

WOODLAND CARIBOU IN THE THOMPSON-NICOLA RESOURCE REGION
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MINISTRY OF ENVIRONMENT - PROVINCE OF BRITISH COLUMBIA

Ralph Ritcey, Unpublished Report

FOREWORD

This report was prepared from material provided by Regional Biologist Ralph Ritcey and the Raft - North Thompson steering committee. Members of the steering committee were Chairman Peter Walton, Ray Addison, John Dick, Wallace Macgregor, and Ray Travers.

INTRODUCTION

This report discusses the status and management objectives for woodland caribou in the east-central portion of the province. The area under consideration includes Supply Block 1 of the Kamloops Timber Supply Area (the Raft and North Thompson Public Sustained Yield Units) immediately south and east of Wells Gray Provincial Park. The Park is included as well because some of the caribou herds cross the boundary during portions of their annual migrations.

THE ENVIRONMENTAL SETTING

The area contains four major land forms (Holland 1964): Quesnel Highlands, Shuswap Highlands, Cariboo Mountains, and Monashee Mountains. The major portion is dominated by the Shuswap Highlands and the Cariboo Mountains. The Shuswap Highlands occupies the southerly half of the area and consists of a gently to moderately sloping plateau with a median elevation of 1500 - 2100 metres. The Cariboo Mountains extend from the Bowron River to the North Thompson River. The highest peaks range from 2590 metres near the Bowron River to over 3350 metres in the Premier Range.

The Quesnel Highlands occur in the most westerly portion of the area and consist of remnants of a highly dissected plateau of moderate relief. Median elevations range from 1500 - 1800 metres, with the highest point being Mount Perseus (2575 metres) on the westerly boundary of Wells Gray park. The Monashee Mountains occur along the easterly fringe of the area which is characterized by massive, sharp peaks separated by deep, steep-sided valleys. The highest peaks are in excess of 3000 metres with many others over 2875 metres.

The interaction of these landforms and the dominant southwesterly air flow has a profound effect on local climate which in turn has an effect on the vegetation. The dry, Interior Douglas Fir Zone occurs in the southwest on the edge of the Shuswap Highlands and in the northeast in the lee of the Cariboo Mountains. As rainfall increases, the Interior Douglas Fir Zone gives way to the moist Interior Western Hemlock Zone. Above 1200 metres there is a gradual transition to the moist Engelmann Spruce - Subalpine Fir Zone, and above 1850 metres to the Alpine Tundra Zone.

THE CARIBOU HERDS

The section describes the caribou of the Raft and North Thompson PSYU's, outlines their food and habitat requirements and identifies the objectives for their management which have been adopted by the Fish and Wildlife Branch.

Description and Taxonomy

The caribou of North America and the reindeer of northern Europe and Asia belong to a single species, *Rangifer tarandus*. Currently four native subspecies are recognized in North America, with the subspecies occurring in British Columbia being the woodland caribou, *Rangifer tarandus caribou* (Banfield 1974a).

Formerly, the British Columbia population was divided into two subspecies, the Osborne caribou and the mountain caribou. Though the Osborne and mountain caribou are now combined in one subspecies, they must be considered two distinct ecotypes or genetically differentiated local populations because of real differences in appearance and behaviour. This has significant implications for caribou management. Once genetic material is lost, it cannot be replaced. For this reason, the Fish and Wildlife Branch has set as one of its main goals the preservation of the genetic diversity of British Columbia's wildlife resources. Objectives for caribou management, in the light of this goal, are discussed later.

The Osborne caribou is larger and inhabits the mountains of the Stikine, Liard, and Findlay River drainages. The smaller mountain caribou, which is the object of the study, occurs south of latitude 54° on the eastern slopes and outlying ranges of the Coast Range, and in the wetter areas of the Columbia and Rocky Mountains.

Distribution and Numbers

Official concern over declining populations of caribou in British Columbia can actually be traced back as far as December 15, 1908, when an Order-in-Council was made declaring a closed season for caribou on the Queen Charlotte Islands. This order followed by one month the killing of three of the only four "Dawson" caribou ever authentically documented. This subspecies is now thought to have been extinct since at least the 1930s.

Twenty-five years ago, Edwards (1954) stated that caribou had decreased alarmingly throughout B.C. Declines were noted by regional personnel during the early sixties and again in the early 1970s; this finally led to a comprehensive survey of the status of caribou herds and a compilation of Fish and Wildlife Branch caribou records by A.T. Bergerud (1978b).

The reasons for the decline in British Columbia's caribou populations are presently a matter of speculation. It is probable, however, that no single factor can be identified: throughout the province, different factors and combinations of factors have been responsible. It has been suggested that habitat destruction due to wildfire and logging has had a major influence on population levels of the North Thompson herds (R. Ritcey pers. comm.) and the southern Selkirk herd (Freddy and Erikson 1975). Other investigators believe that, for many herds in the southern portion of the province, the decline may have resulted from overhunting associated with increased and uncontrolled access (Bergerud 1978b, Bloomfield 1979).

In northern areas, declines may have been associated with predation on calves by wolves, bears, and wolverines (Bergerud 1978b, 1978c). It has even been postulated that the continental decline of caribou is in part due to the general warming trend that occurred from 1935 to 1970, which resulted in the severe reduction of summer snowfields needed by the animals to escape from harassment by biting insects.

The present distribution and relative abundance of caribou in British Columbia are shown on Figure 1 (Page 4) and the estimated populations of the two ecotypes by Resource Management Region as shown in Table 1.

TABLE 1: Population Estimates of the Two Caribou Ecotypes by Resource Management Region

Resource Region	Mountain Ecotype		Osborne Ecotype	
	Number	% of total	Number	% of total
1. Vancouver Island	0	0	0	0
2. Lower Mainland	0	0	0	0
3. Thompson-Okanagan*	400	20	0	0
4. Kootenay	500	25	0	0
5. Cariboo	600	30	0	0
6. Skeena	200	10	5000	56
7. Omineca-Peace	300	15	4000	44

Total	2000	100	9000	100

Adapted from: Preliminary Caribou Management Plan for British Columbia 1979

* the 1980 population census for the Thompson-Okanagan Resource Management Region is 300, a decline of 100 since the last census in 1975.

Of particular note is that, which the Thompson-Okanagan Resource Region contains only 4.4% of the total provincial caribou population, it has 20% of the Mountain caribou ecotype.

Ecological Relationships

Food Habits

Mountain caribou eat a variety of soft herbaceous material. In total, food items are quite numerous; however, utilization varies seasonally and appears to be related to relative availability. Plant groups used include sedges, forbs, the tender portions of various shrubs and coniferous trees, terrestrial and arboreal lichens, and bryophytes. In the winter, however, arboreal lichens become the dominant food source as forage items closer to the ground become inaccessible due to snow accumulation.

Seasonal Distribution and Habitat Use

Mountain caribou undertake seasonal migrations that, although more complex, are more like the altitudinal movements of deer and moose than the extensive large scale movements of other caribou. While deer and moose migrate annually from high elevation summer ranges to low elevation winter ranges, mountain caribou perform two migratory descents and returns each year (see Figure 2).

The factors that apparently control these migrations include available food supply and degree of mobility, both of which are affected by snowpack characteristics (Edwards & Ritcey 1959). Of particular importance to the survival of these animals is the later winter use of mature Engelmann spruce and subalpine fir stands where a deep, firm snowpack allows maximum mobility, and heavy arboreal lichen loads provide an abundant food source.

Recent work by the Fish and Wildlife Branch has provided some indication of caribou use of the subalpine forest. The average winter ranges of three animals were found to be 54 km², 401 km², and 305 km². The individuals were members of separate herds which varied in size from 7 - 14 animals. While this appears to be light intensity of use, it is entirely consistent with the prudent life history strategies of climax species such a caribou with low reproductive rates, behavioural mechanisms to prevent overuse of range, and narrow tolerances to environmental variables.

Often, in response to increasing environmental disturbance, populations of climax species will decline gradually for a period of time and then, as through pushed beyond a critical threshold, will drop catastrophically and sometimes irreversibly. This possibility must be given full consideration as part of any management strategy for mountain caribou.

Figure 2: Elevations and Habitat Types of Caribou Radio Locations, December 14, 1978 - March 30, 1980, in the North Thompson River Watershed¹

MONTHS OF THE YEAR

June - July	climb to Alpine Meadows
July - Oct.	use Alpine Meadows
Oct. - Dec.	descend to lowland
Dec. - mid-Jan.	remain lowland
Jan. - Feb.	climb to Parkland
Feb. - April	remain at high elevations
April Spring Thaw	descent to lower elevations
May	remain at lower elevations

¹ North Thompson River Mountain Caribou Study, a Progress Report to the B.C. Fish and Wildlife Branch April 1980 - T.D. Antifeau

Lichen - Forest Relationships

The ecology of arboreal lichens is presently one of the most poorly understood components of caribou habitat. While the quantitative nature of the relationship is unknown, there is general agreement that the most important factors are the following:

1. Tree Age

Arboreal lichen loads are greatest in high elevation stands 150 - 250 years of age. Stands younger than 150 years generally have negligible lichen loads and usually do not support caribou.

2. Tree Species

Subalpine fir and Engelmann spruce appear to provide the most desirable substrate for lichen growth.

3. Stand Density

Stand density, as it affects microclimate and available light for photosynthesis, probably has an important influence on lichen productivity; however, no information exists on what an optimum stand density might be.

4. Moisture Condition

Variation in arboreal lichen productivity between sites is probably the result of differences in relative humidity, since growth occurs only when lichens are moist. Heaviest lichen loads appear to occur on forest stands in basins, stream bottoms, and on rolling plateaus where subalpine forest types are interspersed with small lakes and wet sedge meadows. Lichen loads are lowest in stands on steep hillsides, presumably because of less favourable moisture conditions.

One of the most critical information gaps, because of its implications for the carrying capacity of caribou winter range, is the lack of even the crudest data on lichen growth rates. The little that is known indicates that lichens grow very slowly, presumably because their photosynthetic processes are less efficient than those of higher plants.

Selection cutting as been proposed as one solution to the conflict between forest harvesting and caribou. Stevenson (1979) looking into this question. Assuming three cutting prescriptions of 16", 20", and 24" minimum diameter at stump height (d.s.h.), the percentage of lichen load removed on harvested trees would be 85, 52, and 49 respectively. Further losses would be sustained because of snag felling, branches knocked off residual trees, and openings for roads and landings. Taking these factors into consideration, the 20" d.s.h. prescription would actually result in the removal of approximately 74% of the lichen load. Any release effect on residual lichens after a selection cut would probably take place only on the moistest sites.

As a result of her study, Stevenson recommended that selection logging be limited to areas used by caribou as travel routes, and then only on an experimental basis. No logging should be carried out in areas where caribou congregate in winter, and mature timber should be left along movement corridors as caribou might not travel through selectively cut areas under certain snow conditions.

Habitat Capability

Though no habitat capability rating system has been devised in British Columbia for the mountain caribou ecotype, quality winter habitat can be defined according to the following generalizations.

Topography: Rolling subalpine terrain above an elevation of 1500 m characterized by moderate relief and slopes generally less than 30%.

Vegetation: Mature subalpine fir/Engelmann spruce stands on medium to poor forest sites interspersed with mountain lakes and wet forb/sedge meadows. Blocks of habitat at least 40,000 ha in extent are usually necessary to support caribou.

On this basis, the following general habitat relationships can be developed for the study area and adjacent Wells Gray Park:

1. Highest lichen loads will occur in the moister subalpine forest immediately adjacent to the Interior Western Hemlock Zone. For this reason, the drier Subalpine Forest above the Interior Douglas Fir Zone in the southwestern and northeastern portions of the study area must be classified as relatively poor caribou habitat.
2. Both the Cariboo and Monashee Mountains represent only fair habitat because of their high vertical relief. The rugged topography affects habitat quality in three ways: first, by limiting mobility; second, by breaking up the subalpine forest into relatively small units; and third, the steep slopes, being drier, will have an adverse effect on lichen productivity. Though the area will support caribou, they will winter here in small, isolated groups.
3. The best habitat occurs in the Quesnel and Shuswap Highlands; however, the former area is somewhat drier and more highly dissected and thus must be termed moderate habitat. The core

area of good habitat occurs in the Shuswap Plateau south of a boundary established by the Murtle River, Murtle Lake, Blue River, and the Mud River. Here large blocks of rolling upland support moist subalpine forest, interspersed with wet sedge meadows and small lakes. Heavy lichen loads and east of mobility combine to provide more available winter forage than in the other units described above.

The general habitat ratings are shown in Figure 3. Although Wells Gray Park supports caribou, only about 10% - 15% of the Park constitutes good caribou habitat. Most of the quality habitat occurs in the Raft PSYU and the southern quarter of the North Thompson PSYU.

CARIBOU MANAGEMENT OBJECTIVES

The first goal of wildlife management in British Columbia is “to maintain the diversity of species representative of the major biophysical zones of the province”. The caribou in southern British Columbia are the only caribou found within the Interior Western Hemlock Zone and the Raft - North Thompson herds represent about one-third of this population. Accordingly, it is the position of the Fish and Wildlife Branch that **the caribou in the Thompson region should be preserved primarily to maintain the species in this region.**

The Fish and Wildlife Branch in Region III, within whose jurisdictional boundaries the Raft and North Thompson caribou populations fall, have identified four principal objectives for caribou management:

1. To maintain caribou at near existing levels until 1985. This may be an obtainable objective in that logging, although destroying habitat, is providing forage on a short-term basis.
2. To protect vital habitat that will maintain woodland caribou as a conspicuous faunal component of high elevation, old growth forests.
3. To foster a knowledge and appreciation of caribou within Region III.
4. To provide opportunities for recreational hunting where it does not conflict with other objectives.

In the period 1965 to 1969, the annual harvest of caribou within the Raft and North Thompson PSYUs averaged 14 animals. Because of concern for the caribou populations, a variety of restrictions were imposed on hunting; the annual kill was reduced to an average of less than 10 animals per year for the period 1970 - 1974 and less than 3 animals per year for the period 1975 - 1979. There has been no legal hunting since the end of the 1979 season.

Figure 3: Generalized Habitat Capability Rating for Caribou

Other Wildlife Values Associated with Caribou and the Climax Subalpine Forest

Mountain caribou, though perhaps the most visible, is only one of a number of wildlife species dependent to a degree on mature subalpine forest. Game and fur bearing animals of the climax

subalpine forest include the pine marten, wolverine, fisher, blue grouse, Franklin grouse, and grizzly bear. A complex of non-game animals species also occur here, including the northern and black-backed three toed woodpecker, hermit thrush, varied thrush, red-breasted nuthatch, red crossbill, white-winged crossbill, pine grosbeak, red backed vole, cinereus and dusky shrews, and tree squirrel. Reservations of climax forest for mountain caribou would also serve to provide habitat for these other wildlife species.

RESOURCE MANAGEMENT OPTIONS

In recent years, the effects of resource developments and expanding settlement have become a source of concern for the Fish and Wildlife Branch. If caribou management objectives are met, it will be necessary to strictly limit other activities such as logging and road construction. There are no simple compromises apparent that will resolve these conflicts: a decision in favour of one resource use will have a negative impact on the other. Put simply, logging in caribou habitat will reduce caribou numbers; and the more logging that occurs, the few will be the caribou that remain.

To place this interaction in perspective, the following section discusses the same four scenarios that were evaluated in the Kamloops TSA Report. Briefly, these are described as follows:

Scenario 1

This affords a high priority to timber production with the exception of the northern portion of the North Thompson PSYU, where larger allowances are made for caribou. This option includes environmental protection area (EPA) allowances for critical habitat plus application of special logging prescriptions.

Scenario 2

This provides for maximum protection of caribou habitat including ranges historically used by caribou. Under Option 1, all range that one supported caribou would be excluded from timber harvesting except on a 250 year rotation. Historical reports suggest that, in what is now Resource Management Region III, caribou inhabited virtually all extensive high mountain ranges north of the Thompson or South Thompson Rivers. These have been mapped at the 1675 metre contour which is a good approximation of the lower limit of critical late winter ranges in most of the region. This option would also require that low elevation early winter range be reserved equal to about 20% of the area of the high elevation range. In this reserve, 80% of the forest would be retained at age 120 years or older to provide the needed canopy for protection the forest floor from heavy snow cover in early winter.

Scenario 3

This provides for protection of range for existing caribou population with provision for a possible future increase. For this option, the caribou of Region III have been divided into several different herds on the basis of their observed distribution and movements.

With the high elevation areas there would be no further logging on poor sites. On good and medium sites, there would be no further logging until the area of age 8 forest (140 years of older) reaches the equivalent of the beginning of 1976. Thereafter, good and medium sites could be logged according to acceptable forest practices provided that the 1976 area was maintained. Age class 8 and 9 on poor sites would increase significantly over time as burns mature, provided that the present level of forest fire protection is maintained.

Scenario 4

This provides protection for ranges vital to caribou that emigrate from Wells Gray Park. Although there are several extensive wintering areas in Wells Gray Park, part of the population does winter

outside the Park in Resource Management Regions III and VII. The protection of these wintering areas contiguous to the Park is given top priority.

Analysis of Impacts on the Caribou Resource

There is a consideration degree of uncertainty in caribou management that must be considered in the evaluation of option and in attributing specific positive or negative impacts to them. Substantial information gaps exist in the areas of:

1. seasonal caribou distribution and habitat use patterns;
2. the major migration corridors in the study area;
3. lichen/forest site relationships;
4. lichen productivity in relation to timber stand age.

The degree of uncertainty can be reduced with improved and more accurate information concerning caribou and by following a conservative approach to caribou management which allows sufficient leeway for uncertainties.

The low uncertainty - high uncertainty continuum encompasses a "critical zone" beyond which continued production of a resource -- be it timber or caribou -- becomes biologically, technologically, or economically impossible. When that critical zone is reached, further reduction of the genetic base and breeding stock will leave a buffer inadequate in size to ensure that foreseeable uncertainties do not lead to elimination of the resource.

Although there is uncertainty involved in attributing specific impacts on caribou to the resource management options, the four options can be estimated to have the following general significance for caribou:

Scenario 1 is not viewed as sufficient to maintain the Park herd at its existing level and will most likely result in a population decline in the Park of 40 animals. Animals outside the Park within the Shuswap Highlands will probably disappear once the unprotected habitat is logged. Animals outside the Park but within the rugged terrain of the Cariboo and Monashee Mountains will probably continue to exist in small herds. The selection of Option IV could cause the population of caribou within Region III to decline by some 80 animals. In relative terms this represents some 27% of the 300 caribou in the Region and about 8% of the Mountain ecotype of caribou. The Fish and Wildlife Branch considers Scenario 1 unacceptable in terms of perceived management objectives.

Scenario 2 provides for maximum protection of caribou habitat including ranges historically used by caribou. Caribou numbers in the study area should increase from present levels to 275 over the long term (150 years) as the total area of caribou range expands.

Scenario 3 provides for protection of range for existing caribou populations with provision for a possible future increase in population. Caribou numbers in the study area should stabilize at current levels (80 animals) and may increase slightly over the long term by 200 animals. For this option the caribou of Region III have been divided into several different herds on the basis of their observed distribution and movements. Each herd is reasonably discrete but it is likely that some interchange occurs.

The herds have been listed in order of protective priorities based on the following factors: proximity to the "core" population in Wells Gray Park, probable ability to exist as a separate entity, accessibility for use and specific knowledge of their low elevation range (Table 2).

TABLE 2: PRIORITY FOR PROTECTION OF CARIBOU HERDS IN THE RAFT AND NORTH THOMPSON PSYUs¹

Priority	Herd Name	Minimum Numbers Preserved by Option II (1979 population)	Probable Long Term Term Numbers (years)
1	Battle - Raft Peddie	20	75
2	Miledge	15	20
3	Upper North Thompson	0	75
4	Tum Tum	10	20
5	Albreda	10	20
6 ²	Bischoff Lakes	20	25
		75	235

¹ These herds are described in some detail in Appendix.

² The Bischoff Lakes herd is thought to use the two PSYUs during portions of its annual migration.

Under this option it is imperative that the integrity of each individual range is not interfered with or the future of the herd may be jeopardized. In other words, if the demands of the forest industry are seen to merit more timber than this option allows, then it would be best to completely eliminate the habitat of one herd rather than reduce the habitat of several herds.

Scenario 4 provides for protection of habitat vital to caribou that emigrate from Wells Gray Park. The caribou population of the Park should stabilize at about 150 animals, barring any unforeseen large-scale disturbance, particularly fire, to habitat in the Park. This option does not provide sufficient flexibility to weather such a catastrophe nor does it ensure that caribou can be maintained as a viable species outside of Park boundaries in the Raft and North Thompson PSYUs. The Fish and Wildlife Branch considers Scenario 4 unacceptable in terms of perceived management objectives.

The implications of the options for caribou management are summarized in Table 3.

TABLE 3: IMPACT OF RESOURCE MANAGEMENT OPTIONS ON CARIBOU POPULATIONS

Scenario	Long Term Caribou Population by Option		Total
	Raft-North Thompson	Park	

1	20	110	130
2	275	200	475
3	200	175	375
4	20	150	170
No allowance	0	110	110
Present population	80	150	230

While the impacts on caribou of the resource management options can be generally estimated, it is neither possible nor desirable to express these impacts in rigorous economic terms. The protection of caribou habitat is a complex social issue hinging on values best expressed in symbolic terms.

Among the values, and consistent with the difficulty outlined in quantifying “intangibles” in economic terms, are the traditional values associated with the sensitive husbanding of the caribou resource. Implicit within these values is the important place which caribou held in the culture of Native and Inuit peoples of North America -- and still do hold in the more northern reaches of the continent -- and in the history of European settlement of British Columbia. It is no coincidence, for example, that the Cariboo district of British Columbia bears the name (with a slightly different spelling) of the caribou animal.

Caribou also have a contemporary role in the recreational life of British Columbians. People actively seek out caribou for observation as well as for hunting. In addition, caribou have a value to people to watch them in wildlife documentaries on television or read of them in newspapers, journals, or magazines. As economists are fond of putting it, a certain “psychic income” is derived by those who take pleasure simply in knowing that caribou exist and that they are being prudently managed.

The role of caribou as an integral part of wild ecosystems also serves to point out the importance that preservation of climax forest for caribou holds for the entire spectrum of wildlife -- bird and mammal -- that inhabits this climax stage of forest.

Making the Resource - Use Trade-off

In making a choice among the four options presented in this report, it is important to keep in mind several aspects of the conflict previously identified. These include:

- (a) the importance of habitat adjacent to Wells Gray Park to the Park caribou herds. Analysis of the implications of the four resource management options for caribou habitat make it clear that protection of Park habitat alone will not ensure maintenance of the existing caribou numbers in the Park, as these animals utilize habitat in the Raft and North Thompson PSYUs.
- (b) the importance of the Raft PSYU to caribou. The best winter habitat for caribou occurs in the Shuswap Plateau, of which the Raft PSYU forms the major portion.

- (c) the importance of the critical zone concept. If a choice is made to maintain caribou habitat outside of that already protected by Wells Gray Park, it would be prudent to minimize risk by following a conservative approach to caribou management which allows sufficient leeway for uncertainties. Whatever the arguments for or against, it is far simpler to remove areas from caribou range through logging than to recreate mature stands of lichen-bearing timber once harvesting has occurred.
- (d) the significance of social as well as economic values in the analysis. The question of how to compare the economic implications of competing land uses has been under study by various provincial government agencies, academics, and consultants for several years. For a variety of reasons, no system has yet been developed that satisfactorily incorporates economic data with other values that are difficult to express in equivalent terms. It is essential, however, that the lack of economic data in any portion of the analysis should not cause neglect of significant social values.
- (e) similar management problems exist in other PSYUs surrounding Wells Gray Park and extend over the region that surrounds Bowron Lake Park and the central plateau east of Prince George. In making a decision about management policy for the Raft and North Thompson PSYUs it must be remembered that there is a definite regional context in which dedicated parks play a crucial role in the protection of caribou habitat. If a lower priority is given to caribou management, then careful attention must be paid to optimizing the use of habitats within the Park by judicious designation of critical complementary habitats outside of the Park boundaries. This would include creation of a continuum of habitats between parks to prevent isolation of genetic characteristics.
- (f) the influence of factors other than habitat which may control caribou numbers. The obvious fact is that caribou require suitable habitat to survive; however, other factors have been identified which could continue to suppress populations in spite of habitat protection. Any long-term projections of caribou numbers under the four options assume that habitat availability is the dominant controlling factor, or that other limiting factors will be identified and controlled.

No one option will satisfy all the requirements of both the forestry sector and the caribou resource. The relative priority of logging and caribou values must be decided and the management objectives of one or the other curtailed to some extent. Simply put, the question becomes: "Which distribution of benefits and costs through time, evaluated in both economic and non-economic terms, best satisfied the social objectives of the Province?" That choice could be any of the four resource management options described or any intermediate point between them.

If an option is chosen which increases the rate of timber harvest, expansion of logging into caribou habitat should be delayed as long as possible. The Ministry of Forests should develop logging plans on the basis that caribou ranges, designated under the next higher option for caribou protection, should be held under a "last to be logged" condition where feasible. This will:

- (a) retain additional short-term benefits from the caribou populations;
- (b) provide time to remove the uncertainties associated with the chosen option;
- (c) retain more opportunities for revising priorities in the future.

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