



## Appendix B.

### Data Limitations for Defining Important Habitats.

The information used to produce the maps in Appendix A and in the map atlas on CD-ROM (Part 2 of these reference materials) has several limitations that should be taken into account by anyone using these maps to assess the importance of areas or habitats to Beverly and Qamanirjuaq caribou.

#### 1) Information sources

Information was obtained from government files and reports, and is based primarily on the results of aerial surveys and satellite-monitoring studies of caribou locations. Much additional information could be acquired from unmapped descriptions of caribou distribution in reports and government files, and from people in communities who have knowledge of caribou range use patterns.

#### 2) Data availability

Limited and variable amounts of scientific data on caribou distribution and movements exist for caribou life cycle periods. Information was available from government surveys between 1940 and 1995 (a 56-year interval) for only 3 to 25 years for each life cycle period. Survey data were available for both herds for more than 20 years during spring migration, calving, and late winter periods, and for less than 10 years during late summer and fall migration/rut periods. Information was available on location and movements of female caribou monitored by satellite radio-collars for all life cycle periods for 4 years (1993-1997). Data were available for 12 Qamanirjuaq caribou in total (2-7 at any particular time) during this period, and for a single Beverly caribou for 2 years (1995-1997).

#### 3) Surveys as "snapshots in time"

Surveys typically identify areas used by caribou for only a small portion of a given life cycle period. Surveys primarily provide information about caribou distribution and movements during the survey period (usually a few days) and for a limited time immediately before the survey (such as movements indicated by recently-used trails). Caribou travel throughout most of the year, however, and movements vary during each life cycle period (from the least during the calving period to the most during spring and fall migration). More continuous information on caribou locations during all life cycle periods is needed, and could be provided by monitoring additional caribou equipped with satellite radio-collars over several years.

#### 4) Variability in geographic coverage

Survey information often provides a very incomplete picture of range use by a caribou herd, even for limited time periods. Some surveys determine the location of most caribou of specific sex and age classes (such as adult females with calves), and therefore identify most or all of the area used by that portion of the herd at a particular time. (An example would be calving ground surveys at the peak of calving.) Other surveys examine restricted geographic areas determined by provincial/territorial borders or limited budgets, and do not identify the total area used by even a portion of the herd at a particular time. (An example would be some monitoring flights conducted for the Caribou Monitoring Program.) More information on the total range used by adult female caribou during each life cycle period could be provided by monitoring additional caribou equipped with satellite radio-collars over several years.

#### 5) Variability in mapping precision

Reference materials do not provide consistent information for mapping because of differences in the scale of mapping, type of information provided (such as point locations vs. general areas), accuracy and precision of mapping, degree to which information has been generalized, availability of information about surveys (such as survey areas and flight lines), and other factors.



## 6) Importance of specific areas

The importance of specific areas to caribou cannot be determined in most cases, as we do not have enough information on the particular areas used by caribou, or where caribou were present and absent during surveys. We also do not have information on long-term (over many years or decades) range use patterns, so we cannot identify which specific areas or habitats are used most often. This information could possibly be collected by placing large numbers of satellite radio-collars on caribou and monitoring them for many years.

## 7) Generalizations based on satellite-monitoring data

Broad generalizations should not be made about patterns of movement and distribution of Beverly and Qamanirjuaq caribou based on the satellite-monitoring data available. During the satellite-monitoring study from March 1993 to May 1997, at any particular time a maximum of only 8 female caribou were monitored, primarily from the Qamanirjuaq herd (one of these caribou was apparently from the Beverly herd). Although the information collected by satellite-monitoring provides insight into seasonal and annual patterns in movements and distribution for several female caribou, it does not indicate the full extent of range use by these herds, which include a total of approximately 780,000 caribou. (1994 estimates were 496,000 Qamanirjuaq caribou and 286,000 Beverly caribou.)

## 8) Importance of water crossings

Knowledge of water crossings and their importance to caribou is limited. Many water crossings used by Beverly and Qamanirjuaq caribou have been documented and are identified in this report and in the map atlas on CD-ROM. However, many other sites are used by caribou to cross water bodies across the caribou range. It is difficult to predict use of crossing sites by caribou or to assess their importance to caribou herds. Changes in herd sizes, migration routes, and locations of calving grounds result in variable use of crossings from year to year. Information on frequency and regularity of use of water crossings by caribou is unavailable or very limited for most sites, except those visited traditionally by Aboriginal people or by biologists conducting research.



## Appendix C.

Factors used to develop generalized ratings for sensitivity of caribou and caribou range to land use activities during annual life cycle periods (see Table 3 of main report).

Table 1. Factors used to develop caribou sensitivity ratings<sup>1</sup>.

LIFE CYCLE PERIOD <sup>2</sup>	RESPONSE TO DISTURBANCE	DENSITY AND GROUP SIZE	CONDITION/ FAT RESERVE	AREA FIDELITY	REPRODUCTION	MORTALITY	ENVIRONMENTAL STRESS <sup>3</sup>	OVERALL RATING <sup>4</sup>
Spring migration	3	3	2	3	4	3	3	3.0
Calving	5	5	5	5	5	5	4	4.9
Post-calving	4	4	5	4	4	4	5	4.3
Late summer	1	1	3	1	3	2	4	2.1
Fall migration/rut	1	2	2	2	2	1	2	2.1
Early winter	1	1	1	1	2	2	1	1.3
Late winter	1	2	2	2	3	2	2	2.0

<sup>1</sup> Notes on factors are provided on the following page; relative ratings range from 1 (low) to 5 (high).

<sup>2</sup> Caribou life cycle periods are described in Table 1 of main report.

<sup>3</sup> Weather (snow and heat), insects, and predators.

<sup>4</sup> Overall rating is the sum of the ratings for individual factors, divided by the number of factors. For example, the overall rating for the spring migration period is:  $\frac{3+3+2+3+4+3+3}{7} = \frac{21}{7} = 3.0$



### *Appendix C - Table 1 (cont.)*

## **Notes on factors used to develop caribou sensitivity ratings:**

### **Response to disturbance:**

Refers to likelihood that caribou will move away from a disturbance. Caribou cows with young calves quickly move away from disturbance and away from others in a group.

### **Density and group size:**

Where caribou are densely aggregated, a large number of animals are likely to be disturbed by some activity. Similarly post-calving aggregations up to 30,000 may all be disturbed at once by some activity such as low-flying aircraft.

### **Condition/fat reserves:**

Female caribou have negative energy balances during spring migration, during calving, and until new sedge (plant) growth appears in late June. Fat reserves are used up during that period. Therefore, any disturbance that requires additional energy or interferes with feeding has a greatest effect in late May and June.

### **Area fidelity:**

Caribou use the traditional calving grounds every year and the same post-calving areas in most years. Also some migration routes and water crossings are used consistently. Large developments in those areas would have a greater effect on caribou and their range than at other life cycle periods.

### **Reproduction:**

Disturbance during calving can result in calf deaths and abandonment of calves by their mothers. Avoidance or movement away from the most favourable calving areas can reduce calf production.

### **Mortality:**

Disturbance of cows and calves in the first month or two after birth can result in death of calves. Movement away from the most favourable calving areas can increase calf mortality. Adults are susceptible to over-heating if caused to run and may die if forced into cold water when they are over-heated.

### **Environmental stress:**

Survival and condition of caribou are influenced by weather-related factors (snow, timing of plant growth, cold and heat) particularly during calving and post-calving, and by the ability to stay away from predators and reduce exposure to insects (mosquitoes, black flies, warble flies, and nose bot flies).



**Table 2. Factors used to develop caribou range sensitivity ratings<sup>1</sup>.**

LIFE CYCLE PERIOD <sup>2</sup>	INTENSITY OF USE	RELATIVE SIZE	FOOD VALUE	ESCAPE VALUE	SENSITIVITY TO POLLUTANTS	OVERALL RATING <sup>3</sup>
Spring migration	3	3	4	2	4	3.2
Calving	5	5	5	5	4	4.8
Post-calving	4	4	4	5	2	3.8
Late summer	1	1	3	2	2	1.8
Fall migration/rut	2	1	2	1	4	2.0
Early winter	1	1	1	1	5	1.8
Late winter	2	2	2	1	5	2.4

<sup>1</sup> Notes on factors are provided below; relative ratings range from 1 (low) to 5 (high).

<sup>2</sup> Caribou life cycle periods are described in Table 1 of main report.

<sup>3</sup> Overall rating is the sum of the ratings for individual factors, divided by the number of factors. For example, the overall rating for the spring migration period is:  $\frac{3+3+4+2+4}{5} = \frac{16}{5} = 3.2$

## Notes on factors used to develop caribou range sensitivity ratings:

### Intensity of use:

Areas intensively used almost every year are most important and should receive highest protection. Certain calving areas and parts of post-calving areas are used almost every year.

### Relative size of seasonal range:

This factor is related to the one above but is independent of herd size. Relatively small seasonal ranges such as calving areas require greatest protection. Summer and winter ranges are relatively large compared with calving and post-calving range.

### Food value:

Availability of high quality food just before and after calving is most critical for calf survival. Late stages of pregnancy and lactation are the largest energy and

nutrient drain for a female caribou. The ability to obtain adequate amounts of high quality foods is important year-round, but the period around calving and during post-calving is critical.

### Escape value:

It is important for caribou to maintain the option of travelling to favourable areas to escape from predators, insects, and warm temperatures in spring and summer. Overheating is a potential problem because adult female caribou retain their winter coat until July. Calving and post-calving range provides some relief from those factors.

### Sensitivity to pollutants:

Lichens are vulnerable to pollution. They are eaten year-round but proportional intake is much reduced in July to September. Currently, pollution is not a major concern for lichen health, but it could become a human health problem because of transfer of radioactive elements from lichens to caribou and to humans.





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