

Caribou Technical Session: recommendations on caribou protection to the NPC

Prepared for

Kivalliq Inuit Association

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Summary:

Management of caribou must be predicated on Inuit Qaujimagatunqangit (IQ) and scientific data related to caribou ecology and known or assumed vulnerability to disturbance, while acknowledging a balance between caribou protection and economic development opportunities. Following are a summary of Kivalliq Inuit Association's (KivIA) positions and recommendations to the Nunavut Planning Commission (NPC) regarding caribou issues for both mainland migratory and tundra wintering herds related to the Nunavut Land Use Plan (NLUP):

1. KivIA supports identification of core calving areas using IQ, scientific survey and collar data, and temporal trends to identify the core areas used by calving and immediately post-calving caribou (during **extent of calving** - peak of calving plus 3 weeks).
2. **Core calving areas** (areas used by caribou from peak of calving through to 3 weeks of age – extent of calving) mapped using IQ, aerial surveys and the most recent 10 years of satellite telemetry, will be closed to development (**year-round Protected Area status**).
3. **Core calving areas that overlap areas of High Mineral Potential** should be provided **seasonal Special Management Area status**, within which stringent measures, based on proposed Kivalliq Mobile Caribou Conservation Measures (MCCM), will be applied for any development contemplated within those areas.
4. Develop a 25-km buffer around core calving areas and apply **mobile protection measures** as per the draft Kivalliq MCCM.
5. The immediate area around **identified water crossings** should be within **year-round Protected Areas**, with the size of the area tailored to traditional caribou approach characteristics based on IQ. Around water crossings we recommend a 10 km radius zone within which **mobile protection measures** would be applied.
6. **For other seasonal ranges** (including as defined here post-calving/summer, late summer/pre-rut, fall migration/rut, winter and spring migration), apply **mobile protection measures** with different criteria and timing for different seasons within anticipated seasonal boundaries and types of exploration or development activities.
7. Major **transportation corridors** and **infrastructure** of significant economic importance to the Kivalliq Region (e.g., the Nunavut-Manitoba Road) should be granted **Special**

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Proposed KivIA position on caribou and caribou habitat

Management Area status with appropriate (and if required, stringent) mobile measures applied.

8. For the purposes of caribou protection and conservation, season designations and dates should be decided through a collaborative exercise, but should consider the practicality of managing.
9. Use only the most recent 10 years of collaring data and address annual trends in seasonal ranges, especially for calving/post-calving areas. Weighting for core ranges should be equally applied among years and non-breeding cows should be screened out from mapping calving grounds.

Background:

The Nunavut Planning Commission (NPC) is organizing the Fourth Technical Meeting³ for developing the Nunavut Land Use Plan (NLUP). The meeting, scheduled for early March 2016 in Iqaluit, includes a 3-day session on the identification of seasonal caribou habitat and the most effective methods to manage land use in these areas.

Kivalliq Inuit Association's (KivIA) interests include caribou – specifically balancing caribou conservation and economic development. Inuit, especially in the Kivalliq Region, have been clear and consistent since the 1970s about their desire to protect caribou especially on calving grounds and at water-crossings. (Caribou water crossings are traditional fixed locations with unique geographical characteristics – juxtaposition between larger lakes or landscape terrain, narrows, shallows, etc.) The desire for protecting caribou was the basis for the Baker Lake Hunters and Trappers Association seeking an injunction against uranium exploration in 1977⁴. In 1978, Judge P. M. Mahoney wrote: “The weight of evidence leads to the conclusion that exploration and mining activity is incompatible with the natural use by caribou of their habitat at times and at places where they congregate in large numbers”. The 1978 court case resulted in area-specific seasonal measures for the calving and post-calving areas and water-crossings, which are areas where large numbers of caribou congregate and thus are vulnerable to disturbance. Those measures (Caribou Protection Measures (CPM)) were developed and applied by the Department of Indian Affairs and Northern Development (DIAND) as conditions for land use permits (most mineral exploration) within Caribou Protection Areas. The history and effectiveness of the boundaries for the Caribou Protection Areas were reviewed in 1984⁴ and 2007⁵. In addition to these documents, for this report we have also drawn on the considerable information presented at the November 2015 Nunavut Wildlife Management Board (NWMB) workshop on Protecting Caribou and Their Habitat held in Iqaluit⁶.

³ <http://www.nunavut.ca/en/news/2016-notice-draft-nunavut-land-use-plan-fourth-technical-meeting>

⁴ Mychasiw, L. 1984. Five-year review of the Beverly and Kaminuriak caribou protection measures. Department of Resources, Wildlife and Economic Development File Report No. 42. 133pp.

⁵ Gunn, A., K. G. Poole, J. Wierzchowski and M. Campbell. 2007. Assessment of Caribou Protection Measures. Unpublished report Submitted to Indian and Northern Affairs Canada, Gatineau, Québec, 45pp.

⁶ <http://www.nwmb.com/en/public-hearings-a-meetings/workshops/november-2015-protecting-caribou-and-their-habitat-workshop#document-resource-development-and-caribou-in-nunavut-finding-a-balance-eng>.

Report Objectives:

To support the KivIA in developing their position for NPC's technical meeting, we have compiled information and made recommendations on the following:

1. The current proposed Protected and Special Management Areas;
2. Position on how seasonal boundaries for Protected and Special Management Areas should be developed and reviewed;
3. Review caribou seasonal susceptibility/sensitivity to disturbance;
4. Position on protection strategies and what strategies could be applied to which seasonal ranges and categories of caribou herds;
5. Position on how to integrate permanent, seasonal, and/or mobile restrictions or prohibitions to balance caribou conservation and economic development; and
6. Additional recommendations related to caribou.

These recommendations pertain to both **mainland migratory and tundra wintering herds**. Note that KivIA has not had access to caribou collar data that can be used to explore various mapping options for calving and other seasonal ranges, thus provision of proposed revised boundaries to NPC was not possible. We do, however, recommend methodology to use in deriving revised boundaries.

Terminology

There are a number of terms which have been used in different ways to describe calving grounds and other seasonal ranges. These different uses can cause confusion. Following are suggested terminology we use in this report:

Seasonal range: The area used by caribou in any one season. A seasonal range may include different habitats (vegetation and terrain). **Annual range** is the area used by caribou during the entire year.

Core: Government of Nunavut (GN) uses the term 'core' for each of nine seasons based on a statistical analysis of the satellite-collared caribou⁷, using a different estimate of core for spring and fall migrations (80% utilization distribution kernel) and a broader estimate for the other seasonal ranges (95% kernel). Without getting overly technical, a 95% utilization distribution kernel surrounds an area within which (in this case) about 95% of the collar locations are found, and an 80% kernel surrounds about 80% of the locations⁸. The proportional area covered by 95% and 80% kernels depends on the pattern (mainly the relative concentration) of collar distribution on the landscape, but 95% kernels may cover from one-quarter to 2-3 times the area of an 80% kernel. There is no justification or explanation provided for the biological reasoning behind these selections.

⁷ Caslys Consulting Ltd. (2015). Barren-Ground Caribou Analysis Methods Summary Report - Draft. Prepared for Government of Nunavut Department of Environment, Wildlife Research Branch. July 2015. 12 pp.

⁸ Seaman et al. 1999. Effects of sample size on kernel home range estimates. *Journal of Wildlife Management* 63:739-747.

Proposed KivIA position on caribou and caribou habitat

Extent of calving⁹: This term, widely accepted among caribou biologists, is based on cow-calf behavior – the calf is completely dependent on nursing from the cow for the about the first 3 weeks after birth. The extent of calving refers to the area used from the peak of calving and for the following approximately 3 weeks. Depending on the timing of calving, extent of calving often extends to the last week or 10 days of June. Movements in the first weeks subsequent to calving remain relatively low⁵. This definition recognizes the time when calves are most sensitive to the maternal and environmental conditions that affect their growth and when they are most vulnerable to predation and disturbance¹⁰.

KivIA suggests that the extent of calving should be considered as equivalent to core calving areas.

Peak of calving⁹: The date (or range of dates, depending on calculation method) when 50% of cows have calved.

Compared to GN seasons the extent of calving largely overlaps calving and immediate post-calving, but GN does not identify the peak of calving. For collared caribou approximate calving date (and location) can be estimated by determining the point of reduced daily distance moved by the cow⁵.

Polygon: The NPC refers to the seasonal ranges as polygons: a polygon is a shape enclosed by a line and is a quite general term. It is makes more sense to refer instead to seasonal ranges.

1. Proposed boundaries to describe Protected and Special Management Areas

The KivIA is concerned that there are different ways to describe Protected and Special Management Areas: current Caribou Protection Measures (CPM); Government of Nunavut (GN) Protected and Special Management areas; and Mobile Caribou Conservation Measures (MCCM).

i) Current Caribou Protection Measures

The current Caribou Protection Measures¹¹ are based on DIAND's CPM developed in 1978. Initially, the CPM were applied to the *Traditional Calving and Post-calving Areas* for the Beverly and Qamanirjuaq herds⁴ based on Inuit knowledge and aerial surveys (1950s-1978). However, subsequent monitoring in the 1980s led to changes in the Traditional Calving Grounds and the modified boundaries were re-named as the *Caribou Protection Areas*. Subsequent annual monitoring flights led to further boundary adjustments to the Caribou Protection Areas^{4,5}. The Caribou Protection Areas had only seasonal restrictions (15 May–31 July) on land use permits and did not provide habitat protection or restrict non-land use permit activities, which led to

⁹ Russell, D.E., G. Kofinas, and B. Griffith. 2002. Barren–Ground caribou Calving Ground Workshop: Report of Proceedings. Technical Report Series No. 390. Canadian Wildlife Service, Ottawa, Ontario, 39pp.

¹⁰ Wolfe, S. A., B. Griffith, and C. A. G. Wolfe. 2000. Response of reindeer and caribou to human activities. *Polar Research* 19:63–73.

¹¹ The Keewatin Regional Land Use Plan http://www.npc.nunavut.ca/eng/regions/Keewatin/keewatin_screen_complete.pdf

Proposed KivIA position on caribou and caribou habitat

criticism¹². The mapped Qamanirjuaq and Beverly calving areas are not comparable to the two Caribou Protection Areas which reflects the very different methods of mapping, date ranges, and information sources.

An assessment of the Beverly Protection Areas boundaries based on aerial monitoring found that calving was within the Caribou Protection Areas (and adjacent Thelon Game Sanctuary) for 13 of 15 years⁵. For the other 2 years (1984 and 1987), the extension of calving outside the Caribou Protection Areas was partial and within 10–20 km of the boundary.

By the mid-1990s, caribou cow movements were being tracked with satellite collars. The information from the year-round locations (weekly or daily) replaced information from aerial monitoring used to map calving and post-calving areas. Based on the 1993-2006 satellite-collar locations average, 68% of the Qamanirjuaq annual calving grounds (peak plus 3 weeks post-calving), were within the Caribou Protection Area⁵. The calculated centre of each annual calving ground (1993-2005) were within the Caribou Protection Area except 2005 when the cows were late reaching the calving grounds⁵.

Thus up to the assessment in 2006, the Caribou Protection Areas for the Qamanirjuaq and Beverly herds, based on Inuit Qaujimagatuqangit (IQ) and aerial surveys prior to the 1980s, were relatively effective⁵. However as the Caribou Protection Areas are based on a long period of time, they are larger than the areas that the caribou use currently⁵.

ii) GN protected areas

NPC's 2014 map¹³ of Protected Areas for calving grounds (Protected Areas #47) shows calving grounds that have many tiny isolated areas and are fragmented by areas with high mineral potential (Special Management Areas #48). Some areas such as Southampton Island and Victoria Island are shown without Protected Areas for calving grounds. GN's June 2015 recommendations to NPC¹⁴ provides revised and smaller core calving areas and key access corridors compared to those mapped in the 2014 NPC map (Fig. 1). The November 2015 presentation to the Nunavut Wildlife Management Board (NWMB)¹⁵ provides additional mapping based on GN's analysis of satellite collars (1993-2013)⁷. According to the GN submission in June 2015, GN is recommending Protected Area status for all core calving grounds and key access corridors, regardless whether the areas have been identified as having

¹² Beverly Qamanirjuaq Caribou Management Board. 2004. Protecting calving grounds, post-calving areas and other important habitats for Beverly and Qamanirjuaq caribou. Beverly Qamanirjuaq Caribou Management Board. http://www.arctic-caribou.com/pdf/Position_Paper.pdf

¹³ http://www.nunavut.ca/files/2014DNLUP/2014_DNLUP_Schedule_A_Designations.pdf

¹⁴ GN Recommendation: Caribou Core Calving Areas and Key Access Corridors. Map submitted to the Nunavut Planning Commission, dated June 19, 2015 [Online.] Available at http://www.nunavut.ca/files/2015-06-19_GN%20Recommendation_CoreCalvingKeyAccess.pdf

¹⁵ Campbell, M. 2015. Resource Development and Caribou in Nunavut: Finding a Balance. Presentation for Nunavut Wildlife Management Board Workshop: Protecting Caribou and their Habitat, Rankin Inlet, Nunavut. Available at <http://www.nwmb.com/en/public-hearings-a-meetings/workshops/november-2015-protecting-caribou-and-their-habitat-workshop#document-resource-development-and-caribou-in-nunavut-finding-a-balance-eng>.

Proposed KivIA position on caribou and caribou habitat

High Mineral Potential¹⁶. However, KivIA is unsure why the proposed GN Protected Areas for main of the mainland herds differs from the NPC map (Fig. 1).

Additionally to the differences between the mapped areas, KivIA has two main concerns with GN's approach:

1. KivIA could not determine if and how IQ was included, as the maps appear to only depend on the satellite collars; and
2. KivIA is concerned that the maps show seasonal ranges averaged over 1993-2013 – a long period, but the length of which period varies among herds. The maps are based on collars for the cumulative period and do not examine whether there are annual trends in the boundaries over that 20 year period.

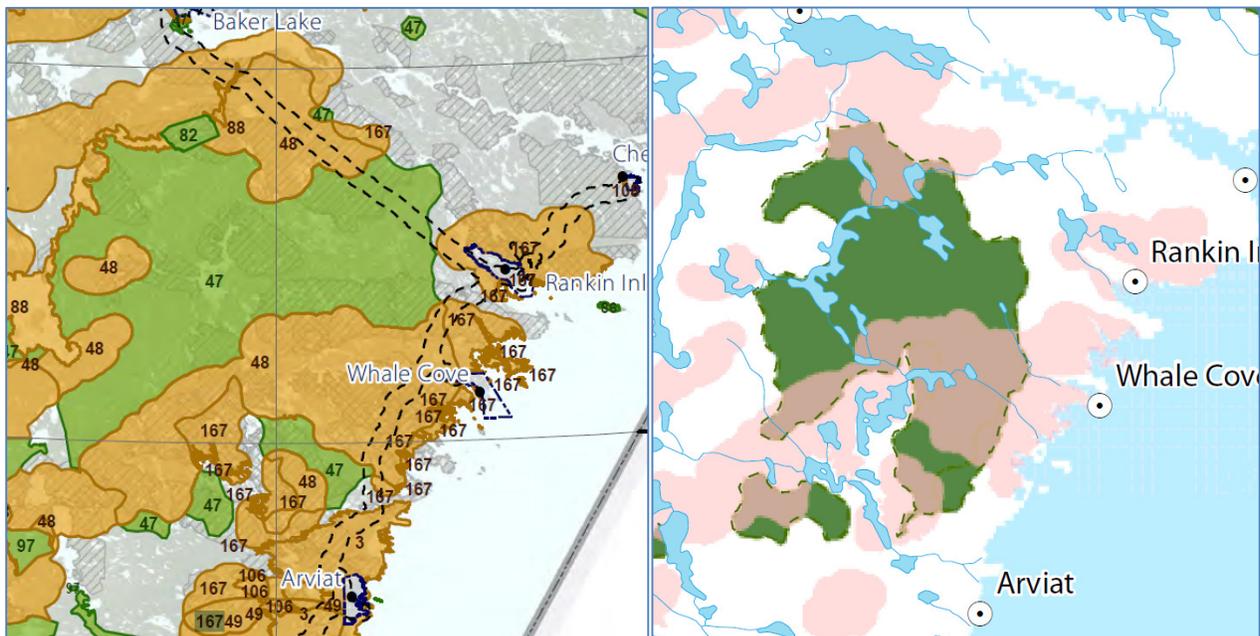


Figure 1. Example of the differences in Qamanirjuaq caribou core calving ground and key access areas from (left map) NPC draft NLUP Schedule A map¹³ (Sites #47 are Protected Areas and #48 are Special Management Areas), and (right map) GN's June 2015 submission to the NPC (green areas are recommended calving core range and key access corridors and enclosed light brown areas are areas of high mineral potential)¹⁴.

Seasonal ranges can change in size and location, especially during winter with consequent implications to spring migration routes. The longer the period of time of monitoring, the larger the cumulative area, especially for winter and spring migration ranges¹⁷. Typically calving grounds are the smallest seasonal range and the least variable in location (cows mostly show fidelity to their calving grounds). A further problem is that the timing of a seasonal use may

¹⁶ http://nunavut.ca/en/draft_plan/consultation_record

¹⁷ Gunn, A., K.G. Poole, and J. Wierzchowski. 2008. A geostatistical analysis for the patterns of caribou occupancy on the Bathurst calving grounds 1966–2007. Unpublished report prepared for Indian and Northern Affairs Canada, Yellowknife, NWT.

Proposed KivIA position on caribou and caribou habitat

vary¹⁸. For example, between 1993 and 2005, Qamanirjuaq cows were arriving on average approximately 2 weeks later and leaving the calving ground approximately 1 week later⁵.

GN's maps of calving and other seasonal ranges have technical limitations:

- The maps use satellite collars (which generally obtained locations every 1-7 days) and GPS collars (which obtain multiple locations each day), and it is unclear how these 2 different data sources are blended in the analysis, as the more frequent GPS locations may disproportionately outnumber the earlier satellite collar data;
- Collar sample size is uneven and mostly low (especially for the earlier satellite collar data and for the smaller herds)¹⁹. For example, between 1993 and 2003 the number of collars on Qamanirjuaq caribou was less than 10 cows annually;
- There are uncertainties how the satellite locations were used, especially the rationale for buffering the locations by 11-20 km and the use of either 80% or 95% kernels for different seasonal ranges;
- There is no clarification whether non-breeders were included (which may explain the scattered small isolated calving areas);
- The collars reflect primarily cow caribou movements, which are appropriate for calving and post-calving ranges, but ignore the bull movements for other seasons;
- There is no clarity on how individuals were assigned to subpopulations, nor whether individuals were assigned on an annual or lifetime basis; and
- Relying only on the collar locations means size of the calving grounds (potential Protected Areas) is not related to the numbers of caribou, which is a measure of vulnerability to disturbance.

iii) Mobile Caribou Conservation Measures

An approach to Mobile Measures was developed on behalf of KivIA²⁰ and was presented at the November 2015 NWMB workshop²¹. The Mobile Measures framework was well received by workshop participants and was included in the NWMB workshop recommendation #9: "Mobile caribou conservation measures deserve careful examination and consideration – for example, within buffer zones in the vicinity of a protected area." Maps of seasonal Caribou Conservation Areas, seasonal areas where caribou are likely to occur (thus providing a degree of predictability to both operators and regulators) and within which Mobile Measures would be implemented, have not been developed but would involve collaborative mapping using both IQ and scientific data²⁰.

¹⁸ Gunn, A., and K.G. Poole. 2010. Environmental trends across the range of the Bathurst caribou herd and timing of the arrival of cows on their calving ground 1996–2009. Unpublished report for Environment and Natural Resources, Yellowknife, NWT.

¹⁹ Nagy, J.A., D.L. Johnson, N.C. Larter, M.W. Campbell, A.E. Derocher, A. Kelly, M. Dumond, D. Allaire, and B. Croft. 2011. Subpopulation structure of caribou (*Rangifer tarandus* L.) in Arctic and subarctic Canada. *Ecological Applications* 21:2334–2348.

²⁰ Poole, K. G., and A. Gunn. 2015. Mobile Caribou Conservation Measures for the Kivalliq Region, Nunavut. Draft Report for the Kivalliq Inuit Association. November 12, 2015.

²¹ <http://www.nwmb.com/en/public-hearings-a-meetings/workshops/november-2015-protecting-caribou-and-their-habitat-workshop#document-mobile-caribou-conservation-measures-eng>

KivIA's position is that Mobile Measures can be adapted to reflect the vulnerability of caribou on seasonal ranges and at water crossings, and can also be applied in a land-use zone (Special Management Area) around core calving grounds.

2. Position on how seasonal boundaries should be developed and reviewed

Number of seasons

Management of caribou must be predicated on IQ and scientific data related to caribou ecology and known or assumed vulnerability to disturbance, while acknowledging a balance between caribou protection and economic development opportunities. We caution against placing excessive dependence on management around land ownership or mineral (potential or actual) dependence boundaries.

KivIA is concerned that for practical purposes management of too many seasons becomes more difficult. In addition, the dates for seasons proposed in the various GN documents^{15, 15} are only based on satellite-collared caribou, do not incorporate IQ, and are insensitive to temporal trends over time. Developing seasonal boundaries first requires collaborative agreement on the season dates. For use of collar data, non-breeder cows have to be screened out as they typically arrive later or not at all on calving grounds; this can be achieved by inspection of the rates of movements as cows slow down when giving birth⁵. The frequency when seasonal boundaries should be reviewed is relative to anticipated changes in herd abundance and pre-calving migration, but should be conducted at least every 5 years.

Risk categories should be used to inform the extent of monitoring and mitigation within seasons. Table 1 is a proposed outline of the seasons and risk categories that could be used with this approach (modified from²⁰). (Note that extent of calving as proposed will cover the calving and a portion of the post-calving season. We have combined some seasons (e.g., fall migration and rut) for ease of logistics and simplicity.) Crucial and cautionary risk timing windows cover the time when a species is most susceptible to disturbance, and low risk timing windows are defined when species are less susceptible to disturbance.

Some seasons will be easier to map and are predictable, while others are less so. To summarize and for the purposes of the March 2016 NPC caribou workshop, we tentatively suggest the following seasons:

- Spring migration
- Calving (to include extent of calving)
- Post-calving/summer (insect season)
- Late summer/pre-rut
- Fall migration/rut
- Winter

Proposed KivIA position on caribou and caribou habitat

Table 1. Summarizing seasons, risk category, timing, relative size and location predictability, and susceptibility of barren-ground caribou to disturbance based on life-history characteristics. Modified from ²⁰

Season	Risk Category	Timing ¹	Relative size and location predictability	Caribou susceptibility and behaviour
Spring migration (pre-calving)	Cautionary	Apr - Jun	Narrow, predictable	Narrow corridors of cows often rapidly moving together with occasional staging in large aggregations
Calving (extent of calving)	Crucial	Jun	Small area, predictable	High densities of cows at annually lowest part of condition cycle and with newborn calves so the cows are responsive to disturbances
Post-calving/ summer (insect season)	Crucial	Late Jun – Aug	Larger, less predictable	Cows and calves aggregating into large groups; calves susceptible to abandonment from disturbance; aggregations susceptible to disturbance at traditional water crossings
Late summer/ pre-rut	Cautionary	Aug - Oct	Larger, less predictable	Caribou often more dispersed and regaining body condition prior to breeding; aggregations susceptible to disturbance at traditional water crossings
Fall migration/ rut	Low	Oct - Nov	Larger, less predictable	Caribou either migrating or staging; aggregations susceptible to disturbance at traditional water crossings
Winter	Low	Dec - Apr	Larger, less predictable	Caribou in aggregations over a large area and less movement

¹ The actual dates differ among herds.

Recommendations for mapping seasonal core ranges

KivIA supports GN's mapping of core calving ranges with the following modifications and additional analyses:

1. For the purposes of caribou protection and conservation, season designations and dates should be decided through a collaborative exercise, but should consider the practicality of managing.
2. Core calving areas should address the extent of calving (peak of calving plus 3 weeks), and should consider IQ and scientific (survey, collar) data.
3. Satellite collar locations should not be arbitrarily buffered by a set distance (11-20 km with previous mapping⁷), as the GIS mapping technique applies buffers around locations and IQ may provide information on calving area boundaries.
4. For core calving area integrate GN's information with IQ and aerial surveys (including aerial surveys conducted for calving ground distribution or population estimates). IQ often can most readily be obtained from research conducted for environmental assessments.
5. Screen out non-breeding cows from calving area delineation (as noted above).

Proposed KivIA position on caribou and caribou habitat

6. Use only the most recent 10 years of collaring data and address annual trends in seasonal ranges, especially for calving/post-calving areas. Weighting for core ranges should be equally applied among years. The satellite collars can be analysed annually to indicate the centre and dispersion of calving which adds emphasis to trends in annual use (some calving grounds have concentrated while others have more dispersed calving).

Examples of the scientific data available for mapping core calving areas are provided in Figures 2 and 3. Figure 2 (left panel) is the Bathurst herd's calving grounds and shows the relationship between the collar locations at peak calving, with the red dot the center of those collared cows; the red lines the different levels of probability of distribution based on the collars (50%, 90% and 95% kernels) and the green areas mapped according to the number of caribou/km² with the light green dot representing the center of the aerially mapped distribution. The right panel shows the centers of the calving grounds 1996-2007 (red dots) based on satellite collars and the size of the circles indexes how tight the collars were together.

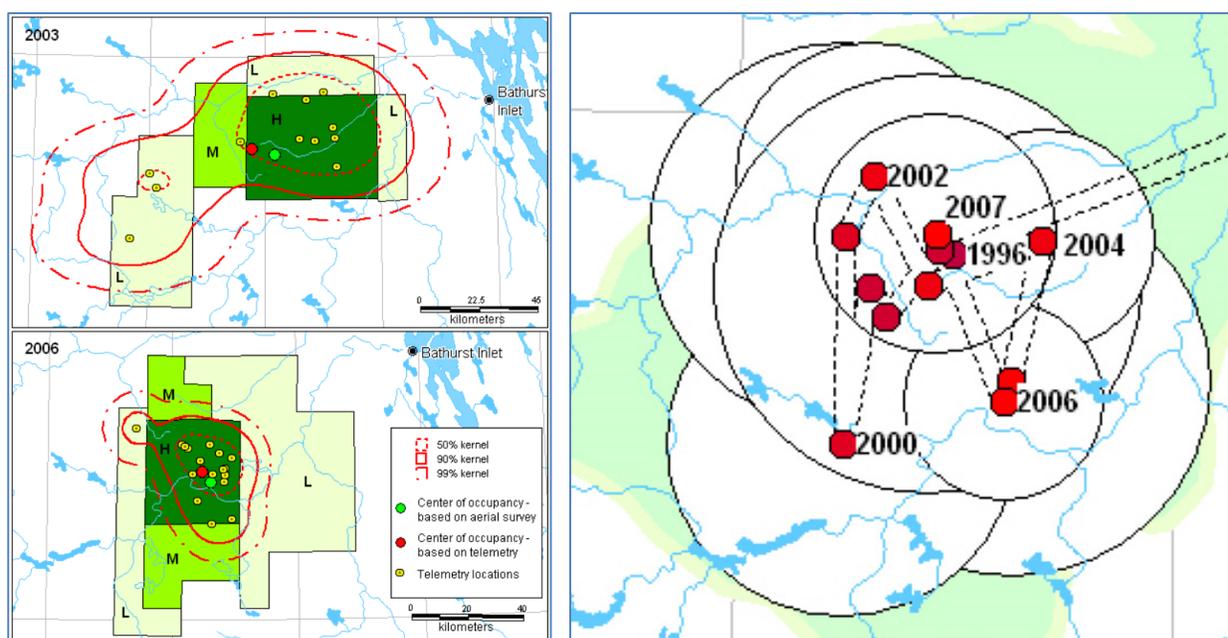


Figure 2. Left map: Relationship for the Bathurst caribou herd between peak calving grounds as determined by satellite collars and peak calving grounds as determined from stratification from aerial surveys. Right map: peak calving ground centroids for the Bathurst herd, 1996-2007. Source¹⁷¹⁷.

Proposed KivIA position on caribou and caribou habitat

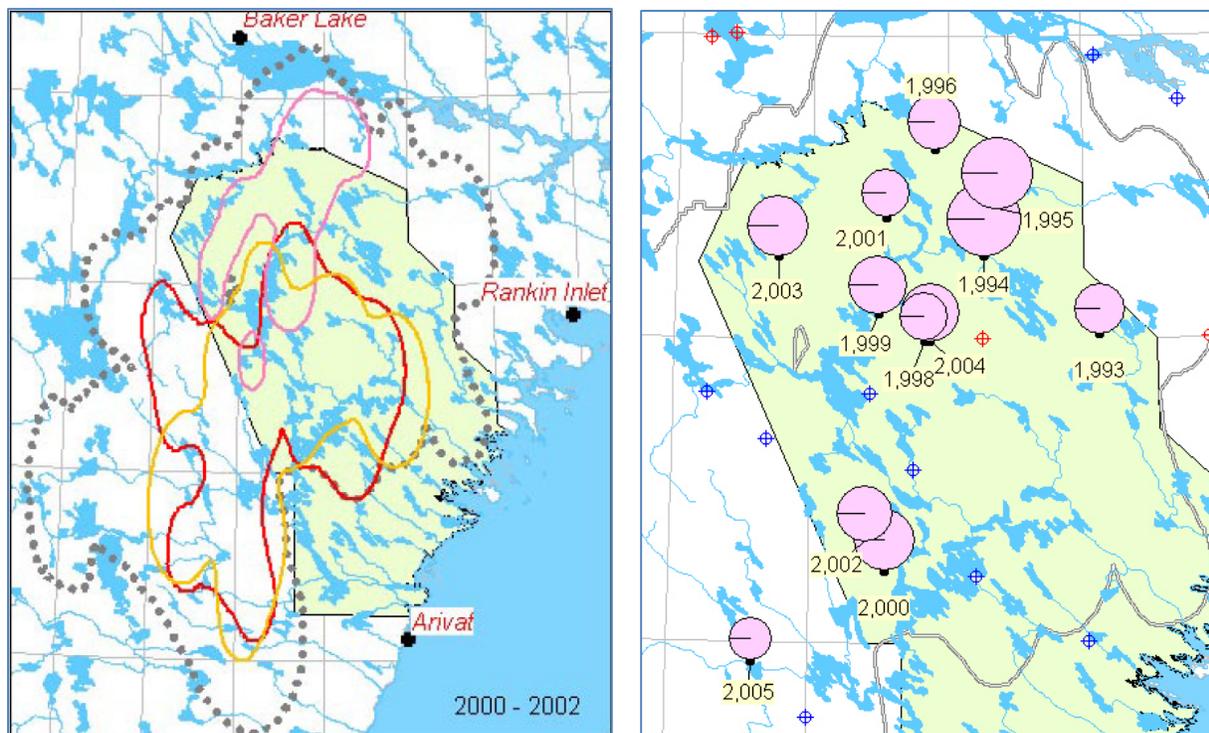


Figure 3. Left map: Qamanirjuaq annual calving grounds based on satellite collar locations, 2000-02. Right map: Distribution of annual Qamanirjuaq annual calving grounds as shown by the centroids (dark dots), 1993-2005. Source⁵.

Figure 3 is for the Qamanirjuaq herd and shows (left panel) how calving distribution based on the collars overlaps the Caribou Protection Area (shaded green area) and the extent of calving (dashed line) for 2000-02. The right panel shows the relationship between the Caribou Protection Area (shaded green area), the extent of calving (double black line) the center of annual peak calving distribution (black dots), and the shape of the calving ground (pink circles).

3. Review caribou seasonal susceptibility/sensitivity to disturbance

KivIA has no additional comments to the review of information on caribou susceptibility/sensitivity to disturbance from both an IQ and scientific perspective that was presented at the NWMB workshop in November 2015⁶. Acknowledging that caribou vulnerability to disturbance varies seasonally related to susceptibility of calves, degree of aggregation, and other factors, there is little point in protecting only the calving grounds without managing disturbance elsewhere within annual ranges. Caribou spend less than 10% of the year on calving and immediate post-calving habitat, thus their period of exposure is comparatively short. Management of land use planning activities has to be linked among seasonal ranges.

4. Position on protection strategies and what strategies could be applied to which seasonal ranges and categories of caribou herds

KivIA's protection strategy is that Mobile Caribou Conservation Measures²⁰ for caribou seasonal ranges should be implemented to support well-defined and regularly reviewed year-round Protected Areas for core calving areas and water-crossings:

1. KivIA supports identification of core calving areas using IQ, scientific data survey and collar data, and temporal trends to identify the core areas used by calving and immediately post-calving caribou (during extent of calving).
2. These core calving areas would be designated as Protected Areas and buffered by areas within which mobile protection measures (MCCM) would be in place to manage disturbance if caribou intersect with exploration and development activities during these critical periods outside of the protected core calving area; and
3. Mobile measures would be applied to other seasonal ranges as described in Table 2 and in the proposed draft MCCM document²⁰. These proposed mobile protection measures consider flexibility to address differing vulnerability to disturbance among seasons.

KivIA's position is based on these principles:

1. To ensure that IQ information is mapped and integrated into describing seasonal ranges;
2. To be collaborative and transparent by sharing information and methods among the concerned groups working together on the NPC's draft NLUP – an example is working with GN on describing caribou seasonal ranges;
3. To build on what already has been done (DIAND's and KivIA's CPM) which used IQ and information additional to a reliance on satellite collars;
4. To achieve a balance between "*development*" and "*protection*" in caribou seasonal ranges by integrating Protected Areas and mobile protection measures applied to seasonal ranges. KivIA recognizes the complexity of caribou and how caribou adapt by changing their movements and use of seasonal ranges. KivIA also recognizes the need for adaptability and flexibility to accommodate boom/bust cycles driven by global economic trends as well as caribou cycles.
5. KivIA is also anxious to ensure that the land use plan is clearly integrated with herd management planning and the environmental assessment process.

Proposed KivIA position on caribou and caribou habitat

Table 2. Season, risk category, and suggested zone sizes and thresholds of caribou numbers counted in the Early Warning Zone, Buffer Zone, and Zone of Influence (ZOI) to trigger corresponding mitigation actions. Analysis of movement rates and local input are needed to refine the dates and number of seasons. Modified from ²⁰.

Season	Risk category	Timing ¹	Suggested zone radii (km)			Threshold number of adult caribou ²			Mitigation actions if thresholds passed in ZOI ⁴
			Early Warning Zone	Buffer Zone	ZOI	Early Warning Zone ³	Buffer Zone	ZOI ⁴	
Spring migration (pre-calving)	Cautionary	Apr - Jun	50	20	15	5/25	50	25/50	Suspend flights and ground operations within 36 hrs/ Close camp within 48 hrs
Calving (extent of calving)	Crucial	Jun	50	15	10	1/10	20	5/10	Suspend flights and ground operations within 24 hrs/ Close camp within 24 hrs
Post-calving/ summer (insect season)	Crucial	Late Jun - Aug	50	15	10	1/10	20	5/10	Suspend flights and ground operations within 24 hrs/ Close camp within 24 hrs
Late summer/ pre-rut	Cautionary	Aug - Oct	30	15	10	5/25	50	10/25	Suspend flights and ground operations within 36 hrs/ Close camp within 48 hrs
Fall migration/ rut	Low	Oct - Nov	50	15	10	5/50	100	25/50	Reduce above-ground operations within 48 hrs/ Suspend above-ground operations within 72 hrs
Winter	Low	Dec - Apr	30	10	5	5/50	100	25/50	Reduce above-ground operations within 48 hrs/ Suspend above-ground operations within 72 hrs

¹ The actual dates differ among herds.

² Proposed numbers based on differences in relative risk during each season. Caribou thresholds (generally collared individuals or incidental sightings) within the Early Warning Zone would trigger surveys within the Buffer Zone and Zone of Influence. Caribou thresholds (generally from aerial surveys) in the Buffer Zone would justify notice to the exploration manager and the land use inspector of a potential suspension should caribou enter the Zone of Influence.

³ xx/yy represent number of collared/observed caribou within the Early Warning Zone.

⁴ xx/yy represent thresholds of number of collared/observed caribou to trigger main sets of mitigation responses.

5. Position on how to integrate permanent, seasonal, and/or mobile restrictions or prohibitions to balance caribou conservation and economic development

The highest level in a hierarchy of integrated protection is applied to areas where caribou are vulnerable through congregating at predictable locations (fidelity) either through behaviour (calving grounds) or geographic constraints (water and ice crossings). KivIA makes the following recommendations:

1. **Core calving areas** (areas used by caribou from peak of calving through to about 3 weeks of age – extent of calving) mapped using IQ, aerial surveys and the most recent 10 years of satellite telemetry, will be closed to development (**year-round Protected Area status**).
2. **Core calving areas that overlap areas of High Mineral Potential** should be provided **seasonal Special Management Area status**, within which stringent measures (based on MCCM) will be applied for any exploration or development contemplated within those areas.
3. Develop a 25-km buffer around core calving areas and apply **mobile protection measures** as per MCCM.
4. The immediate area around **identified water crossings** should be within **year-round Protected Areas**, with the size of the area tailored to traditional caribou approach characteristics based on IQ. We anticipate these areas to have a radius of up to a maximum of several kilometres from the crossing site, and be not necessarily circular in shape. Around the water crossing we recommend a 10 km radius zone within which **mobile protection measures** would be applied (note this means larger monitoring zones – up to 25 km – to ensure adequate time for mitigation).
5. **For other seasonal ranges** (including as defined here post-calving/summer, late summer/pre-rut, fall migration and rut, winter and spring migration), apply **mobile protection measures** with different criteria and timing for different seasons within anticipated seasonal boundaries (Table 2) and types of exploration or development activities²⁰. Mobile measure can be adapted to address potential disturbance issues wherever the caribou travel.
6. Major **transportation corridors and infrastructure** of significant economic important to the Kivalliq Region (e.g., the Nunavut-Manitoba Road) should be granted **Special Management Area** status with appropriate (and if required, stringent) mobile measures applied.
7. For industrial developments that are within different seasonal ranges (e.g., linear road corridors), develop packages of mitigation conditions for project certificate. We assume these would be addressed under the Nunavut Impact Review Board process.

Although KivIA cannot conduct the required analysis with the collar data, the extent of these proposed Protected Areas will likely be consistent with those proposed by GN in their June 2015 submission to NPC¹⁴. However, GN uses longer-term data, often back to 1993. Given possible changes in caribou distribution over time we recommend using the previous 10 years of data with 5-year updates. For example, use of the most recent 10 years of data of the

Proposed KivIA position on caribou and caribou habitat

Qamanirjuaq herd will likely reduce the core calving area to the more northern portion of the current CPM Caribou Protection Area (Fig. 3).

Having two differing management zones (Protected Areas and Special Management Areas) will fragment management within some calving areas, which could increase the vulnerability of the calving caribou; this scenario is not desirable but may be necessary to balance caribou protection and economic development opportunities. We propose that mobile protection measures would be imposed within any Special Management Area within a calving area, with a range of measures including complete closure of areas and no activity during June and July. This does not preclude exploration activity (with appropriate mobile protection measures) during other times of the year, but permit conditions will clearly specify that mine activity could be suspended.

6. Additional recommendations related to caribou

KivIA has additional recommendations for NPC:

1. NPC should ask all parties to provide clear (biological and if necessary statistical) definitions of all terminology, and that NPC then provide direction on preferred and alternative terminology;
2. NPC should ensure an updated list of 'designated' water crossings is developed.

As noted, many of the measures recommended are derived from the proposed draft MCCM document prepared for the Kivalliq Region, and we refer the reader to that document for further details²⁰.