

**GASPÉSIE WOODLAND CARIBOU  
RECOVERY PLAN  
(2002-2012)  
(*Rangifer tarandus caribou*)**

***Update***



**Protéger la faune et la flore menacées  
... C'EST DANS MA NATURE**

**Québec** 

Direction du développement de la faune

Gaspésie Woodland Caribou Recovery Plan (2002-2012)  
(*Rangifer tarandus caribou*)

By

L'équipe de rétablissement du caribou de la Gaspésie  
(Gaspésie Woodland Caribou Recovery Team)

Ministère des Ressources naturelles et de la Faune  
Secteur Faune Québec

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Under the Accord for the Protection of Species at Risk (1996), the federal, provincial, and territorial governments agreed to work together on legislation, programs, and policies to protect wildlife species at risk throughout Canada.

In the spirit of cooperation of the Accord, the Government of Québec has given permission to the Government of Canada to adopt the Gaspésie Woodland Caribou Recovery Plan (2002-2012) (*Rangifer tarandus caribou*) under Section 44 of the *Species at Risk Act* (SARA). Details are provided in the addendum of this document.

Following this 60-day comment period starting in February 2007, and until the federal Minister of Environment determines otherwise, or the Ministère des Ressources naturelles et de la Faune du Québec formally amends this document, this recovery plan will be the recovery strategy of the Minister of the Environment of Canada for this species.

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## NOTE

The Recovery Team has reached a consensus regarding the Gaspésie Woodland Caribou Recovery Plan. However, this in no way commits the organizations that have delegated representatives to sit on the Team.

## SUMMARY

The distribution of the Woodland Caribou (*Rangifer tarandus caribou*) has declined considerably since the middle of the 19th century. In eastern North America, the Gaspésie population is now the only Woodland Caribou herd to be found south of the St. Lawrence River. This relict and genetically distinct population is in a very precarious situation, and was designated as an endangered species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), in May 2002. In September 2001, the Quebec government classified the species and its habitat as vulnerable.

In the 1950s, there was a minimum of 750 individuals in the Gaspésie Woodland Caribou population. According to the most recent estimates, the population now only has about 140 individuals. Historically, this population decline was primarily a result of hunting, and habitat loss linked to logging, mining and forest fires. More recently, caribou herds have had to deal with an added threat - the coyote (*Canis latrans*) - a new predator that kills a significant number of calves. Coyote predation, in addition to predation by black bears (*Ursus americanus*), is the primary cause of the current decline in the Gaspésie Woodland Caribou population. Although there are a number of reasons for adult caribou mortality, the survival rate (85-90%) of adult caribou is comparable to that of other caribou populations. The population currently ranges primarily within the boundaries of the Parc national de la Gaspésie (Gaspésie provincial park), and in an equivalent area of land adjacent to the park. As a result, the caribou are affected by human activities. The normal behaviour of caribou changes when

they sense the presence of hikers on the summits. They spend less time foraging and resting, and more time monitoring their environment, walking and running. They also tend to abandon the summits for the alpine forests, where they are more vulnerable to predation.

The population's activities are concentrated in three main sectors: Mont Albert, various mountains on the McGerrigle range, and Mont Logan, including land adjacent to the boundaries of the Gaspésie provincial park. The caribou frequently move back and forth between the alpine tundra and the alpine forest

A number of measures have been adopted to protect the Gaspésie caribou population. Hunting in the Gaspésie provincial park, which was created in 1937, has been banned since 1949. Furthermore, since 1977, forestry and mining activities are not permitted within the park boundaries. In order to limit predation on caribou calves by coyotes and black bears, caribou predator control operations were undertaken from 1990 to 1996, and again in 2001. A recovery plan was implemented from 1990 to 1995. A number of measures were also taken to restrict park visitors during critical periods for the caribou. Finally, a forest management plan was drawn up in 1999 and remained in effect until 2004; the new version is currently in effect until 2011.

Unfortunately, the caribou situation is still problematic. Since the discontinuation of predator control measures, recruitment has declined considerably, which justifies the development of a new recovery plan. The Recovery Team is proposing a 10-year plan, the key goals of which would be to

establish a population of 150 caribou in five years and 175 in ten years. To this end, it is recommended that measures be adopted, aimed at maintaining calves as 17% of the total fall population. Two key priorities are identified in the plan: 1) the control of coyotes and bears likely to frequent the summits before and during calving periods; and, 2) a research project to study strategies relating to predator movement patterns and habitat use. Predator control will increase the survival rate of calves, and hence population growth. In the short term, the research project will enable us to develop better targeted control methods and, in the long term, identify habitat management strategies that will reduce interaction among caribou and predators. Current measures, aimed at reducing the extent to which caribou are disturbed by visitors to the park, will also be continued.

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## 1. INTRODUCTION

Caribou (*Rangifer tarandus caribou*) were apparently abundant in the Gaspésie at the beginning of the 20th century. However, they were the object of intense commercial harvesting (Moisan 1956). Courtois et al. (2001) briefly looked at historical changes to the size of this population. Caribou were still seen in Gaspé in 1868, sometimes even close to dwellings (Guay 1983), but their range declined rapidly thereafter. Caribou were considered rare in the Matapedia Valley around 1887, probably because of excessive hunting, which was particularly intense between 1900 and 1915. There was an outbreak of an epizootic disease, the cause of which is unknown, between 1920 and 1928 (Moisan 1956). The population was protected by the creation of Gaspésie provincial park in 1937 and the subsequent ban on hunting in 1949. Forestry and mining activities, on the other hand, were only prohibited as of 1977.

In 1953, there were between 700 and 1,500 caribou in the Gaspésie population. The caribou inhabited an area of approximately 1,000 km<sup>2</sup>, and were divided into four main groups that spent the winters on the alpine tundra on Logan, Albert, Jacques-Cartier and Copper mountains (Garland River, Murdochville; Moisan 1957). Recruitment appeared to be good, probably because of the absence of wolves (*Canis lupus*). There were many black bears (*Ursus americanus*); however, they were not considered to be a significant source of predation, and were controlled by park wardens. Nevertheless, Moisan (1957) expressed concern about the caribou's situation resulting from habitat alteration

brought on by logging, forest fires and mining.

Despite the protection efforts of park officials, the caribou population continued to decline, particularly until the middle of the 1970s. There are currently about 140 individuals in the Gaspésie population (Fournier and Faubert 2001). Their situation is very precarious because of predation on calves by coyotes (*Canis latrans*) that appeared in the Gaspésie in the middle of the 1970s, and black bears that live on the summits used by the caribou (Crête and Desrosiers 1993).

In 1984, the population was assessed as threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2000); it was recently reassessed as endangered. A recovery plan focusing on predator control and the reduction of human disturbances has been in place since 1990 (Gaspésie Caribou Recovery Team 1994). A forest management plan was developed to protect habitats in land adjacent to the park (Champagne et al. 1999). Since September 2001, the Quebec government has listed the caribou and its habitat as vulnerable, in accordance with the *Act respecting threatened or vulnerable species* (E-12.01) and the *Regulation respecting threatened or vulnerable species and their habitats* (R.S.Q., c. E-12.01, s.10, r.0.2.3; Gazette officielle du Québec, 2001).

The precarious situation of the Gaspésie Woodland Caribou population led to the creation of a new Recovery Team in the fall of 2001. Given the urgency of the situation, predator control measures were introduced in the summer of the same year. This document sets forth the Recovery Team's report,

and includes a review of literature on caribou, based primarily on the work of Michaud (2001), and a summary of previous action taken with respect to the Gaspésie population. It also outlines the Team's goals and objectives, and the methods it proposes to ensure the survival of the Gaspésie Woodland Caribou population.

## 2. BACKGROUND

### Species Information

**Common name:** Woodland Caribou (Atlantic-Gaspésie population)

**Scientific Name:** *Rangifer tarandus caribou*

**Status:** Endangered

**Reason for Designation:** A small isolated population of less than 200 adult animals confined to the Gaspésie region. The population is at risk from predation and habitat loss.

**Canadian Occurrence:** QC

**Status History:** Atlantic-Gaspésie population designated Threatened in April 1984. Status re-examined and designated Endangered in May 2000. Status re-examined and confirmed in May 2002. Last assessment based on an update status report.

### 2.1 Overall distribution

The distribution of the woodland caribou has declined over the past century (Bergerud 1974). In eastern North America, caribou used to inhabit the Maritime provinces and parts of New England. Now the Gaspésie population is the only caribou population to be found south of the St. Lawrence River (Banfield 1961; Boileau 1996, Courtois et al. 2001). North American caribou live in a number of different types of habitats, and their behaviour varies accordingly, which has led to the definition of ecotypes, three of which are found in Quebec: tundra, mountain and boreal (Courtois et al. 2002). The Gaspésie Woodland Caribou population belongs to the mountain ecotype (Courtois et al. 2002).

The situation of this relict population, believed to be genetically distinct, (Roed et al. 1991; Courtois et al. 2002), is precarious, and the species was recently designated as endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2000). Provincially, Quebec designated the Gaspésie Woodland Caribou population

and its habitat as vulnerable in September 2001 (E-12.01; R.S.Q., c. E-12.01, s.10, r.0.2.3).

## 2.2 Range of the Gaspésie Woodland Caribou population

The Gaspésie Woodland Caribou population lives both in an 802 km<sup>2</sup> area within the Gaspésie provincial park, and in a 290 km<sup>2</sup> area outside the park boundaries (Appendix 1). Radio-telemetry data gathered in the park between 1998 and 2001 shows, once again, that the caribou use three distinct sectors: Mont Albert, Mont Logan, and the various mountains of the McGerrigle range, with little movement from one area to the other (Rivard 1978; Ouellet et al. 1996; Fournier et al. 2001; Mosnier et al. 2002), although a few females had been observed moving between Mont Albert and the McGerrigle Mountains, and, more recently, some caribou had moved from Mont Albert to the Vallières-de-Saint-Réal area. (Rivard 1978); Fournier et al. 2001). Given that there is hardly any movement between these three main sectors, the Gaspésie Woodland Caribou meet the definition of a metapopulation as set forth in Wells and Richmond (1995): a set of spatially disjunct populations with some genetic or demographic connectedness.

A few years ago, in order to manage activities in areas inhabited by caribou, pursuant to the *Regulation respecting wildlife habitats* and the *Act respecting the conservation and development of wildlife* (R.S.Q., c. C-61.1), a 657.2 km<sup>2</sup> area was designated as a legal caribou habitat. In addition to the Gaspésie provincial park, this area also includes parts of the Réserve faunique des Chic-Chocs, notably Petit Mont Sainte-Anne and Mont Vallières-de-Saint-Réal. However,

the actual distribution of the Gaspésie Woodland Caribou extends beyond the limits of its legal habitat (Fournier and Turcotte 2002), particularly in the Mont Logan sector (Table 1).

Recent radio-tracking data has revealed that the caribou move to areas adjacent to the park to find food in the summer and winter, and for calving (Fournier and Turcotte 2002). In order to balance forestry activities with the preservation of the caribou habitat, a forest management plan targeting areas adjacent to Gaspésie provincial park has been implemented.

Table 1. Caribou radio-telemetry locations outside the park by sector (November 1998 to March 2001)

<b>Sector</b>	<b>Percentage of radio-telemetry locations</b>	<b>Number of radio-telemetry locations</b>
Mont Logan	54.6	155
Mont Vallières-de-Saint-Réal	38.0	108
Petit Mont Sainte-Anne	1.4	4
Ruisseau Isabelle	0.4	1
Other	5.6	16
<b>Total</b>	<b>100.0</b>	<b>284<sup>1</sup></b>

<sup>1</sup> Out of a total of 1,622 radio-telemetry locations for the entire area.

## 2.3 Biology

### 2.3.1 Feeding habits

Until quite recently, little was known about the feeding habits of the Gaspésie Woodland Caribou population. Initial observations suggested a fall diet made up primarily of ground lichen, as well as grasses, sedges and mosses (Moisan 1956). Rivard (1978) noted the importance of arboreal lichen, which made up 70% of the caribou's winter diet. The first quantitative data regarding the main components of the Gaspésie Woodland Caribou population's diet appeared in Ouellet et al. (1993) [unpublished data].

The caribou's diet is different in the summer than in the winter. In the summer, caribou eat mainly lichens and herbaceous plants, whereas in the winter, their diet consists primarily of ground and arboreal lichens. Arboreal lichens play an important role in the caribou's diet, because they are an essential source of food when it becomes difficult to access ground lichen in the winter months in alpine regions (Serveheen and Lyon 1989). An analysis of the Gaspésie Woodland Caribou's winter diet revealed large amounts of bark and needles, suggesting that the proportion of arboreal lichen in the caribou's diet is greater than what was previously believed (Ouellet et al. 1993, unpublished).

### 2.3.2 Rutting and mating

In the fall mating season, the caribou gather in the alpine areas on the summits of the Albert, Logan, M<sup>c</sup>Gerrigle and

Vallières-de-Saint-Réal mountains (Moisan 1957; Bergerud 1973; Rivard 1978, Fournier et al. 2001). They form groups, known as "rutting companies" (Bergerud 1973) but, contrary to reports in Banfield (1977), there are no harems of females *per se* within the Gaspésie Woodland Caribou population, since females are free to switch groups and mate with males in other groups. There is, however, a clear hierarchy among males within a given group (Bergerud 1973). The mating season is characterized by sparring battles between male caribou. The males are polygamous. Females are polyestrous (Banfield 1977). Mating usually takes place around the middle of October (Bergerud 1973).

According to Moisan (1956), the use of the open areas in Gaspésie provincial park is important, because these areas enable a better recognition among individuals and improve the chances of successful reproduction.

### 2.3.3 Calving

The gestation period is seven to eight months. Calves are born between mid-May and mid-June (Bergerud 1973). Generally, only one calf is born per cow; twins are very rare (Banfield 1977). Newborn calves start to graze when they are about two weeks old. Nursing is very important during the first month, and often continues until winter. Calves are able to stand within an hour of their birth, and can run several kilometres within 90 minutes (Banfield 1977).

#### 2.3.4 Home range

According to the work of Ouellet (1996), the average home-range area of females in the Gaspésie population is estimated to be 145 km<sup>2</sup>; with 50% of their activities taking place within an area of 14 km<sup>2</sup>. In contrast, recent radio-telemetry data (1998 to 2001) has shown that the average size of the home range of caribou in the Mont Logan, Mont Albert and McGerrigle Mountains sectors is approximately 60 ± 0.6 km<sup>2</sup> (Mosnier et al. 2002). When sectors are examined separately, the home range of caribou in the McGerrigle Mountains sector is larger, and is a result of movement between two peaks. Similar movements were not observed in the Mont Albert and Mont Logan sectors.

#### 2.3.5 Migration and movements

The annual migration of large herds of barren-ground caribou is well documented. A distance of several hundred kilometres may separate their calving grounds and the area where they spend the winter. Seasonal migration is also common among caribou living in wooded areas. However, initial observations of caribou in the Gaspésie herd indicate that these migrations are quite limited. Moisan (1956) mentions "elevational migration," i.e., the caribou's tendency to move to certain elevations at specific times of the year. On the other hand, Ouellet et al. (1996) concluded that the elevational movements of the Gaspésie herd were not as clear as those observed in herds in western Canada.

In early fall, during the rutting and mating season, the caribou move to areas of alpine tundra (Moisan 1956;

Bergerud 1973; Rivard 1978). Open spaces allow for improved recognition among individuals and more successful reproduction (Moisan 1956; Bergerud 1973). The caribou remain at these higher elevations at the beginning of the winter until snow conditions force them to descend to the subalpine forest level to find food (Moisan 1956).

When the weather conditions improve in early spring, the caribou become more mobile. As snow melt exposes new vegetation, the caribou return to the summits to feed.

### 2.3.6 Genetics

In order to assess the impact of geographical isolation on genetic drift, 226 muscle and blood samples were taken from the Gaspésie mountain population, as well as from five forest populations and one tundra population. Eight microsatellite DNA (msDNA) loci were examined. The number of alleles per locus varied among populations. The lowest average values were seen in the mountain population and two isolated forest populations in southern Quebec. The genetic distance was greatest among populations that were furthest apart geographically, particularly between the Gaspésie population and the tundra population. Genetic drift is prevalent in isolated populations, but does not appear to be problematic at this time. To conserve genetic diversity, appropriate measures should be taken to maintain genetic exchanges among populations of the same ecotype, and to increase local populations (Courtois et al. 2002). In the case of the Gaspésie population, the number of individuals

should be increased (J.P. Ouellet, pers. comm.),<sup>1</sup> and habitat corridors connecting the three main sectors should be maintained to facilitate occasional interchanges of caribou (Mosnier et al. 2002).

### 2.3.7 Population dynamics

#### 2.3.7.1 Population density

The population density of the Gaspésie Woodland Caribou population is high (0.14 individuals/km<sup>2</sup>). Although, caribou population density in northern Quebec is greater than one individual/km<sup>2</sup> (Crête and Huot 1993), and sometimes exceeds 10/km<sup>2</sup> when the animals gather at calving grounds (Crête et al. 1989); caribou are scarce in the boreal forest in central Quebec: a density of 0.03 caribou/km<sup>2</sup> has been calculated for herds in the Bienville Lake and Caniapiscau River regions, and from 0.01 to 0.004/km<sup>2</sup> for the Val d'Or herd (Crête et al. 1990; Courtois et al. 2001).

Recent trend data shows a dramatic decline in the caribou population in recent years (Figure 1).

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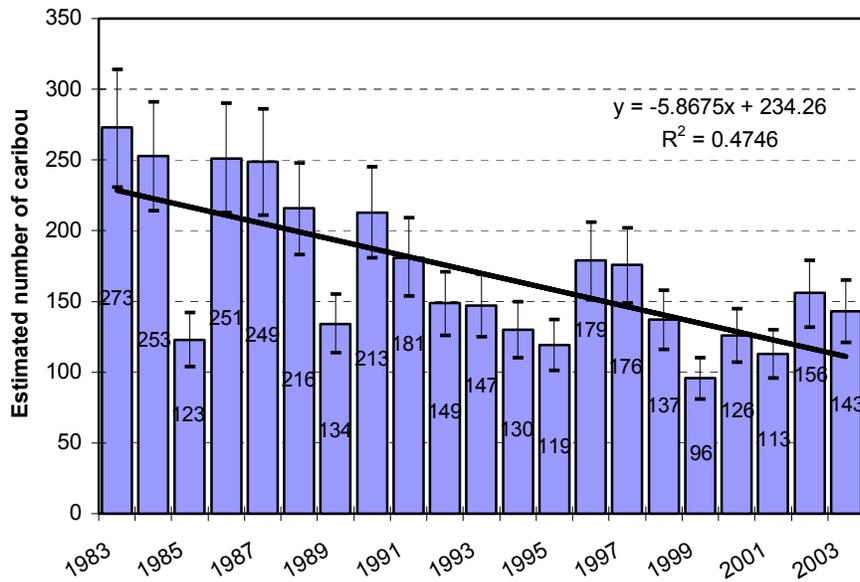


Figure 1. Estimated population of the Gaspésie Woodland Caribou population based on aerial survey data, with a visibility correction factor of 70% and a 95% confidence interval.

#### 2.3.7.2 Sex ratio

The sex ratio fluctuated between approximately 0.45 bulls per cow in the 1950s to about 1.20 bulls per cows in 1984, 1985 and 1986. However, it is difficult to track sex ratio changes between 1973 and 1983 because identification criteria used in aerial surveys do not permit the calculation of this type of data (Messier et al. 1987). Until 1992, the sex ratio hovered slightly above 1 bull per cow (1.14 to 1.07) (Desrosiers 1993); the current rate is also about 1:1 (Fournier and Faubert 2001).

### 2.3.7.3 Adult survival rate

Radio-telemetry data gathered from 1998 to 2002 places the adult survival rate at approximately 85% (Fournier and Faubert 2001). This is contrary to the results of a study conducted by Crête and Desrosiers (1993), in which the adult survival rate was estimated to be over 90%, based on radio-telemetry data from 1987 to 1992.

## 2.4 Description of the habitat used

A description of the habitat used by the caribou was created from radio-telemetry locations. The Gaspésie Woodland Caribou live in mountainous areas made up of mature coniferous stands at lower elevations and alpine tundra on the summits. Using these telemetry locations, an analysis was made of caribou habitat use in different sectors (Monts Logan, Albert and McGerrigle) and in different habitat types (dry and wet alpine tundra, hardwood stands, immature stands less than 70 years old, and mature fir and spruce stands). In comparison with other habitats, tundra was used proportionally more than it was available by sector. Hardwood forests were under-used in the Mont Albert and McGerrigle Mountains sectors, but were used on Mont Logan according to their availability. In all three sectors there were few localities in immature forest. Mature fir stands were used to the degree available on Mont Logan, and were under-used on Mont Albert and in the McGerrigle Mountains sector. Mature spruce stands were under-used on Mont Logan and Mont Albert, and were used according to availability in the McGerrigle Mountains sector (Mosnier et al. 2002).

Although the forest of Gaspésie provincial park has experienced a number of minor natural disturbances, the last major forest fire in the park was in 1965, at which time 22 km<sup>2</sup> of forest in the Mont Richardson region was destroyed. The eastern spruce budworm (*Choristoneura fumiferana*) does not seem to have had a major impact on the park's forest stands (Dansereau 1999). According to calculations in Boileau (1993), only 3% of the study area, which included the entire McGerrigle Mountains sector, had been affected by the spruce budworm, and the majority of the forest stands in question were outside the park. Cold temperatures in the region limited the insect's devastating effects to such an extent that water bombing was not even required (L. Dorais, pers. comm.)<sup>1</sup>.

Seasonal habitat use by the Gaspésie Woodland Caribou population has already been studied. Recent telemetric data from 1998 to 2001 has shown that alpine tundra habitats are used in all seasons, while fir stands are the most widely used forest habitat (Mosnier et al. 2002). Preliminary findings from telemetric data gathered between 1987 and 1992 also reveal that Gaspésie Woodland Caribou make extensive use of alpine tundra and fir stands (Ouellet et al. 1996). Contrary to the findings of previous studies, this study demonstrated that there was little seasonal variation in habitat use, particularly among females (Table 2).

These authors suggested that habitat use by females, who now tend to spend more time on the alpine tundra, may have changed in response to the arrival of a new predator, the

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<sup>1</sup> Ministère des Ressources naturelles et de la Faune (MRNF)

coyote. This new strategy offers calves better protection from predators, since caribou seem to have a greater chance of protecting their calves in open areas rather than on wooded land (Crête et al. 1989, 1990). It is also possible that extensive use of radio-telemetry has provided researchers with a more complete portrait of habitat use than in previous years.

Table 2. Caribou habitat use (females and calves) in Gaspésie provincial park

Stand	Relative Importance (%)	Use (%)			
		Females		Calves	
		Fall	Winter	Summer	Winter
Spruce stands	4	9	<1	2	3
Fir stands	49	21	38	35	33
Other coniferous stands	1	0	0	2	3
Birch stands	8	2	7	2	4
Other hardwood stands	4	2	1	0	<1
Regeneration	13	0	4	2	4
Dry alpine tundra	20	65	50	57	54

(Source: Ouellet et al. 1996)

#### 2.4.1 Features of the summer habitat

Caribou do not seem to use specific habitats during the summer, since food is available just about everywhere (Rivard 1978). High temperatures on the summits lead the caribou to seek cooler locations, such as ravines or patches of lingering snow (Rivard 1978; Fuller and Keith 1981). Dumont (1993) regularly observed caribou in July on patches of snow on Mont Jacques-Cartier.

Caribou also leave the summits to feed on new vegetation growing in transition forests and subalpine stands. Caribou have been observed near lakes and marshes where mosses, lichens and shrubs can be found. However, the caribou regularly return to the alpine plateaus to escape harassment from insects (Bergerud 1973; Trépanier 1984).

#### 2.4.2 Features of the winter habitat

A number of studies have shown that the optimal winter habitat in the boreal forest is one in which the topography is varied, thus producing different snow conditions throughout the winter, which ensures greater accessibility to food during this difficult season.

Arboreal lichen, found primarily in mature fir stands, are an important part of the Gaspésie Woodland Caribou population's diet. They constitute an essential food source when ground lichens become hard to access in alpine regions (Rominger and Oldemeyer 1989; Mosnier et al. 2002). Caribou also make extensive use of the summits (Mosnier et al.

2002). This has been observed in Gaspésie provincial park and the Selkirk Mountains.

In mature fir stands, the caribou select fir stands characterized by dense snow conditions and trees that are wider in diameter bearing the greatest biomass of lichen (Mosnier et al. 2002).

#### 2.4.3 Calving

From end of May to mid-June, females travel to various calving sites (Bergerud 1973; Rivard 1978). Unlike northern caribou herds, the Gaspésie herd does not have a specific calving location within the park or in the surrounding areas, nor a shared calving area.

The patchiness of snow melt is similar one year to the next in this rugged mountanaous terrain. This patchiness makes these areas favourable to predators. When there are fewer areas free of snow, it is more difficult for females to disperse at calving, and for calves to move freely after they are born. Consequently, in addition to impeding movements, deep snow may also affect calf survival.

### 2.5 Known or potential limiting factors

#### 2.5.1 Predation

As is true for many large mammals, the survival of caribou populations depends primarily on calf survival. A number of studies have shown that extensive predation on calves can lead to a sharp decline in populations with low reproductive

rates (Seip 1992; Stuart-Smith et al. 1996; Rettie and Messier 1998). Caribou calves are particularly vulnerable to predation during the first four to six weeks of their lives (Rettie and Messier 1998).

Studies conducted in western North America on caribou (Seip 1992; Boertje et al. 1996) and other cervids, including moose (*Alces alces*) (Stewart et al. 1985), have shown that, in situations where the calf survival rate was very low, removing a large number of predators resulted in a rapid and significant rise in the calf survival rate. Even though they do not occupy the same habitats as caribou, the presence of other cervids, such as moose and white-tailed deer (*Odocoileus virginianus*), tends to lead to an increase in the number of predators (Schwartz and Franzmann 1989; Bergerud et al. 1985) and, consequently, greater caribou predation (Bergerud and Ballard 1988).

#### 2.5.1.1. Coyote and black bear

A large proportion of caribou calf mortality can be blamed on coyotes in those regions where coyotes are found. In north-eastern Alberta, Canada Lynx (*Lynx canadensis*) and coyote are responsible for 44% of calf mortality from predation (Stuart-Smith et al. 1996). In Gaspésie provincial park, coyote and black bear predation accounted for 75% of calf mortality in some years (Crête and Desrosiers 1993). Predation is therefore a major cause of the low recruitment rates seen in 1987, 1988 and 1989 (4, 7 and 13 calves/100 females) and in 1999, when the recruitment rate was 31 calves/100 females (Crête and Desrosiers 1993; Crête et al. 1990; Desrosiers and Faubert 1999) [Figure 2].

Data is only available for the Mont Albert and McGerrigle Mountains sectors; there is no data for the Mont Logan sector, since caribou were only first observed in this region in the past few years. It should also be noted that calves may remain vulnerable to predation until the age of six months (Crête and Desrosiers 1993).

In the Gaspésie, the black bear opportunistically preys on young caribou in the park (Boileau 1993). In recent years, a considerable number of black bears have been seen on the bare summits in recent years (Desrosiers and Faubert 2001).

In an effort to increase the number of calves, control measures were implemented between 1990 and 1996 in the Mont Albert and McGerrigle Mountains sectors, with positive results. The control measures led to a rise in the number of calves. These results corroborate various studies on other cervids, including moose (Stewart et al. 1985; Seip 1992; Boertje et al. 1996). In Alaska, long-term control of the wolf, the caribou's main predator, resulted in significant growth in the size of the caribou population (Boertje et al. 1996). Nevertheless, these studies also showed that, for controls to be truly effective, they need to take place over a period of several years.

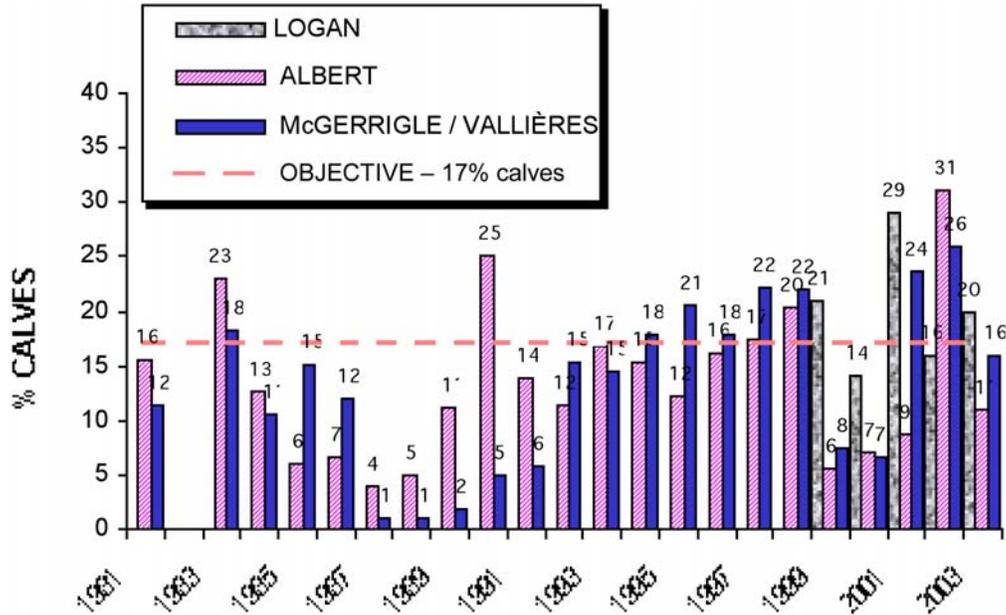


Figure 2. Percentage of calves observed during fall aerial surveys of the Gaspésie Woodland Caribou population between 1981 and 2003. (Source: Desrosiers and Faubert 2004).

#### 2.5.1.2 Canada Lynx

Canada Lynx may be harmful to caribou populations if there is a drop in the number of Snowshoe Hare (*Lepus americanus*), their primary prey. However, no cases of predation by lynx on the Gaspésie Woodland Caribou population have been reported (N. Fournier, FAPAQ, pers. comm.).<sup>1</sup> Consequently, in the short term, Canada Lynx do not pose a threat to the survival of the population.

There appears to be a relatively large lynx population, with little fluctuation in relation to the Quebec average (Courtois et al. 1996).

<sup>1</sup> Société de la faune et des parcs du Québec

### 2.5.1.3 Golden Eagle

Despite the fact that there have been many reports of Golden Eagle (*Aquila chrysaetos*) predation in Yukon and Alaska (Roseneau and Curatolo 1976), this predator is only a marginal threat to the caribou population in Gaspésie provincial park. Only one case of predation has been reported in the region (Crête and Desrosiers 1993). The Golden Eagle only attacks newborn calves, and observation has shown that the mother is usually able to protect her calf (Dumont 1993).

#### 2.5.1.4 Measures taken:

The following caribou predator control measures, aimed at reducing predation, have been taken:

Action	Year
Resumption of predator control in the Mont Albert and McGerrigle Mountains sectors.	2001
Coyote trapping by Société de la faune et des parcs du Québec personnel (Pilon 1997).	1990-1996
Creation of Golden Eagle feeding sites in an open area close to the hilltop alpine tundra in Gaspésie provincial park (Boileau 1996). In the spring, the site was supplied with the carcasses of white-tailed deer and moose that had been killed in highway accidents. Golden Eagle used the site ever since it was set up in 1990. The site was maintained until 1994.	1990-1994
Introduction of black bear hunting in regions adjacent to Gaspésie provincial park (Réserve faunique des Chic-Chocs).	1992
Training and information on trapping canids for trappers operating in the region adjacent to Gaspésie provincial park.	1991
Extension of the official coyote trapping season.	1991
Trapping of black bears on summits by Société de la faune et des parcs du Québec personnel.	1990-1991

#### 2.5.2 Availability of arboreal lichen

Forestry activities may have an effect on the availability of arboreal lichen, which constitutes the caribou's principal food source during the winter months. Arboreal lichen is found in mature fir stands located on summits both within Gaspésie provincial park and in surrounding areas (Bergerud 1983; Rivard 1978; Ouellet et al. 1996; Champagne et al. 1999; Fournier and Turcotte 2002).

In order to limit the impact of these activities, forestry guidelines should take the following into consideration:

- To be suitable for caribou foraging, fir stands should be between 40 and 100 years old, with canopy cover of 70% or less (Racey et al. 1991).
- When the harvesting with regeneration protection (HARP) system is used to restore a site after logging operations, it takes 90 years before a significant lichen biomass is established.
- Lichen biomass on trees is directly related to the diameter of the tree and the vegetation zone, and is greater in the montane zone (Arseneau 1996).
- The minimum age of stands sought by caribou is variable, because the growth rate of lichens depends on the area in which they are growing.
- Besides its availability, the accessibility of lichens must also be taken into consideration, given that caribou primarily eat lichens that are between 0 and 4 metres from the ground (Arseneau 1996).
- The colonization of young forest stands by arboreal lichens is determined by the proximity of adjacent mature stands. Consequently, fragmentation resulting from various types of cutting is a limiting factor in the efficient distribution of lichens (Arseneau et al. 2000).
- Since forest stands in the park are old, there seems to be a high risk of windfall subsequent to felling. Déry and Bélanger (2000) suggest, among other things, that thinning of residual stands between the felling areas when logging with harvest with regeneration protection (HARP) should be avoided, since these areas are more susceptible to windfall. Nevertheless, lichen litterfall and windfall are key mechanisms promoting lichen availability (Arseneau 1996). Van Daele and Johnson (1983) noted that in forest cutting operations, dead, as well as living,

trees should be taken into consideration. Standing dead trees are home to considerable amounts of lichens (Stevenson 1979).

#### 2.5.2.1 Measures taken for caribou habitat protection

##### *A- Forestry management plan*

A forestry management plan for the areas surrounding Gaspésie provincial park was developed jointly by the Ministère des ressources naturelles and the Société de la faune et des parcs du Québec. The goal of the plan was to reconcile caribou protection with the economic benefits of timber harvesting (Champagne et al. 1999). The plan covered the period from 1999 to 2004 and targeted 29,000 hectares of land previously allocated to the forestry industry. An improved plan and renewed agreement apply from 2006 to 2011. The plan's main objectives were to ensure:

- a sustained yield of the forest biomass
- the protection of summits with alpine tundra facies
- the protection of caribou travel corridors
- the introduction of specific standards for forestry operations
- the continuation of forestry activities in certain managed areas

##### *B- Comparisons of forestry operation methods*

Since forest harvesting eliminates a part of the lichen biomass in relation to the extent of the cutting, various studies have been conducted to assess the key variables favouring maximum conservation of arboreal lichens:

- During selective cutting by chain saw in the Réserve faunique de Matane region, arboreal lichen loss was in

the 37 to 55% range; however, when mechanical thinning methods that preserve the largest trees were used, arboreal lichen loss was limited to 32% (Arseneau et al. 2000).

- Removing 25% of the basal area of a mature fir stand did not have a significant impact on the amount of arboreal lichen on residual stands. Lichen loss was limited to that on felled trees.
- A study dealing with the effect of forestry operations on maximum caribou habitat protection (Déry and Bélanger 2000) suggests that it is necessary to maintain an irregular structure in order to ensure the ongoing preservation of trees bearing arboreal lichens.

Among other things, these forestry methods seem to coincide with the natural dynamics of fir stands in Gaspésie provincial park. Thinning or partial cutting ensures the preservation of both the caribou habitat and the original structure. This can be explained by the presence of dominant softwood regeneration already firmly established in the park's fir stands. In fact, partial cutting not only reduces the time between cutting rotations but also makes the habitat more rapidly accessible by caribou than does HARP.

### 2.5.3 Effects of disturbances

#### 2.5.3.1 Forestry operations

Caribou tend to avoid certain areas (Murphy and Curatolo 1987) when their migration routes are affected by forestry activities. They also spend less time foraging and resting, and more time monitoring their environment, walking and

running. This likely leads to increased energy expenditure (Murphy and Curatolo 1987; Dyer et al. 2001). Females and calves seemed to be particularly affected by these disturbances and reacted by moving greater distances than males (Murphy and Curatolo 1987; Chubbs et al. 1993). A Newfoundland study on the effect of clear-cutting on the caribou's summer habitat showed that females who had been using open burn sites and hardwood habitats (and mature stands) before logging, would abandon these areas and move to undisturbed mature stands (Chubbs et al. 1993). However, caribou are able to partially adapt to habitat disturbances, depending on the severity (Bergerud 1974). Avoidance of human activity and roads by caribou appears to be greater in forested areas than in open areas (Racey et al. 1991).

#### 2.5.3.2 Human Activities

The impact of human activities is the subject of much controversy, and the effects of these activities seem to vary depending on the population being studied. Bergerud (1974) found that various activities, and the resulting noise, seemed to have little impact on caribou in Newfoundland. The Selkirk caribou herd in southern British Columbia seems to have grown accustomed to the highway that runs through the area where they live. On the other hand, certain populations seem to be sensitive to disturbances, as is shown by studies assessing the impact of the construction of highways and railways in Norway, and the installation of the Alaska pipeline. In addition, the results of recent studies, indicate that tundra caribou herds did not avoid oil fields, and that the oil fields have not had an effect on the population's growth rate (Pollard et al.

1996; Cronin et al. 1998a, 1998b). In contrast, Dyer et al. (2001) found that woodland caribou avoided human-made industrial infrastructure (oil wells and mining exploration roads and seismic lines), particularly when they were being used extensively. Avoidance levels attained distances of up to 1,000 metres for oil wells, and 250 metres for mining exploration roads and seismic lines, which meant that approximately 22 to 48% of the study area was relatively inhospitable to the caribou. Avoidance was more pronounced in late winter and during the calving season, probably because there was an increase in traffic during these periods.

#### 2.5.3.3 Interpretation activities

The findings of a study on the impact of hikers on the Gaspésie population indicate that the behaviour of caribou is affected by the presence of hikers: the caribou spend less time foraging and resting, and more time monitoring their environment, walking and running (Dumont 1993). Living on the alpine tundra is an effective way for caribou to avoid their main predators (Crête et al. 1989; Seip 1989; Ouellet et al. 1991); however, the presence of hikers in this region, which prompted the caribou to leave the alpine tundra and seek refuge in the subalpine forest (observed in 64.2% of cases), increased the risk of black bear and coyote predation (Crête et al. 1990; Dumont 1993). In light of this situation, Gaspésie provincial park managers introduced a number of measures aimed at better controlling access to the alpine tundra and the activities of hikers who visit the summits (Crête et al. 1990). Tourist activities on Mont Logan, home to a large group of caribous, are growing in

popularity, and will eventually have to be controlled as well.

#### 2.5.3.4 Measures taken in the park to reduce human disturbances

The following measures have been introduced in order to reduce disruptions to the Gaspésie Woodland Caribou population:

- Access to Mont Jacques-Cartier is prohibited prior to June 24 and after the end of September, in order to avoid disturbances during the calving and mating seasons. Furthermore, visitors are only allowed on the mountain between 10 am and 3 pm, and access to the summits of Mont Albert and Mont Richardson is forbidden during mating season (after September 30).
- Visitors are informed about the impact of their presence on the caribou and its habitat by means of interpretation panels and brochures.

#### 2.5.4 Poaching and incidental take

Even though it is obvious that not all cases are reported, poaching does not appear to be a serious problem within Gaspésie provincial park and in the surrounding areas. Over a 15-year period (from 1971 to 1986), only five cases of poaching and two of incidental take were reported (Dupuy and Desrosiers 1986). A hunting accident near Saint-Marcellin was also reported in 1996, and there was one poaching

incident in the fall of 2000 (N. Fournier, FAPAQ, pers. comm.). Owing to a lack of detailed information, it is difficult to determine the exact impact of poaching and incidental take. Nevertheless, we must not dismiss acts such as these, which are unacceptable within a context of biodiversity preservation.

#### 2.5.5 Diseases

##### 2.5.5.1 Meningeal worm

The meningeal worm (*Parelaphostrongylus tenuis*) is a parasite that inhabits the nervous system of white-tailed deer. The parasite causes little damage in its principal host, the white-tailed deer, but can be fatal for moose and caribou (Claveau and Fillion 1984). This parasite was responsible for the disappearance of caribou reintroduced into an environment with white-tailed deer in Nova Scotia in 1968-1969 (Dauphiné 1975), as well as on a Wisconsin reserve (Trainer 1973).

Despite the fact that this parasite has been found in Gaspésie deer (Claveau and Fillion 1984), the risk of transmission to other wild cervids seems to be minimal. There have been no reports of infection of caribou and moose in Gaspésie provincial park (Crête and Desrosiers 1993; Crête et al. 1994). This may be attributed to the fact that the various cervids in the park have specific distribution ranges and separate habitats (Dumont and Crête 1995). The risk of an outbreak has been further reduced by the decline in the number of deer during the 1990s. Nevertheless, the situation should be monitored for signs of infection, and

the presence of deer in Gaspésie provincial park should not be encouraged.

#### 2.5.5.2 Chronic Wasting Disease (CWD)

Chronic Wasting Disease (CWD) is a disease that affects the nervous system of cervids. It belongs to the transmissible spongiform encephalopathy family. In Colorado and Wyoming, between 6 and 15% of deer and 1% of wild elk (*Cervus elaphus*) are believed to be infected (Lachapelle 2000). In Canada, the only reported cases were detected primarily on farms in Saskatchewan, where herds were contaminated by imported animals carrying the disease. These herds were subsequently destroyed. No cases of the disease in wild animals have been reported by either the Canadian Food Inspection Agency (CFIA) or the Veterinary Services Branch of Manitoba Agriculture and Food (Whiting 1999), and these agencies consider the transmission risk to be virtually non-existent. The only remaining transmission risk for caribou in the Gaspésie park would be from red deer (*Cervus elaphus*) farms or from imported animals that are infected. Since the disease is spread by the mother, or through contact with placenta material during calving, the risk of infection in the park is minimal, given the different habitats used by the cervids in question (Dumont and Crête 1995).

#### 2.5.6 Avalanches

Studies from British Columbia (Simpson 1987) have shown that, in certain high-risk areas, avalanches are responsible for a considerable number of mortalities. The characteristics of Gaspésie provincial park-summits

exceeding 1,000 metres in altitude, surrounded by steep-sloped valleys that can receive four to five metres of snow annually—seems to be favourable to the development of avalanches (Boucher 2000).

A study of winter skiing areas, both within the park and in the surrounding region, identified the following avalanche sectors: the Vallée du diable on Mont Albert, Mont Hog's Back, Petit Mont Sainte-Anne, Madeleine mines, Mont de la Passe, Mont Xalibu and Mont Vallières-de-Saint-Réal. A few years ago, winter activities were prohibited in the Mont Vallières-de-Saint-Réal sector in an effort to prevent caribou mortality.

Although caribou in the park are sometimes victims of avalanches, there are no precise statistics on this cause of mortality (N. Fournier, FAPAQ, pers. comm.). At the current time, only a few cases have been reported.

#### 2.5.7 Snow conditions

A study conducted in Alaska (Denali National Park) showed that the body mass of newborn calves declined with increasing snowfall levels (Adams et al. 1995). This study, as well as studies by Boertje et al. (1996), also found a distinct correlation between the survival rate and the birth mass of calves. Furthermore, calf mortality was higher in years when spring came late and there were still large banks of snow on the summits. This can be explained, in part, by the fact there were fewer areas clear of snow that allow caribou to move to calving grounds, and to wander after the birth of their calves. Stuart-Smith et al. (1997) identified

an inverse relationship between caribou movements and snow accumulations in Alberta. In addition to limiting calf survival and mobility, snow depth results in increased energy expenditures and reduces the quality and variety of forage (Boertje 1985).

## 2.6 Situation in Quebec

### 2.6.1 Current status of the population

The Gaspésie Woodland Caribou population is geographically and genetically isolated from other Quebec caribou populations (Courtois et al. 2002). It has been estimated that there were at least 750 caribou in the population at the beginning of the 1950s; however, by the end of the 1980s, the size of the herd had declined to only 200 individuals. Judging by the number of caribou spotted during aerial surveys over the past 10 years, the situation does not seem to have improved in recent years. There are currently only about 140 caribou in the population. Historically, the most probable causes are hunting, and habitat loss linked to logging, mining and forest fires (Moisan 1957). More recently, a newly arrived predator, the coyote, kills a significant number of calves, in addition to those killed by black bears (Fournier and Faubert 2001), and is the primary cause of current decline in the Gaspésie Woodland Caribou population (Crête and Desrosiers 1993).

### 2.6.2 Measures taken to preserve the Gaspésie population

A number of measures have been taken to protect the Gaspésie Woodland Caribou population (Moisan 1957). The sale of

venison was prohibited in 1929, and hunting was banned for five years (Moisan 1956). Hunting was allowed again in 1934, but in 1937 Gaspésie provincial park was created, and hunting was prohibited in the park. Hunting was finally banned in the entire Gaspésie region in 1949. The park's boundaries were reviewed in 1981. Since 1977, logging and mining operations have not been permitted within the park's boundaries. A recovery plan was implemented between 1990 and 1995 (Gaspésie Caribou Recovery Team 1994). Finally, a forest management plan was drawn up in 1999 (Champagne et al. 1999). The next version is currently being drafted. The implementation of measures set forth in the current Recovery Plan (2002-2012) should lead to an increase in the size of the caribou population. A monitoring committee will be set up to oversee the implementation of these measures. Other measures, such as caribou farming, may be considered if recruitment remains too low to ensure the recovery of the caribou population.

## 2.7 Recovery potential

The current situation of the Gaspésie Woodland Caribou population is particularly alarming and worrying. Since this herd is the only vestige of the woodland caribou populations that used to live south of the St. Lawrence River, appropriate action must be taken as swiftly as possible to conserve this population. The situation of the Gaspésie population is critical at the present time because of extensive predation on calves by coyotes and black bears. For this reason, predator control operations were implemented between 1990 and 1996, and again in 2001, following a significant drop in the number of calves. These

controls will be systematically applied over a three-year period, until the number of individuals in the population reaches 150. The methods used will then be re-assessed in order to ensure the maximum efficiency of ongoing operations in terms of sites, periods, extent, etc. Since calf protection is essential to the recovery of the population, control operations must be maintained on a long-term basis. Without these direct interventions, it would be quite difficult to ensure the population's recovery, and the Gaspésie population could disappear completely over the course of time. It is also just as important to protect the caribou's habitat and, in this respect, various measures, such as protecting areas adjacent to Gaspésie provincial park through improvements to the forest management plan, controlling tourist and recreational development and limiting disturbances, are essential.

## 2.8 Recovery Team's advice

Predation appears to be the major limiting factor affecting the Gaspésie Woodland Caribou population. In light of the fact that predator control measures taken in the early 1990s produced very satisfactory results, the Recovery Team is convinced that it will indeed be possible to increase the size of the Gaspésie Woodland Caribou population. In addition, a number of legal and administrative measures (legal status, forest management, limits to disturbances) have been taken over the years, and have received the approval of a vast majority of the various players involved, as well as the public at large.

However, given the caribou's low reproduction levels, the Team acknowledges that the recovery will take a considerable length of time.

### 3. RECOVERY PLAN

In order to maintain and promote an increase in the Gaspésie Woodland Caribou population, the Recovery Team has identified two main objectives, each of which involves a number of recovery measures.

#### 3.1 Recovery Goal

The fact that the Gaspésie Woodland Caribou is naturally limited to a relatively rare habitat affects its recovery. This population will remain low with a very limited range. Despite the natural limiting factors that could affect the population, reducing impacts should ensure the population survival and, in the longer term, its full recovery. Therefore, this plan's recovery goal is to increase the population to a viable level.

#### 3.2 Objectives

Objective 1: For the population's recovery to be successful, calves must make up 17% of the total population.

Since the current survival rate of adult caribou is approximately 87%, the population's recovery will only be possible if the proportion of calves in the population is at least 17%. For this objective to be achieved in the short and medium terms, predator control operations must be applied systematically over a three-year period, at the end of which the situation will be reassessed. Even if controls

are eventually abandoned, they should be re-introduced if fall data shows that targets are no longer being reached.

Objective 2: Increase the size of the population to 150 caribou in 2007 and 175 caribou in 2012.

Taking the current caribou survival rate into consideration, the estimated population should be 150 caribou in 2007 and 175 caribou in 2012.



### 3.3 Strategies proposed by the Team

Table 3. Description of actions to be taken as part of the Gaspésie Woodland Caribou Recovery Plan. Monitoring and interventions

No	Action	Description of the Activity	Priority	Performance Indicators
1	Predator control: black bears and coyote	<p>• Control of these two predators will only take place in the areas around Mont Albert and the McGerrigle Mountains. (The other summit, Mont Logan, will be used as a control for the research project.) Predator control will ensure immediate protection of calves and the subsequent growth of the population.</p> <p><u>Coyote:</u></p> <p>One strategy is to prepare coyote feeding sites some time in February in the areas around the summits of Mont Albert and the McGerrigle Mountains. The sites will be visited, and observed by means of aerial surveys prior to the caribou calving period. Another strategy involves setting out traps during the calving period and at the end of the summer.</p> <p><u>Black bear:</u></p> <p>Black bear control involves placing baited lethal traps in 200-litre barrels in areas near the summits during the period from early spring until mid-July. In addition, medium-sized traps will be used in smaller barrels, which will also be placed near the summits.</p>	1	<p>Results of the control operations:</p> <ul style="list-style-type: none"> <li>-Trapping effort.</li> <li>-Number of coyotes and black bear caught.</li> <li>-Caribou fall population inventory.</li> <li>-Report on findings (annual monitoring by the Recovery Team).</li> </ul>

No	Action	Description of the Activity	Priority	Performance Indicators
2	Encourage black bear and coyote trapping.	<ul style="list-style-type: none"> <li>• Encourage trapping in areas adjacent to Gaspésie provincial park by setting up special programs or introducing initiatives aimed at increasing trappers' involvement. Certain elements could be re-examined, including the area and boundaries of trapping zones, the limitations on trapping permits, the cost of leasing territories, and operating conditions (harvest period, season, annual trapping quotas).</li> </ul>	1	<ul style="list-style-type: none"> <li>- Number of areas covered by a lease of exclusive trapping rights.</li> <li>- Annual trapping levels.</li> </ul>
3	Research project: use of habitat and territory by Gaspésie Woodland Caribou predators.	<p><u>Objectives:</u></p> <p>1- The population's precarious situation means that predator control operations must be clearly focused. We therefore need to have a better understanding of the ecology of the black bear and the coyote.</p> <p>2- Knowledge is also required in order to improve the habitat management strategy in the new version of the forest management plan.</p> <p><u>Methodology:</u></p> <p>Approximately 30 black bears and 30 coyotes will be equipped with GPS or VHF radio-collars for a period of three years. When it is possible, the collars will be removed and put on other animals so that we can track 30 different individuals in each of the two species during the study period.</p>	1	<ul style="list-style-type: none"> <li>- Progress report</li> <li>- Trapping effort</li> <li>- Number of live captures</li> <li>- Number of radio-telemetry locations</li> <li>- Report on findings: annual monitoring by the Recovery Team</li> <li>- Monitoring of the forest management plan</li> </ul>

No	Action	Description of the Activity	Priority	Performance Indicators
4	Raise public awareness of the Gaspésie Woodland Caribou Recovery Plan (2002-2012)	<ul style="list-style-type: none"> <li>• Develop a communication strategy to inform the general public about the content of the Gaspésie Woodland Caribou Recovery Plan.</li> <li>• Develop a communication strategy to inform personnel working at Gaspésie provincial park and the Chic-Chocs and Matane wildlife sanctuaries about the content of the Gaspésie Woodland Caribou Recovery Plan.</li> </ul>	1	<ul style="list-style-type: none"> <li>- News conference</li> <li>- Post-publicity coverage</li> <li>- Local media</li> <li>- Gaspésie provincial park harmonisation table</li> <li>- Wildlife sanctuaries' local boards of directors (LBD)</li> <li>- FAPAQ intranet site</li> <li>- Meeting with wildlife sanctuaries' personnel</li> </ul>
5	Organize the gathering of information on the caribou population and its predators, based on field observations (by naturalists and clients).	<ul style="list-style-type: none"> <li>• Continue to gather information on the caribou population and its predators based on field observations, from sources such as ad hoc observations made by park naturalists, and others; data regarding the use of the wildlife sanctuaries, and scat trails. Consider developing a relative predator abundance indicator.</li> </ul>	1	<ul style="list-style-type: none"> <li>- Data compilation.</li> <li>- Development of maps illustrating the observations.</li> <li>- Data on the use of the wildlife sanctuaries.</li> <li>- Scat trail results.</li> </ul>

No	Action	Description of the Activity	Priority	Performance Indicators
6	Promote reasonable levels of black bear sport hunting in areas adjacent to Gaspésie provincial park.	<ul style="list-style-type: none"> <li>• In light of the potential of the areas surrounding the Mont Albert, McGerrigle Mountains and Mont Logan sectors, black bear hunting will be promoted.</li> </ul>	1	<ul style="list-style-type: none"> <li>- Discussions with officials at the Chic-Chocs and Matane wildlife sanctuaries and the Cap-Chat Controlled Zone (CZ) aimed at establishing a wildlife profile.</li> <li>- LBD of the Chic-Chocs and Matane wildlife sanctuaries and the Board of Directors of the Cap-Chat CZ administration.</li> </ul>
7	Wildlife protection plan	<ul style="list-style-type: none"> <li>• Wildlife protection services at the Sainte-Anne-des-Monts and Matane offices will give priority to all complaints or incident reports involving caribou.</li> </ul> <p>In partnership with Gaspésie provincial park and the Chic-Chocs and Matane wildlife sanctuaries, wildlife protection services will ensure that the four wildlife protection plans in question make mention of the problems facing the caribou population, and required protection measures, if applicable.</p>	1	<ul style="list-style-type: none"> <li>- Development of protection plans.</li> <li>- Monitoring of protection plans.</li> <li>- Assessment of protection plans.</li> <li>- Event reports from various organizations, and the SPF.</li> <li>- Agreed-upon actions, and ad hoc observations.</li> </ul>

No	Action	Description of the Activity	Priority	Performance Indicators
8	Improvements to the forest management plan	<ul style="list-style-type: none"> <li>• Improve the next version of the forest management plan.</li> <li>- Review the plan's objectives, zoning issues and the forest management strategy.</li> <li>• Taking the caribou's current situation into consideration, ensure the integration of knowledge acquired through research projects into the next version of the forest management plan.</li> </ul>	2	- Monitoring Committee: Forest management plan
9	Manage human disturbances and the development of tourist activities; monitor the number of tourists.	<ul style="list-style-type: none"> <li>• Continue providing a framework for the development of recreational and tourist activities.</li> <li>Harmonize the overall recreational and tourist activity management strategy.</li> </ul>	2	<ul style="list-style-type: none"> <li>- Visitor statistics</li> <li>- Management plan: Gaspésie provincial park</li> </ul>
10	Review the boundaries of the caribou's legal habitat.	<ul style="list-style-type: none"> <li>• Review the boundaries of the legal habitat in relation to caribou distribution in order to harmonize the framework for forestry, mining, and recreational and tourist activities.</li> </ul>	2	-Monitoring committee: Forest management plan
11	Assess the mining situation in areas adjacent to Gaspésie provincial park.	<ul style="list-style-type: none"> <li>• Analyse the predicted impact of maintaining mining claims in areas inhabited by caribou, and identify impact mitigation measures that should be introduced.</li> </ul>	3	-Monitoring committee: Recovery Plan

### 3.4 Responsibilities

#### Organizations approached to participate in the Recovery Plan measures

Action	Société de la faune et des parcs du Québec				Société des établissements de plein air du Québec			Ministère des Ressources naturelles	Université du Québec à Rimouski	Associations professionnelles des trappeurs indépendants	Fédération des trappeurs	gestionnaires du Québec	Conseils régionaux de l'Environnement
	Direction de l'aménagement de la faune	Direction de la recherche sur la faune	Direction de la protection de la faune	Direction de l'expertise professionnelle et technique	Gaspésie provincial park	Réserve faunique des Chic-Chocs	Réserve faunique de Matane						
1. Predator control.	X	X		X	X	X	X						
2. Encourage black bear and coyote trapping.	X					X	X			X	X		
3. Research project: the use of habitat and territory by caribou predators.	X	X			X				X				
4. Raise public awareness of the Gaspésie Woodland Caribou Recovery Plan (2002-2012).	X	X	X	X	X	X	X	X		X	X	X	X
5. Organize the gathering of information about the caribou population and its predators based on field observations.	X	X			X	X	X		X				
6. Promote reasonable levels of black bear sport hunting in areas adjacent to Gaspésie provincial park.	X					X	X						
<b>7. Wildlife protection plan</b>			<b>X</b>		<b>X</b>	<b>X</b>	<b>X</b>						
<b>8. Make improvements to the forest management plan.</b>	<b>X</b>				<b>X</b>			<b>X</b>	<b>X</b>				
<b>9. Manage human disturbances and the development of recreational and tourist activities.</b>	<b>X</b>		<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>						

Legend:

Priority	1.	Activity essential to the achievement of the Plan's objectives.
	2.	Activity that plays a key role in the achievement of the Plan's objectives.
	3.	Activity that will enable the Plan's objectives to be fully achieved.

10. Review the boundaries of the caribou's legal habitat.	X				X	X	X	X				
11. Assess the mining situation.	X							X				

Legend:

Priority	1.	Activity essential to the achievement of the Plan's objectives.
	2.	Activity that plays a key role in the achievement of the Plan's objectives.
	3.	Activity that will enable the Plan's objectives to be fully achieved.



#### 4. CONCLUSION

The Recovery Team believes that a lack of human intervention will result in the disappearance of the Gaspésie Woodland Caribou population in the medium term. The literature review shows that human activities have had a negative impact on caribou in general. For the Gaspésie Woodland Caribou population, these negative effects appear to have occurred primarily in the early 20th century. Protection provided by Gaspésie provincial park and the caribou habitat management plan would probably have ensured the survival of the Gaspésie population, had it not been for the arrival of a new predator. Nevertheless, the Team is convinced that the situation can be turned around in the medium term if appropriate measures are taken with respect to the species and habitat involved.

## ACKNOWLEDGEMENTS

The Gaspésie Woodland Caribou Recovery Team would like to give special thanks to Véronique Michaud, an intern biologist, who was responsible for the major part of the literature review referred to in this document. The guidance provided by her excellent work was greatly appreciated.

## REFERENCES

- ADAMS. G. L., F. J. SINGER and W. B. DALE. 1995. Caribou calf mortality in Denali National Park, Alaska. *J. Wildl. Manage.* 59: 584-594.
- ARSENEAU, M. J. 1996. Biomasse, diversité et productivité des lichens arboricoles fruticuleux-radiés dans les sapinières matures du parc national de la Gaspésie, Québec. Université du Québec à Montréal, Montréal, Québec. 64 pp.
- ARSENEAU, M. J., J.-P. OUELLET and L. SIROIS. 2000. Impact des coupes forestières sur les lichens arboricoles dans les sapinières gaspésiennes et mise en place d'outils d'évaluation de la biomasse de lichens. Université du Québec à Rimouski, Rimouski, Québec. 43 pp.
- BANFIELD, A.W.F. 1961. A revision of the reindeer and caribou, genus *Rangifer*, *Nat. Mus. Can., Bull.* 177 pp.
- BANFIELD, A. W. F. 1977. Les mammifères du Canada. Les Presses de l'Université Laval. 406 pp.
- BERGERUD, A. T. 1973. Movement and rutting behavior of caribou (*Rangifer tarandus*) at Mount Albert, Quebec. *Can. Field-Nat.* 87: 357-369.
- BERGERUD, A. T. 1974. Decline of caribou in North America following settlement. *J. Wildl. Manage.* 35: 757-770.
- BERGERUD, A. T. 1974. The role of the environment in aggregation, movement, and disturbance behavior of caribou. In V. GEIST and F. WALTHER (eds). *The behavior of ungulates and its relation to management*, International Union for Conservation of Nature and Natural Resources, Morges, Switzerland, pp. 552-584.
- BERGERUD, A. T. 1980. A review of the population dynamics of caribou and wild reindeer in North America. In REIMERS, E., E. GAARE and S. SKIENNEBERG (eds). *Proc. Second Intern. Reindeer/Caribou Symp., Roros, Norway. Part B.*, pp. 556-581.

- BERGERUD, A. T. 1983. The natural population control of caribou. Pp. 14-16 in Symposium on natural regulation of wildlife populations. Proceedings of the northwest section, the Wildlife Society (F. L. Bunnell, D. S. Eastman, and J. M. Peek, eds.). Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow, ID.
- BERGERUD, A. T., H. E. BUTLER and D. R. MILLER. 1985. Antipredator tactics of calving caribou : dispersion in mountains. *Can. J. Zool.* 63: 1324-1329.
- BERGERUD, A. T. and W. B. BALLARD. 1988. Wolf predation on caribou: the Nelchina herd case history, a different interpretation. *J. Wildl. Manage.* 52: 344-357.
- BOERTJE, R. D. 1985. An energy model for adult female caribou on the Denali herd, Alaska. *J. Range Manage.* 38(5): 468-473.
- BOERTJE, R. D., P. VALKENBURG and M. E. MCNAY. 1996. Increases in moose, caribou, and wolves following wolf control in Alaska. *J. Wildl. Manage.* 60 (3): 474-489.
- BOILEAU, F. 1993. Utilisation de l'habitat par l'ours noir (*Ursus americanus*) dans le parc de conservation de la Gaspésie. M. Sc. Thesis, Université Laval. Québec. 55 pp.
- BOILEAU, F. 1996. Rapport sur la situation du caribou (*Rangifer tarandus caribou*) du parc de conservation de la Gaspésie. Québec, ministère de l'Environnement et de la Faune. 49 pp.
- BOUCHER, D. 2000. Projet d'implantation du centre d'avalanche de La Haute-Gaspésie. MRC de Denis Riverin. 27 pp.
- CHAMPAGNE, S., H. FALARDEAU, J.-M. HARDY, N. FOURNIER, J. LAMOUREUX and G. LANDRY. 1999. Plan d'aménagement de l'aire du caribou de la Gaspésie. Ministère des Ressources naturelles et Société de la faune et des parcs du Québec, Région de la Gaspésie-Îles-de-la-Madeleine. 20 pp.

- CHUBBS, T. E., B. L. KEITH, S. P. MAHONEY and M. J. MCGRATH. 1993. Responses of woodland caribou (*Rangifer tarandus caribou*) to clear-cutting in east central Newfoundland. *Can. J. Zool.* 71: 487-493.
- CLAVEAU, R. and J.-P. FILLION. 1984. Fréquence et distribution du ver des méninges (*Parelaphostrongylus tenuis*) chez le cerf de Virginie de l'Est du Québec. *Naturaliste can.* 111: 203-206.
- COSEWIC. 2000. Canadian Species at Risk, November 2000. Committee on the Status of Endangered Wildlife in Canada, 26 pp.
- COURTOIS, R., L. BERNATCHEZ, J.-P. OUELLET and L. BRETON. 2002. Les écotypes de caribou forment-ils des entités génétiques distinctes? Société de la faune et des parcs du Québec, Direction de la recherche sur la faune. 35 pp.
- COURTOIS, R., J.-P. OUELLET, A. GINGRAS, C. DUSSAULT, L. BRETON and J. MALTAIS. 2001. Changements historiques et répartition actuelle du caribou au Québec. Société de la faune et des parcs du Québec. Report 8027. 44 pp.
- CRÊTE, M., C. BANVILLE, D. LE HÉNAFF, J. LÉVESQUE and H. ROSS. 1989. High calf mortality endangers the Gaspésie Park caribou herd. Pp 178-179 in C. BUTLER and S. P. MAHONEY (eds). Proceedings of the 4th North American Caribou Workshop. St. John's.
- CRÊTE, M., C. BANVILLE, F. DUCHESNEAU, J. FERRON, J. LÉVESQUE and H. ROSS. 1990. Plan de rétablissement de la population de caribous du parc de conservation de la Gaspésie. Ministère du Loisir, de la Chasse et de la Pêche. 20 pp.
- CRÊTE, M., C. BARETTE, F. BOULANGER, J. FERRON, N. FOURNIER, M. HUOT, J. LAMOUREUX, J. LÉVESQUE and H. ROSS. 1994. National Recovery Plan for the Gaspésie Caribou. Report no. 9. Ottawa: Recovery of Nationally Endangered Wildlife Committee. 18 pp.

- CRÊTE, M. and A. DESROSIERS. 1993. L'invasion du coyote (*Canis latran*) menace la survie de la population relique de caribous (*Rangifer tarandus*) du parc de conservation de la Gaspésie. Ministère du Loisir, de la Chasse et de la Pêche, Direction de la faune et des habitats. 33 pp.
- CRÊTE, M. and J. HUOT. 1993. Regulation of large herd of migratory caribou: summer nutrition affects calf growth and body reserves of dams. *Can. J. Zool.* 71: 2291-2296.
- CRÊTE, M., R. NAULT, and H. LAFLAMME. 1990. Plan tactique : Caribou. Ministère du Loisir, de la Chasse et de la Pêche, Direction de la gestion des espèces et des habitats, 73 pp.
- CRONIN, M. A., W. B. BALLARD, J. B. BRYAN, B. J. PIERSON and J. D. MCKENDRICK. 1998A. Northern Alaska oil fields and caribou: a commentary. *Biol. Conserv.* 83: 195-208.
- CRONIN, M. A., S. C. AMSTRUP, G. M. DURNER, L. E. NOEL, T. L. MCDONALD and W. B. BALLARD. 1998b. Caribou distribution during the post-calving period in relation to infrastructure in the Prudhoe Bay oil field, Alaska. *Arctic* 51: 85-93.
- DANSEREAU, M. C. 1999. Mortalité des arbres dans les sapinières matures du parc national de la Gaspésie, Québec. Master's Thesis. UQAM. 86 pp.
- DÉRY, S. and L. BÉLANGER. 2000. La problématique du caribou des bois de la Gaspésie : effet de coupes partielles sur l'habitat. Ministère des Ressources naturelles et Société de la faune et des parcs du Québec, région de la Gaspésie-Îles-de-la-Madeleine. 18 pp.
- DESROSIERS, A. 1993. Inventaire aérien du caribou de la Gaspésie : automne 1993. Ministère du Loisir, de la Chasse et de la Pêche, Direction de la faune et des habitats. 18 pp.
- DESROSIERS, A. and R. FAUBERT. 1999. Inventaire aérien du caribou (*Rangifer tarandus caribou*) du parc national de la Gaspésie, automne 1999. Société de la faune et des parcs du Québec, Direction de la recherche sur la faune et Direction de l'aménagement de la faune de la Gaspésie-Îles-de-la-Madeleine. 47 pp.

- DESROSIERS, A. and R. FAUBERT. 2001. Inventaire aérien du caribou (*Rangifer tarandus caribou*) du parc national de la Gaspésie, automne 2001. Société de la faune et des parcs du Québec, Direction de la recherche sur la faune et Direction de l'aménagement de la faune de la Gaspésie-Îles-de-la-Madeleine. 49 pp.
- DESROSIERS, A. and R. FAUBERT. 2004. Inventaire aérien du caribou (*Rangifer tarandus caribou*) de la Gaspésie, automne 2003. Société de la faune et des parcs du Québec, Direction de la recherche sur la faune et Direction de l'aménagement de la faune de la Gaspésie-Îles-de-la-Madeleine. 50 pp.
- DUMONT, A. and M. CRÊTE. 1995. Le ver des méninges (*Parelaphostrongylus tenuis*) un facteur marginal pour les populations d'orignaux (*Alces alces*) du Québec. Ministère de l'Environnement et de la Faune, Direction de la faune et des habitats. 30 pp.
- DUMONT, A. 1993. Impact des randonneurs sur les caribous (*Rangifer tarandus*) du parc de conservation de la Gaspésie. M. Sc. Thesis, Université Laval, Québec. 86 pp.
- DUPUY, P. and A. DESROSIERS. 1986. Caribou des bois de la Gaspésie : méthode d'inventaire automnal et état de la population en 1986. Québec, Ministère du Loisir, de la Chasse et de la Pêche, Service des parcs, région du Bas-St-Laurent-Gaspésie-Îles-de-la-Madeleine. 60 pp.
- DYER, S. J., J. P. O'NEILL, S. M. WASEL, and S. BOUTIN. 2001. Avoidance of industrial development by woodland caribou. *J. Wildl. Manage.* 65: 531-542.
- GASPÉSIE CARIBOU RECOVERY TEAM. 1994. National Recovery Plan for the Gaspésie Caribou. RENEW Report No. 9, 18 pp.
- FOURNIER, N. and R. FAUBERT. 2001. Évaluation du troupeau de caribous de la Gaspésie. Société de la faune et des parcs du Québec, Direction de l'aménagement de la faune de la Gaspésie-Îles-de-la-Madeleine. 23 pp.

- FOURNIER, N. and C. TURCOTTE. 2002. État de situation : caribou de la Gaspésie. Société de la faune et des parcs du Québec, Direction de l'aménagement de la faune de la Gaspésie-Îles-de-la-Madeleine. 30 pp.
- FRANZMANN, A. W. and C. C. SCHWARTZ. 1986. Black bear predation on moose habitat on the Kenai Peninsula, Alaska. *Alces* 22: 139-153.
- FULLER, T. K. and L. B. KEITH. 1981. Woodland caribou population dynamics in northeastern Alberta. *J. Wildl. Manage.* 45: 197-213.
- GASAWAY, W. C., R. O. STEPHENSON, J. L. DAVIS, P. E. K. SHEPHERD and O. E. BURRIS. 1983. Interrelationships of wolves, prey and man in Interior Alaska. *Wildlife Monograph*. N° 84. 50 pp.
- GAZETTE OFFICIELLE DU QUÉBEC. 1993. Partie 2, Lois et règlements. Éditeur officiel du Québec. Québec, No 29: 4577-4578.
- GAZETTE OFFICIELLE DU QUÉBEC. 2001. Partie 2, Lois et règlements. Éditeur officiel du Québec, Québec, No 36: 6143-6150.
- GUAY, D. 1983. Histoires vraies de la chasse au Québec. VLB Éditeur, Montréal. 268 pp.
- KOENIG, W. D. 1988. On determination of viable population size in birds and mammals. *Wild. Soc. Bull.* 16: 230-234.
- LACHAPPELLE, J. 2000. Après la vache folle, les cervidés fous. *Le Devoir*, mardi 19 décembre 2000.
- MESSIER, F. 1994. Ungulates population models with predation: a case study with the North American moose. *Ecology*, 75: 478-488.
- MESSIER, F., J. FERRON and J.-P. OUELLET. 1987. Le caribou du parc national de la Gaspésie : connaissances et recommandations sur la gestion du troupeau. Ministère du Loisir, de la Chasse et de la Pêche, Direction de la faune terrestre. 65 pp.

- MICHAUD, V. 2001. Revue de littérature en fonction du plan d'action du caribou (*Rangifer tarandus caribou*) du parc national de la Gaspésie. Société de la faune et des parcs du Québec. Direction de l'aménagement de la faune, Gaspésie-Îles-de-la-Madeleine. 35 pp.
- MOISAN, G. 1956. Le caribou de Gaspé I. Histoire et distribution. *Naturaliste can.* 83: 225-234.
- MOISAN, G. 1957. Le caribou de Gaspé III. Analyse de la population et plan d'aménagement. *Naturaliste can.* 84 (1): 5-27.
- MOSNIER, A., J.-P. OUELLET, L. SIROIS, and N. FOURNIER. 2002. Utilisation de l'espace et de l'habitat par la métapopulation de caribou de la Gaspésie. Université du Québec à Rimouski. 31 pp.
- MURPHY, S. M. and J. A. CURATOLO. 1987. Activity budgets and movement rates of caribou encountering pipelines, roads and traffic in northern Alaska. *Can. J. Zool.* 65: 2483-2490.
- OUELLET, J.-P., J. FERRON and L. SIROIS. 1991. Cover changes during the 1954-1990 period in the alpine vegetation used by the Gaspésie Provincial Park caribou herd. *Rangifer, Spec. Issue 7*: 159.
- OUELLET, J.-P., J. FERRON and L. SIROIS. 1996. Space habitat use by the threatened Gaspé Woodland Caribou, southerneastern Québec. *Can. J. Zool.* 74: 1922-1933.
- POLLARD, R. H., W. B. BALLARD, L. E. NOEL and M. A. CRONIN. 1996. Summer distribution of caribou, *Rangifer tarandus granti*, in the area of the Prudhoe Bay oil field, Alaska, 1990-1994. *Can. Field-Nat.* 110: 659-674.
- RACEY, G. D., K. ABRAHAM, W. R. DARBY, H.R. TIMMERMANN and Q. DAY. 1991. Can woodland caribou and the forest industry coexist : The Ontario scene. *Rangifer* 11, Special issue no 7. Proceeding of the 5th North American Caribou Symposium. 108-115.
- RETTIE, J. W. and F. MESSIER. 1998. Dynamics of woodland caribou populations at the southern limit of their range in Saskatchewan. *Can. J. Zool.* 76: 251-259.

- RIVARD, G., 1978. Étude du caribou de la Gaspésie en considérant l'habitat. Québec, Ministère du Tourisme, de la Chasse et de la Pêche, Direction de la recherche faunique. Rap. RRF-22. 65 pp.
- ROED, J. M., P. D. DOERR and J. R. WALTERS. 1986. Determining minimum population size for birds and mammals. In CRÊTE, M., C. BANVILLE, F. DUCHESNEAU, J. FERRON, J. LÉVESQUE, and H. ROSS. 1990. Plan de rétablissement de la population de caribous du parc de conservation de la Gaspésie. Ministère du Loisir, de la Chasse et de la Pêche. 20 pp.
- ROMINGER, E. M. and J. L. OLDEMEYER. 1989. Early winter habitat of woodland caribou, Selkirk Mountains, British Columbia. *J. Wildl. Manage.* 53: 238-243.
- ROSENEAU, D. G., and J. F. CURATOLO. 1976. Distribution and movements of the Porcupine caribou herd in northeastern Alaska and the Yukon Territory 1975. *Arctic Gas, Biological Report Series, Volume 36.* 82 pp.
- SCHWARTZ, C. C. and A. W. FRANZMANN. 1989. Bears, wolfs, moose, and forest succession: some management considerations on the Kenai Peninsula. In RETTIE, J.W. and F. MESSIER. 1998. Dynamics of woodland caribou populations at the southern limit of their range in Saskatchewan. *Can. J. Zool.* 76: 251-259.
- SEIP, D. R. 1989. Limiting factors of woodland caribou in southeastern British Columbia. In BUTLER, C.E. and MAHONEY, S.P. (eds), *Proceedings 4th North American caribou workshop.* St. John's, Newfoundland.
- SEIP, D. R. 1992. Factors limiting woodland caribou populations and their interrelationships with wolves and moose in southeastern British Columbia. *Can. J. Zool.* 70: 1494-1503.
- SERVHEEN, G. and L. J. LYON. 1989. Habitat use by woodland caribou in the Selkirk mountains. *J. Wildl. Manage.* 53 (1): 230-237.
- SIMPSON, K. 1987. The effects of snowmobiling on winter range use of mountain caribou. Wildlife working group report WR-25. Wildlife Branch, Nelson, B. C.

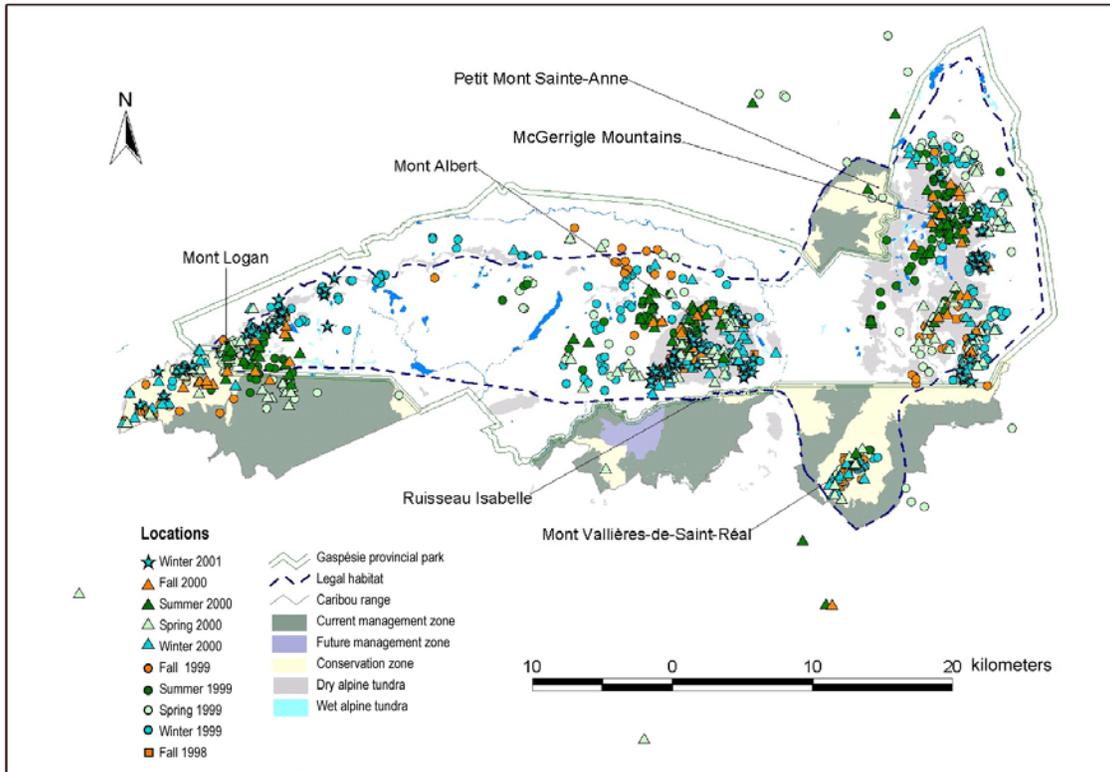
- STEVENSON, S. K. 1979. Effects of selective logging on arboreal lichens used by Selkirk caribou. B.C. In SERVHEEN, G. and L. J. LYON. 1989. Habitat use by woodland caribou in the Selkirk mountains. J. Wildl. Manage. 53 (1): 230-237.
- STEWART, R. R., E. H. KOWAL, R. BEAULIEU and T. W. ROCK. 1985. The impact of black bear removal on moose calf survival in east-central Saskatchewan. Alces 21: 403-418.
- STUART-SMITH, A. K., C. J. A. BRADSHAW, S. BOUTIN, D. M. HEBERT and A. B. RIPPIN. 1997. Woodland caribou relative to landscape patterns in northeastern Alberta. J. Wildl. Manage. 61(3): 622-633.
- TRAINER, D. O. 1973. Caribou mortality due to the meningeal worm. J. Wildl. Diseases 9: 376-379.
- VAN DAELE, L. J. and D. R. JOHNSON. 1983. Estimation of arboreal lichen biomass available to caribou. J. Wildl. Manage. 47 (3): 888-890.
- VERSPoor, E. 1983. Black bear predation on a mule deer fawn. Can. Field-Nat. 97: 114.
- WELLS, J. V. and M. E. Richmond. 1995. Populations, metapopulations, and species populations : what are they and who should care? Wildlife Society Bulletin, 23: 458-462.
- WHITING, T. 1999. Projet d'étude de la maladie débilitante chronique chez les ongulés sauvages. Ministère de l'Agriculture du Manitoba. Direction générale des services vétérinaires.



APPENDIX 1

RADIO-TELEMETRY LOCATIONS FOR CARIBOU  
BETWEEN NOVEMBER 1998 AND MARCH 2001

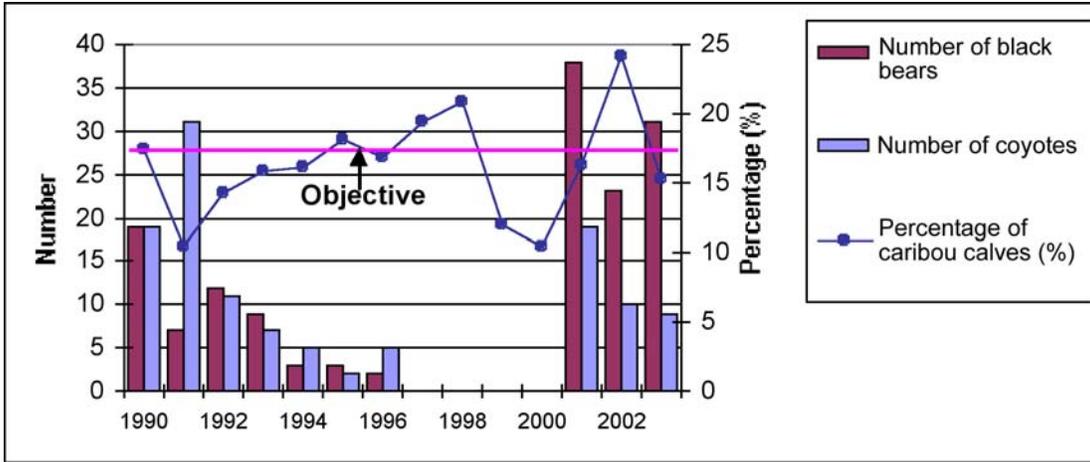




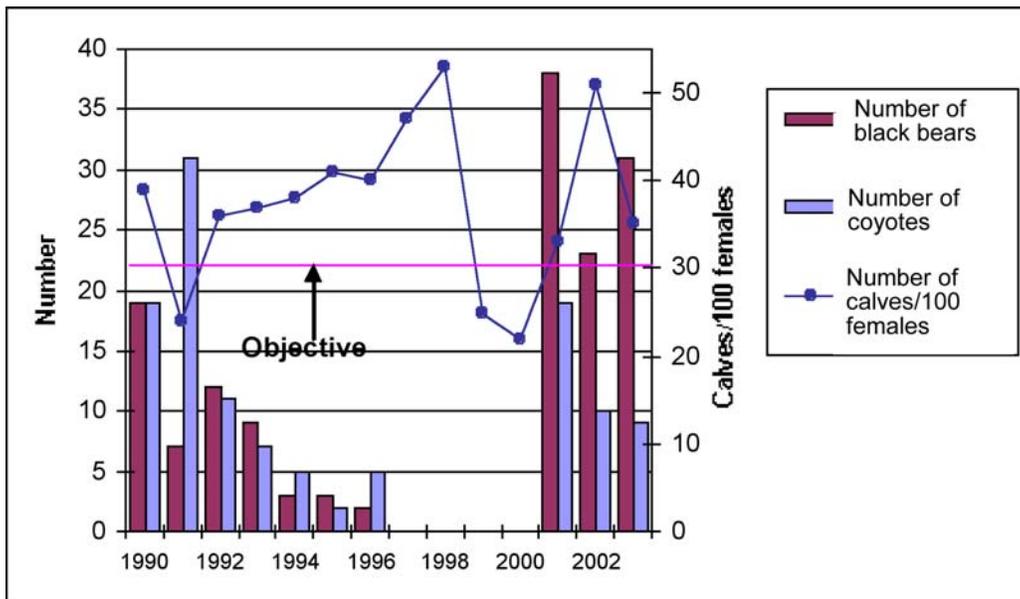


APPENDIX 2

PREDATOR CONTROL OPERATIONS AND CARIBOU POPULATION  
RECRUITMENT



Number of black bear and coyotes captured during predator control operations (1990-1996; 2001-2003), and recruitment (% of calves) in the Gaspésie Woodland Caribou population.



Number of black bear and coyotes captured during predator control operations (1990-1996; 2001-2003); recruitment (calves/100 females) in the Gaspésie Woodland Caribou population.



## **ADDENDUM**

### **ADOPTION BY THE MINISTER OF THE ENVIRONMENT OF CANADA OF THE RECOVERY PLAN FOR THE GASPÉSIE WOODLAND CARIBOU UNDER SECTION 44 OF THE *SPECIES AT RISK ACT***

**This addendum is appended to the original Recovery Plan to assist in  
meeting the *Species at Risk Act* requirements**

## DECLARATION

This recovery strategy has been prepared in cooperation with the jurisdictions responsible for the Gaspésie Woodland Caribou. Environment Canada has reviewed and accepts this document as its recovery strategy for the Gaspésie Woodland Caribou, as required under the *Species at Risk Act*. This recovery strategy also constitutes advice to other jurisdictions and organizations that may be involved in recovering the species.

The goals, objectives and recovery approaches identified in the strategy are based on the best existing knowledge and are subject to modifications resulting from new findings and revised objectives.

This recovery strategy will be the basis for one or more action plans that will provide details on specific recovery measures to be taken to support conservation and recovery of the species. The Minister of the Environment will report on progress within five years.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment Canada or any other jurisdiction alone. In the spirit of the Accord for the Protection of Species at Risk, the Minister of the Environment invites all responsible jurisdictions and Canadians to join Environment Canada in supporting and implementing this strategy for the benefit of the Gaspésie Woodland Caribou and Canadian society as a whole.

## STRATEGIC ENVIRONMENTAL ASSESSMENT

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts on non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below.

Recovery efforts include predator monitoring activities. These activities are aimed at coyote and black bear populations in specific areas, including caribou calving grounds. If we take into account the size of these two species' populations and the limited span of monitoring activities, the impact of these efforts will not be significant. The trapping of predators is done according to standards and under the Province's supervision.

This recovery strategy will clearly benefit the environment by promoting the recovery of the Gaspésie Woodland Caribou. The potential for the strategy to inadvertently lead to adverse effects on other species was considered. The SEA concluded that this strategy will clearly benefit the environment and

will not entail any significant adverse effects. The reader should refer to the following sections of the document in particular: biology, habitat, known or possible limiting factors, strategies proposed by team.

## RESIDENCE

SARA defines residence as: *a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating* [Subsection 2(1)].

Residence descriptions, or the rationale for why the residence concept does not apply to a given species, are posted on the SARA public registry: [www.sararegistry.gc.ca/plans/residence\\_e.cfm](http://www.sararegistry.gc.ca/plans/residence_e.cfm).

## PREFACE

This proposed recovery strategy for the Gaspésie Woodland Caribou has been adopted from the Province of Québec by Environment Canada, as authorized under the article 44 of the *Species at Risk Act*. This document will probably be updated, but is sufficiently complete to guide the species recovery.

# 1. IDENTIFICATION OF THE GASPÉSIE CARIBOU CRITICAL HABITAT

## 1.1 Habitat Used by the Gaspésie Caribou

Previously occurring in the Maritime Provinces and some New England States, the Woodland Caribou population, south of the St. Lawrence River, today is represented by a single population, the Gaspésie population (Banfield 1961; Boileau 1996; Courtois et al. 2001). Courtois et al. (2001) present an analysis of the factors that caused the historical population decline.

Recent studies of habitat use by the Gaspésie caribou have allowed better documentation of the main sectors used annually by this species (Mosnier et al. 2002; C. Turcotte, pers. comm.), and identification of critical habitat to meet the needs of the Gaspésie caribou. Telemetry has shown that, in winter, the Gaspésie caribou use lower elevation montane habitats consisting of mature or overmature (= 70 years) fir and black spruce stands, while in spring, when snow cover is reduced, they use the summits, characterized by alpine tundra (Rivard 1978; Ouellet et al. 1996; Mosnier et al. 2002). This close relationship with overmature forests and summits is typical of the mountain caribou populations of North America (Apps et al. 2001; Poole et al. 2000).

The Gaspésie caribou uses the alpine tundra environments and the softwood forests of Gaspésie provincial park, which was created in 1937, among other reasons, to protect this genetically distinct population. It also uses the surrounding lands, which are potentially harvestable by the region's forest industry (Mosnier 2002).

Moreover, the telemetric monitoring studies show that the caribou's annual range is not limited to the park. About 17% of telemetry locations recorded from 1998 to 2002 were outside the park's 802 km<sup>2</sup> (Fournier and Turcotte 2002; Mosnier 2002), particularly during the calving period (Comité de rétablissement du caribou de la Gaspésie, 2004; C. Turcotte, pers. comm.). Calving areas have been identified in two sectors outside the park: west of Mont Logan and south of Mont Vallières-de-Saint-Réal (Figure 1). These observations confirm that females use various coniferous environments at the park's boundaries for calving, mostly located at 700 m altitude or more (unpublished data). Interannual variations of snow melt could influence the choice of these calving sites (Comité de rétablissement du caribou de la Gaspésie, 2004).

According to available historic documents, the caribou were much less restricted during the 1950's than today. Many sites are probably not occupied anymore because of the disturbances that affected them (forest fires, road construction, etc.). It is also possible that use of some of these potential sites is now prevented by physical obstacles, for example Mont Nicol-Albert (C. Turcotte, pers. comm.)

## 1.2 Critical Habitat Identification

The *Species at Risk Act* (SARA) defines critical habitat as “*the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species*” (Government of Canada 2002).

Following the objectives of this recovery strategy to attain 150 caribous in 2007 and 175 caribous in 2012, critical habitat for the Gaspésie Caribou population consists of (see figure 1):

- The habitat already legally protected by the Quebec Government [A<sup>1</sup>]
- A conservation zone west of the legal habitat (west of Mont Logan) [B]
- An area encompassing the telemetry locations south west of the legal habitat and east of the conservation zone at Mont Logan [C]

## 1.3 Activities Likely to Result in the Destruction of Critical Habitat

Road construction, logging industry and mining exploration and operations (Rettie and Messier 1998, Dyer *et al.* 2001, Kinley and Apps 2001): reduce, to varying degrees, the area of usable mature forests; increase fragmentation (Hanson *et al.* 1990, Caughley 1994); and allow easier access to predators (Stuart-Smith *et al.* 1997, Rettie and Messier 1998). Habitat alteration through road construction and logging promotes younger-growth forest areas where moose and white-tailed deer are found. Increasing these alternative prey species would also promote an increase in predator density in these areas of forest regeneration (Bergerud and Ballard 1988, Poole *et al.* 2000, J.P. Ouellet, pers. comm.).

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<sup>1</sup> The letters correspond to the ones used to locate critical habitat on the figure 1

## 1.4 Special Habitat Protection Measures Implemented

A Gaspésie caribou area management plan (*Plan d'aménagement de l'aire du caribou de la Gaspésie*) specific to the outlying forest zones was developed jointly by Natural Resources Canada and the Société de la faune et des parcs du Québec for the purpose of reconciling caribou protection with the economic contributions related to timber management (Champagne et al. 1999; Comité de rétablissement du caribou de la Gaspésie, 2004). This plan applies to an area of 290 km<sup>2</sup> near the park. The primary objectives of this plan were to ensure:

- Objective 1:** the sustained productivity of forest biomass;
- Objective 2:** protection of summits exhibiting a tundra facies;
- Objective 3:** protection of caribou migration corridors;
- Objective 4:** introduction of special forestry standards;
- Objective 5:** maintenance of forest activities in certain management zones.

Other objectives will be added to the second version of the management plan, which is currently under revision (C. Turcotte, pers. comm.). These objectives aim essentially at ensuring that forestry projects are implemented in accordance with the natural dynamics of the Gaspésie park fir stands (Comité de rétablissement du caribou de la Gaspésie, 2004). At the same time, monitoring studies on forest intervention were conducted to evaluate the actions that promote maximum conservation of the environments used by caribou (Comité de rétablissement du caribou de la Gaspésie, 2004).

This management plan includes “conservation zones” which are fully protected and other areas called “management zones” where forestry operations are adapted to the needs of the Gaspésie caribou. Within the conservation zones about 100 km<sup>2</sup> is found within the Petit Mont Sainte-Anne and Vallières-de-Saint-Réal sectors. These two sectors are part of the *legal habitat*, which also covers almost all of Gaspésie provincial park (see Figure 1). Within the *legal habitat*, some interventions are subject to the provincial Regulation respecting wildlife habitats (C-61.1, r.0.1.5; Gazette officielle du Québec 2001).

It should also be mentioned that a project to expand the limits of the *legal habitat* is currently in progress. The project aims to include a portion of the Vallières-de-Saint-Réal territory and the entire Mont Logan conservation sector identified in the management plan.

## 1.5 Schedule of Studies

Maintain and protect critical habitat

### Dynamics of harvested forests

The Gaspésie Caribou Recovery Plan (*Plan de rétablissement du caribou de la Gaspésie*) and the Gaspésie caribou area management plan (*Plan d'aménagement de l'aire du caribou de la Gaspésie*) propose conditions necessary to maintain the caribou critical habitat. In the medium term, the studies to monitor forest interventions stipulated in the management plan should answer the question as to whether these interventions are adequately in line with the natural dynamics of Gaspésie provincial

park fir stands. Based on these outcomes, it may be necessary to adapt management practices to better mimic natural dynamics.

Some studies are already completed and one is underway, therefore it can be expected that the geomatic analysis and validation can be completed within 2 years (end of 2008).

#### Impact of land-use planning on predator populations

Since an important part of achieving the recovery plan objectives depends on the recruitment and survival of fawns, controlling coyote and black bear populations is a key factor. Preliminary results show that black bears seem to make more use of young forest areas that are regenerating after logging, but unfortunately a lot of data have yet to be analyzed (J.-P. Ouellet, pers. comm.). A master's degree on the use of the habitat by coyotes has been completed, and a doctorate on the bears habitat use will soon be completed. In the light of the outcomes, there could be grounds to consider:

- a site review of logged areas within and around critical habitat;
- a follow-up on sample cutting areas where berries are found;
- effective predator control methods.

These reviews should be conducted annually until 2011.

To support these monitoring activities, the technical committee and the enlarged committee on the management plan of the Gaspésie caribou range, composed of provincial government officials (Faune Québec and Forêt Québec) and university officials (Université Laval and Université du Québec à Rimouski), have mentioned (during a conference call April 25, 2006) that a monitoring program should be set up to measure the caribou habitat components and the predators. In addition, Louis Bélanger (Université Laval) suggested doing verifications in the permanent sample areas within the territory covered by the management plan for the Gaspésie caribou (C. Turcotte, pers. comm.).

#### Possible expansion of the Gaspésie caribou range

##### Analysis of potential colonization sites

The current Gaspésie caribou range is probably related to the intact character of the habitats in the Parc de conservation de la Gaspésie. However, historical documents demonstrate that, in addition to the park, the Gaspésie caribou occupied a few other sectors. Today, this population uses mainly Gaspésie provincial park and the sector identified in the management plan for the Gaspésie caribou range. It is still possible that other sectors near those already protected also have a potential value. An exhaustive assessment of the sites of interest and of the degree of protection required would be useful to ensure that conditions are as favourable as possible for the recovery of this troubled herd.

The analysis of potential colonization sites requires a multi-step theoretical approach. First, the analysis of aerial photographs, ecoforest maps and other decision-making tools will allow the creation of potential site profiles. Next, a land validation could confirm whether these sites are suitable for the caribou or not. Based on the number and size of potential sites, the results could be known within one to two years (ending in 2007 or 2008).

## **2. STATEMENT ON ACTION PLANS**

An action plan relating to this recovery strategy will be completed by 2012.

## REFERENCES

- Adams, G. L., F. J. Singer and W. B. Dale. 1995. Caribou calf mortality in Denali National Park, Alaska. *J. Wildl. Manage.* 59: 584-594.
- Apps, C. D., B. N. McLellan, T. A. Kinley, and J. P. Flaa. 2001. Scale-dependent habitat selection by mountain caribou, Columbia Mountains, British Columbia. *J. Wildl. Manage.* 65(1): 65-77.
- Banfield, A.W.F. 1961. A revision of the reindeer and caribou, genus *Rangifer*, Nat. Mus. Can., Bull. 177 pp.
- Bergerud, A. T. 1983. The natural population control of caribou. Pages 14-61 In F.L. Bunnell, D.S. Eastman, and J. M. Peck, editors. Symposium on natural regulation of wildlife populations. Proceedings of the Northwest Section, The wildlife Society. Forest, Wildlife and Range Experiment Station. University of Idaho, March 10, 1978, Moscow, USA.
- Bergerud, A. T. and W. B. Ballard. 1988. Wolf predation on caribou: the Nelchina herd case history, a different interpretation. *J. Wildl. Manage.* 52: 344-357.
- Boileau, F. 1996. Rapport sur la situation du caribou (*Rangifer tarandus caribou*) du parc de Conservation de la Gaspésie. Ministère de l'Environnement et de la Faune. Québec. 49 pp.
- Caughley, G. 1994. Directions in conservation biology. *J. Anim. Ecol.* 63: 215-244.
- Champagne, S., H. Falardeau, J.-M. Hardy, N. Fournier, J. Lamoureux and G. Landry. 1999. Plan d'aménagement de l'aire du caribou de la Gaspésie. Natural Resources Canada and Société de la faune et des parcs du Québec, Région de la Gaspésie-Îles-de-la-Madeleine. 20 pp.
- Comité de rétablissement du caribou de la Gaspésie. 2004. Gaspé Peninsula Caribou Recovery Plan 2002-2012) (*Rangifer tarandus caribou*). Société de la faune et des parcs du Québec. 71 pp.
- Courtois, R. 2003. La conservation du caribou forestier dans un contexte de perte d'habitat et de fragmentation du milieu. Ph. D. Thesis. Université du Québec à Rimouski. 350 pp.
- Courtois, R., J.-P. Ouellet, A. Gingras, C. Dussault, L. Breton and J. Maltais. 2001. Changements historiques et répartition actuelle du caribou au Québec. Société de la faune et des parcs du Québec. Rapport 8027. 44 pp.
- Courtois, R., L. Bernatchez, J.-P. Ouellet and L. Breton. 2003. Significance of caribou (*Rangifer tarandus*) ecotypes from a molecular genetics viewpoint. *Conservation Genetics.* 4: 393-404.
- Crête, M. and A. Desrosiers. 1995. "Range expansion of Coyotes, *Canis latrans*, threatens a remnant herd of Caribou, *Rangifer tarandus*, in southeastern Québec." *Can. Field-Nat.* 109(2): 227-235.

- Desrosiers, A. and R. Faubert. 2005. Inventaire aérien du caribou (*Rangifer tarandus caribou*) de la Gaspésie, Fall 2004. Ministère des Ressources naturelles, de la Faune et des Parcs du Québec, secteur Faune Québec. Direction de la recherche sur la faune and Direction de l'aménagement de la faune de la Gaspésie-îles-de-la-Madeleine. 51 pp.
- Dyer, S.J., J.P. O'Neill, S.M. Wasel and S. Boutin. 2001. Avoidance of industrial development by woodland caribou. *J. Wildl. Manage.* 65: 531-542.
- Fournier, N. and C. Turcotte. 2002. État de situation : caribou de la Gaspésie. Société de la faune et des parcs du Québec, Direction de l'aménagement de la faune de la Gaspésie-Îles-de-la-Madeleine. 30 pp.
- Fournier, N. and R. Faubert. 2001. Évaluation du troupeau de caribous de la Gaspésie. Société de la faune et des parcs du Québec, Direction de l'aménagement de la faune de la Gaspésie-Îles-de-la-Madeleine. 23 pp.
- Fuller, T. K. and L. B. Keith. 1981. Woodland caribou population dynamics in northeastern Alberta. *Journal of Wildlife Management.* 45:197-213.
- Government of Canada. 2002. Bill C-5. An Act respecting the protection of wildlife species at risk in Canada. Public Works and Government Services Canada, Ottawa. Canada. 97 pp.
- Hanson, J. S., G. P. Malanson, and M. P. Armstrong. 1990. Landscape management and dispersal in a model of riparian forest dynamics. *Ecol. Model.* 49: 277-296.
- Kinley, T. A. and C. D. Apps. 2001. Mortality patterns in a subpopulation of endangered mountain caribou. *Wildl. Soc. Bull.* 29(1): 158-164.
- Mosnier, 2002. Utilisation de l'espace et de l'habitat par le caribou (*Rangifer tarandus*) de la Gaspésie. Master's thesis. Université du Québec à Rimouski. 52 pp.
- Ouellet, J.-P., J. Ferron, and L. Sirois. 1996. Space and habitat use by the threatened Gaspé caribou in southeastern Quebec. *Canadian Journal of Zoology*, 74: 1922-1933.
- Poole, K. G., D. C. Heard and G. Mowat. 2000. Habitat use by woodland caribou near Takla Lake in central British Columbia. *Can. J. Zool.* 78: 1552-1561.
- Rettie, J. W. and F. Messier. 1998. Dynamics of woodland caribou populations at the southern limit of their range in Saskatchewan. *Can. J. Zool.* 76: 251-259.
- Rivard, G. 1978. Étude du caribou de la Gaspésie en considérant l'habitat. Ministère du Tourisme, de la Chasse et de la Pêche, Québec, 65 pp.
- Seip, D. R. 1992. Factors limiting woodland caribou populations and their interrelationships with wolves and moose in southeastern British Columbia. *Can. J. Zool.* 70: 1494-1503.

Stuart-Smith, A. K., C. J. A. Bradshaw, S. Boutin, D. M. Hebert and A. B. Rippin. 1997. Woodland caribou relative to landscape patterns in northeastern Alberta. *J. Wildl. Manage.* 61(3): 622-633.

Van Ballenberghe, V. 1985. Wolf predation on caribou : the Nelchina herd case history. *J. Wildl. Manage.* 49: 711-720.

Figure 1. Approximate location of the critical habitat for the Gaspésie Woodland Caribou (adapted from the map Radio-telemetry locations for caribou between November 1998 and March 2001)

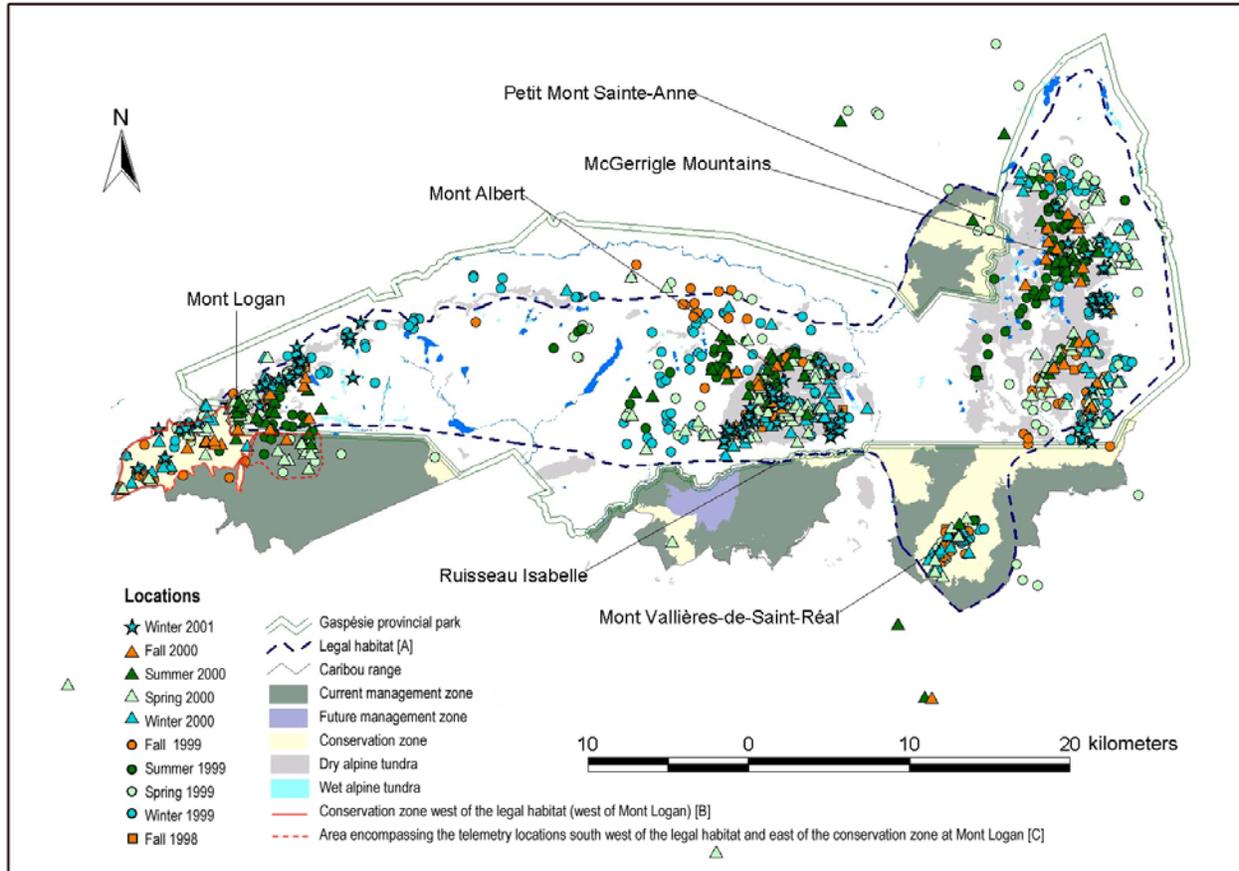


Figure 2. Plan identifying the different intervention territories in the caribou habitat, Gaspé Population

