

## Status of woodland caribou in western north America

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*Abstract:* A review of current population size and trends of woodland caribou (*Rangifer tarandus caribou*) in seven jurisdictions in western North America shows a wide range of situations. A total maximum population estimate of woodland caribou west of the Ontario/Manitoba border is 61,090. Of 44 herds or populations described in this review: 14 are stable; two are stable to slightly decreasing; four are decreasing; four are increasing; and 22 are of unknown status. Caribou are classified as a threatened species in Alberta and as an endangered species in Washington/Idaho. The decline of caribou in North America following settlement (Bergerud 1974) has continued along the southern edge of woodland caribou distribution. Direct loss of habitat to logging, mines and dams continued throughout the 1960's, 1970's and 1980's. The secondary effects of these habitat changes, (i.e. increased roads leading to increased hunting and poaching, and increased early succession habitat leading to increased alternate prey/predator densities) has led in some cases to the total loss or decreased size of local herds. Three ecotypes of woodland caribou are described and their relative distribution delineated. These ecotypes live under different environmental conditions and require different inventory and management approaches. Woodland caribou herds in northern B.C., Yukon and N.W.T. generally are of good numbers and viable (stable or increasing), and management primarily is directed at regulating human harvest and natural predation to prevent herd declines. Land use activities such as logging or energy development are not extensive. Managers in southern caribou ranges stress the need for a better understanding of caribou population stability within mixed prey/predator regimes; how habitat changes (eg. through logging) affect these regimes; and how to develop effective land use guidelines for resource extraction that can sustain caribou populations and maintain resource industries. Caribou managers have suggested that herds may be prioritized for research and management efforts. Unstable, remnant populations may be left to their own fate. The limited research dollars available and difficult management decisions should be applied to caribou herds that are apparently sustainable and provide the greatest potential for long-term viability.

**Keywords:** woodland caribou, population site, trend, ecotype, populations, population dynamics.

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### Introduction

Woodland caribou (*Rangifer tarandus caribou*) generally do not form very large aggregations but tend to be dispersed at low densities throughout their range. This does not imply that they never aggregate, as most studies of woodland caribou have shown seasonal changes in group size. However in comparison to barren ground caribou (*Rangifer tarandus groenlandicus*) or Alaskan caribou (*Rangifer tarandus granti*), woodland caribou are more dispersed, particularly at calving time, and their seasonal movements are not as extensive. As well, I believe that woodland caribou in western North

America fall into three ecological variants or ecotypes (Figure 1):

1. mountain/terrestrial ecotype inhabits mountainous terrain where moderate snow depths allow for primary winter foraging on terrestrial lichens.
2. mountain/arboreal ecotype inhabits mountainous terrain where deep snow necessitates primary winter foraging on arboreal lichens, and
3. boreal ecotype inhabits fens, muskegs and jack pine or lodgepole pine habitats of the boreal forest (primarily terrestrial lichen for winter diet).

Table 1. Population estimates of woodland caribou for 7 jurisdictions in western North America for 1979, 1985 and 1991 (population estimates are maximums).

Year of estimate	Jurisdiction							Total
	Manitoba	Saskatchewan	Alberta	British Columbia	B.C./Wash./ Idaho (Selkirk Herd)	Yukon	NWT	
1971 <sup>1</sup>	3,600	<.....5,000.....>		10,000	25	14,700	10,000	43,325
1985 <sup>2</sup>	5,000	2,500	3,000	5,700 <sup>3</sup>	30	26,500	5,000	47,730
1991	2,000 <sup>4</sup>	2,500	3,300	17,000	60 <sup>5</sup>	26,230 <sup>6</sup>	10,000	61,090

<sup>1</sup> Bergerud, A.T. 1980. Status of *Rangifer* in Canada. 1. Woodland Caribou (*Rangifer tarandus caribou*). In Proceedings of the 2nd International Reindeer/Caribou Symposium, Røros, Norway, 1979. Direktoratet for vilt og ferskvannsfisk, Trondheim, Norway. pp 748-753.

<sup>2</sup> Williams, M.T. and D.C. Heard. 1986. World status of wild *Rangifer tarandus* populations. In Proceedings of the Fourth International Reindeer/Caribou Symposium, Whitehorse, Yukon, 1985. *Rangifer*, Special Issue No. 1, 1986. pp 19-28.

<sup>3</sup> This does not reflect a 50% decline but is more likely the result of incomplete data from the Prince George, Kamloops and Fort St. John/Fort Nelson Regions.

<sup>4</sup> Does not include large tundra associated herd (Pen Island herd).

<sup>5</sup> This herd has been augmented with 60 caribou transplanted from central B.C. since 1987.

<sup>6</sup> Three herds that range across the Yukon/Northwest Territories border are included in Northwest Territory estimate (would increase the Yukon estimate by 10,000).

Stevenson and Hatler (1985) describe two ecotypes for British Columbia; a northern ecotype and a mountain ecotype which are the mountain/terrestrial and mountain/arboreal ecotypes, respectively. This distinction does not imply subspecies differences but recognizes the different adaptations to habitat variation by woodland caribou in western North America. Inventory and management of these woodland caribou ecotypes may vary, as well as the impact of industrial development on their habitat and population parameters.

In this paper, I discuss the population status and distribution of woodland caribou in Manitoba, Saskatchewan, Alberta, British Columbia, Idaho, Yukon and N.W.T. A brief description of woodland caribou status is presented by jurisdiction and summary of the concerns expressed by caribou biologists for the future viability of woodland caribou in western North America. Information was provided by caribou biologists and managers from each jurisdiction and their assistance was greatly appreciated. More information was provided than can be covered in the main text of the paper. Therefore, a more

detailed synthesis of this information is presented in Appendix 1 to 6 and the person providing the information acknowledged.

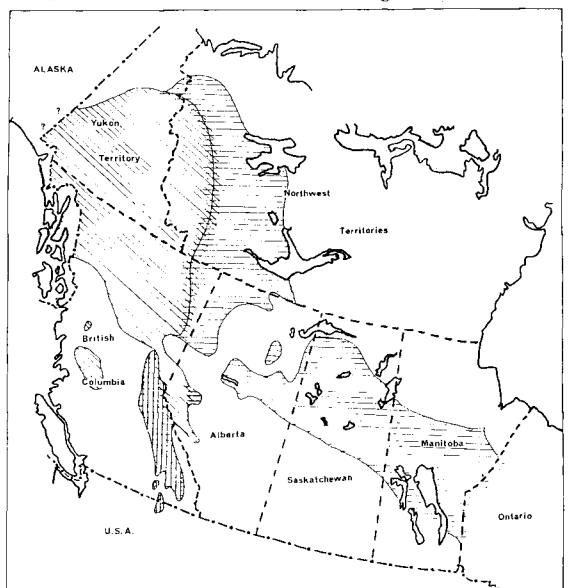


Fig. 1. Mountain/Terrestrial Ecotype  
 Mountain/Arboreal Ecotype  
 Boreal Ecotype

## Past

It is generally accepted that woodland caribou numbers have declined throughout North America following settlement. Bergerud (1974) attributes much of this decline to overhunting and increases in predation. Habitat changes in the southern portions of caribou range due to logging, clearing and fires resulted in an increased abundance of deer and moose with corresponding increases of wolves and greater predation related mortality of caribou.

In the last half of this century the decline in numbers and distribution of woodland caribou along their southern range has continued though perhaps slowed somewhat. Again, overhunting associated with the increased access has been strongly implicated in these declines. As well, expansion of moose and deer in response to changes in caribou habitat has resulted in increased predator numbers and a corresponding decline in caribou numbers. Bergerud's (1980) assessment of woodland caribou status in Canada noted these factors for some of the herds in British Columbia. He estimated the population of woodland caribou west of the Ontario/Manitoba border to be 43,300. Williams and Herd (1986) in their assessment of the world status of wild *Rangifer*, estimated 47,700 woodland caribou west of the Ontario/Manitoba border. Table 1 shows changes in population estimates that have occurred between 1979 and 1990 by jurisdiction.

## Current

Table 2 provides a summary of caribou population estimates and status by jurisdiction and some information for judging the estimate's reliability. Detailed information for each jurisdiction is provided in Appendices 1 - 6. A brief summary by jurisdiction follows.

### Manitoba

Woodland caribou number about 2000 and occur in the central portion of Manitoba. Population estimates are based on aerial surveys and occasional observations of herds by departmental staff during winter. This population estimate is lower than previous estimates (Bergerud 1980; Williams and Heard 1986) and may reflect that the 1991 estimate does not include two large northern herds that behave like bar-

ren-ground caribou. Presently funding is low relative to other species for inventory programs but co-operative work with industry may improve this situation.

Sport harvest (20-25 animals annually) and subsistence harvest (50 animals annually) are low. Increased access related to resource extraction is a concern with respect to hunting. Predation by wolves is not considered to be a major problem in winter ranges, but wolves and black bears may be a factor on summer ranges or while travelling to summer ranges. Crichton (pers. comm.) expressed a concern that white-tailed deer infected with meningeal worm (*Paraelaphostrongylus tenuis*) may invade caribou range, in response to habitat alteration from logging or fire. Recent mild winters appear to be associated with increased sightings of deer further into caribou range.

Presently, habitat is not a limiting factor. Where timber harvest is planned in caribou habitat there is a recognized lack of information about individual herds that can allow wildlife managers to provide meaningful input to forest management planning. Co-operation between the forest industry and wildlife interests is apparently good and a concerned, informed public supports the goal of maintaining woodland caribou in Manitoba.

### Saskatchewan

Kelsall's (1984) population estimate of 2500 woodland caribou in Saskatchewan still holds. The herds are believed to be stable though localized, remnant herds along the southern boundary of distribution may not be recoverable. This population estimate is primarily based on incidental observations during aerial surveys, interviews, hunter and trapper reports. Caribou numbers and distribution have declined in the past 25 years along the southern portion of woodland caribou range. This decline was coincident with a northern expansion of agriculture and logging and overhunting of local bands (Trottier 1988a, 1988b).

Sport hunting was closed in 1987 with a commitment to the sportsmen of Saskatchewan to derive a provincial population estimate and a management plan for the species. To date the assessment work only has been done, i.e. literature reviews, habitat loss to fire and logging and a few aerial surveys (Rock 1988). Operating funds for inventory or research are minimal.

Caribou have traditionally been a low priority species for management dollars and manpower. T. Rock (pers. comm.) believes that woodland caribou populations in Saskatchewan are still viable but that management of portions of the boreal forest for caribou only (i.e. not for moose or deer) is required to ensure their future viability. Changes in the pulp industry and a depressed mining industry has resulted in a recent moderation in road building and habitat loss.

#### Alberta

Current population estimate for woodland caribou in Alberta is 3300. Caribou sport hunting was closed in 1981. In 1985 a review of past and current knowledge of caribou numbers and distribution, and an assessment of future vulnerability of their habitat to logging, oil and gas activity and coal mining resulted in woodland caribou in Alberta being designated a threatened species.

Table 2. Woodland caribou population estimates by jurisdiction in western North America, based on most current surveys or assessment.

Jurisdiction	Population estimate	Status	Time period of Data collection	Notes
1. Manitoba	2000	stable	1970-1990	Population estimate is based on aerial surveys and incidental observations.
2. Saskatchewan	2500	unknown	1985-1990	Population estimate is based on incidental sighting information and a few localized surveys.
3. Alberta	3300	west central Alberta herds appear stable; rest of Alberta, status unknown	1980-1990	Caribou are classified as a threatened species. Population estimate is based on old (1975 to 1983) and sporadic transect surveys, except in west central Alberta where a population estimate of 300-400 is based on annual total count surveys conducted since 1981 (mount/terrestrial ecotype).
4. Selkirk herd	50-60	stable to slightly decreasing	1983-1990	Caribou are classified as an endangered species within U.S. jurisdictions. Transplants to this herd from central B.C. have occurred since 1987.
5. Yukon Territory	20,400-26,230*	of 18 recognized herds, five are stable, two are increasing, three are declining and eight have unknown status	1977-1990	Ten of 18 herds have been inventoried in the past 5 years or are currently being inventoried using total count or extrapolation survey methods.
6. Northwest Territories	7,000-10,000	stable or unknown	1990	No research studies or inventory of woodland caribou have been conducted in N.W.T. The population estimate is a guess and is an estimate for the Mackenzie Mountains area only.
7. British Columbia	13,800-17,000	Mountain/terrestrial ecotype - stable Mountain/arboreal ecotype - stable to decreasing	1980-1990	Population estimate is improving but is still based on a variety of methods from repeated aerial surveys to a guess. Some overlap of B.C. and Yukon herds in the northwest.

Total 49,050 - 61,090

\*Three herds that range across the Yukon/Northwest Territories border are included in the Northwest Territories estimate.

Caribou inventory and management studies were minimal to non-existent in Alberta until 1980, when intensive long-term studies of caribou (mountain/terrestrial ecotype) in west-central Alberta began. In 1990, with large areas of forest land allocated for new or expanded pulp mills and renewed intensity in petroleum and natural gas exploration and development, the Alberta Fish and Wildlife Division began baseline studies and inventory of caribou in northern Alberta. This data collection comes late as meaningful input to develop timber harvest guidelines, and access and seasonal activity plans for petroleum and natural gas activity is needed now. «Adaptive» management programs will be implemented and their success or failure is dependent upon adequate monitoring of caribou response to management guidelines.

As inventory begins throughout caribou range in Alberta, we may find more caribou and our present population estimate may rise. However, the threat to caribou habitat remains serious and maintaining population levels will be difficult.

#### *Yukon*

Yukon presently estimates a woodland caribou population of 27,400 to 36,200 (this includes herds that overlap with the Northwest Territories). Ten of 18 recognized herds have been surveyed (either total count or extrapolation method) in the past six years. Remaining herd estimates are based on surveys or guesses. Of the 18 herds, five are stable, two are increasing, three are declining and eight have unknown status.

Prior to 1980, little was known and little done to learn about woodland caribou herds in the Yukon. Since 1980, studying and managing woodland caribou has become a substantial component of Yukon's big game management program. As woodland caribou are considered to be a very important resource to the Yukon public, this situation is likely to continue if not improve.

Long-term study and intensive management of one herd, the Finlayson Herd, is a key part of caribou management, providing additional knowledge to better assess to continual baseline inventory studies of other herds (Farnell and McDonald 1987).

#### *The Selkirk population - Washington, Idaho and British Columbia*

The international boundary Selkirk population was estimated to number 100 to 200 animals from 1900 to 1950. By the 1970's and early 1980's the population had declined and apparently levelled off at about 25-30 animals. This herd, designated and endangered species in 1984 has received considerable management attention in the past 20 years. This has included a 20 year moratorium on logging remaining old-growth cedar/hemlock forest in caribou range. From 1987 through 1990 the herd was augmented with 60 caribou from central British Columbia. This agumentation effort is currently being evaluated with no final determination of success or failure. Preliminary information suggests that predation may be having a significant impact. Information on the status of this herd was provided by B. Compton, Idaho Fish and Game, Bonner's Ferry, Idaho.

#### *British Columbia*

Presently, B.C. has 13,800 to 17,000 caribou, of which 88% (12,000 to 15,000) are described as the mountain/terrestrial ecotype distributed primarily in the northern third of the province. There is some overlap of population estimates for caribou herds along the Yukon border in northwestern B.C. The mountain/arboreal ecotype number about 1900 to 2000 and are distributed within southeastern British Columbia. This is an increase over the estimate of 1450 reported by Stevenson and Hatler (1985). This increase is largely due to improved inventory rather than a substantial biological increase (Stevenson pers. comm).

The mountain/terrestrial herds appear to be stable with predation being the primary limiting factor. Hunting consists of bull or trophy bull seasons only. Caribou in the northwest areas are presently little affected by logging or mining but caribou range in northcentral and northeastern areas are presently being logged or will be logged in the near future. Oil and gas development and mining also impact caribou range in northeast British Columbia. It is expected that caribou numbers will decline where extensive logging occurs on their winter range.

The caribou herds of the mountain/arboreal ecotype vary considerably with respect to status. The southern herds have declined in both numbers and distribution since historic times

but in recent decades this decline has slowed and most herds are described as stable. Hunting is closed in many areas or is on a limited entry/bull only basis. Fire suppression has helped to maintain old-growth habitat but logging of critical winter habitat continues to be the primary concern.

Mountain/arboreal caribou in central B.C. appear to have increased since the 1970's. The Quesnel caribou herd is a well documented exception and has declined dramatically due to wolf predation. Predation levels have increased due to a recent increase in wolf numbers (Seip in press). Mountain/arboreal herds in the Prince George area have increased since the 1970's but long term viability of these herds is of concern as timber harvest encroaches on the old-growth arboreal-lichen forests of their winter range. Hunting seasons are closed, except for the Quesnel herd, where an open bull season has an average harvest of two.

#### *Northwest Territories*

Any population estimate of woodland caribou in N.W.T., past or present, is a guess based on local knowledge. The maximum population estimate of 10,000 is for the Mackenzie Mountains herds (mountain/terrestrial ecotype?) which also range into Yukon Territory. Numbers of woodland caribou within the boreal forest is unknown. No research or inventory programs are planned for the future.

Woodland caribou populations receive low hunting pressure (sport and subsistence combined). Industrial activity and its associated access within woodland caribou range is minimal and is not expected to increase dramatically in the future so harvest levels should remain low. If increased access does occur, opportunistic hunting could increase. However, this situation may be tempered with falling fur prices and rising fuel costs, leaving local people with less reason to be on the land. The future of woodland caribou populations in N.W.T. looks healthy.

#### **Comments**

Since the reviews of woodland caribou population size by Bergerud (1980) and Williams and Heard (1986), it appears that numbers in western Canada have increased, primarily in northern British Columbia and Yukon. Some of this increase is based on incomplete data from

northern British Columbia in 1985, however improved inventory in both of these areas appears to be the main reason for increased estimates. Total numbers in Alberta, Saskatchewan and Manitoba have remained about the same. Should inventories begin in the Northwest Territories it may prove that the estimate of 10,000 is indeed a conservative one. Yukon, Northwest Territories and northern British Columbia appear to hold the most numerous and possibly most viable populations of woodland caribou in western North America.

The boreal regions of northern Alberta, Saskatchewan and Manitoba presently have low numbers of caribou thinly scattered (boreal ecotype). Along the southern edge of distribution, herds are vulnerable to increasing resource exploration and development.

Managers in northeastern British Columbia, most of Alberta, Saskatchewan and Manitoba need baseline inventory data on herd size, status and range delineation to provide meaningful input to land use planning in caribou range. The affects on caribou populations of increased access, changing predator/prey relationships and loss and recovery of lichen producing habitat will be or should be assessed as resource exploitation activities progress into caribou range.

The mountain/arboreal ecotype of southern British Columbia has decreased in distribution and numbers since historic times but that decline has slowed in recent decades. However, as low elevation timber supplies diminish, the need to keep mills operating will require greater exploitation of remaining caribou habitat. All the problems associated with logging, increased access, direct loss of habitat and changing predator/prey relationships are expected to precipitate renewed declines.

Yukon, Northwest Territories and northwestern British Columbia primarily need to manage caribou populations (mountain/terrestrial ecotype) to ensure that human harvest, when added to natural mortality, does not drive a herd into decline. The intensive study and management of the Finlayson herd in the Yukon will provide the kind of information needed to manage a herd that experiences both human harvest and natural mortality. As well, as multi-prey/predator study that has been initiated in Spatsizi Provincial Park, British Columbia may shed further light on the role of moose and wolves in depressing caribou populations.

Research and inventory of caribou in British Columbia (primarily on the mountain/arboreal ecotype) increased dramatically in the 1980's. Three workshops on caribou research and management have been held since 1985 (Page 1988; Hebert 1990), and a thorough review and assessment of woodland caribou and their habitat in southern and central B.C. was completed (Stevenson and Hatler 1985). These forums of information exchange and problem-solving resulted in recommendations for further research needs. Some of the recommendations that arose repeatedly were: improved inventory methods, a need to better understand how caribou fare within multi-predator/prey systems, predation and its relationship to man-caused changes in caribou habitat, and lichen regeneration after logging.

Overall, there are still good numbers and viable populations of woodland caribou in western North America. However, along their southern range they continue to decline in numbers and shrink in distribution. We have not been very successful in maintaining caribou populations where their habitat has been altered or lost through resource exploitation. Management tools, like predator management or access control are difficult, if not impossible to implement and few battles have been won to save caribou habitat from timber harvesting or mining.

Several caribou managers have stated that if you can't adequately manage a herd or population then let them go, and most would agree that priorities must be set. Not all remnant herds can be maintained. The limited dollars available and the energy required to see difficult management decisions through to completion should be applied to herds that have the most potential for long-term viability. Priorities and the basis for establishing them will differ among jurisdictions.

### Acknowledgements:

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## Appendix 1.

*Manitoba Report - V. Crichton, Manitoba Department of Natural Resources, Winnipeg, Manitoba.*

Historically, woodland caribou ranged south to 58° latitude along the eastern edge of the province into Minnesota. Development activities over the years have resulted in the demise of caribou in the southeastern portion of the province. As well, this disappearance was probably associated with the nematode *Parelaphostrongylus tenuis*, a parasite which invaded the province with white-tailed deer (*Odocoileus virginianus*) about the turn of the 20th century and is extremely pathogenic to woodland caribou.

Management activities until the mid 1970's were restricted to aerial surveys in the more accessible hunting areas, manipulation of hunting seasons and restrictions on the number of licenses available. In the past 15 years, radio telemetry studies have been initiated on discrete herds to obtain data for management purposes, primarily with respect to timber harvest.

The current population estimate is about 2000 and the distribution delineated on Figure 2. Insufficient funding to adequately survey the herds makes reliable population estimates difficult to obtain and the profile of woodland caribou, relative to other game species is low. Mortality factors affecting woodland caribou in Manitoba are licensed and subsistence hunting, predation and other natural causes. Improved access into caribou range resulting from industrial development, is a concern with respect to increased hunting.

It is certain that more development activities will occur and with this more effort must be expended to determine population numbers as well as annual ranges of those herds affected. An examination of woodland caribou range in Manitoba does not lead to the conclusion that habitat is a limiting factor. Caribou ranges need to be identified, delineated and assessed for their vulnerability relative to long term development plans of hydroelectric and logging companies, and government proposals for new access roads.

Development activities in areas frequented by caribou such as tourist establishments, logging, winter roads and all weather roads have to date caused little disturbance to caribou directly. The indirect effects such as increased hunting

activity are of major concerns and «no hunting» corridors along new roads may have to be applied.

The identification of significant wood fibre within caribou range is required in order to assess destruction of habitat, increased harvest vulnerability due to increased access and increased predation resulting from easier access. Hristienko (1985) summarized the literature relevant to the impact of logging on caribou. In 1986, a study to determine the impact of logging on woodland caribou in eastern Manitoba was initiated and is near completion. Loss of merchantable timber outside of caribou range to wild fire could result in greater pressure to harvest timber in caribou range.

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## Appendix 2.

*Saskatchewan Report - T. Rock, Departement of Parks, Recreation and Culture, Wildlife Branch, LaRonge, Saskatchewan.*

There is no population estimate of woodland caribou in Saskatchewan prior to the 1980's. However, by the 1950's it was believed that caribou numbers were increasing in this assessment was associated with a hunting closure and low wolf numbers. A study completed in 1959 in the Sled Lake area estimated a density of 0.14 caribou/km<sup>2</sup>. Figure 3 shows historic and current caribou distribution.

The current population estimate is 2500 and herd size has been reduced to individuals in some areas of the commercial forest, east of Prince Albert National Park, particularly along the forest/agriculture boundary and east of 104° longitude and north of 53° latitude. Group size declines with increasing latitude.

Historically the following factors have influenced woodland caribou population size and distribution:

1. The first pulp mill in Saskatchewan began operation in 1966. Road development associated with forestry and increased mining activities has contributed to increased mortality due to hunting. Rate of road building has decreased since the mid 1970's.





2. Cessation of wolf control programs in the 1970's. The last organized wolf control effort was in 1969.
3. Advent of snowmobiles in accessing caribou range which in turn can result in increased unregulated hunting and frozen, packed trails for easier wolf movement.
4. Mild winters in the 1980's resulted in an increase of deer populations in the boreal forest, in turn providing a higher prey base to support greater numbers of wolves.
5. Severe winters (combined deep snow and short growing seasons) in 1971/72 and 1973/74 with associated poor calf survival as reflected in low calf harvests in 1972 and 1974.
6. Non-resident woodland caribou hunting took place between 1970, 1971 and 1972. Success rates were very high.
7. Desiccation of bogs resulting in increased shrub and tree growth and corresponding increase in deer numbers.
8. From 1972 to 1976 moose licences were limited by a draw system and moose hunters began to hunt in groups with one licence per group. Because each hunter required a big game licence, others in the group purchased a caribou tag. The highest ever caribou kill occurred in 1971 and remained high through to 1976.
9. Habitat loss due to logging and fire (bad fire years were 1970, 72, 73, 80 and 81). Viable herds of woodland caribou still exist in Saskatchewan but remnant populations along the southern range may receive little management effort in order to concentrate on maintaining the existence of healthy, stable or undisturbed populations. Both moose and caribou cannot be managed for high numbers on the same land base. Forest management for caribou only, must be considered.

### Appendix 3.

*Alberta Report - Janet Edmonds, Fish and Wildlife Division, Edson.*

Prior to the 1960's knowledge of caribou distribution and abundance was provided through incidental observations of forest officers, guides, hunters, trappers, etc. Dwyer (1969) in an historical review of the caribou population in Alberta, stated that caribou numbers and distribution have declined substantially since early 1900's

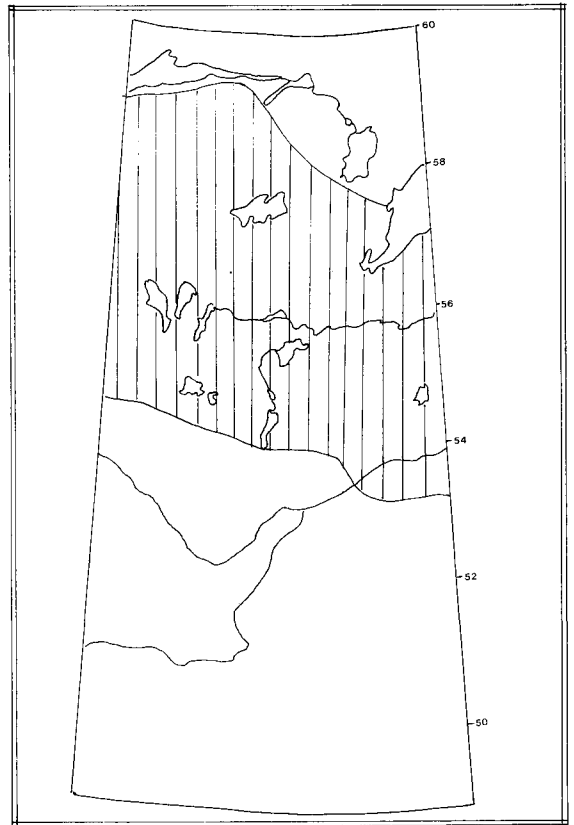



Fig. 3. Distribution of woodland caribou in Saskatchewan. 

and that careful management of this species and its habitat is of paramount importance to their survival. Stelfox (1966) estimated a provincial caribou population of 6,860 to 9,060. Lynch and Pall (1973) revised this estimate to 4,800 to 5,200. The current provincial population estimate of 3,300 is primarily based on guess work as only four herds have been surveyed in the past 5 years. Figure 4 shows current and historic caribou distribution and Table 3 provides a population estimate break down.

Primary factors associated with the decline of woodland caribou in Alberta were overhunting, predation and habitat loss to logging, agriculture and coal mining. Extensive roads and seismic lines associated with petroleum and natural gas exploration and development greatly increased hunting and poaching levels through the 1960's. Concern for caribou in Alberta has increased steadily throughout the 1980's, in particular with respect to the recent allocation of large areas of forest lands in northern Alberta to new or expanded pulp and paper mills. Since 1980 caribou inventory and research primarily

Table 3. Alberta caribou herd population estimates as of January 1991.

Caribou management area	Number of caribou
1. West-Central	400
2. Chinchaga/Dixonville	250
3. Bistcho Lake	300
4. Caribou Mountains	500
5. Birch Hills	400
6. Fort McMurray	300
7. Wabasca/Red Earth	600
8. Slave Lake	100
9. Primrose Lake	250
10. Jasper	250
<b>Total in Alberta</b>	<b>3350</b>

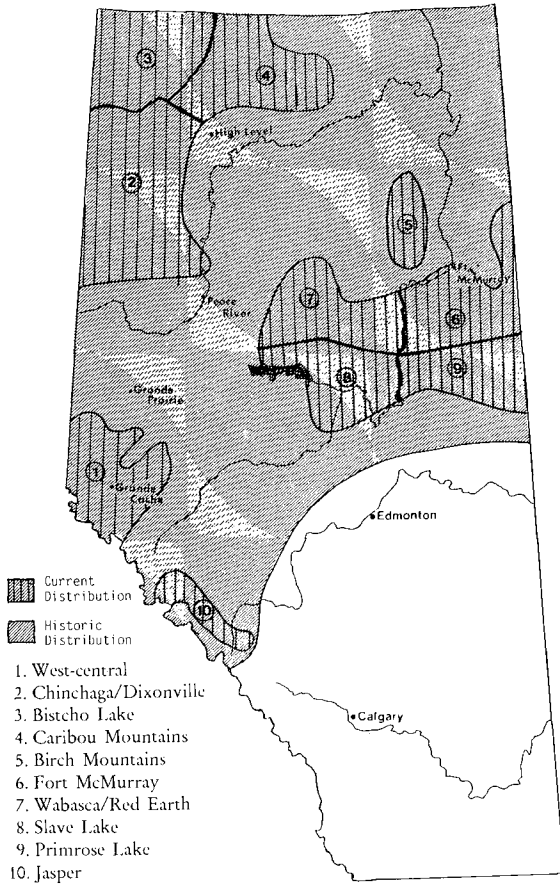


Fig. 4. Caribou Management Areas

was focused on a migratory mountain caribou herd residing in the Grande Cache area of west central Alberta. However, beginning in 1991

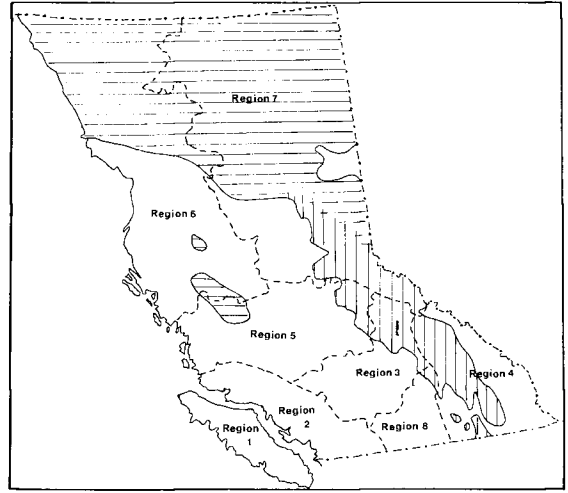




Fig. 5.  Mountain/terrestrial ecotype  
 Mountain/arboreal ecotype

collection of baseline data on herd numbers and distribution and seasonal ranges began in northern Alberta. The imminence of industrial activity determines which herds will be assessed first. Development of guidelines to protect and maintain caribou habitat while extracting timber, oil and gas and mineral resources is ongoing, experimental and will require a commitment to long-term monitoring to assess their success. After many years of benign neglect caribou populations in Alberta are receiving the management time and dollars they need.

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### Appendix 4.

#### *British Columbia Report*

Region 3 Thompson-Nicola (Southern Interior) - D. Low, Ministry of Environment, Fish and Wildlife, Kamloops, British Columbia.

Prior to 1970, woodland caribou (mountain/arboreal ecotype) numbers in this region (Fig. 5)

were estimated to be 250 to 500. Declines were associated with logging and fires but severe winters also affected herd growth. Mature timber canopy and its influence on snow conditions are and were an important factor affecting caribou mobility and food supplies.

Based on 1990 surveys, the caribou population is 500 of which 250 are associated with Wells Grey Provincial Park (Low 1990). Fire suppression appears to have improved range quality, particularly maturing forests important for late winter range. However, because logging removes old growth systems which are critical to caribou in wet forest zones, the rate of harvest and replacement of the stands will determine the changes in caribou population over the long term. The hunting season for caribou was closed in 1983. Presently no management dollars are allocated to caribou. Protection of habitat is handled through the «forestry referral» systems on a cutblock and road access basis as well as five year cut plans. An area has been set aside adjacent to Wells Grey Park to protect high elevation late winter ranges from logging. Fire suppression continues. Snow mobile activity is causing some concern.

**Region 4 Kootenay** - G. Woods, Ministry of Environment, Fish and Wildlife, Nelson, B.C.

Population trend for the mountain/arboreal ecotype since the distance past has been downward. Indications are that there may have been two or three times more caribou in this region (Fig. 5) around 1900. The Mica Reservoir is believed to have had a serious impact on caribou on the Rockies east of the Mica Dam. By the 1960's caribou in the southern Monashee Mountains seem to have disappeared. Distribution in the Selkirk and Purcell Mountains has not changed significantly but numbers have declined. Logging may have been a factor in this decline but it is difficult to confirm. Hunting is believed to have been excessive with increased access increasing hunting success. Seasons were reduced considerably in the 1960's.

Current population estimate of caribou in the Kootenay Region is about 600. Logging and loss of early winter habitat is believed to be a local problem now and a major problem for the future. Hunting is no longer a significant factor and predation by cougar may be an increasing factor. Deer numbers are higher and

deer, elk and moose have expanded their distribution throughout much of the Region.

Future management efforts will be directed at maintaining habitat until caribou habitat requirements are well understood. Recent concerns about cougar predation need to be addressed. Land use decisions need to be made, based on whether the public want to maintain caribou throughout their historic range, and then the costs accepted for which ever course is chosen.

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**Region 5 Cariboo (Northern Interior)** - T. Smith, Ministry of Environment, Fish and Wildlife Division, Williams Lake, B.C.

This region (Fig. 5) has 2 main herds; the Quesnel Herd (mountain/arboreal ecotype) and the Itcha-llgachuz Mountain Herd (mountain/terrestrial ecotype). Prior to 1975 the Itcha-llgachuz herd was estimated to be around 350 caribou with a stable or slightly increasing status. Presently it is estimated to be about 1,400 in number and stable to slightly decreasing. This herd has expanded its winter range further in the lowland pine forests. Portions of this herd's winter range is scheduled for logging, wolf numbers appear to have increased within its range and it is expected that declining numbers in caribou will follow. The Itcha-llgachuz herd has a trophy bull season (25-30 annual harvest) and 40 cow permits (<5 harvested annually) for residents are issued. Thirty caribou from this herd were transplanted to Idaho in 1987 to

1989. Chichowski (1989) presents data on the status of this herd and its seasonal range use. The Quesnel herd was estimated to have 300 to 400 caribou prior to the 1970's. A spatial overlap of moose into caribou range and increases in wolf numbers has resulted in a sharp decline in this herd to about 100 (Seip in press). Predator management is required to prevent the loss of this herd. Conflict with snowmobile activity in spring range is also a potential concern.

Region 6 Skeena - R. Marshall, Ministry of Environment, Fish and Wildlife Division, Smithers, B.C.

Prior to the 1960's there was an estimated 10,000 to 12,000 woodland caribou (mountain-/terrestrial ecotype) in this region (Fig. 5). A major decline was suspected in the mid to late 1970's based on low calf percentages (4-12%) in several surveyed herds, and predation (grizzly and wolf) was perceived to be the main factor involved with this decline. Currently, there are estimated to be about 4,000 to 6,000 caribou in the Skeena Region, although no inventories have been carried out. Predation is assumed to be the primary limiting factor on herds. About 175 bulls are harvested annually (5 point restriction), and this is believed to have little effect on the herds (based on limited data, pregnancy rates are 85% or more).

Most of the northern Skeena Region herds are not, and for the foreseeable future, will not be adversely affected by man's activities. Logging and mining activities are not extensive. The two remaining southern herds (Telkwa and Tweedsmuir) are more likely to be affected by future logging activities. Timber harvesting is occurring along the primary migration route and will occur in 2-4 years in the primary winter range of the Tweedsmuir herd. Mid-elevation logging in the Telkwa Mountains may impact winter habitat of this small herd (75 animals).

Predation appears to be the main limiting factor of all herds. Additional research is required on multi-predator/prey systems. The Spatsizi Association for Biological Research is undertaking studies at present and results can be applied to our northern herds. In addition to research on predators of southern caribou, research is required on the impacts of forest harvesting on terrestrial lichen communities.

Given the lack of resource development and current harvest levels in the north, priorities will remain directed to the Tweedsmuir Herd. The development of an inventory technique is essential although funds may not be available within the next five years. Stable or decreasing numbers of caribou are anticipated over the long term.

During the late 1970's and early 1980's significantly more effort was spent on developing caribou inventory methods and was in response to perceived very low calf crops. Since 1983 (other than the Tweedsmuir Caribou Herd Study) virtually no data (other than harvest) have been collected regarding northern populations. The only non-hunted population is the Telkwa Herd. Presently, management effort on caribou is directed primarily to monitoring the yearly harvest and that effort is considerably less than the current time and effort directed towards moose, grizzly bear and mountain goat.

The most significant project is that being undertaken by the Spatsizi Association for Biological Research (D. Hatler, Smithers, B.C.) whose focus was on caribou (Hatler 1986) and is now on wolf, moose and grizzly bear. It is hoped that this project will shed some light on Bergerud's hypothesis that increased numbers of moose have caused an increase in the number of wolves which then affect caribou.

Region 7 Omineca-Peace, Sub-region 7.1 Peace/Liard - R. Thomson, Ministry of the Environment, Fish and Wildlife Division, Fort St. John, B.C.

Currently woodland caribou in this sub-region (Fig 5, primarily the mountain terrestrial ecotype and an unknown number of boreal ecotype in the northeast corner) are estimated to be about 5,000. The current population is relatively stable but is about 25% of that estimated for the 1960's and early 1970's. This decline is believed to be due to deep snow winters in the late 1960's and early 1970's and predation. Woodland caribou are found throughout this sub-region except in the area around Fort St. John and Dawson Creek which is primarily agricultural land.

Presently snowfall and predation (wolves and grizzlies) are considered to be the primary factors influencing population size and distribution

(Bergerud and Elliot 1986; Bergerud and Page 1987). Hunting is restricted to trophy bulls only. In the north Liard zone caribou appear to be stable now but may start to decline to early 1980 levels because of predation. Inventory is poor for the south Peace zone. It is probable that populations are stable but may decline in the area south of Dawson Creek as logging moves into poor pine stands with terrestrial lichens.

Region 7 Omineca-Peace, Sub-region 7.2 Prince George - Dave King, Ministry of Environment, Fish and Wildlife, Prince George, B.C.

This sub-region (Fig. 5) presently has about 600 to 700 mountain/arboreal ecotype and 1200 to 1600 mountain/terrestrial ecotype. This is decrease of more than 50% since the past (prior to 1960) but an apparent increase from the low estimates of the 1970's. Some of this increase may be a reflection of better inventory rather than a biological increase (S. Stevenson, pers. comm.).

Reasons for decline in mountain/arboreal populations are many and complex but over-hunting and habitat loss are considered to be of primary importance. Less is known about the more northern mountain/terrestrial ecotype. Hunting is closed or restricted throughout caribou range in this sub-region. Logging and increased road access is affecting all of the range of the mountain/arboreal ecotype and at least half of the mountain/terrestrial range.

Since 1985 a substantial increase in dollars and manpower has been applied to caribou management in this sub-region primarily to address forest harvesting conflicts within caribou range. Due to habitat change and loss (primarily due to logging), it is not expected that caribou numbers will reach historic levels. The goal is to attain population levels that can sustain a harvestable surplus. There is concern for maintaining adequate amounts of old growth forest for the mountain/arboreal ecotype, and in some areas logging and access are encroaching on lower elevation winter habitat of the mountain/terrestrial ecotype. An industry/government co-operative program is underway to develop ways of managing and harvesting timber without destroying caribou habitat (Mountain Caribou in Managed Forests Program).

## Appendix 5.

*Northwest Territories Report - R. Graf, Department of Renewable Resources, Fort Smith, N.W.T. and P. Latour, Department of Renewable Resources, Norman Wells, N.W.T.*

No assessment of woodland caribou numbers and distribution prior to 1970 is available. Current knowledge is still scant. No extensive surveys have been done over the Mackenzie Mountains or Mackenzie Valley, but woodland caribou numbers in the Mackenzie Mountains may be 7,000 to 10,000. Densities are believed to be much lower in the Valley, where woodland caribou are scattered broadly and thinly.

Within the Mackenzie Mountains, numbers appear to be highest in the central one third

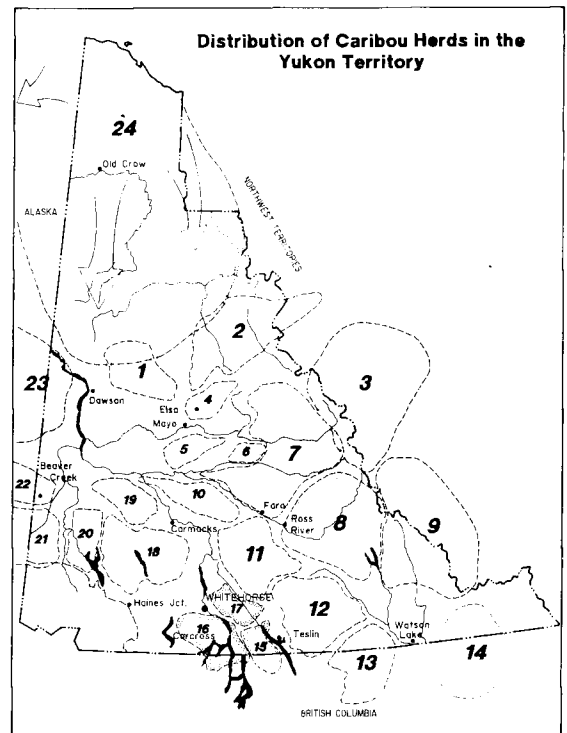


Fig. 6. Caribou herds: 1. Hart River. 2. Bonnet Plume. 3. Redstone. 4. Mayo. 5. Ethel Lake. 6. Moose Lake. 7. Tay River. 8. Finlayson. 9. Nahanni. 10. Glenlyon/Tatchun. 11. Pewlly Herds. 12. Wolf Lake. 13. Little Rancheria. 14. Smith River. 15. Teslin/Atlin. 16. Carcross Herds. 17. Squanga. 18. Aishihik. 19. KJaza. 20. Burwash. 21. Chisana. 22. Nelchina/Mentasta (Alaskan caribou). 23. Fortymile Herd (Alaskan caribou). 24. Porcupine Herd (Alaskan caribou).

and major wintering areas occur along the Kele River and at Wrigley Lake. Work carried out by the N.W.T. and Yukon Wildlife Departments in the early 1970's indicate that these caribou disperse west as far as the Yukon border in summer. Caribou in the northern third of the Mackenzie Mountains are thought to move between these mountains and the Wernecke Mountains in the Yukon; even less is known of caribou in the southern one third of the Mackenzie Mountains.

Approximately 200 woodland caribou are shot in the Mackenzie Mountains, annually: 100 as trophy bulls by outfitted hunters and 100 as native subsistence kill. The demography of these caribou is poorly known but based on limited data, Colling (1983) concluded that this was a high quality population exhibiting high pregnancy, birth, and calf survival rates and relatively short life spans. There is negligible harvest of woodland caribou in the Mackenzie Valley and east.

In the near future, there is no plan to conduct research on woodland caribou (barren-ground caribou receive all research and management dollars). Currently caribou status is good and hunting levels are low and relatively controllable. Industrial activity in the Mackenzie Mountains remains negligible and in the Valley seismic and drilling activity is localized. This situation results in little access into the majority of caribou range, thus harvest levels and loss of habitat remains low.

## Appendix 6.

*Yukon Report - R. Farnell, Department of Renewable Resources, Wildlife Branch, Whitehorse, Yukon Territory.*

Prior to the 1970's the size and distribution of Yukon's woodland caribou herds was understood at a minimal level, based on local knowledge. No inventory or management activities were carried out and reasons for suspected declines or increase are speculative. The decline of the Forty Mile herd coupled with increased road expansion may have resulted in the overharvest of some herds.

Current population estimates for herds in the Yukon Territory is presented in Table 4. Figure 6 shows approximate distribution of the herds. Wolf predation has been identified as the single most influential factor in naturally limited po-

pulations. Winter ranges are traditional as a result of obligatory response to snow cover and are critical seasonal habitats. However, in the Yukon, there has been as yet no evidence of winter forage or range condition limiting caribou populations. Hunting is an additive factor and if greater than 2-3% will cause population decline where wolves are not manipulated.

For the future, woodland caribou in the Yukon will be managed to maintain viable populations. Caribou herds will not be allowed to decline in numbers to the point they become threatened with extinction or reach unbalanced sex composition ratio due to any man-caused factors. Some herds will be intensively managed to provide hunting, while other herds will be allowed to follow their own natural course of growth or decline without substantial human interference.

Although it is well understood that predation and hunting exceed the influence of range condition on population dynamics, some population mechanisms still need investigation, e.g. low male ratio and its affect on population dynamics, and natural adult mortality rates.

Yukon's caribou management program entails a broad initial inventory of all herds on their winter range. Snow cover and food habits on the winter range are measured to provide a crude assessment of a herd's potential based on its most critical habitat. A second program is the intensive management of one representative herd, the Finlayson herd, to evaluate factors limiting population growth, to assess practical management methods, to test monitoring procedures, etc. The combination of an intensive management model of one herd with ongoing inventory of other herds, guides management decisions.

This approach has been in place for 10 years and represents a substantial portion of Yukon's big game management scheme. Woodland caribou are viewed as an important resource to the Yukon public, so the program is likely to continue or gain greater support in the future.

*Table 4. overleaf →*

*Printed from manuscript after editorial review.*

Table 4. Summary of woodland caribou population status

Herd	Population estimate	Year	M <sup>1</sup>	T <sup>2</sup>	Yukon harvest No. <sup>3</sup>	Yukon harvest %	Current status and notes
Hart River	1200	1978	B	S	13	1.1	Healthy. Inventoried in 1981-82. Porcupine herd overlaps with herd in late fall to spring.
Bonnet Plume	5000	1982	C	I	37	0.7	Healthy. Range partially in N.W.T. Inventoried in 1981-82. Porcupine herd overlaps with herd in late fall to spring. Almost all harvest is by non-residents.
Redstone	5000-10000	1982	C	U	38	0.4-0.8	Healthy. Harvested in MacPass area. Range largely in N.W.T.
Mayo	?	—	—	U	0	0	Anecdotal information only. Occasional caribou harvest.
Ethel Lake	200	1977	C	U	2	1.0	Vulnerable. Presently being inventoried. Population census slated for March 1992.
Moose Lake	87	1991	A	U	10	11.5	Vulnerable. Inventoried 1989-91. Population census in 1991. Large portion of winter range burned in 1989. Entire harvest is by non-residents.
Tay River	5752 ± 594	1991	B	I	21	0.6	Inventoried 1989-91. Population census in 1991. Favourable bull/cow ratios and calf recruitment.
Finalyson	5950 ± 1053	1990	B	I	55	0.9	Increasing. Intensive management. Wolf reduction program 1982-89. High bull/cow and calf/cow ratios.
Nahanni	2000	1981	C	U	29	1.5	Range partially in N.W.T. Moderate level of harvest from Tungsten Road.
Glenlyon/Tatchum	350	1977	C	U	10	2.9	285 caribou observed during Tatchum 1976 sheep survey.
Pelly	1000	1977	C	U	14	1.4	670 caribou observed during 1978 sheep survey.
Wolf Lake	664 ± 133	1987	B	S	4	0.6	Inventoried 1984-87. Population census in 1987. Skewed sex ratio: 29 bulls/100 adults cows.
Little Rancheria	681 ± 136	1988	B	S	0	0	Vulnerable. Inventoried 1985-88. Skewed sex ratio: 30 bulls/100 adult cows. Summer range in



herd).											
Smith River	200	—	C	U	0	—				Anecdotal information only. Estimate from B.C. Wildlife Branch. Partially range in B.C.	
Teslin/Atlin	400	1978	C	U	0	—				Possibly 2 discrete herds or may be part of Gladys Lake herd from BC. No licensed season in Yukon.	
Carcross	400	1980	B	S	6	1.5				Vulnerable. Range partially in B.C. Permit hunt closed after 1989 season. Only Ibez herd inventoried 1982-85. Ongoing annual rut counts on Ibez herd since 1983. Substantial native harvest on Ibez and Nares herds.	
Squance	300	1980	C	U	9	3.0				Partially inventoried 1978-90 (Foothills Pipeline)	
Aishihik	785	1991	A	D	43	5.5				Inventory commenced 1991. Population census April 1991. Extremely low bull/cow ratios and poor calf recruitment. Caribou hunting closed in 1991. Postcalving and rut counts conducted in 1981, in which 1,225 caribou were observed and population estimated at 1,500.	
Klaza	441	1989	A	U	4	0.9				Vulnerable. Mining road developments in area. Resident and non-residents hunting closed for moose and caribou after 1988 season. Permit hunt for caribou scheduled for 1991 season.	
Burwash	200	1990	B	D	11	5.5				Susceptible to overharvest. Partially range in Klutane Game Sanctuary. Population estimated at 400 in 1982. Caribou hunting closed in 1991.	
Chisana	1660	1989	A	D	12	0.7				Range largely in Alaska and Klutane Game Sanctuary. Couuted by Alaska Department of Fish and Game. Mainly non-resident harvest. Alaska harvest average 2,5% of herd each year. Extremely poor calf recruitment for 1989 and 1990.	
Total	27,397 - 36,229										

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Total 27,397 - 36,229

<sup>1</sup>Method A = Total count, B = Extrapolation, C = Guess

<sup>2</sup>Trend I = increasing, S = stable, D = declining, U = unknown

<sup>3</sup>Some herds are hunted by NWT residents.