch. More information is necessary to refine this information, and additional surveys are planned in 1977.

On the basis of existing information, there are areas, such as the Spatsizi Plateau, with large caribou populations. One way to select an ecological reserve for mountain caribou would be to conduct detailed surveys on as large a number of candidate sites as time and money permit. This perhaps ideal approach has not been followed because of monetary constraints of the Ecological Reserves Branch. However, one important criterion of an ecological reserve to protect mountain caribou is a high degree of self-sufficiency--otherwise there is little reason to establish a reserve (see next section). Delineation of boundaries that encompass a herd's range is exceedingly difficult in areas where large numbers of caribou seem to be running all over. Very expensive and long-term studies would be

necessary, and even then the results might show a significant amount of interchange between "herds". So, a better objective may be the protection of a small herd in a confined range, rather than focusing on large amorphous aggregations. This reasoning is a basic assumption of this study; it was adopted in consultation with J.B. Foster and D.F. Hatler before the field work commenced.

The Ecological Reserves Branch gave us a northern focus for our assessment, and we canvassed the two Regional Wildlife Biologists who collectively are responsible for more than half of the Province: the Skeena Region, D.F. Hatler, and the Omineca-Peace Region, Mr. K.N. Child. The latter directed us to an area north-west of McBride, B.C., which we evaluated very briefly, and Theberge submitted a report entitled "Proposed Resolution of Land-Use Conflict Between Logging and Caribou in the West Twin Creek-Ptarmigan Creek Area, Prince George District, B.C." to Mr. Child. We did not recommend ecological reserve status for this area at the present time, because of ill-defined caribou numbers and movements, and an apparently serious land-use conflict with logging.

Dr. Hatler gave priority to the Telkwa Mountains. Because of topographic features, the caribou herd is relatively confined. The area has other features as well: it is accessible for scientific study (remote areas are extremely expensive to

conduct research in), and the history of caribou there indicated that the opportunity may exist to study a population in a recovery phase (more later). Also, it appeared to present minimal land-use conflict (more later), and contained botanical values previously identified as significant for reserve status. A proposed wilderness provincial park in part of the area added to its attractiveness.

Thus, with Dr. Hatler's guidance, we settled on the Telkwa Mountains for detailed study.

Rationale for an Ecological Reserve to Protect Mountain Caribou

Ecological Reserves in B.C. have purposes of "permanent outdoor research laboratories, genetic banks, benchmark areas against which man's modification of most of the province can be measured, and outdoor classrooms" (Ecological Reserves in B.C., Dept. of Lands, Forests and Water Resources, 1975). They differ from parks in emphasizing protection first, rather than recreation. Most of the 65 reserves established to date protect unique botanical assemblages or concentrations of birds in sea-bird colonies. They have been oriented to specific ecosystems, and all but one are small. As such, they can adequately protect representatives of relatively stationary or concentrated biota. However, they exclude large, ranging ungulates such as caribou, sheep, and goats unless these species are specifically considered, in which case reserves must be larger,

and encompass parts of various ecosystems that these species use at different times of the year. This has been recognized in the establishment of Gladys Lake Ecological Reserve, 206 km^2 (128 square miles) to protect selected groups of stone sheep and mountain goats in their variety of annual ranges. The philosophy that led to the extension of ecological reserves to protect these large ungulates is now needed to create an ecological reserve primarily for mountain caribou.

Three quotes distill much of the concern which wildlife biologists have for mountain caribou: "It is almost inevitable that after occupation of a country by technological, pastoral or agricultural man, we find ourselves struggling to preserve the animals of climax status, such as bison, musk-ox and caribou" (Leopold and Darling, 1953, quoted by Ritcey, 1974). "The mountain caribou has decreased alarmingly throughout most of British Columbia" (Edwards, 1954). "Initially then, caribou management must consist largely of preservation, the very antithesis of forest and wildlife management as presently practiced" (Ritcey, 1974). While there may be a few tens of thousand caribou in B.C. (pers. comm. D. Eastman, Fish & Wildlife Branch, Victoria), their future as a major wildlife species is far from assured. Ritcey, who has done the most research on caribou in B.C., ended his recent paper (1974) in which he summarized aspects of caribou management with the

comment, "History does not deal kindly with those who contribute to the elimination of a species." In short, biologists feel that mountain caribou need our help.

Mountain caribou are probably the most intolerant of B.C.'s ungulate species to man's traditional activities as he invades wilderness lands. That does not mean that man and caribou cannot mix, but there seem to be inevitable consequences of this invasion, among which is access for hunting which is often difficult to regulate and police, and destruction of caribou range. The intolerance of caribou is a function of a variety of biological and ecological factors:

1. Periodic requirement for relatively mature or climax coniferous forests for winter range, where they may feed on arboreal lichens for an extended, or a short but critical time (Edwards, et al., 1960; Edwards and Ritcey, 1960; Bergerud, 1972; Freddy, 1974a; among others). Caribou appear to choose this food when snow depth makes herbaceous vegetation or ground lichens unavailable (Bergerud, 1972; Skoog, 1968). Such conditions may not occur every year, but when they do, the opportunity to eat this only available food may be critical. Aboreal lichens (principally of the genera *Usnea* and *Alectoria*) grow slowly, and achieve maximum abundance only on old trees (Freddy, 1974) (more on this later). Forest fires, and to a lesser extent clear-cut logging have eliminated much critical

caribou range in central B.C. (Edwards, 1954) and the Selkirk Mountains (Evans, 1964; Johnson, 1976).

2. A low natural rate of recruitment of breeding age animals into the population. This means that the sum of all causes of annual adult mortality must be kept lower than in other species of ungulates, or a decline will occur. From this standpoint, mountain caribou are thus susceptible to overhunting. There is no evidence that mountain caribou are capable of compensatory reproduction (twinning has only been verified once in wild caribou in North America [Shoesmith, 1976]) whereby higher than usual mortality is compensated for by increased reproductive success, such as has been identified for moose (Pimlott, 1959). The reasons for the low recruitment in mountain caribou are not clear. Contributing seems to be a characteristic low natality, which has been as low as 57% of females bearing young on the Yukon's Burwash Uplands (Oosenbrug, 1976). Summer mortality of calves has been reported as accounting for up to a 70% loss in the Nelchina caribou herd (R.t.granti) in Alaska (Skoog, 1968); first winter mortality may reach 30% (Skoog, 1968). If there are common underlying reasons for low annual recruitment to breeding age, they are not clear, and form part of the need for further research.

3. Local migratory movements from summer to early winter to late winter and spring ranges, which often bring herds in contact with humans, and pose problems of harassment by snowmobiles on winter ranges or ATV's on summer tundra ranges, poaching, or highway mortality where they may be attracted by salt (Johnson, 1976).

4. Common re-appearance of herds at the same places in successive years, which during the rut and co-incident hunting season are in open tundra habitats where caribou can be seen and shot more easily than in the forest, and a helicopter can land relatively easily. This, plus their gregarious nature, migratory behaviour and low annual recruitment noted earlier, make mountain caribou vulnerable to over-hunting within a few years of local knowledge of their presence. Overhunting has been responsible for declines in R.t. caribou in Ontario (Cringan, 1957), Labrador (Bergerud, 1967), Newfoundland (Bergerud, 1971) and as will be noted, in the Telkwa Mountains. Overharvesting is guarded against to some extent in B.C. by the apparent selection by B.C. hunters of male caribou (Ritcey, 1974) and observations by Bergerud (1974) that breeding is not reduced until ratios of male:female exceed 1:12. However, when a herd becomes accessible to a sudden increase in hunting, there is still a danger of local overhunting (the Telkwa case). This prompted Ritcey (1974) to say, "Despite generally conservative

harvesting at present, in the future we will have to initiate special management with quotes based on productivity if we are to protect local populations."

Thus, taking these points together, mountain caribou are in a greater jeopardy as man invades wilderness areas in B.C. than forest ungulates like deer, moose, and elk which benefit to a greater degree from early stages of secondary succession after fire or logging, and are better hidden and dispersed year round than caribou. Mountain caribou may be less well served than these other ungulates by even good inter-agency co-operation in allocating multiple land use. These facts form the basic rationale for the establishment of an ecological reserve for mountain caribou.

Nevertheless, one might argue that northern B.C. is large and there are lots of places where caribou may still live for years with little possibility of interference by man. Two arguments, however, make any lack of urgency because of this belief, less valid. The first is subjective, related to how individuals perceive the rate of northern development. With considerable thought and after discussions with Regional Wildlife Habitat biologists we can very realistically perceive a scenario of rapid northern development in B.C. that may alter the character of much wilderness lands and possibly reduce caribou to only isolated relic populations rather than a major

ungulate resource. There really can be no argument against this except that of timeframe, or some economic barrier that prevents resource development. And there is no logic in postponing the establishment of an ecological reserve for caribou until the situation is more critical, land values escalated, pressures against dedicating land to purposes with no monetary gain even greater.

Secondly, management biologists need more understanding of caribou ecology now, with protected animals and their ecosystems as not only subjects of scientific study but benchmarks for comparison with man-altered caribou ecosystems. Our understanding of mountain caribou is really still back at a need for more descriptive ecology; along with mountain goats they are more poorly understood than other B.C. ungulates. In B.C., they have only been studied in the central area (Wells Gray, Tweedsmuir) in the past (a series of papers by R. Ritcey and R.Y. Edwards), in the southern Selkirks and Purcells (papers by D.R. Johnson and D.J. Freddy), and to a lesser extent in Glacier Park (thesis by Hamer, 1974). In adjacent areas, they have been studied in Jasper by Parks Canada, Alaska by Skoog and the southern Yukon by the authors of this report. That, along with the aerial censusing and routine management efforts of Regional Wildlife Biologists, forms the total knowledge upon which management can proceed. It is a foundation

only, with many unanswered questions. We need to better understand the reasons for low recruitment; the attributes of critical winter and summer ranges, their utilization and the factors that govern caribou movements; the role of predation in population limitation which involves dynamics of wolf-caribou-moose relationships; and the welfare of a completely protected herd for comparison with herds elsewhere. An ecological reserve will facilitate this.

What about existing reserve areas to perform these functions? There are few areas in B.C. where mountain caribou and their habitats are protected. Both are protected in Glacier and Mt. Revelstoke National Parks. Caribou are absent from other National Parks in B.C. In Glacier, Hamer (1974) estimated 25 caribou in the northern and western sectors, and an unknown number, but no evidence of any substantial numbers, in the rest of the Park. At Mt. Revelstoke, "caribou may be reduced in numbers or eliminated by construction of the Revelstoke dam" (Hamer, 1974, page 142). Even in Glacier, "the national park fails to include the complete range of the mountain caribou population", and Hamer made a recommendation to create a management unit adjacent to the Park to aid in protection of caribou. This recommendation has not been acted upon.

In B.C. provincial parks, caribou can be hunted in all but Tweedsmuir and Bowron Lakes. However, even in Tweedsmuir

the predators of caribou, wolf and lynx, can be killed. The ecological system is therefore not preserved. Bowron Lakes is the only provincial park where caribou and their predators, and the habitat are all protected. It, however, is too small to contain a self-contained caribou range, and has very limited upland habitat. The Gladys Lake Ecological Reserve in Spatsizi Provincial Park has very few caribou, and those only sporadically, in it. It was not established with mountain caribou in mind.

Many wildlife management units are closed for caribou hunting, including the Telkwa Mountains, but except for the small Rainbow-Nature Conservancy Area adjacent to Tweedsmuir, caribou habitat is not protected since they are open for resource exploitation.

In summary, there can be no doubt left that existing areas fail to fill the needs for an ecological reserve for mountain caribou.

Finally, how well may an ecological reserve actually protect caribou and their habitat? Questions of both management of a reserve, and adequacy of boundaries bear on this. There is little likelihood of setting aside a few hundred square miles in which only wildlife research and management scientists can go. Undoubtedly, wilderness recreation must be an important part of justifying land preservation at this scale (although the authors' personal belief is that such need not necessarily be so,

depending on how significant society views both the theoretical and applied values of understanding ecological functions of wilderness). In the case of the Telkwa Mountains, the reserve area includes a proposed wilderness Class A provincial park, so non-motorized recreation is a "given". No clear judgement of the potential negative impact of wilderness recreation in an ecological reserve for caribou can be made. However, if management objectives and planning clearly give primacy to minimizing man-caribou interactions, no problem would likely occur.

The problem of drawing adequate boundaries is more difficult. Many authors have referred to shifts in ranges used by a caribou herd. Freddy (1974a) believed that caribou rotated their winter ranges in the Selkirk Mountains. Caribou may reduce arboreal lichens they can reach to the point of lowering the capacity of an area to support caribou, unless wind knocks down branches and trees sufficient to recharge their food supply at critical times (as appears to happen on the Slate Islands in Lake Superior, pers. comm. A.T. Bergerud). While caribou use traditional ranges, as noted, they are also opportunists--"These animals are survival artists who rapidly shift to the most favourable locality at the required time over great distances so as to circumvent the negative effects of cold and snow while capitalizing on their benefits" (Geist, 1974).

This introduces an element of uncertainty in any boundary delineations. We have used as one criteria for selection of an area for intensive study its relative discreteness. Beyond that, we see no alternative but to attempt to draw the best boundaries possible at that area on the basis of present information, recommend some management guidelines for those peripheral areas that may be important at times for caribou, and recommend keeping a watch on the population in order to identify any shifts in range.

Methods

The field study spanned the months of August and September, 1976. The study area was covered as thoroughly as possible on foot.

Aircraft support aided in getting into the most remote areas, and laying out food caches. Four-wheel drive provided access at a number of other places. In addition, we made two survey flights, one by helicopter in early August over the main Telkwa block, and one by fixed-wing in mid September over the Burnie Lakes block. D. Hatler made a third survey on October 1.

In the field we mapped all sightings of caribou or their tracks or droppings or antlers. The tundra and sub-alpine sections were mapped according to three classes of caribou habitat (to be described), by direct estimation from the vantage

points of high hills, and from colour aerial photographs supplied by the B.C. Department of the Environment. Forested areas were walked in the Goathorn, Cabinet, Webster, Emerson and Howson Creek areas, and subjective notes were made on extent and type of arboreal and terrestrial lichens and character of the forest floor and degree of canopy closure.

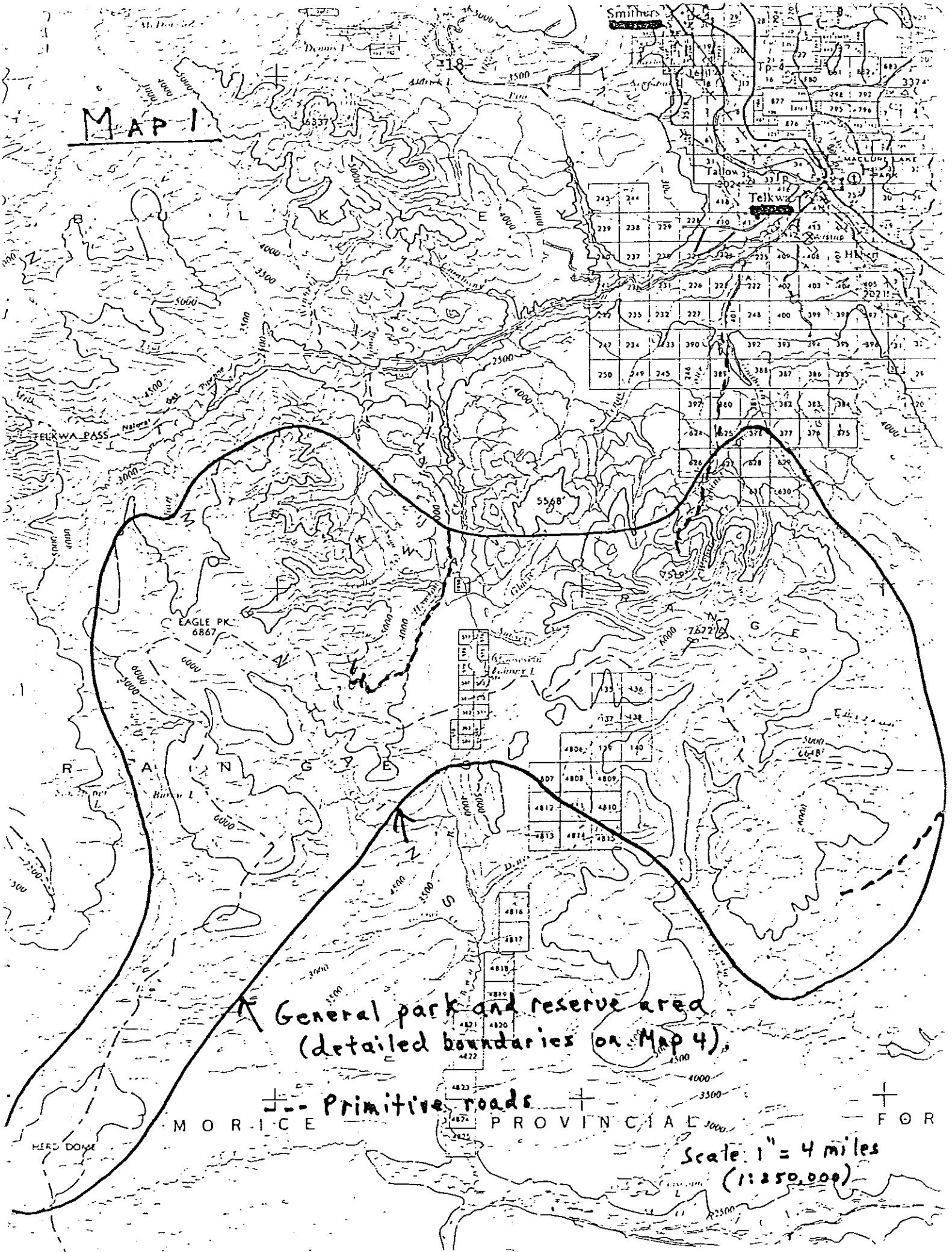
Resource agencies were contacted for specific information on past, present and possible future land uses: B.C. Forest Service in Smithers and Houston, Minerals Section in Smithers, Parks Branch in Smithers, B.C. Forest Towerman for Nanika Mountain, and Canadian Geological Surveys in Calgary.

TELKWA CARIBOU

General Description of the Area

The Telkwa Mountains are a short spur of the Hazelton Mountains which form the eastern flank of the coast ranges in west central B.C. The closest town is Telkwa, in the Bulkley River valley 10 miles from the most northerly part of the area. The Telkwa Mountains are bounded on the north-east and east by the Bulkley River valley, the south-east and south by the Morice River valley which is a major tributary valley to the broad Bulkley valley, on the west by the glaciers along the crest of the Hazelton Mountains west of the Burnie Lakes, and on the north-west by the Telkwa River valley which is another tributary of the Bulkley (Map 1). The area proposed for reservation consists of two mountain blocks: the western, which is proposed for provincial park status, and the eastern, proposed for ecological reserve status. Uplands on both blocks are convoluted and broken by rocky peaks. Between the two blocks is a four to five mile wide north-south running pass containing Howson Creek (north flowing) and Thautil River (south flowing), and associated tributaries.

Some smaller mountain blocks lie north of the Telkwa River. One of these, locally known as MacDonald Ridge, was traversed on foot, and all were classified for tundra caribou habitat, but they were not ultimately included in the proposed boundaries of the reserve.


MAP 1
Smithers
Telkwa
MACLURE LAKE PARK
BULKLEY
TELKWA PASS
EAGLE PK
6867
5568'
7622'
6648'
RANGE
RANGE
MORICE
PROVINCIAL
FOR
HERD DOME
General park and reserve area
(detailed boundaries on Map 4)
Primitive roads
Scale: 1" = 4 miles
(1:250,000)

The total area proposed for protection covers about 1427 km^2 (551 square miles) (reserve and provincial park) east of Burnie Lakes. Of this, approximately 204 km^2 (79 square miles) are permanent ice and rock, 65 km^2 (25 square miles) tundra vegetation, 54 km^2 (21 square miles) sub-alpine forest, and the remainder lowland forest. Elevations vary from 884 m (2900 feet) to 2338 m (7672 feet). Five peaks exceed 1829 m (6000 feet).

The area has a complex physiography of fault scarps, glacier and water scoured valleys, local catch basins that form small lakes, moraine ridges and hills. In general, the area is very rugged, with steep slopes, deep canyons and some near vertical rock walls. Scattered throughout are tundra and sub-alpine plateaus which provide caribou habitat. From our evidence, caribou successfully negotiate the rugged country between these plateaus.

Geomorphological processes expected in such an alpine environment are evident: rock glacier, rock polygons, solifluction, stripes, mud boils--all characteristic features of frozen soil. In association with such soils are many arctic-alpine plants (more later).

The bedrock of the area consists primarily of the "Hazelton Group", described as consisting of "an apparently conformable succession possibly 10,000 feet thick, of interbedded

sedimentary and volcanic rocks ranging in age from pre-Middle Jurassic to Lower Cretaceous" (Preliminary Map 44-23, Smithers, Dept. of Mines and Resources, Geological Survey). A remaining approximately 10% of the proposed reserve area is igneous rock of a variety of types and of a younger Cretaceous or Tertiary age. This 10% constitutes the highest areas in altitude, and the largest part underlying the tundra block and peaks northeast of North Burnie Lake, and a second chunk on the high rugged mountain area east of Glacis Lake. In addition, there are small areas of sedimentary rocks along lower Cabinet, Goathorn, and Denys Creeks.

The forested areas are classified as "sub-alpine coastal" (Rowe, 1959). They are predominated by white spruce (Picea glauca) and Engelman's spruce (Picea engelmannii) and true firs--amabilis (Abies amabilis) and at a higher elevation, alpine fir (Abies lasiocarpa). Mountain hemlock (Tsuga mertensiana) makes up a smaller component. Western hemlock (Tsuga heterophylla) is found in the lower Howson Creek area, an eastern occurrence for it and part of the rationale for the previously proposed 5,111 acre Howson Creek Ecological Reserve (Report No. 201, B.C. Application for Ecological Reserve). Lodgepole pine (Pinus contorta) is found in disturbed areas, with scattered dwarfed individuals in the sub-alpine. Whitebark pine (Pinus albicaulis), a sub-alpine species, occurs rarely

and is at its northern limit, which is part of the rationale for the previously proposed 7,792 acre Glacis Lake Ecological Reserve (Report No. 202, B.C. Application for Ecological Reserve).

Tundra, sub-alpine, and understory forest vegetation will be described later under Range Analysis.

The nearest weather station is at Telkwa, at a lower elevation of 683 m (2240 feet). Data collected here are therefore not truly representative of the area. Most salient features of data collected here are days with frost 215, annual mean snowfall of 181 cm (71.2 inches). The region receives a heavy snowfall despite its position interior to the coast ranges.

The area has limited access. One abandoned mining road, navigable by 4-wheel drive vehicle, runs from the Telkwa River road to the sub-alpine on the north part of the area. Another road of similar quality runs from the Telkwa River road up Howson Creek. In 1976 the bridge over the Telkwa River was out making the road inaccessible. Numerous blowdowns were also lying across it. A third similar road runs from the town of Quick, north of the area, to Grizzly Lake, a small lake on the east side of the area south of Emerson Creek. This road continues as a trail 9.7 km (6 miles) to the sub-alpine south of upper Emerson Creek (see Map 1).

Fixed wing aircraft can land on three lakes: North Burnie, South Burnie, and Mooseskin Johnny. Fishing parties were being flown into these lakes periodically from the town of Telkwa.

Man's activities in the past have been limited to mining, some lumbering, hunting, and trapping. The extent of these will be discussed later. The evidence man has left of his presence has been abandoned mining buildings at Hunter Basin, mining buildings near Scanlon Creek, scars of bulldozers on the tundra in these two places and a few others (such as above Emerson Creek). Some clear cuts are on lower slopes adjacent to the area. Otherwise, except for the ubiquitous beer can in unexpected places, the land appears in its pristine state, beautiful and wild.

History of the Telkwa Caribou

The Telkwa caribou have been surveyed periodically since the late 1940's. They have gone from high numbers of a few hundred animals in the early 1940's to low numbers in the late 1940's. The decline was primarily because of excessive hunting (L. Cox, Senior Conservation Officer, Smithers). They increased in numbers again until the mid 1960's, then were overhunted again to low numbers in the late 1960's. The herd is now in a recovery phase.

Caribou Statistics	Year								
	late 1940's	1949	1956	1964	1965	1966	1967	1968	1975
Number	low	60-100	>100	180	271	166	2	40,38	28,38
Season & observation conditions		Summer horse-back trip		April	March perfect cond. little snow	March heavy snow, bare patches	April heavy snow, animals still in trees	Feb. May	April Nov.
Significant events	Hunting closed 1947-48	to 1956			Obvious immigra-tion	Heli-copter hunting, mining, snowmob. concern F&W Br.		Known 20 caribou shot	Hunting closed 1973-74 to present

Caribou were apparently overhunted in the late 1940's. They were gone from the Babine Mountains a few years earlier, leaving the Telkwa animals the most accessible in the Smithers area. Road access existed to Hunter Basin, and trail access to Mooseskin Johnny and Burnie Lakes. The Telkwa herd may have hit a low of only 18 animals (L. Cox, personal communication). Under a hunting closure initiated in 1947-48, numbers of caribou rose through the 1950's to more than 100, and the hunting season was opened. The herd built until 1965 when 271 animals were counted. In the spring of 1966 the herd had decreased by 105 animals (39%). The cause of this decline was attributed to a

"somewhat severe winter and also as a result of greatly increased hunting pressure and known kill brought on by the availability of rotating wing aircraft," according to a letter written by L. Cox to the Prince George office. In another letter he referred to "the terrible hunting pressure put on this herd by the use of helicopter last fall".

The April 1967 survey was not accurate because of far more snow than usual, causing the caribou to stay down in the timber. Two surveys in 1968 were alarming, with a drop from 1966 of 126 animals (76%). Conservation Officer R.W. Seredick appealed to Prince George to "immediately abrogate the anterless season, and end the season at the end of September or mid October at the latest". Why he did not recommend complete closure is not clear, unless he doubted the accuracy of the two low counts in early 1968. The reasons given for the decline were "Hunting pressure is undoubtedly a significant contributing factor of the decline. Unbelievably accelerated 'prospecting' activity with attendant use of helicopters has no doubt made a contribution to the decline, indeed abuses have been documented." R. Seredick also documented that "at least 20 caribou were known to be taken out of this region last fall".

Between 1968 and 1973 there was no file information on the herd. However, in 1973-74, the hunting season was at last closed to protect what was left. Counts in 1975 indicated that

that was about 40 animals. This is the current estimate. Hunting remains closed. Mining activity has decreased to almost nothing. The scales are tipped to allow an increase in caribou as occurred 15 years ago.

Some of the past counts separated adults from calves. In 1965, 49 calves were counted (18% of animals); in 1966, 27 calves (18%); in 1968, 9 calves (26%). These figures indicate good recruitment to breeding age (for caribou). In comparison, Labrador caribou averaged 11% calves in March over 6 years (Bergerud, 1967); the Nelchina herd in Alaska (R.T. granti), during years of its rapid growth up to 1962 consisted of approximately 19% recruiting calves (calculated from figures presented by Bos (1975)). This indicates that the Telkwa range has demonstrated an ability to produce good calf crops.

There is evidence that immigration took place when numbers reached their maximum in 1965. The increase of 91 animals (50%) between 1964 and 1965 cannot be attributed to reproductive success--it is too great. On adjacent caribou range, now unoccupied, we found old caribou evidence (more later). This suggests that perhaps our proposed reserve boundaries may not be adequate when numbers of caribou are large again. However, this cannot be foreseen with enough certainty to make this a valid consideration in proposing boundaries.

The locations of caribou observations were given only in 1965 and 1966, at the time of peak numbers. "Hankin Basin" ranked first both years, followed by the area west of Walcott, then the Camel Humps, and finally west of Mooseskin Johnny Lake. This suggests that the eastern mountain block (to be proposed as ecological reserve) held more caribou than the western mountain block, which is part of the proposed Burnie Lakes Provincial Park (the area west of Mooseskin Johnny is in this western block).

There are some additional observations of caribou in the western block, made in the 1975 study by the B.C. Parks Branch. Two caribou were seen in the summer, east of the middle of North Burnie Lake on the high plateau, and one was seen east of the middle of South Burnie Lake. As well, fresh and old tracks, and droppings were fairly frequent on the "south alpine," (likely east of South Burnie Lake), and less frequent on the "north alpine" (likely east of North Burnie Lake) (in "A Fisheries and Wildlife Survey of the Burnie Lakes Parks Proposal," Parks Branch, Smithers, October 1975). No antlers were found in that study. In the report also there is mention of observation of 8 caribou by G. Hazelwood in September (including at least one bull) but locations are not known. Caribou therefore, use the west block, but apparently to a lesser extent than the east block.

Telkwa Caribou Range

We subdivided the study area into five categories:

2 tundra, 1 sub-alpine, 1 boreal forest, and 1 unvegetated. These are shown on Map 2, and at an expanded size in the back of the report. The number given each class is for descriptive purposes, and does not imply relative quality.

Plants found above 1370 m (4500 feet) are listed in Appendix IV.

Class 1 Caribou Habitat: Areas classified as Class 1 habitat were characterized by poorly drained, generally flat terrain above 1525 m (5000 feet). This habitat was often found in association with snow-melt areas, where water exits from snow-deposits, in depressions or on moist slopes.

Only major areas of Class 1 habitat are shown on Map 2. Small pockets of Class 1 habitat were found wherever the above conditions existed.

Plant species common throughout Class 1 habitat were those most frequently utilized by caribou during the summer (Edwards 1963; Freddy 1974a; Oosenbrug 1976; Skoog 1968). These included a variety of sedges, i.e. Carex aquautilis, Carex machrochaeta, Carex podocarpa, and succulent forbs such as Valeriana sitchensis, Ranunculus escholtzii, Senecio triangularis and Artemesia arctica.

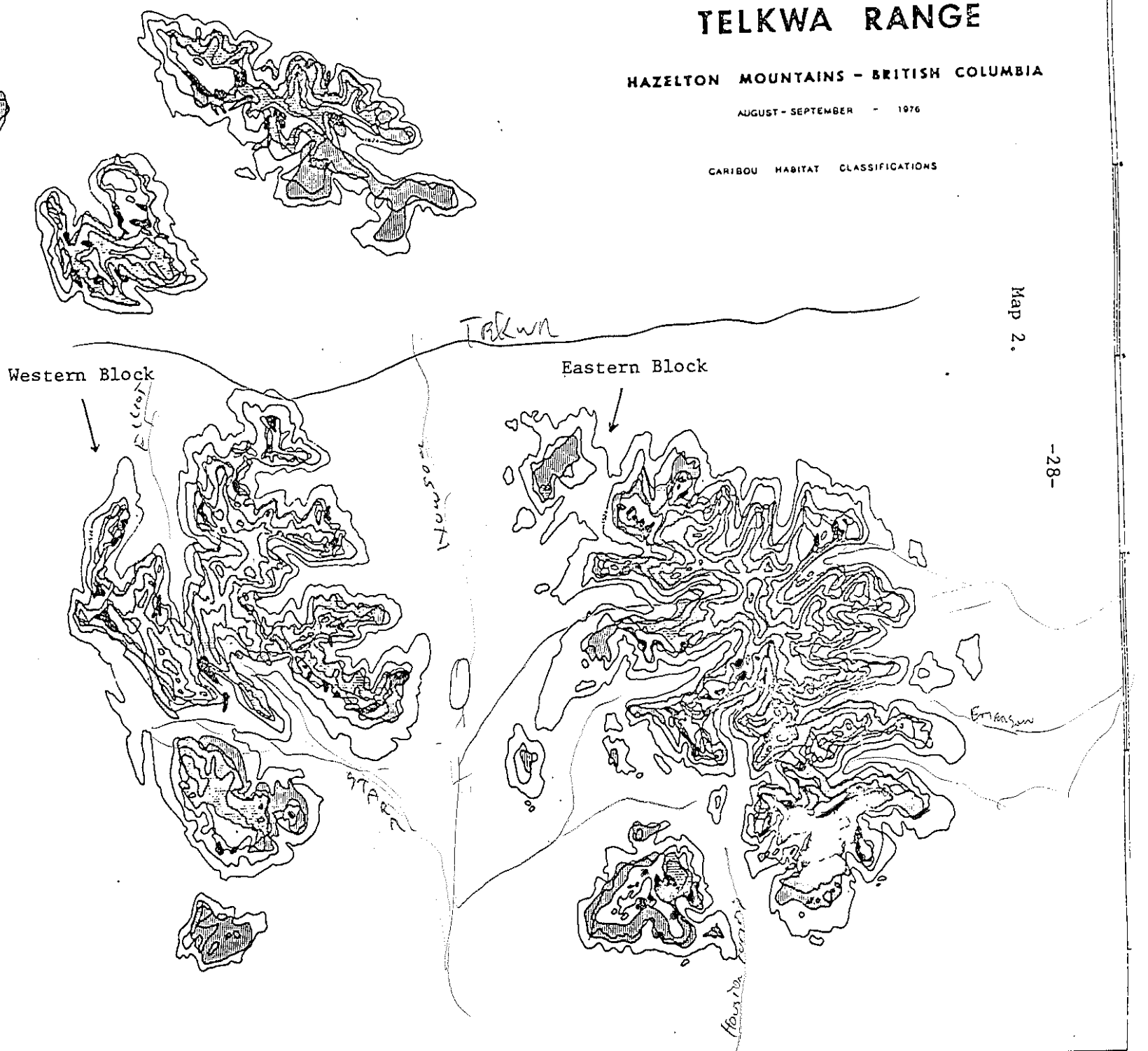
TELKWA RANGE

HAZELTON MOUNTAINS - BRITISH COLUMBIA

AUGUST - SEPTEMBER - 1976

CARIBOU HABITAT CLASSIFICATIONS

Map 2.



Other common species in decreasing order of occurrence included:

Carex albo-nigra
Salix reticulata
Caltha leptosepala
Petasites frigidus
Juncus drummondii
Luzula parviflora
Eriophorum brachyantherum
Ranunculus occidentalis
Aconitum delphinifolium
Ranunculus coolevae
Saxifraga cernua
Parnassia fimbriata
Leptorena pyrolafolia

Class 2 Caribou Habitat: Areas classified as Class 2 habitat were characterized by well drained, gentle to moderate (5-20°) slopes, usually with a westerly aspect, and dry hilltops and knolls, generally above 1698 m. Vegetation was dominated by grasses, rather than sedges and succulents in Class 1.

These areas were dominated by a variety of grasses such as Festuca altaica, Luzula parviflora and Luzula spicata, Poa alpina, as well as lichens (Cladonia alpestris, Cetraria nivalis, Stereocaulon sp.) and forbs (Artemesia arctica, Rumex arcticus, Antennaria sp.). In places there was low growing Salix reticulata, Salix arctica, and Betula glandulosa, or patches of Dryas integrifolia where drier, or patches of Cassiope mertensiana in wetter gullies.

Class 2 habitat appears to have been utilized by caribou when Class 1 may not have been available (under snow), perhaps in

early spring and late fall (more later).

Class 3 Caribou Habitat: This is sub-alpine forest, mostly lying above 1373 m (4500 feet). It is an open parkland more similar to sub-alpine areas in the Rocky and Cascade Ranges farther south than the shrub-dominated sub-alpine a little farther north in the Yukon Territory and Alaska. Alpine fir trees are scattered throughout, sometimes exhibiting Krumholtz growth-form. The sub-alpine is characterized by a mosaic of wet and dry sites, with ground vegetation in the latter dominated by Arctostaphylos uva-ursi, Juniperus communis, Lupinus arcticus, the lichens Cladonia sp. and Stereocaulon sp., and some patches of Betula glandulosa. Wet areas are more common, and ground-vegetation here is very similar to that in Class 1, with much Valeriana sitchensis, Senecio triangularis, and Artemesia arctica as well as Veratrum veride, giving these areas the same bright green colour as Class 1 vegetation when viewed from a distance or from the air (Class 2 was distinctly tan-coloured because of the grasses).

Arboreal lichens were not evident except at the lower edge of the sub-alpine where it graded into thicker montane forest.

In addition to these 3 classes of upland vegetation, some of the rocky areas support limited plant growth, but these are of little value to caribou. The most common plants in these areas were: Saxifraga tricuspidata, Sedum spp., Astragalus spp. and some Stereocaulon sp.

Forested areas: These were described briefly under "General Description of the Area". The forest is made up of a mosaic of age and species groupings, as described on Forest Cover Maps. In the upper altitudes of the forested zone relative to this study (above 1219 m (4000 feet)), mixed stands of fir and spruce are most common, in an age class 141 and 250 years, or greater than 250 years. In some places, lodgepole is in the mixture, but these are in younger stands. This latter younger association with lodgepole, is not common; it bears only light loads of arboreal lichens in comparison with the older spruce-fir associations.

Arboreal lichens are common in these forests: Alectoria spp. (mostly fremontii and sarmentosa, the former mostly growing high in trees and the latter more common down low where there were forest openings). The forests are generally thick, with little ground shrub vegetation. Terrestrial lichens (Cladonia and Peltigera) are common on organic debris in open places. High willows (Salix spp.) grow in open areas along the few roads or in places near the sub-alpine.

Numbers and Distribution of Telkwa Caribou, August - September 1976, and Probably Seasonal Movements

Caribou were observed on 11 occasions, constituting a total of 42 animals believed to be different. Of these, 23 were adult (2 years old) females, 2 were adult males, 7 were calves of

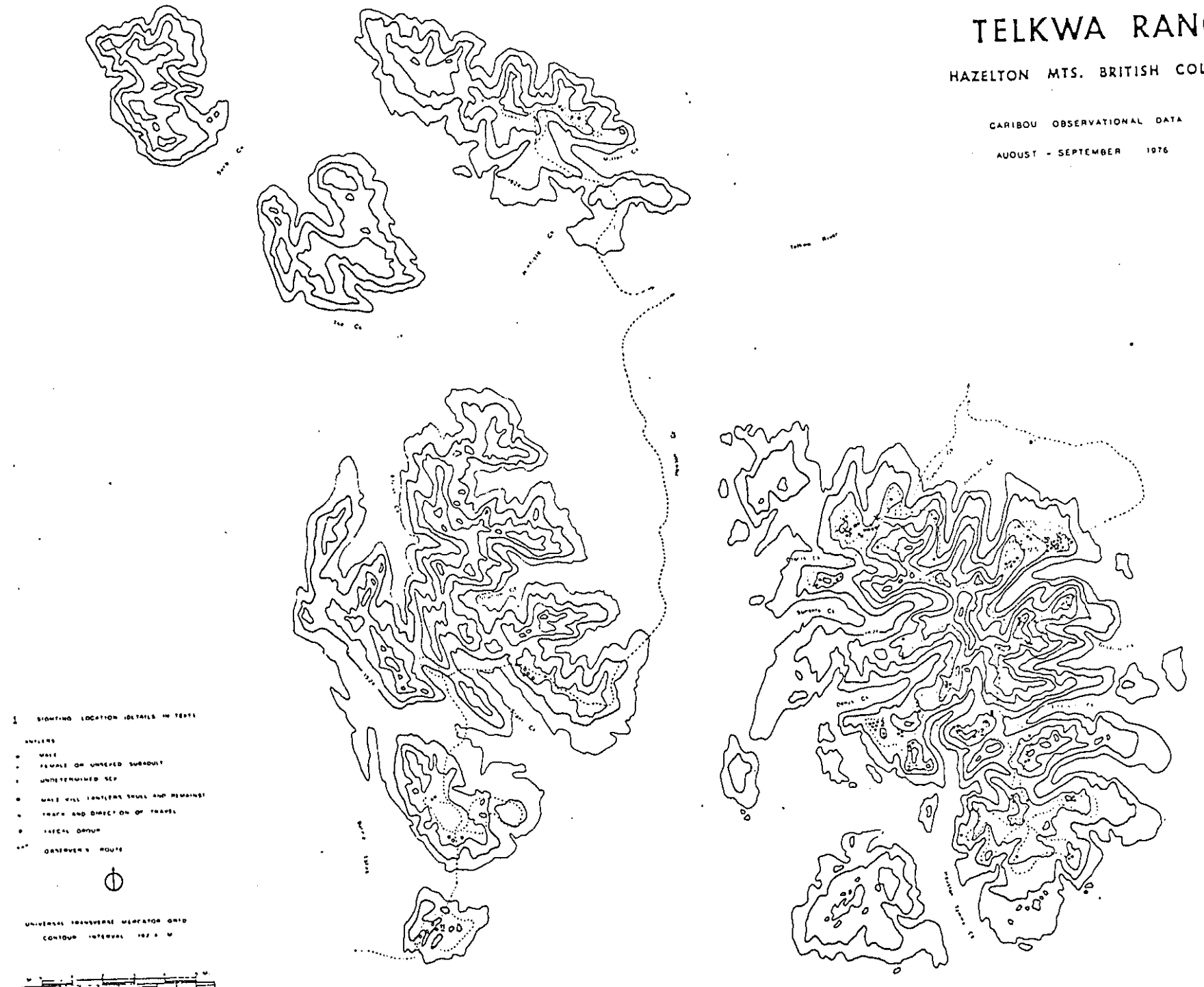
TELKWA RANGE

HAZELTON MTS. BRITISH COLUMBIA

CARIBOU OBSERVATIONAL DATA

AUGUST - SEPTEMBER 1976

Map 3



the year, 6 were sub-adults, and 4 were unknown sex or age. These sightings are listed in Appendix I, with additional particulars, and Map 3 (with an enlarged version at the back of the report). All sightings but one (4 animals) were made on the large eastern mountain block. The other one was made on the small dome south-east of South Burnie Lake.

We surmise that the herd must exceed 42 animals, because we found only 2 adult males. However, we acknowledge the possibility of double counting some of our observations, even though we excluded sightings (3) where we suspected this.

The largest herd consisted of 12 animals. They were first sighted from the air (11 animals at that time) on August 5, and seen again from the ground on the next two days. They were on the tundra between upper Sunset and Denys Creeks.

Mean herd size, including the large group, was 4.7 animals. All caribou observed and approached on the ground were very wary and always ran off in great panic.

Other evidence of caribou--tracks, antlers, droppings, provided valuable information on caribou. All observations are described and listed in Appendix II, and locations also on Map 3.

Taking observations of caribou, their antlers, tracks and droppings together we can draw some conclusions about spring, summer, and fall habitat use and movements. During mid-summer,

caribou occupied high-elevation terrain, above 1698 m (5511 feet) and utilized food species in pockets of Class 1 habitat at the edge of snow deposits and unvegetated terrain. In September, habitats at lower elevations were occupied. Antler locations (153 antlers found, Appendix II) indicated that caribou occupied the lower parts of Class 2 tundra habitat during fall and early winter (when most males shed their antlers) and also in late winter and early spring (when females shed their antlers-- (Bergerud, 1976)). The latter provides indirect but not conclusive evidence of calving areas, since most pregnant does shed their antlers a few days after parturition (Bergerud, 1976). This conclusion is complicated, however, by barren does which normally shed their antlers some weeks earlier. Lower sections of Class 2 habitats are used in late fall and early spring because respectively they are the last tundra areas to be snow-covered, and first to be snow-free. Fewer antlers were found in Class 1 habitats, suggesting that they are likely normally snow-covered in late fall and early spring (they are either at high elevations, or are snow catchment areas, as previously described). For example few antlers were found in the south-east corner of the study area (Map 3) which is the most extensive Class 1 habitat. However, in contrast, a few antlers were found in pockets of Class 1 habitat in the vicinity of the "Camel Humps" north of Glacis Creek and also

on the plateau in the north-east corner of the study area between Webster and Dockrill Creeks.

Antler locations also indicated that caribou traverse areas of unvegetated terrain (rock, scree slopes, ice caps) from one region of vegetation to another, despite their formidable appearance. These may be windblown much of the fall and spring periods.

Little evidence of caribou use of Class 3 habitat or lowland forest was noted. One sighting only (Appendix I, number 11) was made, in Class 3. However, Class 3 habitat was more difficult to assess because of more limited visibility than on the tundra. Also, its herbaceous plant communities were similar to those found in wet seep Class 1 areas, suggesting it was good summer habitat. And the males had to be somewhere. Therefore, our lack of evidence of spring to fall use of these habitats is not considered conclusive, and especially not felt to be so for Class 3 habitat.

On MacDonald Ridge, north of the Telkwa River, evidence of caribou was limited to 6 old antlers (Map 3). No droppings or tracks were found. While the tundra range is very similar in vegetation to the areas south of the Telkwa River, there was less evidence that caribou have been using this area than other areas we studied.

Caribou movements and the ranges they use in the winter were not directly part of this study. As a result of our verbal

identification of the need for more study here, the B.C. Ecological Reserves Branch have financially supported winter work by the Fish and Wildlife Branch at Smithers (Keith Hodgson and Dave Hatler). The report that will come out of this work should be referred to.

Since caribou are not always traditional in their use of winter range, all the evidence possible must be assembled to draw any reasonable conclusions. The following estimate of probable winter range comes from the fragmentary historical observations to date plus expected behaviour of caribou derived from the literature.

Caribou have been described as following three patterns of movements in winter:

1) Movement into heavy timber in October or November when snow becomes deep and is soft. Here they initially feed on ground vegetation and ground or tree lichens, pawing through snow where trees have held some snow aloft. Caribou can smell lichens under a maximum of 7 inches of snow, and when deeper than that, can detect them at the base of shrubs which provide air tunnels upward (Bergerud, personal communication). Caribou may turn to arboreal lichens more when ground vegetation becomes unavailable. In January or February, caribou travel up to the sub-alpine where snow is now more compact than earlier in the winter, and feed on principally arboreal lichens until the

lowlands begin to thaw in April when they go back down, and progressively follow snow-melt upwards through the spring. This pattern was reported by Edwards and Ritcey (1959) for caribou in Wells Gray Park.

2) Mountain caribou in the Selkirks (on the B.C.-Idaho border) did not follow this pattern of double migration to the lowlands, but moved from alpine to lowlands in October and stayed there until March when they moved upward and stayed up. Their lowest elevation was about 1402 m (4600 feet) below which was a cedar hemlock zone which they rately inhabited (Freddy, 1974a). (This contrasts with caribou north-west of McBride, B.C., which go below 914 m (3000 feet) and enter the cedar-hemlock zone to winter, and cross the Yellowhead highway).

3) Mountain caribou in the Burwash Uplands in the south-west Yukon Territory appear to maintain themselves all year either on the tundra or upper sub-alpine of headwater streams, using the lowland forests only rarely at unknown times in the winter (Oosenbrug, 1976). The hypothetical reason for this is the presence of bare ground on the tundra in some places all winter because of winds generated by the near-by huge Icefield Ranges (largest icecap outside polar regions in the world).

In applying these observations to the Telkwa Mountain caribou, forest-use in winter (either 1 or 2) is likely most

common considering snow depths (previously mentioned) and past conclusions drawn by aerial surveyors that caribou were down in the trees (such as in 1967). Whether a pattern of single or double migration down is followed is not known, but is perhaps somewhat irrelevant to boundary delineation.

However, the 1976-77 surveys currently underway by K. Hodgson have shown that in this exceedingly light snowfall winter, caribou mainly stayed up on the tundra. L. Cox, Senior Conservation Officer at Smithers, believes that this has happened in the past, too.

Clearly, there is no set pattern. Delineating winter range is either the sum of many years of detailed work, or is an educated guess to take in ranges likely needed. Supporting this is Stardom's (1975) observation about R.t. caribou in Manitoba that "In a winter of thin snow-cover, the groups making up the resident bands in the intensive study area were smaller and fed more extensively over their winter range. Conversely, in a winter of thick snow cover, there was a greater aggregation of individuals into larger groups which fed intensively in small areas of their winter range." Also relevant is Freddy's (1974a) observation of rotating use of wintering areas, referred to previously. Caribou are opportunists.

What forested areas may be important to caribou? The following "educated guess" is based on the past locations of

caribou sited mainly in the late winter. Presumably the animals have moved up from adjacent lowlands in the years they were down. On the basis of this indirect information, the forests below Hankin Basin (Webster-Dockrill area), the north-west corner below the Camel Humps, and the east side in upper Emerson and south Dockrill Creeks (described in past years as west of Walcott), are possibly important in some years. Many antlers were found on the tundra especially above Webster-Dockrill Creeks. This really adds up to all the adjacent forests around the eastern mountain block.

How far down might caribou go? There are no data. In Wells Gray, caribou came down to 1066 m (3500 feet) (Edwards and Ritcey, 1959); in the Selkirk Mountains, 1402 m (4600 feet) (Freddy, 1974). Not altitude, but specific conditions are significant. If hard pressed for food, the literature suggests that caribou will seek arboreal lichens where snow conditions make them most available. Before a snow crust of late winter in the sub-alpine, this will be in stands of mature timber, somewhat open (around bogs, etc) (otherwise lichen growth will be primarily too high in the trees to reach), but with canopy closures sufficient to intercept some snow.

We assessed some forested areas for very subjective impressions of possible utility for caribou--upper Emerson, Webster, Cabinet, Goathorn and Howson Creeks, and the Telkwa

River valley. Arboreal lichens are available in all these areas in good supply, except the Telkwa River valley. The densest area was an old selective cut west of Grizzly Lake (Emerson Creek). The date of this cut was not recorded at the Houston B.C. Forest Service office, but the cut is a network of roads with selective cutting only a few hundred feet on either side. Forest species composition and age composition have been altered little, but along the roads the canopy has been opened and lichen growth is consequently very heavy (trees are listed as 250+ years old on B.C. Forest Service cover map). In uncut areas here, arboreal lichens are also plentiful, but not quite so much as the old cut areas. Alectoria sarmentosa was most plentiful down low in trees; Alectoria fremontii was most common up high. For caribou to use much of the latter would depend on availability of wind-thrown trees and branches.

Another semi-open area exists around swamps in upper Goathorn Creek. Similar arboreal lichen conditions (not quite as good) exist here as in the old selective cut described.

The forests examined, with seemingly good potential caribou winter habitat, were mostly above 1219 m (4000 feet) or in upper creek valleys. The old selective cut referred to is slightly lower, at 1067 m (3500 feet).

EXTENT OF POSSIBLE COMPETING LAND USES

Since establishment of ecological reserves requires the approval of other B.C. Government natural resource agencies, an effort was made initially to study an area that may create minimum conflict.

Logging

The spruce-fir forests of the Bulkley Valley support commercial forest operations. However, these are confined principally to valley floors and lower elevations, below 1371 m (4500 feet).

The proposed ecological reserve boundaries (to be described) encompass only one past logging operation--the old selective cut described in the last section. In addition, it includes one approved cutting permit presently being logged immediately on the east side of Goathorn Creek just above the Goathorn-Cabinet Creek (884 to 1036 m--2900 to 3400 feet). Pacific Inland Resources who hold this permit, holds lease rights over a larger area here, and in September, had applied for 7 cutting permits which range in elevation from 853 m (2800 feet) to 1280 m (4200 feet). This area presents the only conflict with logging which we were able to identify. The proposed reserve boundaries go down lowest here, to 793 m (2600 feet) to take in the swampy openings referred to which are

just to the east. However, the B.C. Forest Service disallowed the application for these cutting permits, on February 12, 1977, because the timber was immature. As well, the Forest Service was aware of the concern over the possible negative impact of cutting here on caribou. Relevant letters, and a map, describe this issue more thoroughly, in Appendix V. The conflict has been resolved, and this possibly significant area for caribou protected at present.

There is other logging activity in the vicinity: one clear cut north of Emerson Creek, and a number on the north side of the Telkwa River; but these are of no consequence to the proposal. Northwood Pulp Co. Ltd. (mill at Houston) have lease rights for lower Emerson Creek and to the south of that. This company is currently building a road north from the Morice River to north of Klinger Lake and, according to personnel at the Houston Ranger Station, will likely be submitting applications for cutting permits in a few years. However, the indication was given that they are not interested in forests above about 1372 m (4500 feet).

In summary, since we have been able to keep the boundaries of the proposed reserve above 1219 m (4000 feet) except for some heads of valleys and in the upper Goathorn area, we have minimized any conflict with logging to what we are sure will be acceptable.

Mining

The volcanics of the "Hazelton Group" are described as having mineral potential, in Preliminary Map 44-23, Department of Mines and Resources, Geological Survey, 1944: "The copper-gold-silver deposits in Telkwa Mountains occur in volcanic rocks of the Hazelton group and consist either of veins or vein-like replacements occupying fault or shear zones, or of mineralized shear zones. Many of the deposits are of no economic interest, but others may develop into mines or afford small shipments of hand-sorted ore."

The first geological survey was conducted by W.W. Leach in 1906 and 1907. Coal had already been discovered along the Telkwa River. Leach wrote, "It is now fairly certain that no great coal fields exist in the Bulkley Valley district from Hazelton to the headwaters of the Morice, but many comparatively small, isolated areas are known in which coal varies from lignitic to a semi-anthracite. In some of these areas the strata are greatly disturbed, much faulting and folding being in evidence." (from Maslow, 1975). The ecological reserve proposal does not come close to the Cretaceous sedimentary strata along the Telkwa River where coal mining has in the past been carried out. The reserve area contains only a tiny patch of this strata, along Cabinet Creek, and another one in upper Denys Creek. In the latter, there were apparently

intentions of development in 1968, as described in a letter from Conservation Officer R.W. Seredick to Regional Game Biologist K. Sumanik: "Negotiations are underway by a development company to provide coal from a south-western extremity of the area mentioned, on Thautil Creek (Denys is an upper tributary)." Seredick voiced his concern for its impact on caribou: "Naturally a road must be provided and is perhaps imminent. It would be superfluous for me to mention the obvious impact which improved access will cause caribou populations." This area, however, was never developed and no road built, to our knowledge.

Of the "Hazelton Group", which underlies the majority of the area to be proposed as an ecological reserve, there has only been three small mines come into production over the years, although a lot of claims and consequent exploration have been filed. These three are:

> #41 (on "Revised Mineral Inventory Map 93L (M1), B.C. Department of Mines and Petroleum Resources), in Hunter Basin. In 1914 produced 30 tons of ore high in Cu and Ag (This is a very small amount, taken out in one summer).
>
> #43, in Hunter Basin. In 1914 produced 42 tons of ore which had copper 6.7% and Ag 100 ounces.
>
> #63, directly west of Mooseskin Johnny Lake. In 1967 produced 239 tons of ore (still was one summer's work). Au trace, Ag 9.5 ounces/ton, Cu 17%.

A second indication of low mineral values is the small area held under mineral claims. In the past, there were many

more mineral claims in the area than at present. Many have been allowed to lapse, a large number just this past year. Within the area to be proposed as an ecological reserve and provincial park are 90 claims (of the old designated 51.65 acres maximum per claim) and one new "claim" under the "modified grid system" (which equals about 24 of what used to be called claims, in this case), at the date of this report. All claims are mapped in Appendix VI. These total 23.8 km^2 (9.2 square miles), or 1.6 per cent of the proposed reserve and park area. Most of this (15 km^2 or 5.8 square miles) is in upper Cabinet and Webster Creeks. An additional 3.9 km^2 (1.5 square miles) is east of upper Houston Tommy Creek. Also, 4.8 km^2 (1.9 square miles) is in the proposed extention to the proposed provincial park (to be discussed), west of upper Howson Creek.

The very small past production of this area, and small area held today in mineral claims are not because the area has been passed by. Many more claims once existed, as stated (and can be seen in part in the maps in Appendix VI). As well, the area has had a lot of exploratory work. The latter is documented in part by the following information on exploration in the area, recorded in the Smithers Office of the Department of Mines and Petroleum Resources:

Mineral Occurrence Number	Location	Exploratory Work
36	Upper Cabinet Creek	2 holes drilled, 1970
37	"	6200 feet trenched, 1969
42	"	1000 feet stripped in ? and 730 feet, 1972 and 4 holes drilled, 1970
45	"	2 holes drilled, 1968 Minor dug and blasted pits and trenched
47	"	100 feet trenched, 1972 8 holes drilled, 1968 6 Ax holes 685 feet, 1969
61	Upper Howson Creek	Hand trenching, 1967
62	"	Trenching, 1967
64	"	Hand trenching 1 adit 70 feet long, 1967
65	"	22 trenches, 11,200 feet, 1968
66	"	Hand and bulldozer trenching 2 adits and several cross adits 1270 feet At least 6 BO holes 7400 feet, 1967

We conclude that this area represents only a very slight conflict with mineral values, on the basis of very small past production and very small per cent of the area currently under mineral claims, and the evidence of considerable past efforts to find anything that might be there. There are likely few areas in northern B.C. where less than 2 per cent of a large area is under mineral claim and to find such we believe is a considerable accomplishment in making our proposal acceptable to B.C. Government mining interests.

Notwithstanding the above information, Senior Geologist N.C. Carter of the Department of Mines and Petroleum Resources, Victoria, wrote J.B. Theberge on July 2, 1975: "A great number of mineral occurrences are known in the area and many of these are covered by valid mineral claims. While exploration work in the past few years has been nearly dormant in this area, there appears to be a rejuvenation of interest as indicated by recent claim staking. It should be pointed out that virtually all of the area possesses high mineral potential."

Since this letter was written, mineral claims have substantially reduced. Marharaja Minerals of Vancouver let lapse a large number of claims, in October 1976.

In the past, statements of high mineral value by government and industry spokesmen, which in my experience always are elicited when any land use that would prohibit mining is being discussed, have gone unchallenged. Public accountability for such statements has rarely been given. What is the relative worth of the area, related to other areas? Is it in the top 5, or 10 hottest projects in northern B.C. that should be given a priority for mineral exploitation? If it is valuable, then why are there so few claims? Why so little production? Are the answers to these questions related to transportation problems which may have some immediate solution, or low mineral prices, or low concentrations of

minerals in the ore? What is the basis for saying such an area, with such a poor track record, has "high mineral potential", when claims are even on the decrease?

In short, we have documented a conclusion that the area, on the basis of all past performance and present interest, is not one which the B.C. Department of Mines and Petroleum Resources has any basis for preventing becoming a park and ecological reserve. We trust that they will not oppose, merely on belief that mining should always be first, the reservation of an area of value for another resource.

Privately Held Land

We were able to identify none in the area of our interest, with the possible exception of the land and cabin at Mooseskin Johnny Lake. Whether this is leased or owned we are not certain.

Trapping Rights

Only one registered trapline is held within the boundary of the Ecological Reserve, 2 in the proposed provincial park, 1 in the proposed additional land for the provincial park, and 3 on creeks where headwaters only are in the proposed reserve.

The one in the proposed reserve (Francis Holland--Starr, Denys, Sunset, Glacis Creeks) is active; the one partly in the proposed provincial park (A. Dennis--Burnie Lake, Herd Dome) is

not active; the one partly in the proposed park addition (Benjamin Holland & Co.--Herd Dome, Morice River) is not active; and the 3 that have headwaters only in the reserve (G. Lonig, G. Hall-Tenas, Webster, Goathorn, Bulkley River) (John & Tom Co.--Houston Tommy Creek) (M. Michell--Morice River, Denys Creek) are all active, but trappers believed to work the lower reaches outside the reserve primarily (D. Hatler, pers. comm.). All these traplines but the first belong to native people. According to Dr. Hatler, "none rely on the lines for major portions of their annual incomes, although status value of traplines to these people can be very high".

Existing trapping rights would have to be negotiated and extinguished, but the rights described are few.

Proposed Wilderness Provincial Park

We have mentioned the existence of the proposed Burnie Lakes Provincial Park a number of times previously. A study (quoted from earlier) was done by the Parks Branch in 1975. This report, together with later deliberations we examined in the Smithers Office file, has resulted in a proposed area of approximately 227 square miles (Map 4). Much of this land (east of the Burnie Lakes), is part of the caribou range and complimentary to the ecological reserve if the two abut.

As a wilderness park, no motorized access within the park is planned (we presume that also excludes landing of aircraft on Burnie Lakes?). Trail access will undoubtedly be developed if aircraft cannot land, and the Howson Creek road (now "bridgeless" at the Telkwa River) is a logical candidate.

There is no reason that backpackers and caribou cannot get along. Few people would be entering the area at caribou calving time, except perhaps for fishing. If care was taken to avoid any calving areas that eventually may become known, there would be little harm done. We see the park proposal as a definite strength to the ecological reserve proposal, a chance to accomplish more than one purpose, and a chance to set aside a large enough block of land through the two abutting systems.

OTHER ECOLOGICAL VALUES IN THE AREA

We take a somewhat myopic view by basing an evaluation of an ecological reserve on only one species. Caribou are but one component of a number of ecosystems which they use and are a part of.

The forests and sub-alpine areas in the proposed reserve provide features of value to the system of reserves in B.C. The Telkwa area falls within the bioclimatic zone of Engelman's spruce sub-alpine fir (ESSF) (Krajina, 1960/70). There are 8 ecological reserves that have representation of this zone (Nos. 34, 39, 46, 56, 57, 59, 68?, 70). However, the zone is further sub-divided into southern, central and northern subzones. The Telkwa area falls into the central subzone, along with 4 of the above (39, 46, 59, 70). Only 1 of these 4, however, may have coastal influences similar to the Telkwa area (59), and falls within Rowe's (1959) category of "coastal sub-alpine". Except for possibly this latter area, the distinguishing feature of the Telkwa forest are Abies amabilis (separates bioclimatic subzones south and central from northern), absence of Pinus flexibis, Larix lyallii, and more common Betula glandulosa (separates bioclimatic subzones south from central), and the coastal representation of Tsuga mertensiana (separates the western sector of the central subzones from the eastern).

The Glacis Lake area, which falls within our proposal, has already been proposed as an ecological reserve, as previously mentioned. The purpose of that reserve is "To conserve an Alpland with volcanic rocks which are nutritionally rich (vegetation is composed of many species). Specific botanical features mentioned in that proposal are: Sphagnum capillaceum in the alpine tundra zone; Pinus albicaulis at its northern occurrence (although in the present study we found it farther north on MacDonald ridge), Antennaria monocephala." The flora of the Alpine Tundra bioclimatic zone, the most significant feature of the Glacis Lake proposal, is magnified in the Telkwa proposal.

From a geomorphological standpoint, the area exhibits a range of phenomena induced by frozen ground, as described previously. Of particular note is a classic example of a rock glacier, beside Glacis Lake. Special landscape features listed for the Glacis Lake Ecological Reserve proposal are: "old moraines", and "cascades of Glacis Creek".

A sizeable mountain goat population lives in the area. Fifty-two goats were seen on a single day, August 6 (Appendix III). Goats appeared to be scattered across the high "backbone" of the east mountain block, with concentrations in upper Denys Creek area and upper Dockrill to Webster Creek area. Two sightings of single goats were made on the west mountain block.

This goat population is a significant value of the reserve-park area.

Moose are present in unknown numbers in all the forested lower parts of the area, particularly the Emerson Creek-Grizzly Lake area, and the upper Howson Creek-Mooseskin Johnny Lake and associated wet sub-alpine plateaus. In the latter, we observed 13 moose on our flight of September 8. The moose population is significant to caribou in possibly funneling off wolf predation. Unpublished work in Alaska by G. Haber has shown that wolves can shift quickly from preying on moose, to caribou when sufficient moose are not present. Thus, moose may need protection in an ecological reserve established primarily for mountain caribou--this is an example of ecosystem inter-relationships that shows the importance of preserving all components of an ecosystem even if the primary objective is one species.

Wolf tracks and droppings were observed in the Emerson Creek-Grizzly Lake area, in the sub-alpine at Hunter Basin, and on the old Howson Creek Road. We do not consider that we gathered sufficient data to estimate the size of the wolf population. D. Hatler (pers. comm.) believes that both wolves and moose are more common north of the Telkwa River near Telkwa Pass.

Dear tracks were observed only on Howson Creek Road.

Two sightings were made of grizzlies, one family group of 3, in sub-alpine west of Hunter Basin, and a single grizzly on the west mountain block. Droppings and tracks were found on the tundra north of Emerson Creek, on the north-east tundra corner of the study area, and in the upper Tenas Creek area.

One black bear was seen, on the Howson Creek Road.

Among smaller mammals, hoary marmots are common in high areas, porcupines were encountered on 2 occasions right up on the treeless tundra, a beaver lodge was observed at Hunter Basin (there are likely others), red squirrels and hares live in the forested areas. Conspicuous by their absence were both pika and ground squirrel.

Birds seen during the study are listed in Appendix III. Most interesting were raptors: 5 sightings of golden eagles, plus Cooper's hawk, sharp-shinned hawk, Swanson's hawk, marsh hawk, sparrow hawk and a hawk owl. Tetraonids included willow and white-tailed ptarmigan, and Franklin's grouse. On the tundra, American pipits, and horned larks were commonly seen. The area would be fascinating to study at the breeding bird season.

The area is a superb natural wilderness.

EVALUATION OF EVIDENCE AND PROPOSAL

For an Ecological Reserve to Protect Mountain Caribou in the Telkwa Mountains

1) We have documented the need and value of an ecological reserve for mountain caribou, from a scientific standpoint leading to better management, and from a conservation standpoint of a species with some biological traits that make it vulnerable to traditional human activities attendant with development of wilderness areas.

2) We have stressed the value of the Telkwa herd primarily on the basis of its accessibility for study.

3) While the numbers of caribou are today small, the herd is expected to build, based on past evidence that it did so earlier, and evidence that the range can produce good calf crops. The expected recovery phase adds a valuable dimension to the scientific value of this herd (when numbers change greatly between years, conclusions on factors influencing population regulation are easier to discern than in a stable population).

4) The adjacent proposed wilderness park is a clear asset, allowing compatible recreational use on part of the caribou range.

5) The land is still almost entirely in its pristine state.

6) A number of associated ecological values add

considerable merit to the area, expecially one extant small ecological reserve proposal made for botanical reasons (Glacis Lake), and mountain goat populations. The area is an intact naturally functioning ecosystem, with all the interesting components of bird and mammal species expected in a northern B.C. wilderness area.

7) A reasonably well defined and distinct range (relatively isolated mountain blocks).

8) A minimal extent of potential conflict with other resource users: with logging we can see almost no conflict; with mining there appears to be little justification for opposition. Only one possible private holding exists, and very limited trapping rights.

Against an Ecological Reserve

1) We maintain an uneasy feeling about recommending the only one area we studied in-depth. There was a strong rationale for its candidacy, as explained, and we relied heavily on the judgement of Dr. Hatler who knows what there is to know of candidate areas. If we had had 10 sites to study, and then landed on the Telkwa as best, we would be most confident. Perhaps we can state our case ignoring the question of whether indeed the Telkwa Mountains is the very best area, which may never be known, because hope of funding for a full survey of a lot of sites is beyond reality, and conclude that the Telkwa's

have the makings of a great ecological reserve for caribou, whether best or not.

2) We wish there were more caribou. Even if this made it less attractive scientifically we would feel better if the future of the herd was better assured by greater numbers. However, we maintain faith in our "educated guess" that with no hunting and limited predation, everything is go for this caribou population.

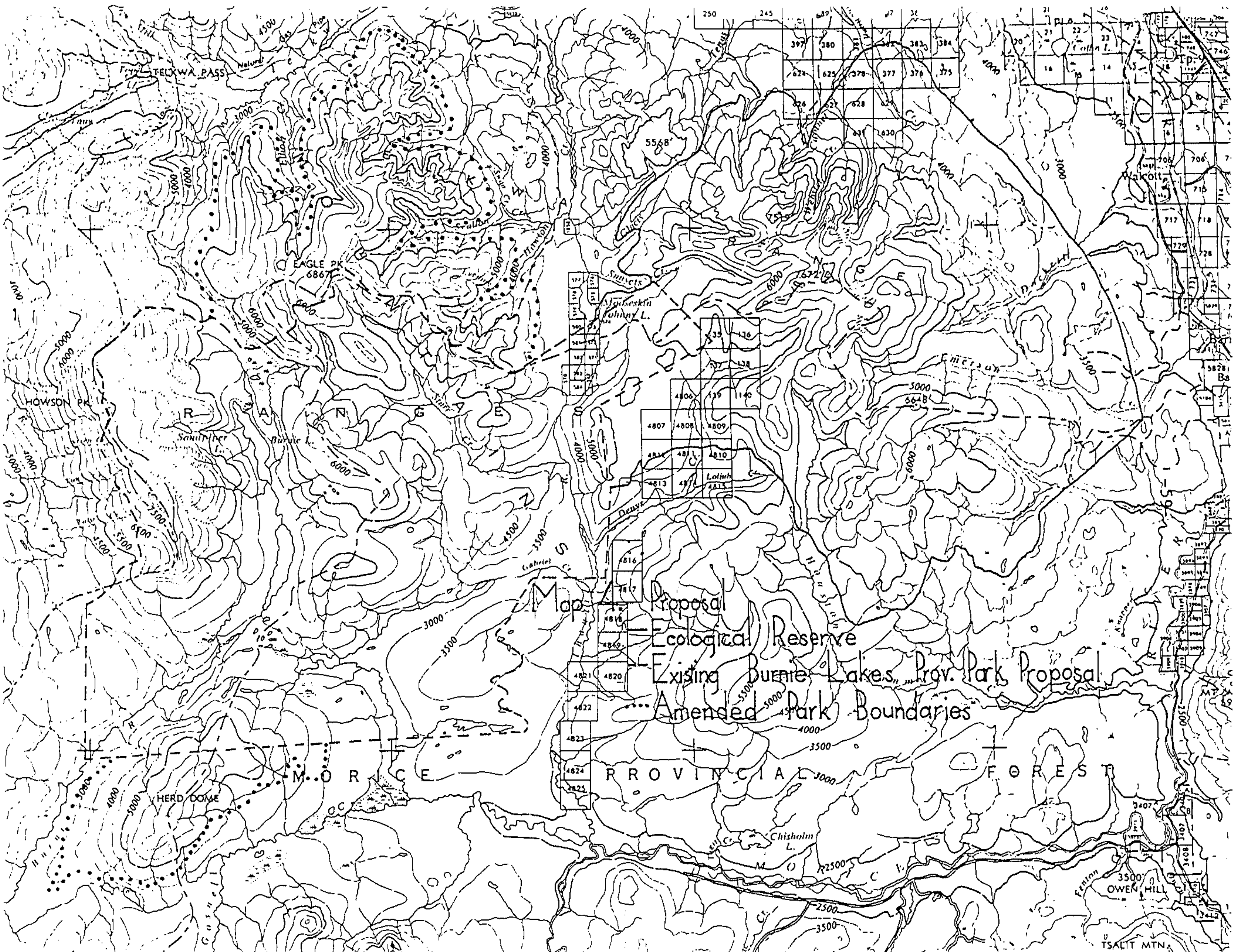
3) We wish we had a better appreciation of possible periodically critical winter range, to allow us to propose boundaries with greater confidence. However, as stated, many winters of study would necessarily have to go into this to allow anyone to gain confidence that they know the winter range. We have some basis for our boundaries, and hope the present winter work will add new information.

In summary, we maintain some reservations from the standpoint of lack of scientific information. We have made some estimates that leave us a little uneasy. However, in balance, the "Fors" seem compelling to us, and we make the following proposal for evaluation by the B.C. Ecological Reserves Branch and Fish and Wildlife Branch:

- That the B.C. Ecological Reserves Branch establish a 554 km^2 (213 square miles - approximately) ecological reserve of the eastern mountain block, as shown on Map 4, following

approximately a 1219 m (4000 foot) contour on the south, west and northwest sides, and on the northeast and east taking in the Goathorn-Cabinet Creek junction to Grizzly Lake. So drawn, the ecological reserve constitutes approximately 355 km^2 (137 square miles) of forests around the perimeter, 34 km^2 (13 square miles) of sub-alpine (Class 3), 26 km^2 (10 square miles) of tundra class 2, 21 km^2 (8 square miles) of tundra class 1, and 119 km^2 (46 square miles) of unvegetated terrain.

- In addition, that the B.C. Parks Branch establish its proposed Burnie Lakes Provincial Wilderness Park of approximately 611 km^2 (236 square miles) (Map 4), plus the remainder of the western tundra block which its northern boundary cuts right across, adding 202 km^2 (78 square miles), plus the remainder of Herd Dome which its southern boundary cuts right across, adding 62 km^2 (24 square miles). In total, the Park would then be 875 km^2 (338 square miles), and would add another 8 km^2 (3 square miles) of class 1 tundra, 13 km^2 (5 square miles) of class 2 tundra, 23 km^2 (9 square miles) of sub-alpine class 3, 88 km^2 (34 square miles) of unvegetated terrain, east of Burnie Lakes. Alternately, the ecological reserve could be set up in 3 separate chunks around the existing proposed boundaries of the park, which would mean it would encompass 554 + 202 + 62 = 818 km^2 (213 + 78 + 24 = 315 square


Map 4
Proposal
Ecological Reserve
Existing Burnie Lakes Prov. Park Proposal
Amended Park Boundaries
TELKWA PASS
EAGLE PK 6867
HOWSON PK
HERD DOME
OWEN HILL
TSALIT MTN
MORICE PROVINCIAL FOREST
Chisholm L.
Burnie L.
Sandpiper L.
Mooseskin Johnny L.
Emerson
Houston
Gosnell
Wakott
5568
6648
7672

miles). However, it would seem more reasonable for the Parks Branch to amend its boundaries to better accommodate the caribou which has been noted as a park feature. The proposed boundary changes to the park remove the illogical (from the standpoint of caribou) lines cutting right across the tundra habitats (Map 4).

In total, therefore, the proposed unit of provincial park and ecological reserve total 1427 km^2 (551 square miles).

If these two agencies would cooperate in this venture, a very valuable scientific and recreational asset would be created.

We recommend that the Ecological Reserves Branch seek the cooperation of the Parks Branch in this endeavour. If, however, Parks are not willing to give their proposal high priority, we recommend that the Ecological Reserves Branch "go it alone". In that case, the part of the proposed park land west of Burnie Lakes should be dropped from the proposal. Taken out would be approximately 197 km^2 (76 square miles) of lake, glacier, and lowland forests. Also, a piece of lowland forest of approximately 111 km^2 (43 square miles) could be dropped from the southeast corner of the proposed park. The ecological reserve would then be 1119 km^2 (432 square miles). This however, is a decidedly second best, and we hope the two agencies will together make this valuable reserve-park.

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Appendix I. Table 1. CARIBOU OBSERVATIONAL DATA

Sighting #	Date and time	Number, sex and age	Location	Elevation and slope	Habitat	Behaviour
1	5 Aug. 1030	11: 6 adult female 1 young of year 1 subadult male 3 unaged unsexed	617800 mE 6035800 mN	1891 m WSW slope 10-40°	Class 2 with pockets of Class 1. Rubble and snow patches. Vegetation just appearing. Luzula sp., Sedum sp., Cladonia sp., Silene acaulis, Ranunculus sp., Carex podocarpa, Kobresia myosuroides, mosses.	Most of group lying down at edge or on snow; several feeding in patches of vegetation when first sighted from helicopter. At 1200 group had resumed feeding and resting; when approached to 100 m group ran SW into Denys Creek.
2	5 Aug. 1100	6: 4 adult female 1 young of year 1 subadult male	618400 mE 6030300 mN	1769 m SSW slope 10-30°	Class 2. Sloping terrain with pockets of Class 1. Festuca sp., Artemesia sp., various grasses and sedges.	Feeding and standing when first sighted from helicopter.

3	6 Aug. 1000	11: 6 adult female 1 young of year 2 subadult male 2 subadult unsexed Same group as 11 sighted 5 August	620100 mE 6035100 mN	1739 m WNW slope 20-30°	Class 1. Seepage site, bouldery wet depressions and snow patches. Prostrate Salix sp., Carex podocarpa, Ranunculus sp., Anemone parviflora, Senecio triangularis.	Feeding on Salix sp., Carex podocarpa, Ranunculus sp., and Anemone parviflora. Approached to 50 m before sighting us, then ran S over snow-covered ridge in alarm.
4	7 Aug. 0900	12: 6 adult female 1 young of year 3 subadult male 2 subadult unsexed Same as 11 sighted 6 Aug.	618500 mE 6033400 mN	1708 m W slope 5-10°	Class 2 with pockets of Class 1 in snow-melt sites. Patches of rubble and snow deposits. Sedges, mosses, and succulent forbs.	Feeding and moving E. Approached to 100 m before sighting us, then trotted ENE along draw.
5	7 Aug. 1300	2: 1 adult female 1 young of year	61800 mE 6032500 mN	1632 m No slope	Class 1. Valley bottom, snow-melt stream and some standing water. Carex sp., Ranunculus sp., Valeriana sp., Caltha leptosepala.	Female feeding and fawn resting, occasionally rising to feed. Undisturbed, but both gone at 1400.

6 **	7 Aug. 1300	4: 1 adult female 1 young of year 2 unaged unsexed	618200 mE 6030000 mN	1739 m WSW slope 0-20°	Moving through Class 1 to Class 2 on slope	Female and fawn moving NE; 2 unaged unsexed resting on snow.
	1500	5: 3 adult female 1 young of year 1 subadult male	618200 mE 6031200 mN	1739 m SE slope 10-20°	In small draw. Class 2 with small pockets of Class 1. Snow patches and depressions of standing water.	Several lying down, others feeding on Carex sp. and Salix sp. Approached from SE to 50 m; smelled us and circle clockwise to S; hesitant and curious.
7	6 Aug. 1300	6: 3 adult female 2 young of year unsexed 1 subadult unsexed	622000 mE 6031700 mN	1800 m SE slope 10-20°	Class 2 habitat with pockets of Class 1 where water exits from snow deposits	Lying on or at edge of snow deposit. Approached to 100 m, then ran N over saddle into Houston Tommy Creek
8	8 Aug. 1400	2: 1 adult female 1 young of year unsexed	622400 mE 6032800 mN	1678 m No slope	Class 2 habitat. Rocky and bouldery terrain with numerous vegetated snow-melt depressions	Feeding on Carex sp. and Ranunculus sp. Observed from above; looked up and saw us, then ran in panic NNW into Houston Tommy Creek headwaters.

**Probably same group as 6 sighted 5 August

9	16 Aug. 1200	2: ? unaged unsexed	625900 mE 6041400 mN	1693 m No slope	Class 1 habitat. Stand of Carex aquatilis.	Resting at 1200; feeding at at 1400, and gone by 1600.
10	3 Sept. 1100	3: 2 adult female 1 adult male	625200 mE 6041800 mN	1647 m ENE slope 0-10°	Class 1 habitat. Carex sp. meadow.	First seen trotting toward us. Curious but alarmed, then moved away, running and trotting WSW out of sight behind hill.
11	8 Sept. 1030	4: 3 adult female 1 adult male	594500 mE 6021700 mN	1524 m No slope	Class 3 habitat. Edge of small pond. Cassiope tetragona, Senecio triangularis, Valeriana sp.	Standing when first sighted from aircraft.

* See map

Appendix II Table 2. CARIBOU OBSERVATIONAL DATA

Antlers and/or skull and remains

Number and sex	Condition (1-3)*	Location	Elevation, slope and aspect	Habitat and comments
1 male	2	617700 mE 6036700 mN	1983 m No slope	Edge Class 2 and unvegetated terrain
1 male	1	620200 mE 6034300 mN	1861 m No slope	Edge Class2 and unvegetated terrain
1 female	2	619800 mE 6033700 mN	1830 m No slope	Edge Class 2 and unvegetated terrain.
Antlers and skull (male)	2	618500 mE 6032900 mN	1632 m No slope	Class 1 At old campsite.
1 male	2	617800 mE 6031800 mN	1739 m WSW 5-20°	Class 2
2 male	2	617500 mE 6031700 mN	1769 m WSW 5-20°	Class 2
1 male	2	617500 mE 6031900 mN	1739 m SW 5-20°	Class 2
6 male	2	616400 mE 6032300 mN	1662 m WNW-SW 5-10°	Edge Class 2 and 3
2 male	2	616900 mE 6031800 mN	1678 m No slope	Class 2
1 male	2	618200 mE 6031200 mN	1754 m W 5-20°	Edge Class 1 and 2
1 female	2	618500 mE 6030100 mN	1754 m No slope	Class 2
2 male	2	620600 mE 6032200 mN	1708 m WNW 10-30°	Class 2

3 female	2	620600 mE 6031700 mN	1800 m No slope	Edge Class 2 and unvegetated terrain Possible fawning site; sever dips and knolls with wind-protected, SW slopes
Antlers and skull (male)	2	621500 mE 6031600 mN	1800 m SSE 5-10°	Class 2
1 female	2	621700 mE 6031700 mN	1815 m No slope	Class 2
Antlers and skull (male)	2	622300 mE 6032700 mN	1830 m No slope	Unvegetated terrain
3 male	3	623500 mE 6028600 mN	1739 m WNW 5-30°	Class 2
2 female	2	623500 mE 6028300 mN	1815 m WNW 5-30°	Class 2
2 female	2	621700 mE 6027800 mN	1800 m No slope	Unvegetated terrain
2 male	3	621400 mE 6027800 mN	1723 m WSW 5-20°	Class 2
1 male	2	620900 mE 6026500 mN	1662 m No slope	Class 2
1 male	2	623700 mE 6025400 mN	1739 m No slope	Class 1
2 male	2	626400 mE 6025500 mN	1708 m WSW 10-20°	Class 2
1 male	2	626500 mE 6025300 mN	1723 m WSW 0-10°	Class 2
2 male	3	626500 mE 6028400 mN	1815 m SE 0-5°	Edge Class 2 and unvegetate terrain
2 male	2	626500 mE 6028300 mN	1800 m No slope	Edge Class 2 and unvegetate terrain
1 male	2	624300 mE 6028300 mN	1769 m N 25°	Unvegetated terrain Scree slope at edge of of boreal forest

2 male	2	624300 mE 6030400 mN	1861 m SW 0-10°	Edge Class 1 and 2
1 female	2	627300 mE 6031300 mN	1754 m SW 20°	Class 2 Top of knoll
1 male	2	624300 mE 6031600 mN	1617 m No slope	Unvegetated terrain In rocks at edge of boreal forest
1 male	3	622700 mE 6033500 mN	1891 m SSW 20-30°	Class 2
1 female	2	622700 mE 6036200 mN	2169 m No slope,	Unvegetated terrain Rock on top of mountain
2 male (pair)	2	624400 mE 6036400 mN	2166 m No slope	Unvegetated terrain Top of plateau
1 female	2	625200 mE 6036900 mN	1708 m No slope	Class 2 Base of glacier
2 female	2	626000 mE 6037700 mN	1891 m ESE 0-5°	Unvegetated terrain
1 female	2	626000 mE 6038400 mN	2013 m No slope	Unvegetated terrain Top of plateau
1 female	2	626200 mE 6038400 mN	2013 m No slope	Unvegetated terrain Top of plateau
2 female	2	626400 mE 6038800 mN	2028 m No slope	"
2 female	2	626600 mE 6038900 mN	2028 m No slope	"
1 female	2	626700 mE 6038900 mN	2028 m No slope	"
1 male	2	626400 mE 6038300 mN	2013 m No slope	"
1 undetermined	2	626400 mE 6038400 mN	2013 m No slope	"

1 female	2	624100 mE 6037500 mN	2135 m No slope	Unvegetated terrain Top of plateau
2 male	2	623800 mE 6037500 mN	2135 m No slope	"
1 male	2	623700 mE 6037600 mN	2150 m No slope	"
1 male	2	624600 mE 6037600 mN	2135 m E 0-5°	"
1 male	2	627400 mE 6037600 mN	1662 m No slope	Class 2
1 male	2	622900 mE 6039900 mN	1952 m No slope	Unvegetated terrain Boulder field
2 undetermined	2	623200 mE 6040200 mN	1952 m No slope	"
1 female	2	623400 mE 6041500 mN	1952 m No slope	Class 2
1 undetermined	2	623900 mE 6041200 mN	1861 m NNE 0-5°	"
1 female	2	623900 mE 6041500 mN	1830 m N 0-5°	"
2 male	3	624200 mE 6041700 mN	1739 m No slope	"
1 male	2	623800 mE 6042300 mN	1739 m No slope	"
5 female	2	624400 mE 6041000 mN to 625000 mE 6041000 mN	1769 m SE 0-10°	"
1 male	2	625300 mE 6041000 mN	1693 m No slope	"

5 male	2	625500 mE 6041500 mN	1647 m No slope	Edge Class 1 and 2
1 female	2	625500 mE 6041500 mN	1647 m No slope	"
2 male (pair)	1	625800 mE 6041400 mN	1693 m No slope	Class 1 At edge of sedge marsh
1 female	2	626300 mE 6041600 mN	1678 m No slope	Class 2 Hilltop
2 male	2	626000 mE 6041200 mN	1678 m SSE 10-20°	"
1 male	3	626400 mE 6041800 mN	1647 m No slope	"
1 male	2	626400 mE 6041800 mN	1647 m No slope	"
1 male	2	626000 mE 6041500 mN	1708 m No slope	" Rolling hills and depressio
2 male	3	625900 mE 6041500 mN	1693 m No slope	"
1 female	2	625900 mE 6041500 mN	1693 m No slope	"
3 female	2	623500 mE 6014100 mN	1891 m No slope	Class 2 Flat plateau
1 male	2	616500 mE 6041400 mN	2013 m No slope	Unvegetated terrain Boulder field
2 male	2	616300 mE 6042200 mN	1739 m No slope	Class 2
Antlers and skull, parts of carcass(male)	1	616200 mE 6042300 mN	1739 m No slope	"
Antlers and skull, carcass remains (male)	1	615400 mE 6042400 mN	1784 m No slope	Edge Class 1 and 2 Antlers in velvet - died during summer of 1976

1 male	2	615400 mE 6042400 mN	1784 m No slope	Edge Class 1 and 2
2 male	2	614700 mE 6042700 mN	1830 m No slope	Edge Class 2 and unvegetated terrain
2 male	2	614900 mE 6041900 mN	1739 m No slope	Class 1 Sedge meadow
1 male	2	614900 mE 6042000 mN	1739 m No slope	"
3 male	2	614700 mE 6042300 mN	1800 m No slope	"
2 female	2	614700 mE 6042300 mN	1800 m No slope	"
1 male	3	615700 mE 6041800 mN	1754 m No slope	"
1 male	2	615700 mE 6041800 mN	1754 m No slope	"
1 female	1	614700 mE 6039800 mN	1693 m No slope	Edge Class 2 and unvegetated terrain
1 male	2	614000 mE 6039400 mN	1800 m SSE 20-30°	Unvegetated terrain On scree slope
1 male	2	613300 mE 6039300 mN	1647 m WSW 0-5°	Edge Class 2 and 3
1 male	2	613500 mE 6039600 mN	1769 m WSW 10-15°	Edge Class 2 and unvegetated terrain
1 male	3	615900 mE 6042100 mN	1739 m No slope	Class 2
Skull and 1 attached antler	2	616000 mE 6042200 mN	1723 m No slope	Edge Class 1 and 2
1 male	2	616500 mE 6042700 mN	1769 m No slope	Unvegetated terrain Boulder field

1 male	2	617300 mE 6043800 mN	1739 m No slope	Class 2 Top of hill
2 female	2	616700 mE 6042800 mN	1739 m No slope	Edge Class 2 and unvegetated terrain
1 male	3	616700 mE 6042800 mN	1739 m No slope	"
2 male	2	599700 mE 6063400 mN	1769 m SSW 0-10°	"
2 male (pair)	2	601100 mE 6063900 mN	1754 m S 5-10°	Class 2
1 male	2	601800 mE 6063400 mN	1769 m No slope	Unvegetated terrain Boulder field
Skull and 1 attached antler (male)	2	602100 mE 6063300 mN	1769 m S 0-10°	"
1 male	2	619500 mE 6042700 mN	1891 m ENE 5-40°	Unvegetated terrain Ridge top, edge of scree slc
1 male	2	619400 mE 6040700 mN	1693 m No slope	Unvegetated terrain Basin
1 female	1	619100 mE 6039600 mE	2166 m SSE 10-30°	Unvegetated terrain Rubble and scree slope
2 male	2	623400 mE 6040400 mN	1937 m No slope	Unvegetated terrain Top of plateau
2 female	1	623400 mE 6040500 mN	1952 m No slope	"
1 male	2	623400 mE 6040500 mN	1952 m No slope	"
1 male	1	623800 mE 6040700 mN	1876 m E 0-10°	Class 2 Edge of plateau
1 male	2	624100 mE 6041100 mN	1830 m NE 5-20°	"
2 male (pair)	1	594200 mE 6028600 mN	1754 m No slope	Edge Class 2 and unvegetatec terrain

* 1=recent; 2=old; 3=very old.

Table 3.

Tracks and faecal groups

Identification	Date	Location	Elevation, slope and aspect	Habitat and comments
Track (1)*	13 Aug.	623800 mE 6030500 mN	1876 m SW 10-30°	Unvegetated terrain Track moving uphill
Track (2-3)	15 Aug.	622600 mE 6033700 mN	1891 m SW 20-30°	Class 2 and unvegetated terrain Tracks moving uphill
Track (3-5)	20 Aug.	614700 mE 6042300 mN	1800 mE No slope	Class 1 Several tracks in mud heading W
Faecal group (1)	4 Sept.	624700 mE 6045800 mN	1098 m NW 0-45°	Pellets of caribou(?) in boreal forest at edge of steep bank down to creek
Faecal group (3+)	9 Sept.	593300 mE 6021500 mN	1556 m No slope	Class 3 Scattered over plateau
Faecal group (3+)	10 Sept.	595200 mE 6026200 mN	1708 m S 0-5°	Class 2 Along edge of plateau
Faecal group (5+)	14 Sept.	598500 mE 6035400 mN	1739 m SW 10-20°	Class 1 and 2 On moist seepage sites
Track (1-2)	14 Sept.	598500 mE 6035400 mN to 599900 mE 6034700 mN	1754 m SW 0-20°	Class 2 and unvegetated terrain On slope and alpine ridge

* Figures in brackets indicate a number estimate

Appendix III Table 4.

GOAT OBSERVATIONS

DATE	NUMBER	LOCATION
5 Aug.	5	618800 mE; 6034300 mN
	3	619500 mE; 6037500 mN
6 Aug.	15	622500 mE; 6035100 mN
	5	620400 mE; 6033800 mN
	1	619100 mE; 6033900 mN
	2	619700 mE; 6033300 mN
	3	619300 mE; 6033100 mN
	20 —	618500 mE; 6032900 mN
	1 (This is the same group.)	618400 mE; 6033800 mN
	5	618100 mE; 6032300 mN
7 Aug.	20 —	616800 mE; 6032400 mN
11 Aug.	2	621700 mE; 6027800 mN
13 Aug.	2	622400 mE; 6033500 mN
15 Aug.	20 —	618300 mE; 6031600 mN
16 Aug.	2	623600 mE; 6036600 mN
1 Sept.	3	623500 mE; 6040900 mN
	1	622900 mE; 6040700 mN
11 Sept.	1	596600 mE; 6028300 mN } Pair
12 Sept.	1	594000 mE; 6029700 mN }
18 Sept.	24	Headwaters of Dockrill Ck. and two plateaus north to Cabinet Ck.

Appendix III

Table 5. BIRD OBSERVATIONS

Common goldeneye	1	sighting
Sharp shinned hawk	1	"
Cooper's hawk	3	"
Swainson's hawk	1	"
Golden eagle	5	"
Marsh hawk	1	"
Sparrow hawk	1	"
Hawk owl	1	"
Franklin's grouse	2	"
Willow ptarmigan	>5	"
White-tailed ptarmigan	2	"
Black swift	1	"
Rufous hummingbird	1	"
Northern three-toed woodpecker	1	"
Horned lark	>5	"
Gray jay	>5	"
Steller's jay	>5	"
Clarke's nutcracker	>5	"
Boreal chickadee	>5	"
Red breasted nuthatch	>5	"
Dipper	1	"
Winter wren	>5	"
Varied thrush	>5	"
Golden-crowned kinglet	>5	"
Ruby-crowned kinglet	>5	"
American pipit	>5	"
Bohemian waxwing	1	"
Rusty blackbird	1	"
Gray-crowned rosy finch	1	"
Dark-eyed junco	>5	"
Tree sparrow	>5	"
Fox sparrow	1	"
Song sparrow	>5	"

Appendix IV

LIST OF PLANT SPECIES FOUND ABOVE 1370 m
(4500 feet)

Abies lasiocarpa

Aconitum delphinifolium

Achillia millefolium

Anemone multifida
Anemone parviflora

Antennaria neglecta
Antennaria pallida

Aquilegia formosa

Arabis lyrata

Arctostaphylos uva-ursi

Arnica alpina
Arnica latifolia

Artemisia arctica

Astragalus spp.

Betula glandulosa

Botrychium lunaria

Calamagrostis canadensis

Caltha leptosepala

Carex albonigra
Carex aquatilis
Carex capitata
Carex macrochaeta
Carex podocarpa
Carex scirpoidea

Cassiope tetragona

Castilleja hyperborea
Castilleja miniata
Castilleja parviflora

Cerastium beeringianum

Crepis nana

Cystopteris fragilis

Delphinium glaucum

Draba oligosperma (?)

Dryas integrifolia

Empetrum nigrum

Epilobium angustifolium
Epilobium latifolium

Equisetum arvense
Equisetum pratense
Equisetum scirpoides

Erigeron acris
Erigeron uniflora

Eriophorum brachyantherum

Festuca altaica
Festuca brachyphylla

Fragaria vesca

Gentiana glauca
Gentiana propinqua

Habenaria dilatata

Heracleum lanatum

Hieracium triste

Hierochloe alpina

Juncus drummondii

Juniperus communis

Leptarrhena pyrolifolia

Luetkea pectinata

Lupinus arcticus

Luzula parviflora
Luzula spicata

Lycopodium alpinum

Mitella pentandra

Myosotis alpestris

Kobresia myosuroides

Oxyria digyna

Parnassia fimbriata

Pedicularis kanei
Pedicularis ornithorhyncha

Penstemon gormanii
Penstemon procerus

Petasites frigidus (hyperboreus?)

Pinus albicaulis
Pinus contorta

Phyllodoce empetriformis
Habenaria dilatata
Poa alpina
Poa arctica
Poa cusickii

Polemonium pulcherrimum

Potentilla diversifolia

Polygonum viviparum

Pyrola asarifolia

Ranunculus cooleyae
Ranunculus eschscholtzii
Rununcelus occidentalis

Rumex arcticus

Salix arctica
Salix glauca
Salix reticulata

Sanguisorba stimpulata

Saxifraga cernua
Saxifraga lyallii
Saxifraga oppositifolia
Saxifraga tricuspidata

Sedum divergens
Sedum lanceolatum
Sedum rosea

Senecio triangularis

Sibbaldia procumbens

Silene acaulis

Solidago multiradiata

Taraxacum ceratophorum

Tofieldia pusilla

Trisetum spicatum

Tsuga mertensiana

Vaccinium caespitosa
Vaccinium membranaceum

Valeriana sitchensis

Veratrum viride

Veronica wormskjoldii

Viola biflora (?)

Viola langsdorfii

Appendix V

RESOLUTION OF PROBLEM WITH LOGGING, GOATHORN CREEK

PR 2692

XR Goathorn W
(Telkwa-Bulkley)

Post Office Box 3250
Smithers, B.C.

16 February 1977

District Forester
Prince Rupert Forest District
Court House
Prince Rupert, B.C.

Dear Sir:

Re: T.S.H.L. A-08410 - C.P. 67 - Goathorn Creek - Smithers, P.S.Y.U.

We understand that this cutting permit has been disallowed due to immaturity of the standing timber. If logging is reconsidered in the future, we would appreciate being advised so that we may include protection guidelines for the Telkwa Mountain caribou population.

Thank you for considering our request.

Yours truly,

Bob Allan
Habitat Protection Technician
for Regional Director
/lb

cc. D.F. Hatler

GOVERNMENT OF BRITISH COLUMBIA
FOREST SERVICE
B.C. FOREST SERVICE
BOX 200
SMITHERS, B.C.
V0J 2N0

February 18, 1977

File: A-08410
CP 067

Pacific Inland Resources Limited
P. O. Box 3130
Smithers, B. C.
V0J 2N0

Attention: Mr. R. Jessee

Dear Sir:

Reference is made to your preliminary application for Cutting Permit 067 of Timber Sale Harvesting Licence A-08410 in vicinity of Goathorn and Cabinet Creeks.

An air and ground examination has now been concluded over the application area. Although minor volumes of mature to overmature timber were found within Block 1, the remaining six blocks consisted of thrifty mature to immature spruce, balsam and lodgepole pine timber still gaining increment.

In view that this timber is below the recognized cutting ages of 140 years for spruce and balsam and 100 years for lodgepole pine, a formal cutting permit application over the area will not be favourble entertained at this time. Your harvesting priorities should therefore be concentrated on the mature to over mature age groups in the Telkwa River area.

Yours truly,

J. H. Wenger, Zone Forester

JHW:dd

for A. C. MacPherson
District Forester

cc:
Regional Director, F & W Branch

FEB 22 1977

University of Waterloo

Waterloo, Ontario, Canada
N2L 3G1

Faculty of Environmental Studies
519/885-1211

10 September 1976

Dr. D. Hatler
Regional Wildlife Biologist
Fish & Wildlife Branch
P.O. Box 3250
Smithers, B.C.

Dear Dave:

I am concerned over the application of Pacific Inland Resources for cutting permits in the area of Goathorn and Cabinet Creeks on the north slope of the Telkwa Mountains (specific blocks SP1 731 (4 of them), SB 630 (2 of them), SP1 630, R1 SB 630, BS P1 831. Also CPE 98056, which has already gained approval.

As you know, I am assessing parts of the Telkwa Mountain block for a possible ecological reserve to protect primarily caribou. This work is being financed by the Ecological Reserve Program and your Fish and Wildlife District budget. At the moment, it appears that the forests on the north and north-east corner of the mountain block are significant wintering areas for the caribou. The Telkwa Mountain herd is at low numbers, perhaps near a critical threshold, and if they are to survive and build back former numbers, the scales must be tipped in their favour. Any cutting of the forests of the upper Goathorn, Cabinet, Webster, Dockrill Creeks may be extremely detrimental to this herd.

Since this area is under active study for an ecological reserve, is it possible for the Fish and Wildlife Branch to request withholding of the granting of cutting permits until a decision can be made on the proposed Ecological Reserve? I will be submitting my final report and recommendations in January.

Pacific Inland Resources have other applications for cutting permits before the Forest Service to which they have asked for priority in assessment - lower Winfield Creek and south of Coffin Lake. These areas appear to be beyond the area which is critical to the caribou and can be cut without harming them.

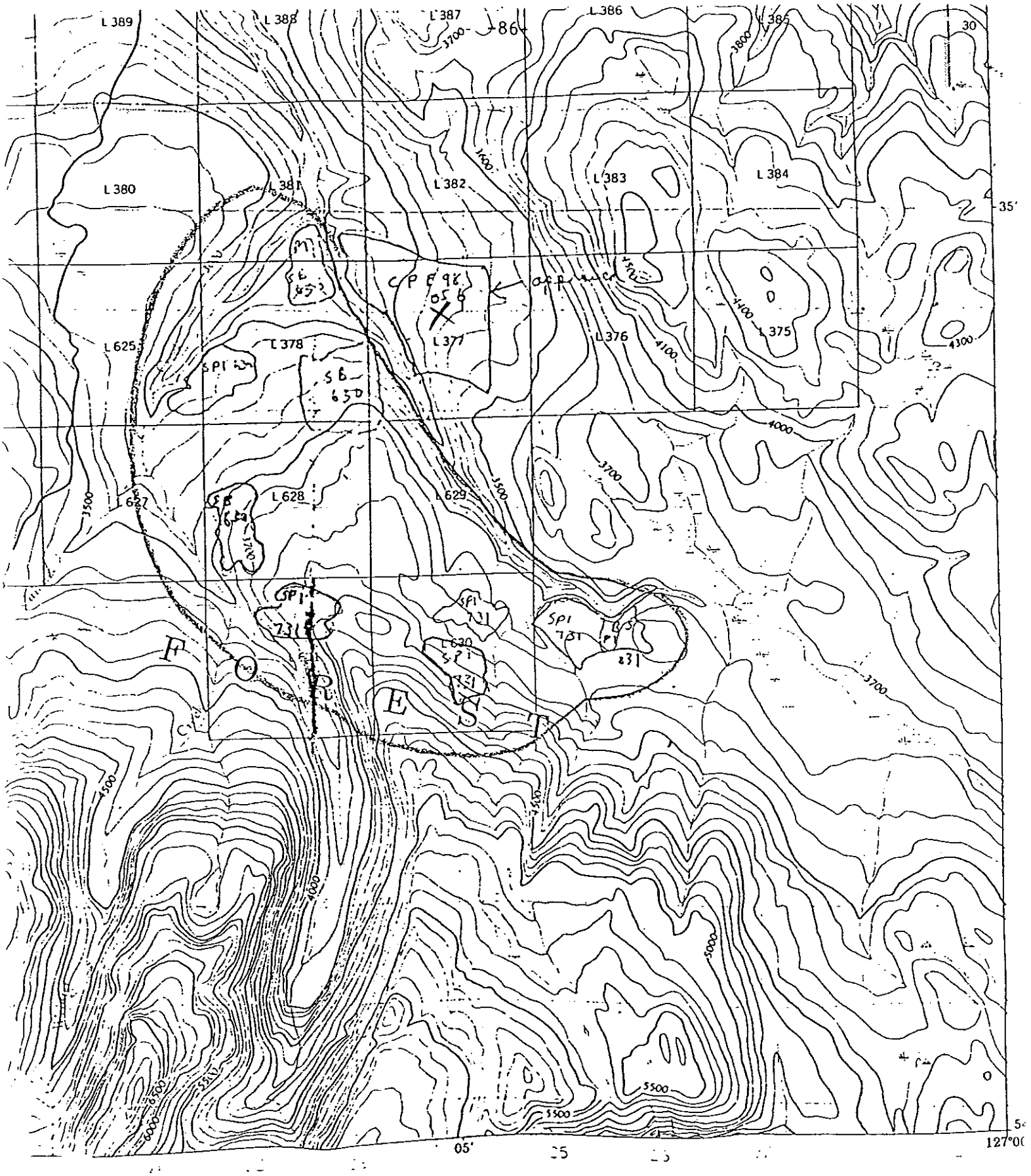
.....2

I sincerely hope that the possible reserve for caribou and the caribou population itself are not jeopardized in these late stages of assessment, as would be the case if cutting proceeded on the areas described.

Sincerely,

John B. Theberge (Ph.D)

cc. D. Bustard, Habitat Protection Biologist, Smithers
B. Foster, Director, B.C. Ecological Reserves Program, Victoria



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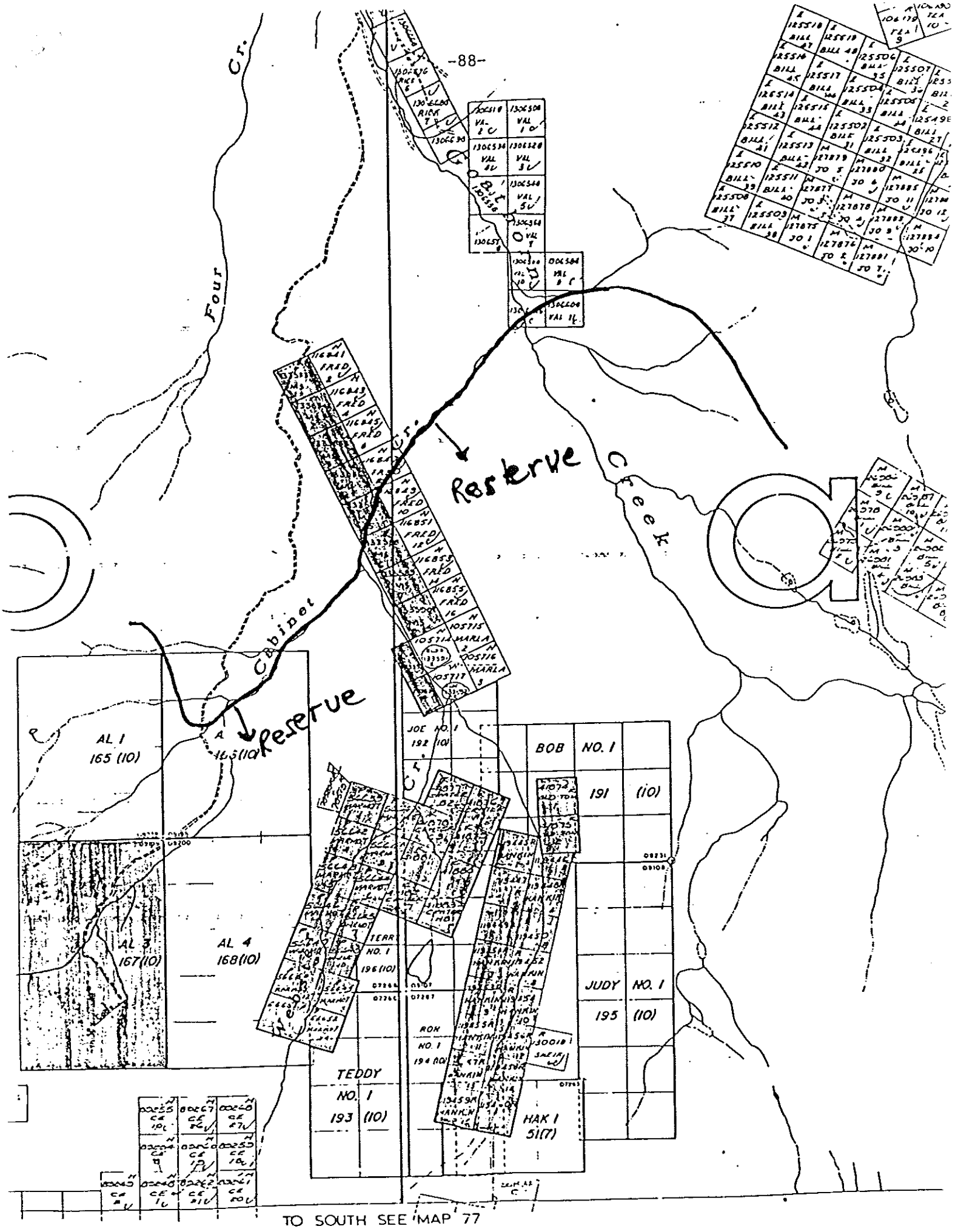
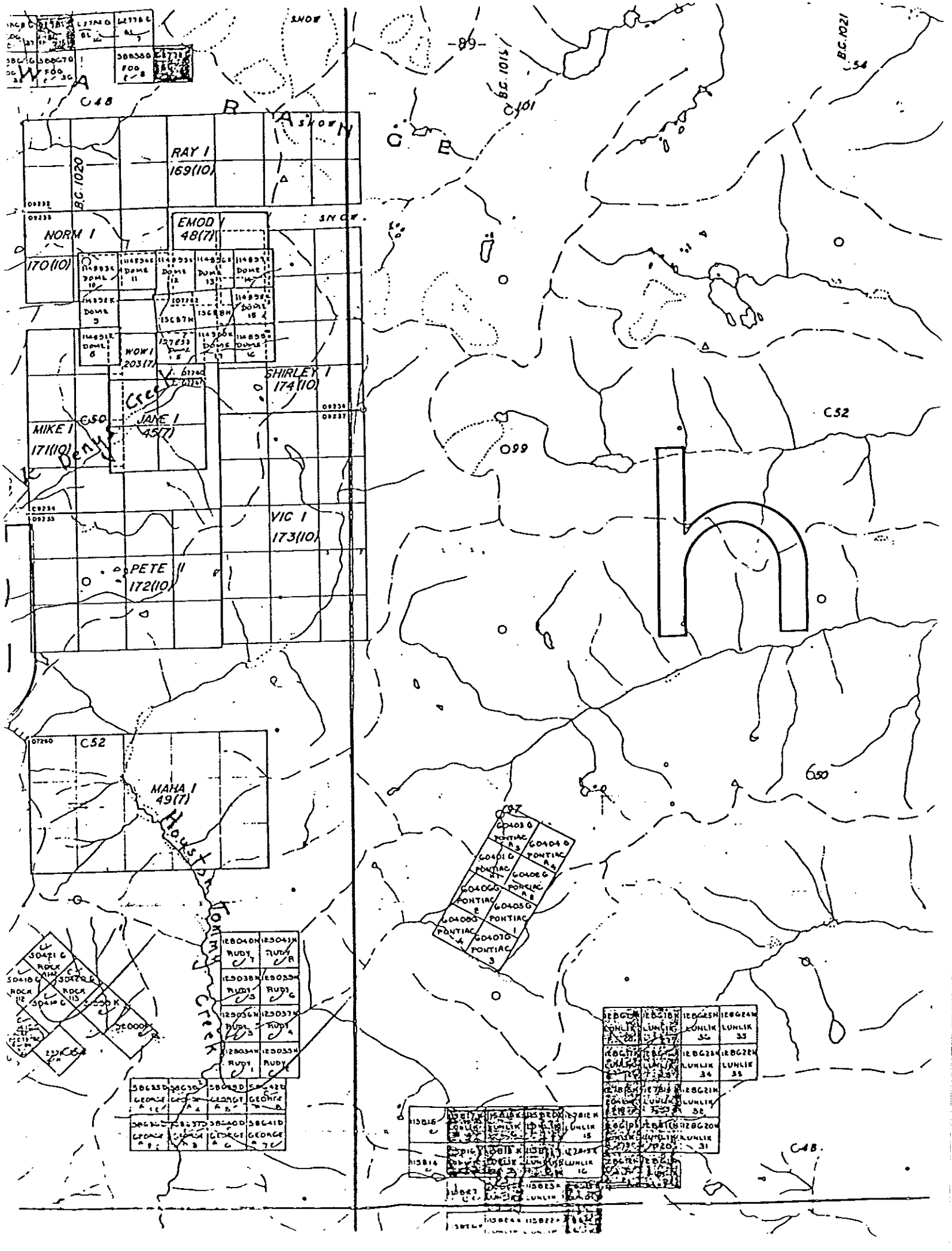
Appendix VI

VALID MINERAL CLAIMS

(only the claims which are blacked in are existing claims as of the date of this report. All others have lapsed. Areas not covered by maps in this Appendix had no extant mineral claims).



TO SOUTH SEE MAP 77


SNOW
B.C. 1015
B.C. 1021
C54
C48
C101
RAY I
169(10)
B.C. 1020
EMOD I
48(7)
NORM I
170(10)
SHIRLEY I
174(10)
JANE I
45(7)
MIKE I
171(10)
VIC I
173(10)
PETE II
172(10)
C52
C50
099
650
MAHA I
49(7)
Horsethief Creek
C48