CARIBOU MANAGEMENT PLAN, REGION III

R.W. Ritcey, Regional Wildlife Biologist
Fish and Wildlife Branch, Kamloops BC July 1976

Ralph Ritcey, Unpublished Report

INTRODUCTION

Caribou are found in several mountainous areas along the northern and eastern fringes of the Kamloops Okanagan Region (Map 1). Rolling topography clad in mature forests of sub-alpine fir/Engelmann spruce endowed with an abundance of natural openings is ideal habitat. The race occurring is *Rangifer tarandus montanus* , a smaller animal than the Osborne caribou found in the northern part of the province.

The present inhabited range in the region has shrunk considerably from that inhabited in the early part of the century. Without exception, even where there are still caribou, the range has been significantly reduced in the past 20 years.

There are between 400 and 650 caribou in the Kamloops Region, representing 1 to 2% of the provincial population. However, south of the 53rd parallel, about half of the existing numbers are within regional boundaries. Caribou populations in this region are among the most accessible to be found in the southern part of the province.

This provides a good opportunity for viewing these animals with many of the inhabited sub-alpine ranges being within easy hiking distance from forest access or logging roads. However, little non-consumptive use has been made of the the caribou herds because, until recently, they have been unknown or inaccessible during the summer.

Harvests of caribou within Region III are small (Table I), being reduced in recent years as a result of more conservative hunting regulations and lowered populations.

Caribou in the mountains of southern British Columbia are dependent on lichen-bearing conifer forests that reach their highest value to caribou when they are mature or over-mature (Edwards 1954; Edwards and Ritcey 1959, 1960; Edwards et al 1960; Freddy and Erickson 1972). This places them in direct conflict with traditional forest management, with its emphasis on young productive forests to produce the maximum sustained crop of wood products.

TABLE I: Caribou Harvests - Region III
Estimates from Hunter Sample plus Guide Returns

	Wells Gray Park	North Thompson Adams/Shuswap	Southern Monashee	Region
1964	29	13	2	44
1965	24	11	0	35
1966	36	5	5	46
1967	25	9	3	37
1968	36	23	0	59
1969	34	21	0	55
1970	19	5	0	24
1971	19	4	2	25
1972	16	12	0	28

1973	5	28	9	42
1974	3	0	0	3
1975	2	4	0	6
Mean	21	11	2	34

CARIBOU POLICY STATEMENT

The Fish and Wildlife Branch recognizes its responsibility to protect the remaining populations of caribou and their habitat within the Kamloops Region, maintaining diversity in wildlife species as well as in preserving a threatened race of caribou.

The Branch recognizes that mountain caribou require old forests rich in lichen for their survival. It will ensure that this requirement is protected wherever possible and that mountain caribou are given proper consideration in forest management in the Thompson-Okanagan Region. In particular, they will offer advice on the consequences of carrying out various types of forest management within the caribou range, and propose protective measures that will have social and economic validity.

The Branch supports the concept of managing resources on a broad ecologic basis and that caribou are only a part of an ecosystem having many other values. The Branch will therefore point out, where appropriate, subsidiary values in protecting caribou and their habitat.

The Branch recognizes that sport hunting is a legitimate use of the caribou resources and will, where possible, permit hunting of the species. The Branch appreciates that caribou can be easily over-exploited and will design hunting seasons to prevent this. It will also protect populations from illegal hunting through enforcement of the Wildlife Act and its regulations.

The Branch recognizes that there is a growing public interest in wildlife, particularly in such spectacular and rare species as mountain caribou. This public interest in seeing, photographing, and general appreciation of caribou will be accommodated in management of the species and will not be sacrificed to hunter-oriented programs.

The Branch recognizes the need for scientific study as a basis for sound management of the resource. It will keep abreast of current and pertinent studies being carried out elsewhere in the province and carry out necessary studies within this region consistent with its budgetary limitations.

The broad objectives of the Fish and Wildlife Branch in caribou management within the Thompson-Okanagan Region may be listed as follows:

1. to protect, maintain, and enhance the caribou resource (the species and its habitat) in Region III,

2. to manage caribou populations within Region III for the sustained benefit of British Columbia residents,

3. to develop an information and education program in the Region, to educate the public about the biological characteristics, ecological requirements, and innate value of caribou, and

4. to increase our knowledge of caribou by co-operating with interagency research programs.

These objectives are compatible with and nearly identical to the Branch's objectives for the species on a provincial scale.

The following program will be necessary to meet the regional objectives for caribou management: 1. Inventory of ranges, 2. Inventory of numbers, 3. Modification of forest management, 4. Harvest management and regulations, 5. Enforcement, 6. Information and Education, and 7. Research.

1. Range Inventory

Most of the areas occupied by caribou in late winter are known and have been mapped. Two exceptions are Wells Gray Park, where there are probably several wintering areas within the Park boundaries, and Hunters Range, where repeated flights have failed to locate a suspected winter range.

The absence of caribou from a winter range for a few years does not mean that the range is no longer of value. Caribou are nomadic and they may suddenly appear on winter ranges that have not been used in several years. It is necessary then, to protect ranges having the apparent capability to support caribou and with a know history of previous caribou use.

Present and potential important wintering areas have been delineated by using forest cover maps, topographic maps, and aerial surveys. In general, these areas are medium to poor sites in spruce-balsam or balsam-spruce of age class 8 or 9 at an elevation of 5,000 to 6,000 feet.

Additional range inventory could delineate the most vital habitats within the broad high elevation range. However, this would be costly and should only be undertaken if the Forest Service decided to permit extensive logging within the high elevation caribou range and, more specifically, if it were necessary to protect only portions of the range. Flights over the winter range show a fairly uniform coverage of mature conifer stands at high elevations and it is unlikely that a significant portion could be excluded as being unimportant to caribou. Current studies being carried out at Williams Lake by M. Beets and D. Russell, and on Vancouver Island by S. Stevenson, should produce better methods of winter range inventory for caribou.

Other areas at lower elevations are used in winter as migration routes or feeding areas. These are more difficult to delimit and have only been mapped in a few management units. Location and mapping of the important early winter ranges and migration routes must be done within the next three years or the opportunity to protect them will be lost.

2. Inventory of Numbers

Estimates of numbers of caribou have been made for all management units in the region (Table II). Despite the rather wide limits placed on these estimates, they should be useful in detemining the relative importance of each of the units as caribou producers. They should also indicate where habitat protection efforts should be directed.

TABLE II: Estimated Populations of Mountain Caribou Region III - 1975

Management Unit	Summer Population	Winter Population
323, 24, 25	45 +/- 15	45 +/- 15
334	0	20 +/- 20
335	20 +/- 10	?
336	40 +/- 20	?
337	occasionally present	occasional
340	20 +/- 10	80 +/- 30
341, 42	40 +/- 20	20 +/- 10
343	20 +/- 10	40 +/- 10
344	50 +/- 20	50 +/- 20
345, 346	350 +/- 100	?
	585 +/- 205	unknown

Figure 1: Caribou are readily classified as to sex by presence or absence of antlers in midsummer. Calves are easily separated by size.

There are inter-regional shifts in distribution so it will be impossible to obtain the best information unless inventories are coordinated between regions. Present inventories of numbers are carried out in mid-summer by helicopter on a five-year rotation. Inventory flights classify the animals as to bulls, cows, and calves or small antlered adults that cannot be sexed from the air. Usually the sexes can be separated on the basis of antler characteristics as male antler development is usually well-advanced at the time of the survey, while cows are antlerless (Fig. 1) or have only small antlers.

The success of summer inventories is dependent on early, hot summer weather to concentrate caribou on shrunken snow patches. Estimates of numbers can be misleading when based on inventories carried out in less than ideal conditions.'

The total number of caribou seen on the summer inventory in the Wells Gray/North Thompson area dipped from 308 in 1970 to 123 in 1975 despite the latter census covering some parts of the range not surveyed in 1970. Subsequent ground work that found caribou in low elevation timbered areas and unsuccessful air surveys by other regions were indicators that in 1975 caribou did not concentrate in the alpine to the extent that they usually do. The delayed melt of high elevation snow packs because of cool June weather was believed responsible for the change in distribution from the previous survey. With such large weather-induced discrepancies in counts, it is impossible to ascribe even substantial differences in changed population status if conditions are not similar both for the year and for the date.

Inventory for numbers has been attempted for parts of the range in late winter - early spring. This may be a more feasible method of collecting data on numbers once all of the winter ranges have been located.

The sex and age structure of the population cannot be so readily determined in late winter both because differences in antler characteristics are not so apparent at this time and because the animals are in more forested situations where they are more difficult to approach closely from the air.

The present schedule calls for an inventory once every five years in the North Thompson - Wells Gray areas. Inventories will have to be more frequent, preferably every other year, if we are to document changes in population -- whether caused by loss of habitat or other reasons. Inventories should be scheduled for summer, but carried out only in years when snow fields in the alpine areas are small by early July. Study of satellite photos should establish standards to which snow shrinkage should occur before the survey should begin. Observation of snow packs and a check of weather the day proposed for the flight would determine if the summer survey would be successful. If suitable conditions do not occur, the survey should be delayed until the late winter period (late March) of the same fiscal year. Such scheduling would allow for a more effective expenditure of budget in each year and should produce counts with less weather-caused variation.

3. Modification of Forest Management

Timber harvesting, natural wild fires, and slash burns in the sub-alpine zone, if allowed to continue at their present rate, would largely eliminate caribou from the region within 20 years. The only exception would be a population in Wells Gray Park, much reduced from its present size.

Lichen production and availability is probably at a maximum in high elevation stands aged 150 to 250 years. (There is some indication from Edwards et al 1960 and Schroeder 1974 that lichen production in low elevation stands may peak somewhat earlier.) High elevation stands younger than 150 years have negligible loads of arboreal lichens and usually do not support caribou. Stands older than 250 years may support heavy loads of lichen but by this time may be highly susceptible to fire and disease. It may not be practicable to maintain sub-alpine forests beyond this age, even though they would be characterized by high lichen production.

If logging is to be continued on the caribou range, the rotation length must be lengthened considerably in order to keep a significant proportion of the range in production (Fig. 2). The desired extension of the cutting cycle would involve a drop of about 40% in the a.a.c. (Fig. 3), based on a 250-year rotation instead of 150. Regardless of whether the rotation is 150 or 250, the present cut is in excess of that which can be sustained for such long rotations in the sub-alpine zone. The total removal of commercial stands above 5,000 feet has been in excess of 10% for the past five-year period.

Kimmins (1972) has pointed out the dangers of over-exploitation of nutrients in the new soils of the sub-alpine and suggests that rotations following exploitation of original stands may have to be lengthened.

Fig. 2: relation of rotation length to proportion of forest in productive winter range for caribou

Logging of the key caribou areas as delineated on forest cover maps (appended to this plan) should be halted immediately until a long-range cutting plan, based on a 250-year rotation, is advanced by the Forest Service. Failing that, annual cuts should not remove in excess of

0.4%(annual replacement at 250-year cycle) from age classes 8 and 9 in the key caribou areas -- while logging, except for salvage, should be completely eliminated from the younger age classes.

heavy commitments to the forest industries will make it impractical to protect caribou range in areas where populations have already been depressed by previous loss of habitat. The watersheds between the Thompson and Adams River offer an example of forest exploitation that has progressed to the point where it is problematical as to whether or not the area will ever again be able to sustain caribou on a continuous basis. The caribou reserve does not include areas that are potential caribou range but have already been eliminated by destruction of the mature forest. It also does not include areas where caribou are still present but cannot be expect to remain in the S.Y.U. in question is to maintain a reasonable production of timber.

The reduction in the a.a.c. would be less severe if forest operations did not waste so much timber. Winter logging probably costs minimum of a 10% volume loss in the deep snow belts of the sub-alpine forest. The average stump heights in some cut blocks on Avola Mountain was almost 5 feet for winter logging, 1975/76. These heights have been exceeded in the past and such wastefulness has contributed to the shortage of timber.

The immediate cessation or severe curtailment of logging in high winter ranges is the only effective way to protect remaining caribou populations. This would involve but a small reduction in the a.a.c. for any S.Y.U. provided that better utilization was made of existing cuts and that logging was diverted to lower elevations even if this meant cutting immature timber. It is obvious that high capability forest lands at low and mid elevations will furnish most of the a.a.c. in future. If this cannot be done, any logging should follow the guidelines proposed by Freddy (1974). See Appendix III. These guidelines are not specific and would have to be negotiated between Forest Service and Fish and Wildlife Branch.

Fig 3: rotation length and annual allowable cut as % of mature volume

Escaped slash burns have been responsible for significant losses of caribou range over the past several years. The escaped slash fire on Lempriere Creek is a tragic example of mismanagement of forest lands and the 900 odd acres of caribou winter range lost from this fire will result in a significant reduction in the ability of this range to support caribou in winter. Smaller areas have been lost in other slash burns to swell the total acreage lost to fire. Slash burning should be eliminated in the caribou winter range unless it can be shown that an extreme hazard would be created by leaving slash accumulations to decay naturally.

So much caribou range has been lot through logging or logging-related fires that the remaining range should be protected from all fires during the next 10 - 20 years. This would involved an upgrading of the sub-alpine range in fire protection plans. The initial strike for fire bombers is more important in the largely inaccessible caribou range than elsewhere because of the difficulty in moving fire-fighting equipment to the fire location. Fire protection assumes great importance in and adjacent to Wells Gray Park. A long-term policy regarding fires in the park needs to be worked out with Parks Branch, Forest Service, and Fish and Wildlife Branch if protection of caribou range is to be assured.

4. Control of Caribou Harvest

There will be no attempt to harvest a maximum sustained yield of caribou in the near future. The present objective is to provide hunting recreation only if it is established that there is no danger of over-harvest of the populations concerned. Cow seasons have been eliminated in the region following increased access to the caribou range. This, and severe cutbacks in season length, have depressed the annual harvest to well below the maximum sustained yield calculated for the region.

Probable Maximum Annual Sustained Harvest of Caribou
Assuming No Further Habitat Loss

Management Unit	Maximum Allowable Harvest	Present Legal Harvest
3-23, 24, 25	4	0
3-34	0	0
3-35	3	1 - 3
3-36	6	1 - 3
3-37	0	0
3-40	12	0
3-41, 42	6	0
3-43	3	0
3-44	7	4
3-46	30	6
	71	12 - 16

Regulating harvests by “bulls only” seasons is wasteful because the female component of the herd contributes nothing to the harvest even though theoretically half of the harvest could be females. There is also the problem of hunters distinguishing between bulls and cows in the field; this inevitably leads to some wastage because it is inevitable that some cows will be illegally taken and abandoned.

The present “bulls only” hunting will be replaced by a system of limited entry hunting for both sexes as soon as the hunter sample allows us to establish safe permit numbers on the basis of success ratios by management unit. There will be no costly yearly population surveys to establish higher yearly harvests. Seasons will continue to be set early to allow male caribou to be taken prior to the rut when meat quality is highest.

5. Enforcement of Hunting Regulations and of Habitat Protection

The entire management program is dependent to some extent on adequate enforcement. The present program is inadequate because there is only minimal coverage of most caribou areas. This is especially apparent in the North Thompson where the nearest conservation officer is some 90 miles from the main caribou range. There is an immediate need for conservation officer to be

stationed at Clearwater where he would be better able to curb illegal killing of caribou and be in immediate contact with logging activities on the caribou winter range.

6. Information and Education

This is a continuing program to inform the public on caribou, their ecology, and especially to point out the impact of fire and logging on caribou populations. Information pamphlets are an effective and relatively inexpensive way of educating the public on various animal species. The completion of a caribou pamphlet will be a first priority in the information and education program.

The second need is for a slide film pack for caribou, for use in presentations by the I. & E. officer. Caribou slides and pictures are in relatively short supply in the the region, so this shortage will be remedied by field staff.

7. Research

The need for research becomes more apparent as logging eliminates more of more caribou range. The Region should carry out applied research to solve immediate problems rather than participate in basic research. However, the distinction between basic research and applied research and between applied research and field investigations tends to be one of degree rather than of absolutes. The following are some areas in need of research:

1. Fall and early winter migration and distribution. Effective methods of studying caribou movements in early winter have yet to be worked out. The evolution of methods as well as relating distribution to snow depth, snow characteristics, and vegetation make this a high priority research project. The Williams Lake project as well as others that have had but limited success suggest that it will be difficult and costly to locate caribou throughout the early winter. Radio telemetry will have to be used as well as a considerable amount of air time if the early winter ranges are to be properly delineated and protected.
2. Reproduction and population dynamics. We need to know why the reproductive rate of caribou in Region III is below the potential for the species. This will mean a long-term effort to relation reproductive performance and mortality of populations to ecologic factors. Population statistics will be obtained from inventory flights and from specimens of hunter-killed animals; numbers of caribou are too small to justify taking a large number of specimens for study. Ecologic conditions to be studied will include characteristics and timing of winter snow packs from available weather statistics, summer temperature patterns, logging history of caribou ranges, and wild fires on the same ranges.
3. Methods of evaluating caribou winter range. Several methods of estimating lichen loads on caribou winter range have been proposed. At present, none of these are entirely satisfactory and, in addition, even though lichen loads may be estimated, the importance of other factors in determining winter distribution is not know. It is proposed to investigate the use of aerial photography in relating winter use to vegetative types and to snow pack characteristics.

There are, of course, many other aspects of caribou ecology that need to be investigated. Some of these are being studied in other regions or will be studied elsewhere. The three topics listed are basic to caribou management in Region III and will be investigated here if answers are not available from research carried on elsewhere.

APPENDIX I

RESERVE AREAS NEEDED TO PROTECT CARIBOU RANGES IN REGION III

MANAGEMENT UNIT 3-24 (Spallumcheen S.Y.U.): The known winter range south of Greenbush Lake and the potential caribou range to the north should be protected.

MANAGEMENT UNIT 3-34 (Eagle S.Y.U.): Headwater drainages of Wap Creek in the south east corner of the S.Y.U. should be protected at present. It is not known whether this population can be sustained and it may be possible to delete parts of this reserve in future.

MANAGEMENT UNIT 3-35 (Eagle S.Y.U.): Reserves are chiefly above 5,500' in Crazy and Bews Creek drainages with some additional medium or poor site areas down to 5,000'. Early winter ranges and migration routes in the Perry River valley will need some additional protection.

MANAGEMENT UNIT 3-36 (Shuswap S.Y.U.): Most timbered areas above 5,000' in the drainage of Myoff Creek and the headwater drainage of Ratchford Creek should be protected. The low elevation winter range associated with this population may be in the Columbia river drainage.

MANAGEMENT UNIT 3-37 (Adams S.Y.U.): A few caribou still use portions of this unit but there is insufficient remaining winter range to ensure a continuing viable population. No protective measures will be recommended for caribou range in this unit if caribou range in other units can be adequately safeguarded.

MANAGEMENT UNIT 3-38 (Shuswap S.Y.U.): Some potential caribou range exists but logging and fires have eliminated a large part of the range and there is no known caribou populations in this unit. No protective measures will be recommended for caribou range in this unit if caribou range in other management units can be adequate safeguarded.

MANAGEMENT UNIT 3-40 (Raft and North Thompson S.Y.U.): Remaining winter range in this management unit should be vigorously protected. The extensive sub-alpine flats between the headwaters of the Mad and Raft Rivers have some of the best capability to support caribou in the region. The caribou wintering ground at the headwaters of Peddie Creek is probably the most consistently used of the known wintering areas and is of prime importance to the well-being of the caribou that summer in Wells Gray Park. The migration route lying at the border of the Park in unit 3-44 must also be protected or this range will be of little use.

MANAGEMENT UNITS 3-41, 3-42 (North Thompson S.Y.U.): Caribou still winter in several isolated pockets in these management units. Logging of sub-alpine forests on the same scale that has occurred in the past 5 years will certainly eliminate these lands in the next twenty years**. Valley bottoms used in early winter have been extensively cut over** (e.g. Finn Creek and parts of the North Thompson) or are threatened with imminent logging (e.g. Tum Tum Lake). Since extensive logging has already seriously jeopardized the future existence of these caribou, it is probably unrealistic to propose protective reserves that may, in the long run, prove inadequate. It will be necessary to protect some low elevation wintering areas use by caribou from adjoining M.U. 3-44 when these can be properly delimited.

MANAGEMENT UNIT 3-44 (North Thompson S.Y.U.): The remaining caribou in this unit can be saved with strict adherence to a "no cut" policy in the designated wintering areas and in the known migration routes. Protection of the migration route on the eastern boundary of Wells Gray Park is of paramount importance.

APPENDIX II

This section outlines some wildlife species and values, additional to the caribou resource, that would be enhanced with protection of the mature sub-alpine forest. The total value of these resources may make it economically attractive to preserve caribou range in situations where the single value of the caribou resource would not warrant such protection.

MARTEN: The pine marten is considered to be a climax species although not to the same extent as the caribou. The greatest marten activity is in mesic spruce - alpine fir communities older than 100 years (Koehler et al 1975). The present value of marten fur is low, but it would only take a price rise comparable to that enjoyed by lynx, bobcat, fox, and coyote to make tapping competitive with logging of poor sites at high elevations. The forest - alpine transition zone is a highly preferred habitat in fall and summer but of lesser importance to marten during winter. Protection of the lower reaches of this zone would considerably enhance production of marten.

WOLVERINE AND FISHER: These two species show less dependence on mature forests than do marten but appear to reach greater densities in areas where there are at least some extensive areas of undisturbed climax vegetation.

GROUSE: Franklin and Blue Grouse winter in conifer stands although their requirement for mature or overmature s not so deprived as with caribou. However, there is little doubt that extensive logging of the sub-alpine would result in a depression in grouse numbers in that zone. In such drainages as the Raft, Mad, and Upper Adams, stands of high elevation mature alpine fir assume major importance to Blue Grouse for the lower slopes support few areas suitable for wintering.

GRIZZLY BEAR: This species is found in varying abundance in nearly all of the caribou areas. The grizzly uses mature sub-alpine forest as a preferred habitat at certain seasons of the year. When snows come to the high country in early fall, the conifer canopy protects the understory allowing bears to forage later there than elsewhere. This preference for forest fringe areas in the sub-alpine has been noted several times in Wells Gray Park in early fall.

Logging in grizzly habitat is harmful not only because of the removal of cover but also because increased access brings with it the problem of illegal killing. Where timber values are high, it would be unrealistic to attempt to exclude logging from grizzly habitat but the intrusion of marginal logging into caribou - grizzly range is equally unwarranted because of the limited range and numbers of these animals remaining in the southern part of the province.

NON-GAME SPECIES: There is a complex of birds found in greater abundance in mature and overmature sub-alpine forests than in the younger serol stages of this zone. These birds, especially such insectivorous species such as the Northern Three-Toed and Black-backed Three-Toed Woodpeckerts, are stabilizing factors in the forest ecosystem. The role of insectivorous birds in controlling insect outbreaks is poorly understood, but certainly decreasing numbers of woodpeckers and allied species that are predacious on the forest insects can only lead to more violent fluctuations in pest populations.

Hermit Thrush, Varied Thrush, Northern Three-Toed Woodpecker, Red-Breasted Nuthatch, Red Crossbill, White-winged Crossbill, and Pine Grosbeak would all benefit from preservation of large blocks of forested sub-alpine habitat. These species become less abundant yearly in the Raft S.Y.U. where logging has made severe inroads in remaining high elevation conifer stands.
DOWNSLOPE BENEFITS: Most of the better caribou wintering areas are above the altitudinal limits of productive forest sites, a short growing season and low temperature impose limits on tree growth. Lower on the slopes, trees have more favourable growing conditions and many medium sites are found. These sites could benefit from the upper areas being left in a treed condition to stabilize water and nutrient flows.

It should be emphasized that the largest part of the caribou wintering area is in Class 5 Forest Capability or worse in the BC Forest Inventory, and none is classified as good site in the BC Forest

Inventory. Kimmins (1972) has pointed out the dangers of logging in the thin organic soils of the high mountains and that subsequent rotations may be considerably longer than indicated by present standing crops. Because of the uncertainly of the length of rotation and the generally destructive effect of high elevation logging on other resource values, any move to slow down the extraction of timber from the high caribou range would appear to make good ecologic sense.

Bolle et al (1970) have pointed out the economic futility of silviculture inputs to stands with large rotation costs. Logging the high elevation stands that constitute caribou winter range can only be considered timber mining in the light of present economic conditions.

The non-hunting recreation potential of the sub-alpine forest is moderate to high, and logging would tend, in most cases, to diminish its value. The value of unlogged wilderness type areas will tend to increase rather than decrease as they become scarcer.

LITERATURE CITED:

BOLLE, A.W., R. W. Behan, G. Browder, W.I. Pengelly, R.W. Wambach, T. Payne, & R.W. Shannon, 1970. Report on the Bitterroot National Forest

EDWARDS, R.Y., 1954. Fire and the decline of a mountain caribou herd.
J. Wildl. Mgmt. 18:4 521-526

EDWARDS, R.Y. & R.W. Ritcey, 1959. Migrations of caribou in a mountainous area in Wells Gray Park, British Columbia. Can. Field Nat. 73:1 21 - 25

EDWARDS, R.Y., J. Soos, & R.W. Ritcey, 1960. Quantitative observations on epidendric lichens used as food by caribou. Ecol. 41: 425 - 431

EDWARDS, R.Y. & R.W. Ritcey, 1960. Foods of caribou in Wells Gray Park, British Columbia. Can. Field Nat. 74:1 3 - 7

FREDDY, Dave, 1974. Management guidelines for timber harvesting in caribou winter range in the southern Selkirk and Purcell Mountains. Report to BC Forest Service

FREDDY, D.J. & A.W. Erickson, 1972. Status of the Selkirk mountain caribou. Presented at the first international reindeer/caribou symposium, University of Alaska

KIMMINS, J.P., 1972. The ecology of forestry. University of British Columbia extension course

SCHROEDER, Gary J., 1974. Arboreal lichens: a discussion of their importance in the management of the Selkirk caribou. A report to the International Caribou Study Steering Committee.

APPENDIX III

Management Guidelines for Timber Harvesting in Caribou Winter Habitat in the Southern Selkirk and Purcell Mountains

Dave Freddy
Consultant Wildlife Biologist
BC Forest Service, Nelson

August 1974

The objectives of this report are to describe characteristics of caribou habitat and to identify basic guidelines for logging in drainages containing important segments of caribou habitat. This report should serve as an initial planning guideline for both Industry and the Forest Service. the information is primarily applicable to caribou habitat in the southern portions of the Purcell and Selkirk mountains.

I Characteristics of Caribou Habitat

The study of Selkirk caribou from February 1972 through April 1973 revealed specific areas utilized by caribou, and physical and vegetative characteristics of these areas. Habitat characteristics of areas utilized by caribou were:

1. Caribou almost exclusively inhabited areas at or above 4600 feet elevation with 83 percent of observed locations of caribou or tracks at or above 5000 feet elevation. Generally, the balsam fir - Engelmann spruce forest predominated in areas above 4600 feet elevation.

2. Caribou utilized two elevational habitat components: (a) low elevation habitat 4600 - 5000 feet in elevation was used from October into February and (b) high elevation habitat above 5000 feet elevation was used from March through September.

3. Caribou tracks were generally associated with areas of moderate relief such as basins, stream bottoms, and lakes. Caribou showed an affinity for slopes less than or equal to 35 percent, and for northern aspects (N, NE, NW, E).

4. Caribou wintering areas were primarily found in the mature Engelmann spruce - balsam fir forest. In BC,caribou primarily unitized spruce-balsam stands 130 years of age or older.

5. Caribou established movement routes between areas utilized within and between drainages.

6. Caribou fed on a variety of understory plants during October and November, while arboreal lichens of the genus *Alectoria* were utilized from October into May. Arboreal lichens were considered the critical winter food of these caribou because of the unavailability of other foodstuffs due to excessive snowpack depths. From May to September, caribou fed on understory vegetation.

7. Information suggested that balsam fir and Engelmann spruce were the most desirable tree species for producing arboreal lichens that would be available to caribou. Observations also suggested that arboreal lichen biomass tended to increase as timber stand age increased, and tended to increase, up to a point, as timber stand densities decreased. Furthermore, spruce - balsam stands in basins and stream bottoms appeared to produce larger amounts of available arboreal lichens than spruce - balsam stands located on sidehills.

The study concluded that maintaining movement routes and the suitable arboreal lichen producing mature spruce - balsam forest was essential to sustaining the Selkirk caribou herd. Primary threats to maintaining caribou habitat were identified as extensive clearcut logging, forest fires, and other surface developments.

II Management Guidelines for Timber Harvesting in Caribou Habitat

A. Low Elevation Caribou Habitat: 4600 - 5000 ft. elev. (Fig. 1)
TYPE AREAS: Low elevation habitat is generally found in moderately sloped basin, steam, or lake areas containing hemlock - cedar, hemlock - spruce - balsam, or spruce - balsam stands usually timber typed as HC, SBH, HBS, SB, or BS - 941, 841, or 831 (age class 7 stands may apply - 741 or 731).

1. Caribou Management Objectives
Maintain a mature (130 years or older) forest canopy to assure availability of understory plants used as forage by caribou from October into February. A mature canopy intercepts snow, thereby reducing the depth of snow on understory vegetation. A mature timber stand will also provide arboreal lichens for caribou as caribou become increasingly dependent on lichens for food as snowpack depth increases.

2. Timber Management Practices
Utilize wide stream and/or lake buffer strips to incorporate mature timber stands located in moderately sloped areas lying adjacent to a stream or lake. Locate clearcuts on adjoining sidehills (Fig. 2, 3, 4).

To function as low elevation caribou habitat, buffer areas should be no less than 5 chains wide; and, where topographic features or caribou use data indicate, preferable 10 - 15 chains wide (Fig. 2, 3). Within large low elevation habitat areas (10 - 15 chains wide) small clearcuts (< 20 acres) could be interspersed within the habitat area to provide forage for caribou prior to snow accumulation and to remove some mature timber. Small clearcuts should remove no more than 1/3 of the mature timber in the steam habitat area such that at least 2/3 of the habitat area always contains mature timber. Fringe timber around natural meadows within a stream zone should be left intact.

Buffer strips for low elevation caribou habitat would not necessarily need to be on both sides of a stream or lake, because low elevation moderately sloped areas may occur on only one side of a stream or lake. In the case of a stream, habitat type areas may change sides of the stream, resulting in an alternative reserve (Fig. 2).

B. High Elevation Caribou Habitat: above 5000 ft. elev. (Fig. 1)
TYPE AREAS: High elevation habitat is usually along streams and in headwater basins or lateral cirque basins within drainages. Timber stands are balsam - spruce mixtures timber typed as BS or SB - 941, 831, 841, 822, and Alpine Forest (age class 7 stands may apply - 741 or 731).

1. Caribou Management Objectives
Maintain mature spruce - balsam timber to provide essential arboreal lichens used for forage by caribou from March into May. Caribou move to high elevations in mid-winter to feed on arboreal lichens which are available above a deep snowpack.

2. Timber Management Practices
Logging is stringently restricted in this habitat component. In many cases, no logging would be recommended.

Certain spruce - balsam stands within headwater or lateral cirque basins may be logged if, after on site inspection, the areas are not suitable for caribou from the standpoint of topography, timber

type, and lichen availability. However, such specific sites are likely to be small and therefore cut-blocks should probably be 20 - 60 acres in size. Cut-blocks should be elongated or somewhat triangular in shape. If portions of the cut-block are narrow in width (3 - 5 chains), the cut-block will probably not be a barrier to caribou movement.

High elevation habitat along streams may be maintained by using buffer strips as discussed earlier. Within large high elevation (10 - 15 chains wide) habitat areas along streams, small clearcuts may be interspersed within the habitat area such that 2/3 of the habitat area always contains mature timber. High elevation habitat along streams can also serve as a movement corridor between headwater basins and low elevation habitat areas (Fig. 4, 2).

If constraints of windthrow, regeneration, and economic cost can be overcome, small patch cutting or group selection partial cutting may be feasible over larger areas of caribou winter habitat. Research is needed to insure that such partial cutting methods would not be detrimental to caribou from the standpoint of arboreal lichen production and availability.

C. Movement Corridors

1. Caribou Management Objectives
Maintain routes of caribou travel to insure continued patterns of caribou movement and range utilization between and within drainages. Within a drainage, movement routes occur within mature timber usually along the main stream and feeder streams such that high elevation basis and stream zone habitat areas are linked by movement routes. When moving between drainages, caribou usually utilize natural passes along ridges.

Mature timber usually provides snow conditions more suitable for caribou travel than non-timbered areas (often slash areas). Slash areas contain soft and unstable snow during early winter and spring which creates difficult travel conditions that can impair the movement of caribou.

2. Timber Management Practices
Maintain mature timber along travel routes (Fig. 4) such that a continuum of forest cover is provided between habitat component areas. Utilize stream zones as movement corridors. Locations of reserves along streams for caribou movement corridors may alternate sides of streams as in streamside habitat reserves (Fig. 2). Moderately sloped areas adjacent to the stream should be incorporated into movement corridor (Fig. 2). Corridors should be a minimum of 3 - 5 chains wide.

D. Harassment Control

1. Caribou Management Objectives
Control the potential for human harassment or illegal hunting of caribou, especially from October through April when caribou group sizes tend to be largest.

2. Timber Management Practices
Fall and/or winter logging may be restricted in certain habitat areas. Road closures may be necessary in portions of drainages. Snowmobiles may be restricted from using specific high caribou use areas.

Fig. 1: Schematic distribution of caribou habitat components in a typical stream drainage showing seasonal use of habitat components by caribou.

Fig. 2: Schematic example of moderately sloped caribou habitat (dotted) along a stream zone and possible timber harvest locations (hatched).

Fig. 3: Stream buffer zones used to incorporate caribou habitat in wide stream bottoms (top) and narrow stream bottoms (bottom).

Fig. 4: Location of timber harvest (dotted) in a drainage containing caribou habitat (hatched).