



March 31, 2022

Sharon Ehaloak
Executive Director
Nunavut Planning Commission
P.O. BOX 1797
IQALUIT NUNAVUT X0A 0H0

by EMAIL

Dear Sharon Ehaloak:

Government of the Northwest Territories Review of the 2021 Draft Nunavut Land Use Plan - Additional Comments

The Government of Northwest Territories (GNWT) appreciates the opportunity to provide the Nunavut Planning Commission (NPC) with additional comments and recommendations on the 2021 Draft Nunavut Land Use Plan (DNLUP).

The GNWT first carried out an interdepartmental review of the 2021 DNLUP in the fall in 2021 and provided comments to NPC on October 8, 2021.

The GNWT completed a second interdepartmental review in February 2022. The comments and recommendations in this submission are in addition to those provided in our October 8, 2021, submission to NPC. They are from a GNWT-wide perspective and are focused on components of the DNLUP that have, or may have, transboundary implications.

The GNWT commends the NPC for their efforts in working towards a Nunavut Land Use Plan and appreciates its consideration of transboundary issues.

If you have any questions or wish to set up a meeting to discuss these comments, please contact Justin Adams, Manager, Land Use Planning at Justin_Adams@gov.nt.ca.

Sincerely,

Gina Ridgely
Director, Land Use and Sustainability
Lands

Attachment

Government of the Northwest Territories submission on the 2021 Draft

Nunavut Land Use Plan

March 31, 2022

The GNWT completed a second interdepartmental review of the DNULP in February 2022. The comments and recommendations in this submission are in addition to those provided in our October 8, 2021 submission to NPC. They are from a GNWT-wide perspective and are focused on components of the DNLUP that have, or may have, transboundary implications.

General Comments and Recommendations

The GNWT recommends that the list of Indigenous governments and Indigenous organizations for engagement on the DNLUP be updated to also include Délı̄nę Got'ı̄ne Government, Northwest Territory Métis Nation, and North Slave Métis Nation.

Specific Comments and Recommendations

Section 2.2 Caribou

Comment:

The GNWT noted that the topic of Mobile Caribou Conservation Measures (MCCM) was raised in some submissions to the NPC's public registry. The GNWT Department of Environment and Natural Resources has a preliminary draft framework for testing, applying, and evaluating Mobile Caribou Conservation Measures (MCCM), and is sharing this with the NPC for information purposes as it may be helpful in supporting further discussions on MCCM's in the draft NLUP. Details of the framework are provided in the following two attached documents: 'An Implementation Framework for Mobile Caribou Conservation Measures on the Bathurst Caribou Range' and 'Mobile Caribou Conservation Measures – Operational Guidance'.



An Implementation Framework for Mobile Caribou Conservation Measures on the Bathurst Caribou Range

PRELIMINARY DRAFT REPORT

for

Department of Environment and Natural Resources

Government of Northwest Territories

Environment and Natural Resources

February 2022

Executive Summary

Mobile Caribou Conservation Measures (Mobile Measures) are a flexible tool to avoid or minimize effects on caribou (*Rangifer tarandus groenlandicus*) when caribou are exposed to human disturbance. For land and wildlife managers, understanding the likelihood of caribou encountering and responding to industrial activities is essential to effectively reduce sensory disturbance without unnecessarily limiting economic development.

Mobile Measures link monitoring with site-specific mitigation, and are based on thresholds relative to numbers and proximity of caribou to development coupled with seasonal sensitivity and movement rates. The approach relies on monitoring of specific zones around development sites to give early warning of approaching caribou so that actions to avoid and minimize interaction between caribou and development can be taken. The criteria for caribou presence within an Early Warning Zone and Zone of Influence around development vary with season and are determined through several monitoring approaches (e.g., locations of satellite-collared caribou, height of land surveys and incidental observations of caribou from aircraft). Tiered mitigation is a pre-determined, progressive reduction of activities that is applied as caribou approach and move through the zones.

The Bathurst Caribou Range Plan (GNWT 2019:Table 7), co- developed by a Working Group of Indigenous governments and organizations, Government of the Northwest Territories (GNWT), Government of Nunavut and industry partners requires a framework for the development and implementation of Mobile Measures on the Bathurst caribou range on a trial basis.

The Bathurst Caribou Range Plan recommends implementing Mobile Measures within the Centre of Habitation of the Bathurst caribou herd as a means to reduce sensory disturbance of the herd in its core use area. The main points for the planning, operation and assessment of Mobile Measures can be summarized as follows:

1. A Framework document provides the rationale, considerations and general approaches for implementing Mobile Measures.
2. An Operational Guidance document will clearly set out how land use operators with activities located within the Bathurst Centre of Habitation can implement and report on Mobile Measures at their sites.
3. ENR staff will work closely with land use operators to share all necessary information and provide support as required.
4. Caribou will be monitored within zones surrounding a land use project, and the monitoring results compared to pre-assigned threshold levels. When a threshold is met, it triggers pre-determined mitigations which are applied with increasing intensity as

caribou approach the project, to avoid or minimize any potential sensory disturbance to caribou.

5. Operators will report annually using a standard template, enabling GNWT assessment of the effectiveness of the Mobile Measures including consideration of costs, personnel requirements and achievement of desired outcomes.

List of acronyms

COH	Centre of Habitation (core use area)
CLDF	Cumulative Land Disturbance Framework
CPM	Caribou Protection Measures
INAC	Indigenous and Northern Affairs Canada
DOE-GN	Department of Environment, Government of Nunavut
ENR-GNWT	Environment and Natural Resources, Government of the Northwest Territories
Mobile Measures	Mobile Caribou Conservation Measures
MVEIRB	Mackenzie Valley Environmental Impact Review Board
NIRB	Nunavut Impact Review Board
NLUP	Nunavut Land Use Plan
NPC	Nunavut Planning Commission
Range Plan	Bathurst Caribou Range Plan
ZOI	Zone of Influence

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1 Introduction

The Bathurst Caribou Range Plan (Range Plan) is the guide for decision-makers, industry and communities to help manage activities on the land to support the recovery of the migratory Bathurst barren-ground caribou (*Rangifer tarandus groenlandicus*) herd (GNWT 2019). The Range Plan's goal is to “ensure the Bathurst herd annual range is in a resilient landscape condition” through recommending cumulative spatial thresholds for each of five Range Assessment Areas across the annual range of the Bathurst herd. The Range Plan's recommendations include using Mobile Caribou Conservation Measures (Mobile Measures) as a flexible way of minimizing caribou disturbance while not unnecessarily restricting economic development.

The history of caribou protection measures goes back to the 1970s when the Inuit of Baker Lake took the federal government to court over effects of mineral exploration on caribou ranges (Text Box 1). Subsequently, the concept of protection measures evolved to Mobile Measures, which are designed to move with the caribou.

The Mobile Measures have three components:

- (i) Monitoring to detect the approach of caribou;
- (ii) A set of thresholds for caribou presence that trigger mitigation; and
- (iii) Progressively intensified mitigation levels (tiered mitigation).

The completed Range Plan (GNWT 2019) recommends that a framework and operational guidelines for Mobile Measures on the Bathurst caribou range be developed and implemented on a trial basis. Mobile Measures are to be implemented for land use activities within the Bathurst herd's Centre of Habitation; the core or refuge area that includes the habitats and migration paths which caribou use when the herd is at low numbers in its natural cycle. During the continued severe decline, the Bathurst herd's seasonal ranges have shifted and contracted in area (GNWT 2019). The Centre of Habitation is the current core area used annually by the herd based on the previous three years of satellite collar data coupled with traditional knowledge of important migratory, geographic, and habitat features (GNWT 2019: section 2.3.3). The Centre of Habitation is revised annually to reflect changes in herd size and subsequent range use (it can be found on the GNWT's Species and Habitat (*insert link when available)).

Mobile Measures are intended to apply to generally smaller-scale operations or early to mid-stage exploration programs in the NWT. Monitoring and adaptive mitigation approaches analogous to Mobile Measures have already been proposed or implemented for some mines in the NWT and Nunavut, including the approved Back River project (Sabina Gold & Silver

Corp. 2017) and the existing Meadowbank (Agnico Eagle Mines Ltd. 2017), Meliadine (Golder 2014), and Ekati mines (Golder 2017). In the NWT, larger developments such as roads or mines that meet criteria in Section 95 of the *Wildlife Act* are required to produce Wildlife Management and Monitoring Plans which can be designed to include tiered monitoring and mitigation, and in some cases temporary operation shutdowns, to afford a high level of protection for caribou. Mobile Measures are intended to avoid and minimize the relatively smaller-scale disturbance impacts associated with smaller operations that may be more widely distributed on the landscape.

Text Box 1. History of Caribou Protection Measures

Mobile Caribou Conservation Measures were adapted from the Caribou Protection Measures originally developed for the Beverly and Qamanirjuaq barren ground caribou herds in the late 1970s and 1980s (Gunn et al. 2007). The measures were conditions on land use permits that prohibited industrial exploration in calving and post-calving grounds (May 15 to July 15) and designated river crossings. The traditional calving and post-calving areas were closed to exploration, although flexibility came from air- and ground-monitoring to assess caribou distribution relative to the land use site. If caribou were not in the vicinity, the land use inspector could release the land use site from the restrictions. If the land use site was outside the closed calving and post-calving areas, but within the May 15 to July 15 window, the land use could proceed unless the monitoring flights found caribou, in which case the land use was suspended. There was no uniform size of the area assessed, or frequency of monitoring specified.

In developing (then termed) *Mobile* Caribou Protection Measures in 2009, the procedures for mapping caribou distribution were refined and tested to combine satellite collared caribou and aerial surveys as concentric early warning and buffer zone for the Bluenose East herd's winter range (Gunn and Poole 2009). Further modification occurred in 2015 when the Kivalliq Inuit Association was developing range-wide mobile management measures to link monitoring thresholds with incremental mitigation (Poole and Gunn 2015, 2016, 2017).

The Range Plan recommends that Mobile Measures implementation occurs in three phases (GNWT 2019):

1. Planning (development of an approach that includes minimum standards for monitoring and mitigation);
2. Operation (coordination among government, industry and community guardians on monitoring and compliance); and
3. Review (an assessment of the effectiveness including consideration of costs, personnel requirements and achievement of desired outcomes).

This report provides a Framework describing the rationale, considerations and general approach for implementing Mobile Measures. A companion document, Operational Guidance, will provide more specific direction for land use operators¹ to follow as they prepare for their project.

The Mobile Measures have three components:

- (iv) monitoring to detect the approach of caribou;
- (v) a set of thresholds for caribou presence that trigger progressively intense mitigation levels (tiered mitigation); and
- (vi) mitigation.

The tiered mitigations are designed to avoid or minimize any potential sensory disturbance to caribou. In turn, monitoring can be used to gauge the effectiveness of the mitigation.

This report proposes monitoring areas, approaches and trigger levels for tiered mitigation measures as an initial approach for implementing Mobile Measures on the range of the Bathurst caribou herd. ENR may adapt the recommended monitoring areas, approaches and trigger levels in response to review and evaluation of the annual reports submitted by land use operators.

This document does not address the specifics of the different government regulatory bodies and jurisdictions that may be involved in land management within the Bathurst caribou herd range.

¹ A land use operator is someone or entity that is undertaking activities associated with the mineral exploration cycle from ground acquisition through to advanced exploration.

2.1 Cumulative Land Disturbance Framework

Mobile Measures are an adaptive mitigation approach which moves with the caribou and is one of seven management tools identified in the Range Plan (GNWT 2019). The Measures are designed to be responsive to the levels of exposure, sensitivity and risk identified in the Range Plan and fit within the broader framework of the Range Plan (Figure 1).

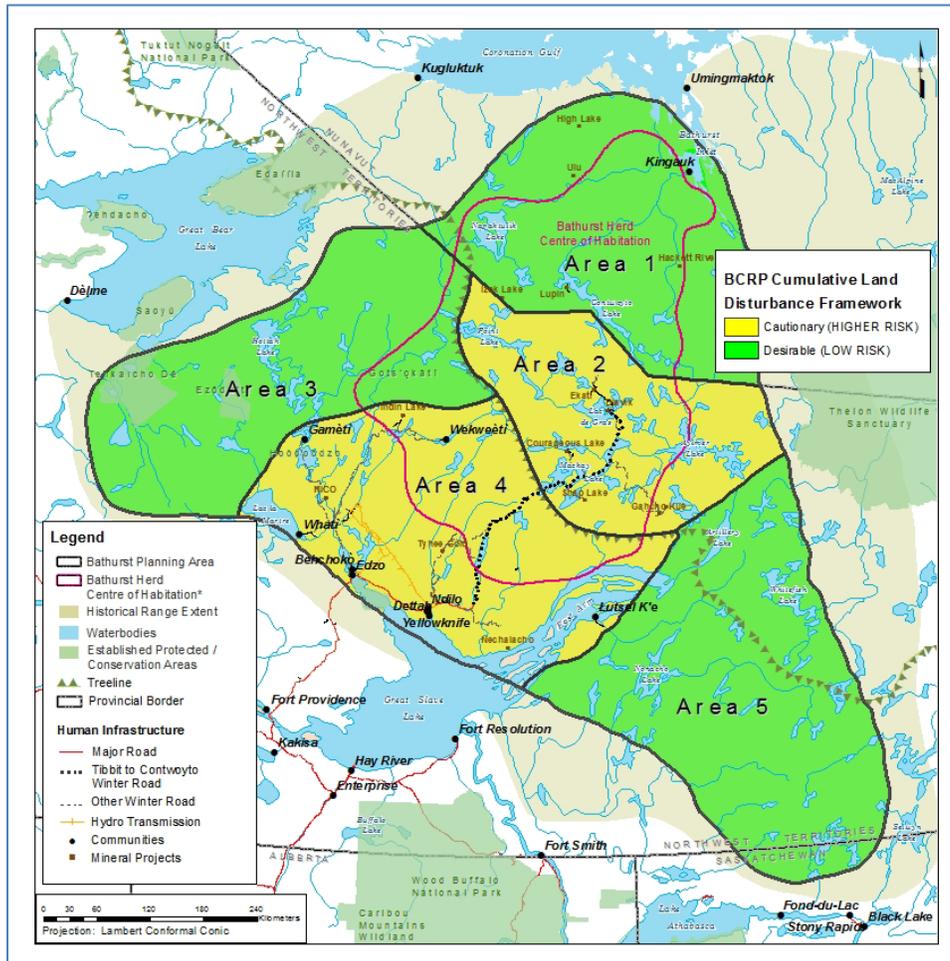


Figure 1. Map showing Range Assessment Areas 1-5, Cumulative Land Disturbance Framework status for each area and the Centre of Habitation.

The Range Plan’s Cumulative Land Disturbance Framework sets out cumulative disturbance thresholds of increasing concern (Desirable, Cautionary and High Risk). Those cumulative disturbance categories translate to three risk categories to caribou and/or habitat that are

assigned (Low, Moderate and High) with management responses scaled to those risk levels (GNWT 2019).

The Range Plan divides the Bathurst herd’s annual range into five Range Assessment Areas (Figure 1) based on human land use patterns, administrative boundaries, and caribou range use and habitat (GNWT 2019). The Range Plan also mapped relative range sensitivity areas based on telemetry and local knowledge with calving, post-calving and summer ranges being the most sensitive seasonal ranges. The area with the greatest likelihood of caribou exposure is the Centre of Habitation or the area of core habitat use when the herd is at low numbers. To minimize disturbance to caribou within the Centre of Habitation, the Range Plan recommends the implementation of Mobile Measures.

2.2 Seasonal Sensitivity of Caribou

The seasonal sensitivity rating, cumulative disturbance category of Range Assessment Areas and season duration (Table 1) influence the implementation of Mobile Measures (see following sections). For example, although calving and post-calving have the highest seasonal sensitivity, their season is relatively brief (27 days) and they occur in Range Assessment Area 1 which has a low cumulative land disturbance category (GNWT 2019).

Table 1. Seasons, sensitivity rating, seasonal use of cumulative land disturbance areas in the Bathurst Caribou Range Plan (GNWT 2019).

Season	Seasonal range duration (days) ¹	Seasonal caribou sensitivity rating ²	Seasonal use of Range Assessment Areas ³
Spring migration	43	3	1, 2
Calving + post-calving	27	5-4	1
Summer	70	2	1, 2
Fall	85	2	1, 2, 3
Winter	140	1-2	2, 3, 4

¹ Season duration is an average number of days during 2010-19, and will vary annually and over time.

² Rating from very low (1) to very high (5) sensitivity (BCRP Project Team 2018; Table 7). These sensitivity ratings and range duration were developed during the Bathurst Caribou Range Plan process based on assessment from the late 1990s and due to changes in range use patterns will be updated during the next Range Plan review.

³ Range Assessment Areas 1, 3 and 5 are currently ranked at the Desirable Cumulative Land Disturbance Framework and Areas 2 and 4 are ranked Cautionary.

The seasons when caribou are the most sensitive are spring migration, calving/post-calving, and summer (Tables 1–3). While the Range Plan used five seasons to identify sensitivity

(Table 1), for the purposes of the MCCM, six seasons (Tables 2 and 3) have been identified. The calving/post-calving season has been split to recognize the distinction between the slower-moving but high densities of cows calving on relatively predictably located calving grounds and the post-calving movement of large aggregations of cows and young calves making rapid and unpredictable movements (Tables 2 and 3).

2.3 Project Specific Zones

The Mobile Measures are implemented within two concentric zones, an outer Early Warning Zone and an inner Zone of Influence directly surrounding the site of a land use operation (Figure 3). Surveillance effort to assess the presence or likely arrival of caribou in these two zones increases as caribou move from the “Early Warning Zone” to the “Zone of Influence”

i. Early Warning Zone

The “Early Warning Zone” is used to alert operators of the need for enhanced awareness and monitoring, while the presence of caribou within the inner half of the Early Warning Zone is the trigger for enhanced monitoring or tiered mitigation depending on numbers of caribou relative to thresholds (see Section 4).

The size of the Early Warning Zone in any given caribou season (Table 1) is based on movement rates and directionality of travel (Tables 2, 3). For example, a smaller Early Warning Zone is used during winter when movement rates are generally lower and less directional. A larger Early Warning Zone is used during spring migration/pre-calving when distances moved daily are generally higher and more directional.

The objective of the Early Warning Zone is to determine whether caribou are likely to be exposed to the land use project with sufficient warning to be ready for mitigation. The radius of the Early Warning Zone is based on the average distance travelled by caribou over a 3-day period for each season based on collared caribou (Tables 2, 3). The use of 3 days as the initial time frame is to provide sufficient time for collar information to be downloaded and relayed to the project operator.

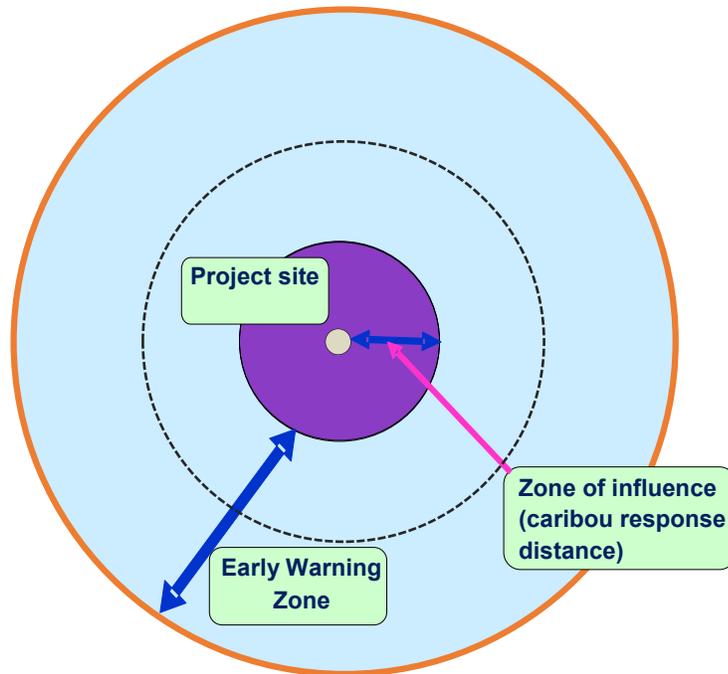


Figure 2. Schematic relationship between an exploration site, Zone of Influence, Early Warning Zone, and monitoring survey area. Note the Early Warning Zone is split into an inner and an outer zone.

Range sizes for the Bathurst caribou herd have contracted and shifted northward during the severe decline in herd size (GNWT 2019a). This contraction may have altered seasonal timing of migrations, and therefore seasonal ranges, duration and movement rates should be revised at 3-year intervals.

Table 2. The relative size of seasonal ranges and location predictability listed with the susceptibility of Bathurst caribou to disturbance based on behavior.

Season	Relative size and location predictability of seasonal ranges	Caribou susceptibility and behaviour
Spring migration	Narrow, predictable	Narrow corridors of cows often rapidly moving together with high directionality and occasional staging in large aggregations
Calving	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	Larger, less predictable	Cows and calves aggregate into large groups; calves susceptible to abandonment; aggregations susceptible to disturbance at traditional water crossings

Summer	Larger, less predictable	Cows and calves aggregating into large groups; aggregations susceptible at traditional water crossings
Fall	Smaller to larger, less predictable	Caribou either migrating or staging; often more dispersed and regaining body condition prior to breeding
Winter	Larger, less predictable	Caribou in aggregations over a large area and less movement

Table 3. Mean daily movement rates by season for satellite collared cows, Bathurst caribou herd, 2010-19. Data supplied by ENR, analyses conducted by G. Pelchat, Whitehorse, YT. Sample sizes range from 88–118 caribou-years per season.

Season	Dates	Mean km/day \pm SD	Approximate movement distance (km) over 3 days
Spring migration	20 Apr – 1 Jun	12.2 \pm 3.26	35
Calving	2-16 Jun	7.7 \pm 3.87	25
Post-calving	17-28 Jun	11.4 \pm 4.34	35
Summer	29 Jun – 6 Sep	16.2 \pm 3.34	45
Fall	7 Sep – 30 Nov	10.3 \pm 3.24	30
Winter	1 Dec – 19 Apr	4.2 \pm 2.57	15

Inside the Early Warning Zone, the number of collared caribou and, possibly, incidental observations from overflying aircraft are used to assess the imminent arrival of caribou into the inner ‘Zone of Influence’. Section 3.1 addresses monitoring in the Early Warning Zone.

ii) Zone of Influence

The Zone of Influence is the area around a site of a land use project where the behaviour and relative abundance of caribou may change in response to the site’s activities. While the Zone of Influence for different activities has not been measured, a minimum extent for exploration sites is 5 km as applied in cumulative effects assessments (e.g., DDEC 2014, Sabina Gold & Silver Corp. 2017) and for mapping human disturbance in the Range Plan (BCRP Project Team 2018:Table 1). A 5 km radius Zone of Influence has been selected for these Mobile Measures, however, the effectiveness and efficiency of this distance has not yet been determined.

2.4 Caribou thresholds

The number of collared or observed caribou in the Early Warning Zone indicates to the land use operator and ENR of the potential need for mitigation should caribou appear poised to enter the Zone of Influence. Specifically, the number of caribou within the inner half of the Early Warning Zone and therefore likely to enter the Zone of Influence is the trigger for implementing mitigation.

The number of collars or caribou within the inner half of the Early Warning Zone that would trigger mitigation is influenced by season and the size of the Early Warning Zone (Table 4). The Bathurst herd currently (2021) has a target deployment of 70 collars (50 on cows, 20 on bulls). Assuming roughly 5,200 potentially breeding females out of a population estimate of 8,200 caribou (Adamczewski et al. 2019) and full collar deployment, this means one collared cow represents roughly 100 individual adult cows, and one collared caribou represents about 120 caribou. A 50% increase in the radius of the Early Warning Zone equates to a 100% increase in the area of the zone (e.g., calving to spring migration), thus influencing the density of collars or caribou that may be used to trigger a response. The number of caribou also reflects seasonal typical group size.

Monitoring thresholds rely on detections within the inner ring of the Early Warning Zone, but if monitoring within the Zone of Influence detects or estimates more than the Level 2 thresholds listed in Table 4, then mitigation actions should also be initiated.

The intent is to afford protection from disturbance for a majority of caribou that may interact with the project site. The seasonal thresholds also are more conservative if the land use site is within the Cautionary cumulative disturbance category (Table 4).

Table 4. Seasonal Level 1 and Level 2 thresholds for caribou collars and observed caribou within the inner half of the Early Warning Zone¹ for corresponding Level 1 and Level 2 mitigation actions within the 5 km Zone of Influence (Appendix B). Triggers are more sensitive in the Cautionary Range Status.²

Season	Thresholds for Level 1 Mitigations				Thresholds for Level 2 Mitigations			
	Desirable Status		Cautionary Status		Desirable Status		Cautionary Status	
	Collars	Caribou	Collars	Caribou	Collars	Caribou	Collars	Caribou
Spring migration	2	≥200	1	≥100	4	≥400	2	≥200
Calving	1	≥50	1	≥25	2	≥100	2	≥50
Post-calving	1	≥100	1	≥50	2	≥200	2	≥100
Summer	2	≥200	1	≥100	4	≥400	2	≥200
Fall	2	≥100	1	≥50	4	≥200	2	≥100
Winter	3	≥300	2	≥200	6	≥600	4	≥400

¹ The Early Warning Zone radius begins at the outer extent of the 5 km radius (~80 km²) Zone of Influence.

² The lower value of the collars or caribou will trigger a response, e.g., for spring migration in Desirable range status (Low risk) if 2 collars are detected but only 100 caribou are estimated (via aerial survey or observations), then the threshold is triggered.

3 Monitoring

Mobile Measures include monitoring to determine the proximity of caribou to a land use project and whether the caribou numbers exceed a minimum level to trigger mitigation actions to be taken. Monitoring is used to assess the numbers, speed and direction of travel of caribou in the vicinity of a land use project; essentially providing an estimate of the likelihood that caribou will encounter a project. Monitoring is also used to gauge the effectiveness of mitigation.

3.1 Monitoring within the Early Warning Zone

The objective of the Early Warning Zone is to determine whether caribou are likely to be exposed to the land use project with sufficient warning to be ready for mitigation. The two most likely techniques to determine caribou numbers and rate of encountering the land use project are through the use of GPS or satellite collars (hereafter collars) and aerial surveys; each with its advantages and disadvantages. Aerial surveys provide a more complete and

likely accurate snapshot of the distribution of all caribou within the monitoring area, but only provide data when the surveys are flown. Further, concerns raised about aerial surveys disturbing caribou has placed greater emphasis on the use of alternative methods for monitoring caribou presence and abundance (e.g., collars, cameras) at many of the mine operations in NWT and Nunavut. Currently, there are no tested and proven effective methods for long- to medium-distance (>5 km) detection of caribou (see Section 3.4).

Caribou collar data are managed by GNWT and can be provided on a regular basis to land use operators. Using caribou collar locations to trigger mitigation will require locations 2 or 3 times a week which will require timely and coordinated information sharing between GNWT and the operator during the appropriate season. The companion Operation Guidance document provides detailed information on key contacts and processes for setting up data sharing arrangements. While collar locations provide the rate and direction of movement, they are less revealing about the number of caribou that might be associated with each location (aside from the collared animal).

Well-designed aerial surveys at altitudes high enough to reduce disturbance can provide accurate and instantaneous monitoring of the distribution of all sex and age classes of caribou and are useful to determine how representative are the collars (Gunn and Poole 2009). However, the land use operations under consideration are unlikely to have the available resources to conduct aerial surveys of the required frequency. Helicopters may be available depending on the type of activity taking place and can provide valuable incidental observations during crew changes and drill moves. However, helicopters can be noisy and at lower altitudes often cause greater reactions in caribou than fixed-wing aircraft (Wolfe et al. 2000).

Although other techniques such as long-distance cameras on towers or drone surveillance are being discussed for mine sites (e.g., long-distance cameras for the Back River Project; Sabina Gold & Silver Corp. 2017), the efficacy of these techniques and a technical review are not yet available. In the near future, drones may provide a safe and effective survey alternative to aircraft, subject to flight safety considerations (Koh and Wich 2012).

3.2 Monitoring within the Zone of Influence

The Zone of Influence is assumed to be the response distance for caribou; the area around a project site within which a behavioural response is elicited. The intent is for monitoring to detect caribou in the Early Warning Zone such that mitigations are in place if they continue to move into the Zone of Influence but it is possible caribou are not detected before they enter the Zone of Influence. During seasons when caribou are potentially present around the land use site, monitoring within the Zone of Influence provides frequent tracking of wildlife

The most realistic monitoring that can be conducted within the Zone of Influence is using height of land, towers or multiple observation locations around the land use site to look for caribou. Testing conducted at the Baffinland project at Mary River, Nunavut found that although observers from a height of land could likely detect animals (caribou) as far out as 5 km, the distance was scaled back to 4 km to ensure that anything the size of a caribou would be detected if within view (EDI Environmental Dynamics Inc. 2017). Methods for a height of land survey are provided in the Operational Guidance document. Although not required, a viewscape analysis (GIS technique) would identify what portion of the 4-km radius Zone of Influence at a land use site would be within view and effectively covered by these surveys (Figure 4).

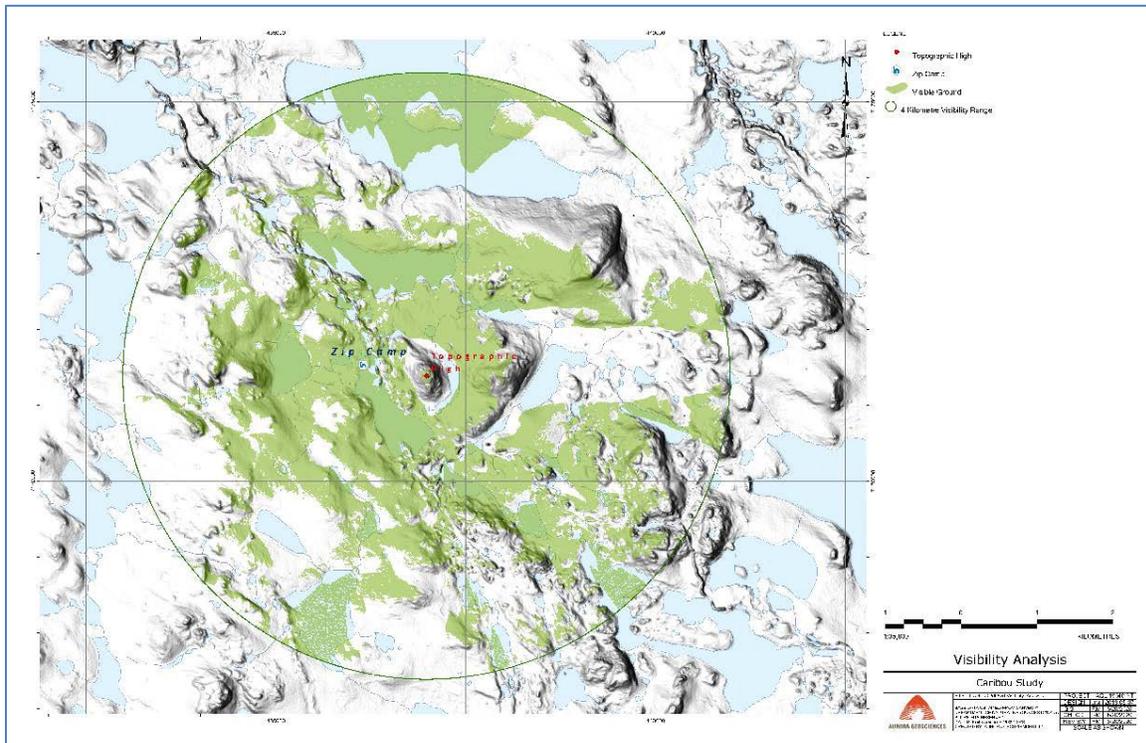


Figure 3. Example of a viewscape analysis. The green indicates the visible portions of a 4 km radius area around a height of land which could be surveyed for caribou from the ground.

3.3 Guardians in the monitoring

Including Community Guardians in the monitoring participating in Height of Land surveys and when assessing the effectiveness of Mobile Measures would facilitate collaboration and the use of multiple lines of evidence in assessing caribou responses (for example, Tengo et al. 2014). Building on the Range Plan recommendation, Indigenous governments and organizations have come together to develop a Caribou Guardians Coalition for collaborating and networking existing caribou guardian programs already being undertaken on the range of the Bathurst caribou herd. Over the next three years, with financial support from Polar Knowledge Canada, this group will further develop and coordinate a regional guardian network.

4 Mitigation

Mobile Measures provide phased mitigations by type of activity grouped according to the mineral exploration stage: ground acquisition, early exploration, middle exploration and advanced exploration. Projects in more advanced development stages are assumed to likely trigger an environmental assessment and would be assessed in relation to requirements under the *Wildlife Act* for a Wildlife Management and Monitoring Plan; as such, they are not considered here.

4.1 Base Level Mitigation

Base level mitigation that should be conducted at all land use sites, to minimize behavioural responses of caribou, include:

- Provide employee education and caribou awareness training;
- Avoid direct movement of equipment and people toward caribou;
- Avoid approaching caribou or stopping within sight of caribou when operating vehicles including all-terrain vehicles and snow machines; and
- Maintain at least 610 m above ground level and avoid areas of known caribou concentrations when possible (subject to pilot discretion regarding aircraft and human safety) when flying over calving and post-calving range and near identified caribou water crossings when sites are active. Seasonal ranges and information on water crossing can be found on the GNWT Species and Habitat Viewer (*insert link when available). Outside of these seasons, altitudes of 300 m above ground level should be maintained.

4.2 Tiered Mitigation in Response to Monitoring

If monitoring (collar locations, aerial surveys, incidental observations) in the Early Warning Zone or monitoring within the Zone of Influence (height of land surveys, incidental observations), reveals that the number of collars or caribou exceeded the thresholds in Table 4 then mitigations are applied to the land use operation in three phases.

The menu of prescribed mitigation actions is organized into tiers that can be intensified or reduced to be more or less conservative. Tiered mitigation measures are used to avoid or minimize potential sensory disturbance of caribou approaching and moving through the land use project area.

Operations with primarily ground-based activities and limited aircraft support may generate less potential disturbance than helicopter supported programs. Generally, the first two mitigation phases aim to adjust flight paths to reduce or avoid flying over caribou. Mitigation in the third phase is to delay aerial or drill programs (this may not be applicable in all situations) in addition to minimizing ground activity.

For larger projects, actions taken to avoid effects on caribou from sensory disturbance are to modify movement of aircraft first, then vehicles and other above-ground activities (such as blasting and drilling), and finally to reduce most other non-essential camp operations (i.e., ensure that machinery is not operating beyond essential care and maintenance). Mitigation may target specific quadrants of the Early Warning Zone if caribou distribution near the site is clumped in particular areas (e.g., plan flights, select targets/drill sites and reduce ground activity such as snowmobiles, quads, trucks to avoid quadrants with caribou).

More stringent mitigation measures can be scaled back once caribou leave the operations area. For example, during summer if 2 of 4 collared caribou or 200 of 400 individuals move out of the inner half of the Early Warning Zone (leaving 2 collar and ~200 individuals) then mitigation can be scaled back to Mitigation Level 1 (Table 4). Monitoring should continue if caribou move to just outside of the Early Warning Zone since caribou movements are unpredictable and may reverse direction. The operator should clearly document the rationale followed to reduce mitigation intensity.

Details of Mobile Measures monitoring thresholds and mitigation are provided in Appendix B of the Operational Guidance document.

5 Communication and Coordination

Application of Mobile Measures requires adherence to a series of tasks, activities and communications outline in Table 5. Coordination among government and land use operators will be critical to successful implementation of Mobile Measures. ENR will share information

in a timely manner with land use operators on caribou collar locations in relation to project sites. The land use operator is responsible for understanding the Mobile Measures as they apply to the specific project, to implement mitigation actions, and to provide an annual report on activities. It is the land use operator’s decision and costs to undertake additional monitoring such as aerial surveys.

Table 5. Suggested progression of activities for a land use operation using Mobile Caribou Conservation Measures within the Bathurst caribou range.

	Task	Government Agency	Land Use Operator
1	Planning	GNWT publicizes need for Mobile Measures through Chamber of Mines, Mining Recorders Office, GNWT website, etc.	Land use operator is made aware of requirements for Mobile Measures through Chamber of Mines, Mining Recorders Office, GNWT website.
2	Planning	ENR has point of contact for Mobile Measures oversight.	Land use operator contacts ENR.
3	Planning	ENR provides and discusses Operational Guidance document and clarifies expectations/requirements.	Discusses Operational Guidance document and clarifies expectations/requirements.
4	Planning	Discusses and determines location relative to range assessment area and season of proposed operation.	Discusses and determines location relative to range assessment area and season of proposed operation.
5	Planning	Summary of expected seasonal caribou abundance and residency provided in Operational Guidance document.	Reviews caribou information and responds with proposed schedule of operations
6	Planning	Size of Early Warning Zone and trigger levels of caribou are discussed and understood.	Size of Early Warning Zone and trigger levels of caribou are discussed and understood.
7	Planning	Reviews and agrees upon suggested list of tiered mitigations.	Provides potential list of tiered mitigations based on mineral cycle stage and type of activity (Table 4).
8	Planning	Ensures project site contact information is received for information sharing.	Provides project site contact information to ENR for information sharing (e.g., emailing collar location maps).
9	Operations	ENR provides emails with maps of collar locations relative to Early Warning Zone, Zone of Influence and project site.	Receives emails with maps of collar locations relative to Early Warning Zone, Zone of Influence and project site.
10	Operations	ENR available to respond to any questions or concerns during operations.	Monitors collar locations in the Early Warning Zone; conducts an aerial survey if desired.
11	Operations	ENR expects the operator to implement mitigation, and is available to respond to any questions concerns during operations.	If caribou threshold exceeded, the land use operator will implement mitigation; monitoring within the Zone of Influence as advised.

	Task	Government Agency	Land Use Operator
12	Operations	ENR available to respond to any questions concerns during operations.	Continued monitoring and mitigation until caribou move out of the Early Warning Zone.
13	Reporting	ENR to provide an annual report on Mobile Measures-related activities within the Bathurst caribou Centre of Habitation (see template in Appendix G of the Operational Guidance document.	Land user to provide an annual report on Mobile Measures-related activities using template provided in Appendix F of the Operational Guidance document.
14	Review	Assess the effectiveness of the Mobile Measures including consideration of costs, personnel requirements and achievement of desired outcomes. ENR will send the report to Wek'èezhìi Land and Water Board.	Assess the effectiveness of the Mobile Measures including actions taken, costs, personnel requirements and consequences to operations.

5.1 Information sharing with land use operators.

A companion document, Operational Guidance for Mobile Measures, provides background information on Mobile Measures, how they are to be implemented, key contacts, reporting templates, checklists, information on previous caribou seasonal abundance and distribution, and various other information sources for planning purposes. This guidance is meant to support operators in preparing for their field season activities relative to caribou movements; clear descriptions of why and how the Mobile Measures work will be essential along with prepared 'Frequently Asked Questions' (and answers) along with a GNWT contact to answer additional questions. These materials should provide sufficient awareness information of the land use operators. This document and supporting materials are available on the ENR website (*insert link when available).

6 Reporting and Review

Review of the application of Mobile Measures for land use operators within the range of the Bathurst caribou herd requires addressing both the effectiveness of the mechanics of the program and an evaluation of the results (Atkinson 2016). Reporting from both the government side and the operator is essential. Especially in this trial application of Mobile Measures, the program should address questions to, if necessary, adaptively modify the program in response:

1. Was communication and data/information exchange between the regulators and the land user efficient and effective (e.g., timely collar maps)?
2. If triggered, were Mobile Measures implemented as listed and if not, why?

3. What changes need to be made to make implementation more successful?
4. Were the costs, personnel requirements and achievement of desired outcomes in line with expectations and desired outcomes?

Details on reporting requirements are provided in the Operational Guidance document with a reporting template provided in Appendix F.

6.1 Database management and report archiving

Reporting is an essential component of the review process. Part of the effort to assess the effectiveness of the Mobile Measures will require an accessible archive of the camp operator observations (using the standardized templates provided in Appendix F of the Operational Guidance document). Caribou collar data, aerial survey results (if applicable), observations from monitoring within the Zone of Influence, implementation of mitigation and reports and evaluations from both government and the land user should be archived in a central location.

6.2 Field Trials

The GNWT conducted a desktop exercise in Fall 2020 to assess the methods, operational guidance, data sharing and data reporting templates. The exercise considered caribou presence (as determined through satellite collared caribou in the Bathurst and Beverly caribou herds) in relation to five mineral exploration camps and one research station. Results are reported in an Appendix to the Operational Guidance Document.

A field test of the program should also be implemented, involving a run-through of the steps outlined in Table 6. A cooperative exploration camp could be used to test the effectiveness of communication as well as exploration of the link between collars in the Early Warning Zone and likelihood of movement into the Zone of Influence (via height of land surveys or incidental aerial observations). The monitoring and mitigation proposed here are the best of our current knowledge, but have not been tested in an operational exploration camp context.

7 Acknowledgements

Development of framework and operational Mobile Caribou Conservation Measures for the Bathurst Caribou Range Plan was highly collaborative. A. Gunn and K. Poole, Aurora Wildlife Research, took the lead for operational details based on previous work on Mobile Measures in the Kivalliq Region, and they thank the Kivalliq Inuit Association for supporting development of Mobile Measures in their region. K. Clark and A. Patenaude, ENR, graciously answered questions and provided reviews of earlier drafts, and K. Clark ably handled administrative logistics. B. Fournier, ENR, used her GIS experience to provide outstanding maps and analyses. G. Vivian and C. Hrkac, Aurora Geosciences, provided excellent feedback

and discussions on the project. A. Kolback, ENR Intern, reviewed the map data for a pilot desktop exercise.

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Mobile Caribou Conservation Measures – Operational Guidance

PRELIMINARY DRAFT REPORT

for

Department of Environment and Natural Resources

Government of Northwest Territories

Environment and Natural Resources

February 2022

Government of
Northwest Territories

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1. Purpose and Overview

1.1 What is the objective?

This document provides guidance to land use operators¹ on the Bathurst caribou range on how to implement Mobile Caribou Conservation Measures (Mobile Measures) at their site. MCCM provide a flexible approach to planning, monitoring and undertaking land use activities in a way that avoids and minimizes disturbance to caribou while also not unnecessarily restricting economic development. Mobile Measures were one of the key recommendations of the Bathurst Caribou Range Plan (Range Plan) (GNWT 2019²). The Range Plan is the guide for decision-makers, industry and communities to help manage activities on the land to support the recovery of the migratory Bathurst barren-ground caribou (*Rangifer tarandus groenlandicus*) herd (GNWT 2019).

While Mobile Measures can assist with planning operations anywhere in barren-ground caribou range, they are to be primarily implemented for land use activities within the Centre of Habitation for the Bathurst herd which is the core or refuge area identified in the Range Plan that includes the habitats and migration paths which caribou use when the herd is at low numbers in its natural cycle.

The main points for the planning, operation and assessment of Mobile Measures can be summarized as follows:

1. An accompanying Framework document provides the rationale, considerations and general approaches for implementing Mobile Measures.
2. This Operational Guidance document will clearly set out how land use operators with activities located within the Bathurst Centre of Habitation can implement and report on Mobile Measures at their sites.
3. ENR staff will work closely with land use operators to share all necessary information and provide support as required.
4. Caribou will be monitored within zones surrounding a project site, and the monitoring results compared to pre-assigned trigger levels. When a trigger is met, pre-determined mitigations are applied with increasing intensity as caribou approach the project, to avoid or minimize any potential sensory disturbance to caribou.

¹ A land use operator is someone or entity that is undertaking activities associated with the mineral exploration cycle from ground acquisition through to advanced exploration.

² Government of the Northwest Territories. 2019. Bathurst Caribou Range Plan. August 2019. Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NT. 86 + iii pp.

5. Operators will report annually using a standard template, enabling assessment of the effectiveness of the Mobile Measures including consideration of costs, personnel requirements and achievement of desired outcomes.

1.2 Where do they apply?

1.2.1 Centre of Habitation

Mobile Caribou Conservation Measures (Mobile Measures) will be applied within the Centre of Habitation, defined in this document as the core use area, currently used by the majority of Bathurst caribou. As the Bathurst herd's population has declined, their seasonal ranges have shifted and contracted in area (GNWT 2019). GNWT annually updates the Centre of Habitation based on the most recent three years of satellite-collar data (2018-2020) to reflect changes in herd size and subsequent range use (Figure 1).³

³ ENR is currently (2021) maintaining a target of 70 collars on Bathurst caribou (50 on cows, 20 on bulls), a good sample size at the current population level for providing data to inform distribution.



Figure 1. Bathurst caribou herd Centre of Habitation (COH) for 2018-20.

1.3 How do they work?

1.3.1 Monitoring in Zones

Mobile Measures operate within two concentric zones, with increasing surveillance effort to assess the likely arrival or presence of caribou. Figure 2 represents a single point site of project activity, such as a camp. These zones may be established and combined around a number of sites of activity, to reflect the extent of activity of a single operation.

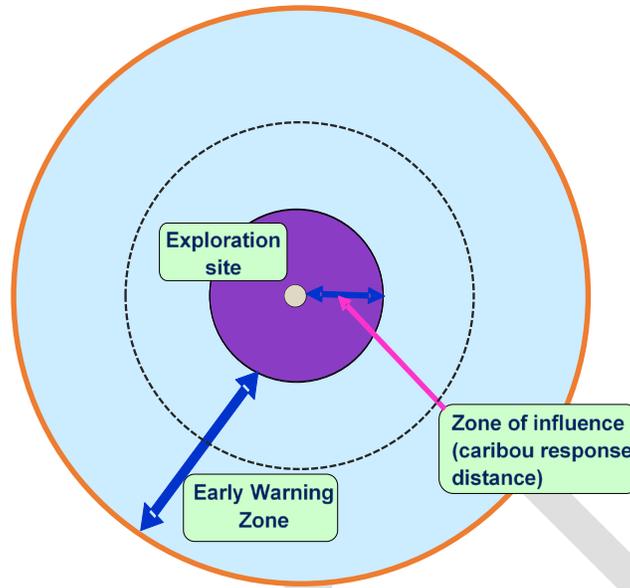


Figure 2. Schematic relationship between a project (exploration) site, Zone of Influence, Early Warning Zone, and monitoring survey area. Note the Early Warning Zone is split into an inner and an outer zone.

An ‘Early Warning Zone’ varies in size with caribou season (reflecting relative sensitivity of caribou to disturbance during that season) and movement rates (Table 1). For example, a smaller Early Warning Zone is used during winter when movement rates are generally lower and less directional. A larger Early Warning Zone is used during spring migration when distances moved daily are generally higher and more directional. The Zone of Influence (ZOI) is the area around a project site where the behaviour and distribution of caribou may change in response to the site’s activities, in effect, the caribou response distance.

Table 1. Caribou seasons and the radius of the Early Warning Zone¹ (EWZ) for corresponding mitigation actions within the 5 km radius Zone of Influence.

Season	Dates	EWZ radius (km)
Spring migration	20 Apr – 1 Jun	35
Calving	2-16 Jun	25
Post-calving	17-28 Jun	35
Summer	29 Jun – 6 Sep	45
Fall	7 Sep – 30 Nov	30
Winter	1 Dec – 19 Apr	15

¹The Early Warning Zone radius begins at the outer extent of the 5 km radius Zone of Influence.

A land use operator will need to know where their project site is in relation to caribou seasonal ranges (see Appendix C) and with respect to the Range Status indicated in the Bathurst Caribou

Range Plan (Appendix A). This information is most easily obtained by visiting the GNWT, ENR Species and Habitat Viewer website (https://www.maps.geomatics.gov.nt.ca/Html5Viewer/index.html?viewer=NWT_SHV). On this site, a user can indicate a project location and generate a report on the overlapping caribou herds seasonal ranges and range assessment area along with other information on species at risk that may also occur in the area of the project site.

1.3.2 Thresholds

The threshold numbers of collars or observed caribou that would trigger mitigation is influenced by seasonal susceptibility and the size of the Early Warning Zone. Thresholds also decrease in areas rated as Cautionary in the Range Plan (Table 2). The intent is to afford protection from disturbance for a majority of caribou that may be near the project site.

Information from collared caribou will likely be used as the first line of monitoring in combination with incidental observations made during project-related flights. Coordination with GNWT, ENR will be required to ensure sharing of caribou collar data and maps two or three times a week.

When collared caribou are present or caribou are observed in the outer ring of the Early Warning Zone, enhanced awareness and monitoring is required (see Section 2). When the number of collared caribou or observed caribou within the inner half of the Early Warning Zone meets or exceeds Level 1 threshold levels, Level 1 mitigation actions and additional monitoring within the Zone of Influence are required. If numbers of collars in the inner ring of the Early Warning Zone meets or exceeds Level 2 thresholds, mitigation actions are intensified. If monitoring conducted within the Zone of Influence detects or estimates more than the Level 2 threshold of caribou for the inner Early Warning Zone, mitigation actions should also be initiated (see Section 3, Appendix B).

Table 2. Seasonal Level 1 and Level 2 thresholds for caribou collars and observed caribou within the inner half of the Early Warning Zone¹ for corresponding Level 1 and Level 2 mitigation actions within the 5 km Zone of Influence (Appendix B). Triggers are more sensitive in the Cautionary Range Status.²

Season	Thresholds for Level 1 Mitigations				Thresholds for Level 2 Mitigations			
	Desirable Status		Cautionary Status		Desirable Status		Cautionary Status	
	Collars	Caribou	Collars	Caribou	Collars	Caribou	Collars	Caribou
Spring migration	2	≥200	1	≥100	4	≥400	2	≥200
Calving	1	≥50	1	≥25	2	≥100	2	≥50
Post-calving	1	≥100	1	≥50	2	≥200	2	≥100
Summer	2	≥200	1	≥100	4	≥400	2	≥200
Fall	2	≥100	1	≥50	4	≥200	2	≥100
Winter	3	≥300	2	≥200	6	≥600	4	≥400

¹ The Early Warning Zone radius begins at the outer extent of the 5 km radius (~80 km²) Zone of Influence.

² The lower value of the collars or caribou will trigger a response, e.g., for spring migration in Desirable Status (Low risk) if 2 collars are detected but only 100 caribou are estimated (via aerial survey or observations), then the threshold is triggered.

1.3.3 Actions

If monitoring (collar locations, aerial surveys, incidental observations) in the Early Warning Zone or monitoring within the Zone of Influence (height of land surveys, incidental observations), reveals that the number of collars or caribou exceeded the thresholds, mitigations are applied to the land use operation in three levels. Generally, the first two levels aim to adjust flight paths to reduce or avoid flying over or landing near caribou, with Level 1 triggers from Table 2 applied within the Early Warning Zone and Level 2 triggers in Table 2 also applied within the Early Warning Zone. Mitigation in Level 3 is to delay aerial or drill programs (as much as practicable) and minimize ground activity, triggered by the Level 2 triggers within the Zone of Influence. Where the operator declares that delays to land use operations are not feasible or practical, discussions between the land use operator and ENR should occur. The operator is expected to make every possible effort to modify their program to minimize potential impact to caribou. Specific mitigations by type of activity grouped according to the mineral exploration stage are provided in Appendix B.

1.4 Who does what, when?

The Mobile Measures have three components: (i) monitoring, the results of which are compared to pre-assigned thresholds; (ii) thresholds which trigger decisions about the intensity of tiered mitigation; and (iii) mitigation. The tiered mitigations are implemented to avoid or minimize any potential sensory disturbance to caribou. In turn, monitoring can be used to gauge the effectiveness of the mitigation.

Coordination among government and land use operators will be critical to successful implementation of Mobile Measures. Land use operators will be provided with Mobile Measures documentation early in their planning and made aware that it is expected that they will follow the intent of the Mobile Measures to avoid and minimize potential disturbance to caribou. This is especially important to smaller, early exploration projects where regular internet may be lacking in the field. ENR will share with land use operators the caribou collar locations in relation to project sites 2 or 3 times a week. The land use operator is responsible for understanding the Mobile Measures as they apply to the specific project, to implement mitigation actions, and to provide an annual report on activities. An overview of actions and responsibilities is provided in Table 3.

Table 3. Suggested progression of activities for a land use operation using Mobile Caribou Conservation Measures within the Bathurst caribou range.

	Task	Government Agency	Land Use Operator
1	Planning	GNWT publicizes need for Mobile Measures through Chamber of Mines, Mining Recorders Office, GNWT website, etc.	Land use operator is made aware of requirements for Mobile Measures through Chamber of Mines, Mining Recorders Office, GNWT website.
2	Planning	ENR has point of contact for Mobile Measures oversight.	Land use operator contacts ENR.
3	Planning	ENR provides and discusses Operational Guidance document and clarifies expectations/requirements.	Discusses Operational Guidance document and clarifies expectations/requirements.
4	Planning	Discusses and determines location relative to range assessment area and season of proposed operation.	Discusses and determines location relative to range assessment area and season of proposed operation.
5	Planning	Summary of expected seasonal caribou abundance and residency provided in Operational Guidance document.	Reviews caribou information and responds with proposed schedule of operations.
6	Planning	Size of Early Warning Zone and trigger levels of caribou are discussed and understood.	Size of Early Warning Zone and trigger levels of caribou are discussed and understood.
7	Planning	Reviews and agrees upon suggested list of tiered mitigations.	Provides potential list of tiered mitigations based on mineral cycle stage and type of activity (Appendix B).
8	Planning	Ensures project site contact information is received for information sharing.	Provides project site contact information to ENR for information sharing (e.g., emailing collar location maps).
9	Operations	ENR provides emails with maps of	Receives emails with maps of collar

	Task	Government Agency	Land Use Operator
		collar locations relative to Early Warning Zone, Zone of Influence and project site.	locations relative to Early Warning Zone, Zone of Influence and project site.
10	Operations	ENR available to respond to any questions or concerns during operations.	Monitors collar locations in the Early Warning Zone; conducts an aerial survey if desired.
11	Operations	ENR expects the operator to implement mitigation, and is available to respond to any questions concerns during operations.	If caribou threshold exceeded, the land use operator will implement mitigation; monitoring within the Zone of Influence is advised.
12	Operations	ENR available to respond to any questions concerns during operations.	Continued monitoring and mitigation until caribou move out of the Early Warning Zone.
13	Reporting	ENR to provide an annual report on Mobile Measures-related activities within the Bathurst caribou Centre of Habitation (Appendix G).	Land user to provide an annual report on Mobile Measures-related activities (Appendix F).
14	Review	Assess the effectiveness of the Mobile Measures including consideration of costs, personnel requirements and achievement of desired outcomes. ENR will send the report to Wek'èezhii Land and Water Board.	Assess the effectiveness of the Mobile Measures including actions taken, costs, personnel requirements and consequences to operations.

1.5 Where to get more information

- ENR contact (Appendix D)
- Website for the Species and Habitat Viewer
https://www.maps.geomatics.gov.nt.ca/Html5Viewer/index.html?viewer=NWT_SH
[v](#))

2 Monitoring Requirements

Information presented in Appendix C provides operators with an indication when caribou may be near their project which can be provided to the operators prior to fieldwork. Here, we present the actual monitoring requirements.

2.1 Collar maps

The first indication that caribou may or may soon occur within one of the monitoring zones surrounding a project will likely be provided by maps of collared caribou movements provided

by ENR. These maps will include the relevant Early Warning Zone and Zone of Influence. Access to these maps will be arranged with ENR, with the maps emailed to the agreed-upon email address(s). The frequency at which maps are provided to the operator will be determined through prior discussions with ENR (see Appendix D for ENR contact list), but could be 2 or 3 times a week when ENR determines that collared caribou may be heading towards a project site, to daily during appropriate seasons and when collared caribou are just outside of or within the Early Warning Zone or Zone of Influence⁴.

2.2 Aircraft

Exploration projects within the Centre of Habitation typically rely on aircraft support, generally in the form of fixed-wing aircraft to supply camps and helicopters or fixed-wing aircraft to move personnel and equipment. These flights provide opportunities for incidental observations of caribou beyond what can be seen from camp. These flights are not intended to actively search for caribou, but aerial sightings can supplement collar and ground data.

Aircraft personnel should record the following information on a data form (Appendix E) that should be relayed to the camp for documentation:

- Date and time of observations;
- Aircraft type and name of observer;
- Locations coordinates (in Lat/Long or UTM) plus general location if available;
- Group size (estimated), composition (if known) and direction of travel (if known);
- Additional comments.

At camp the sightings should be plotted on a reference collar map which includes the Early Warning Zone and Zone of Influence. The aerial sightings are supplemental to collar and ground-derived observations.

2.3 Ground-based

Operators will need to supplement collar data with ground-based monitoring. Ground-based monitoring has the advantage of providing herd-level observations within the direct vicinity of the project. The intent is to establish survey points – heights of land, towers or multiple observation locations around the project site – within and near the camp where visibility allows >1 km sightline in multiple directions. A GIS viewshed or visibility analysis may be conducted to determine survey coverage from a single or multiple survey points (Figure 3).

⁴ Due to staggered downloads of collar locations from the satellite system and time for processing, there will generally be a delay of half to 2 days between collar locations and providing information to the operators.

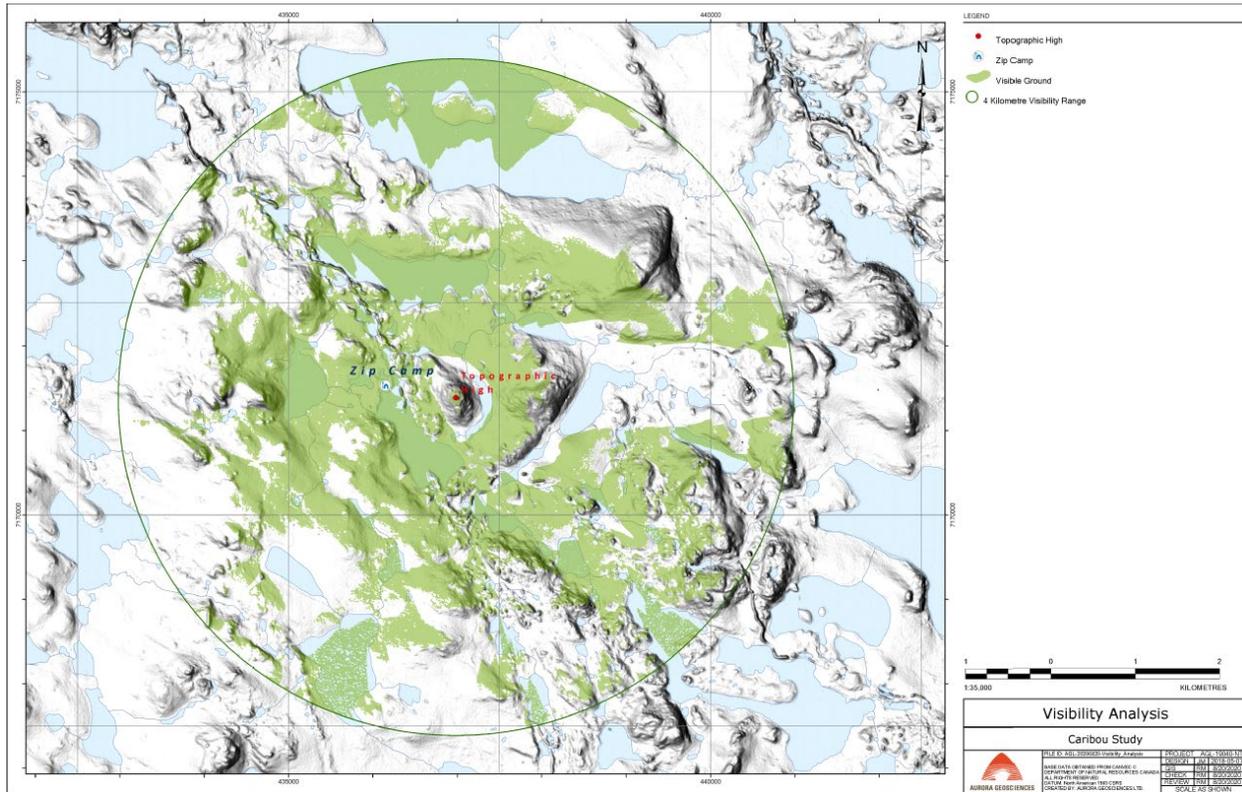


Figure 3. Example of a height of land viewed or visibility analysis from an exploration camp (Aurora Geosciences Ltd.).

Height of Land (HOL) surveys involve observing an area from a high point of land or physical structure (to increase the amount of observable area) for a prescribed amount of time, using binoculars (and a spotting scope if available) to detect and record caribou and their proximity to the exploration camp or activity.

Height of Land survey design:

1. Pick one or two locations within reasonably easy access of camp/activity with as complete a 360° view and as much viewed as possible (with as little amount as possible of terrain within 2–3 km hidden by topography)⁵.
2. Two observers would be helpful but one observer is sufficient.

⁵ Studies at Baffinland, Nunavut, suggested that the maximum distance that observers were able to detect caribou using a spotting scope was about 4 km (EDI Environmental Dynamics Inc. 2017), but this depends on background and observer expertise. A focus within 2–3 km is more reasonable.

3. Using the HOL survey form (Appendix E), record the HOL name and location (coordinates), estimate maximum visibility in the four cardinal directions, record any obstructions to visibility such as fog or rain and whether the ground is bare or snow covered, and the date and start and end time of the observation. A sketched plan may be helpful.
4. Using binoculars or a spotting scope (record on the form), the observer should spend a minimum of 20 minutes and a maximum of 30 minutes scanning all directions. If all 4 cardinal directions have a reasonable viewshed (at least 2 km), the observer could spend ~5 minutes searching in each 90° quadrant.
5. Within each quadrant, record the number of caribou observed, their estimated distance from the observer, the numbers moving towards or away from camp or bedded or foraging, and any other large mammal species. If snow cover is present, note any caribou tracks observed in “comments”.
6. Complete the form even if no caribou are seen.

Height of Land survey frequency:

- If no collared caribou or incidental sightings of caribou (e.g., from project aircraft) are within the Early Warning Zone or Zone of Influence and the frequency chart (e.g., Appendix C; Figure 6) indicates little to no likelihood of caribou presence based on recent experience, then HOL surveys need not be conducted.
- If no collared caribou or incidental sightings of caribou (e.g., from project aircraft) are within the Early Warning Zone but the frequency chart (e.g., Appendix C; Figure 6) indicates a likelihood of caribou presence based on recent experience, then HOL surveys should be conducted once a week (precautionary).
- Once caribou are known to occur within the inner Early Warning Zone or Zone of Influence, HOL surveys should be conducted daily.
- After caribou are present in the area and begin to move out, if there are no collars and <100 caribou are observed within the inner Early Warning Zone or Zone of Influence, HOL surveys should be conducted once a week.

Ground-based incidental sights should also be recorded on a camp data form (Appendix E).

3 Tiered Mitigation by Camp Type and Size

Monitoring and mitigation requirements will vary among types of operations and project sites, related to the area covered by the operation, modes of transportation and equipment used, the size of the camp (number of personnel), and how long the activities are proposed to occur (Appendix B). Operators are expected to plan their activities to avoid seasons/times of year when large numbers of caribou might be in the vicinity of their site (see Appendix C).

Base level mitigation that should be conducted at all project sites include:

1. Provide employee education and caribou awareness training;
2. Avoid direct movement of equipment and people toward caribou;
3. Avoid approaching caribou or stopping within sight of caribou when operating vehicles including all-terrain vehicles and snow machines; and
4. Maintain at least 610 m above ground level and avoid areas of known caribou concentrations when possible (subject to pilot discretion regarding aircraft and human safety) when flying over calving and post-calving range and near identified caribou water crossings when sites are active. Outside of these seasons, altitudes of 300 m above ground level should be maintained.

For larger projects, actions taken to avoid effects on caribou from sensory disturbance are to modify movement of aircraft first, then vehicles and other above-ground activities (such as blasting and drilling), and finally to reduce most other non-essential camp operations (i.e., ensure that machinery is not operating beyond essential care and maintenance). Mitigation may target specific quadrants of the Early Warning Zone if caribou distribution near the site is clumped in particular areas.

More stringent mitigation measures can be scaled back once caribou leave the operations area. For example, if 2 of 3 collared caribou or 200 of 300 individuals move out of the Zone of Influence (leaving 1 collar and ~100 individuals) then mitigation can be scaled back to Mitigation Level 2. The thresholds would essentially be followed in reverse to scale back monitoring and mitigation. Monitoring should continue if caribou move to just outside of the Early Warning Zone since caribou movements are unpredictable and may reverse direction. The operator should clearly document the rationale followed to reduce mitigation intensity.

4 Reporting

Reporting of Mobile Measure-related activities is essential to assess the effectiveness and efficiency of monitoring and mitigation operations and to continue to support collaboration. Estimating effectiveness is related to whether sensory disturbance of the caribou was likely to have been reduced as land use activities decreased. This assumes that it is more likely activity (aircraft overflights, moving machinery and people) rather than structures (tents, buildings, stationary structures) which causes the caribou to respond. The mitigation either shortens the time the caribou are exposed to disturbance (stopping activities) or the caribou are exposed to a lower level of disturbance (by increasing the distance to the caribou).

Each operator should provide ENR with a brief report on Mobile Measure activities conducted during their field season summarizing monitoring effort and subsequent mitigation, and the

basis for decisions to intensify or reduce mitigation along with recommendations to improve communications and Mobile Measures effectiveness (Appendix F). Delays to operations should be included to help in estimating costs of the Mobile Measures as an index to efficiency.

The government's annual report will summarize encounters of collared caribou of the Bathurst herd with land use operations and the number of collared caribou entries into each land use operation's Early Warning Zone and Zone of Influence (Appendix G). The government will summarize when the number of collared caribou thresholds triggered mitigation and the nature of the mitigation including the duration of delays in operations, if necessary. Departmental staff will summarize the number and nature of communications between the government and land use operators to consider if improvements or adjustments are necessary and for the government to assess its staff costs.

5 Acknowledgements

Development of framework and operational Mobile Caribou Conservation Measures for the Bathurst Caribou Range Plan was highly collaborative. A. Gunn and K. Poole, Aurora Wildlife Research, took the lead for operational details based on previous work on Mobile Measures in the Kivalliq Region, and they thank the Kivalliq Inuit Association for supporting development of Mobile Measures in their region. K. Clark and A. Patenaude, ENR, graciously answered questions and provided reviews of earlier drafts, and K. Clark ably handled administrative logistics. B. Fournier, ENR, used her GIS experience to provide outstanding maps and analyses. G. Vivian and C. Hrkac, Aurora Geosciences, provided excellent feedback and discussions on the project.

Appendix A – Range Assessment Areas

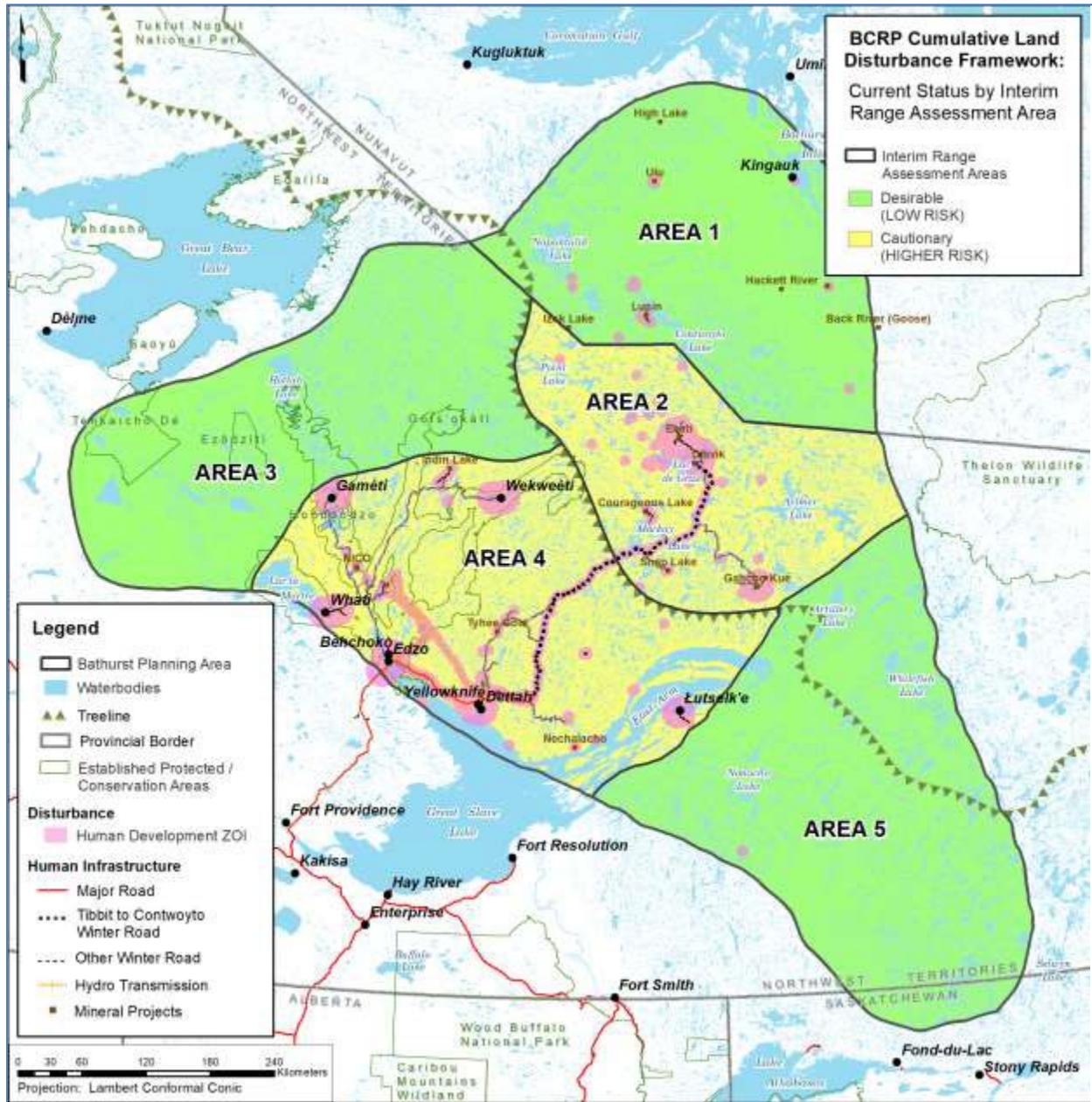


Figure 4. Status of each Range Assessment Area based on the Cumulative Land Disturbance Framework (from GNWT 2019: Figure 16).

Appendix B – Mineral Cycle Stage and Mobile Caribou Conservation Measures

Proponents are expected to apply the triggers and mitigation responses as best they can. It is only with this collaborative approach that industry can support and be seen to support the long term health and sustainability of the Bathurst caribou herd and range.

Note: The lower value of the number of collars or caribou provided in Table 4 (replicated below from Section 1.3) within the inner half of the Early Warning Zone (EWZ) will trigger Level 1 response. Observations of more than the threshold of caribou within the Zone of Influence (ZOI) will also trigger a response.

Mineral cycle stage/Activity	Purpose	Timeframe	Triggers	Mitigation	Comments
Ground Acquisition					
Ground staking	Only in the trees (therefore mainly fall-winter). Blaze and mark a trail from post to post.	Generally, 1-2 weeks long; most Mar - May; some summer	If chopper support involved, then 1 collar or 100 caribou within EWZ; otherwise walking in trees of little concern	Plan chopper drop-offs to avoid quadrant of ZOI/EWZ where caribou occur	Don't land near or fly over caribou
Heli-staking	Only in the barrenlands (summer, fall, winter). Landing at all corner posts, 5 km apart. (Thus, little concentrated chopper activity)	1-2 days up to weeks	<ol style="list-style-type: none"> 1. See Table 2 for Level 1 triggers within EWZ 2. See Table 2 for Level 2 triggers within EWZ 3. Level 3 triggers are Level 2 values in the ZOI 	<ol style="list-style-type: none"> 1. Plan flying to avoid quadrant with caribou on alternating days 2. Avoid all flying in quadrants with caribou 3. Delay program until caribou move out of area (ENR maps) 	Operator could delay if caribou in area

Mineral cycle stage/Activity	Purpose	Timeframe	Triggers	Mitigation	Comments
Map Staking	Not yet available but will help minimally with disturbance.	Could be months of office prep but one actual day to acquire	N/A	N/A	Not yet available
Early Exploration					
Prospecting/Sampling	First impact on the ground. Traversing up to 15-20 km/day	1 week up to 2 months	N/A	N/A	Limited aerial support and limited human activity - no specific measures required
Ground geophysics	Testing small areas to evaluate mineralization at depth		N/A	N/A	Limited aerial support and limited human activity - no specific measures required.

Mineral cycle stage/Activity	Purpose	Timeframe	Triggers	Mitigation	Comments
Airborne geophysical survey	This might be the first thing that happens. Depends on the client, the size of the land package and how deep the pockets. Flown anywhere, trees or barrens	A few days up to a month	<ol style="list-style-type: none"> 1. See Table 2 for Level 1 triggers within EWZ 2. See Table 2 for Level 2 triggers within EWZ 3. Level 3 triggers are Level 2 values in the ZOI 	<ol style="list-style-type: none"> 1. Plan flying to avoid quadrant with caribou 2. Use line spacing (skip transects) to avoid caribou 3. Delay program until caribou move out of area (ENR maps) 	Consider wider spaced flight lines - skip lines. Could delay flying. If prolonged residency by caribou (48 hrs in winter, 72 hrs in other seasons), program can be restarted. ⁶
Prospecting/Sampling - second round	Follow up of airborne geophysical survey, more intense and defined areas, channel sampling, etc.	Mostly 2-3 weeks up to 2 months	Aerial support for camp moves only; limited disturbance from foot traffic	Avoid camp moves into areas of caribou ⁷	Consider flexible camp locations to limit disturbance to caribou.

⁶ If the program restarts after prolonged residency by caribou is observed, the operator should report this via email notification to ENR at the time and in the final report.

⁷ “areas of caribou” as identified through monitoring caribou collar data, incidental observations and height of land surveys, if they are being conducted

Mineral cycle stage/Activity	Purpose	Timeframe	Triggers	Mitigation	Comments
Geophysical surveying	Follow-up ground surveys to delineate extent of airborne conductors	2-3 weeks on average, up to 2 months	Aerial support for camp moves only; limited disturbance from foot traffic	Avoid camp moves into areas of caribou	Consider flexible camp locations to limit disturbance to caribou.
Diamond drilling	Usually in second or third year of ground exploration	Average 3 weeks to 1 month and up to 3 months with success	<ol style="list-style-type: none"> 1. See Table 2 for Level 1 triggers within EWZ 2. See Table 2 for Level 2 triggers within EWZ 3. Level 3 triggers are Level 2 values in the ZOI 	<ol style="list-style-type: none"> 1. Plan flights to avoid flying over caribou 2. Select targets/drill sites to avoid caribou 3. Delay drill moves, crew change flights and ground activity until caribou move out of the area (can complete drilling of hole). 	Most concern during chopper drill moves or crew changes; if need to fly over caribou then delay move. If prolonged residency by caribou (48 hrs in winter, 72 hrs in other seasons), program can be restarted. ⁸

⁸ If the program restarts after prolonged residency by caribou is observed, the operator should report this via email notification to ENR at the time and in the final report.

Mineral cycle stage/Activity	Purpose	Timeframe	Triggers	Mitigation	Comments
Initial wildlife and environmental surveys	Usually in second or third year of ground exploration	Duration of camp	1. See Table 2 for Level 1 triggers within EWZ 2. See Table 2 for Level 2 triggers within EWZ 3. Level 3 triggers are Level 2 values in the ZOI	1. Avoid flying near caribou 2. Avoid all flying in quadrants with caribou 3. Reduce all flights to every 2nd day	Limited and adaptable aerial support
Middle Stage Exploration					
Larger Camp Base - up to 15 tents	Establishment of a prominent base camp to advance showings	Average camp time is 2-4 months	1. See Table 2 for Level 1 triggers within EWZ 2. See Table 2 for Level 2 triggers within EWZ 3. Level 3 triggers are Level 2 values in the ZOI	1. Plan flying to avoid quadrant with caribou 2. Reduce flights for alternating days 3. Delay flights; personnel restricted to camp until caribou move out of the area	Crew change chopper can fly higher than drill moves. If prolonged residency by caribou (48 hrs in winter, 72 hrs in other seasons), program can be restarted. ⁹

⁹ If the program restarts after prolonged residency by caribou is observed, the operator should report this via email notification to ENR at the time and in the final report.

Mineral cycle stage/Activity	Purpose	Timeframe	Triggers	Mitigation	Comments
Geological program	Detailed showings mapped and sampled using channel or trench samples. Still doing reconnaissance traverses	Average time 2 months	Limited aerial support (drop-off and pickup)	Plan flying to avoid caribou (change in target selection)	
Geophysical program	High resolution geophysics to help outline potential resource possibilities. Still doing reconnaissance grids.	Average time 2 months	Limited aerial support (drop-off and pickup)	Plan flying to avoid caribou (change in target selection)	

Mineral cycle stage/Activity	Purpose	Timeframe	Triggers	Mitigation	Comments
Diamond drilling	Up to 2-3 drills but could be 1-15 km apart	Average time 2 months	<ol style="list-style-type: none"> 1. See Table 2 for Level 1 triggers within EWZ 2. See Table 2 for Level 2 triggers within EWZ 3. Level 3 triggers are Level 2 values in the ZOI 	<ol style="list-style-type: none"> 1. Plan flights to avoid flying over caribou 2. Select targets/drill sites to avoid caribou 3. Delay drill moves, crew change flights and ground activity until caribou move out of the area (can complete drilling of hole). 	If herd moving in to one drill; could shut that drill for a few days while caribou move through; tougher for single drill operations. If prolonged residency by caribou (48 hrs in winter, 72 hrs in other seasons), program can be restarted. ¹⁰
Environmental baseline studies	Prepping for advanced stage of exploration; project has engaged an environmental consulting company	2-3 weeks over the duration of the spring and summer season	<ol style="list-style-type: none"> 1. See Table 2 for Level 1 triggers within EWZ 2. See Table 2 for Level 2 triggers within EWZ 3. Level 3 triggers are Level 2 values in the ZOI 	<ol style="list-style-type: none"> 1. Avoid flying near caribou 2. Avoid all flying in quadrants with caribou 3. Reduce all flights to every 2nd day 	Limited and adaptable aerial support

¹⁰ If the program restarts after prolonged residency by caribou is observed, the operator should report this via email notification to ENR at the time and in the final report.

Mineral cycle stage/Activity	Purpose	Timeframe	Triggers	Mitigation	Comments
Advanced Stage Exploration					
Geological Program	Mostly tied into diamond drilling, below		Limited aerial support (drop-off and pickup)	Plan flying to avoid caribou (change in target selection)	
Geophysical Program	Continuing with high-definition geophysics		Limited aerial support (drop-off and pickup)	Plan flying to avoid caribou (change in target selection)	
Diamond Drilling/RC or Underground Sampling	Occurs usually after about 5 years of exploration. Delineate the limits of economic resource for full assessment	Average time would be 3-4 months but could run up to 8 months.	<ol style="list-style-type: none"> 1. See Table 2 for Level 1 triggers within EWZ 2. See Table 2 for Level 2 triggers within EWZ 3. Level 3 triggers are Level 2 values in the ZOI 	<ol style="list-style-type: none"> 1. Plan flights to avoid flying over caribou 2. Select targets/drill sites to avoid caribou; reduce ground activity (snowmobiles, quads, trucks) 3. Delay drill moves, crew change flights and ground activity until caribou move out of area (can complete drilling of hole) 	Likely both concentrated work area and middle stage wider area exploration.

Table 4. Seasonal Level 1 and Level 2 thresholds for caribou collars and observed caribou within the inner half of the Early Warning Zone¹ for corresponding Level 1 and Level 2 mitigation actions within the 5 km Zone of Influence (Appendix B). Triggers are more sensitive in the Cautionary Range Status.²

Season	Thresholds for Level 1 Mitigations				Thresholds for Level 2 Mitigations			
	Desirable Status		Cautionary Status		Desirable Status		Cautionary Status	
	Collars	Caribou	Collars	Caribou	Collars	Caribou	Collars	Caribou
Spring migration	2	≥200	1	≥100	4	≥400	2	≥200
Calving	1	≥50	1	≥25	2	≥100	2	≥50
Post-calving	1	≥100	1	≥50	2	≥200	2	≥100
Summer	2	≥200	1	≥100	4	≥400	2	≥200
Fall	2	≥100	1	≥50	4	≥200	2	≥100
Winter	3	≥300	2	≥200	6	≥600	4	≥400

¹ The Early Warning Zone radius begins at the outer extent of the 5 km radius (~80 km²) Zone of Influence.

² The lower value of the collars or caribou will trigger a response, e.g., for spring migration in Desirable Status (Low risk) if 2 collars are detected but only 100 caribou are estimated (via aerial survey or observations), then the threshold is triggered.

Appendix C – Planning Ahead: Are Caribou Likely to be Near Your Site?

Heat map and caribou occupancy

We present here analyses to show operators the likely timing, distribution and variability in seasonal caribou use; essentially the potential for caribou interacting within a given area within the Centre of Habitation and what to expect for monitoring effort and days of reduced activity based on the probability of caribou occurrence in the proximity to project sites. A 30-km grid cell was applied over the Centre of Habitation (buffered by 100 km) to provide sufficient resolution for caribou distribution. The mean number of collar locations and the mean number of days collared caribou occurred within each grid cell demonstrates the relative occupancy and duration for each season. Figure 5 shows an example of the relative seasonal distribution of caribou within the Centre of Habitation for the fall season. Figure 6 shows the number of caribou collars throughout the year in the proximity of a project site. In the latter example, caribou were most frequently near the example project site from late October to mid-December, with moderate presence from mid-December to early March and sporadic presence during spring. This analysis of the number of collars close to a site is optional for an operator and could be requested from ENR.

As caribou herd size changes, their seasonal ranges change in size and location. Thus, seasonal distribution patterns over the previous 3 years may not always accurately predict caribou movements and distribution in future years. Depending on the extent of any shifts in seasonal ranges, such as caribou wintering further north, spring migration may start later. Therefore, seasonal dates will be reviewed at 3-year intervals.

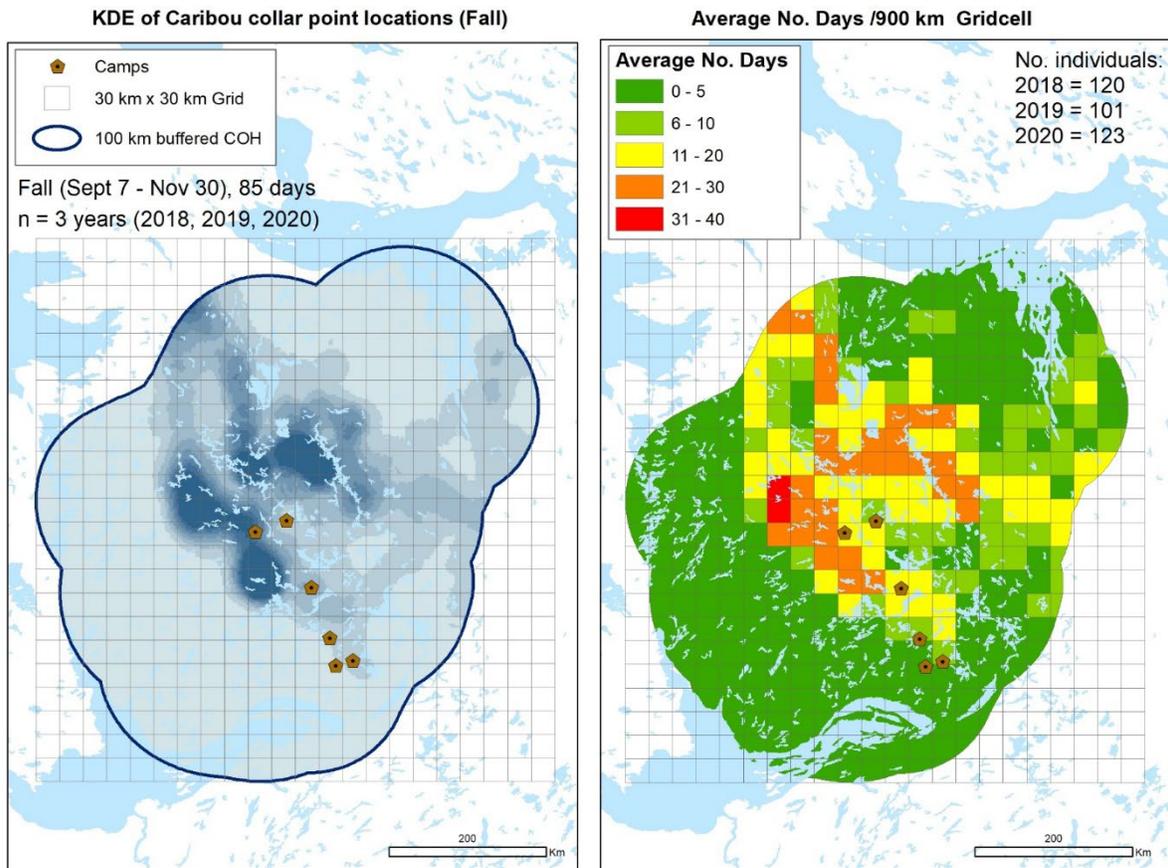


Figure 5. Example heat map based on fall distribution of collared caribou and average number of days of occupancy within 30 x 30 km grid cells within the 100-km buffered 2018-20 Centre of Habitation (COH).

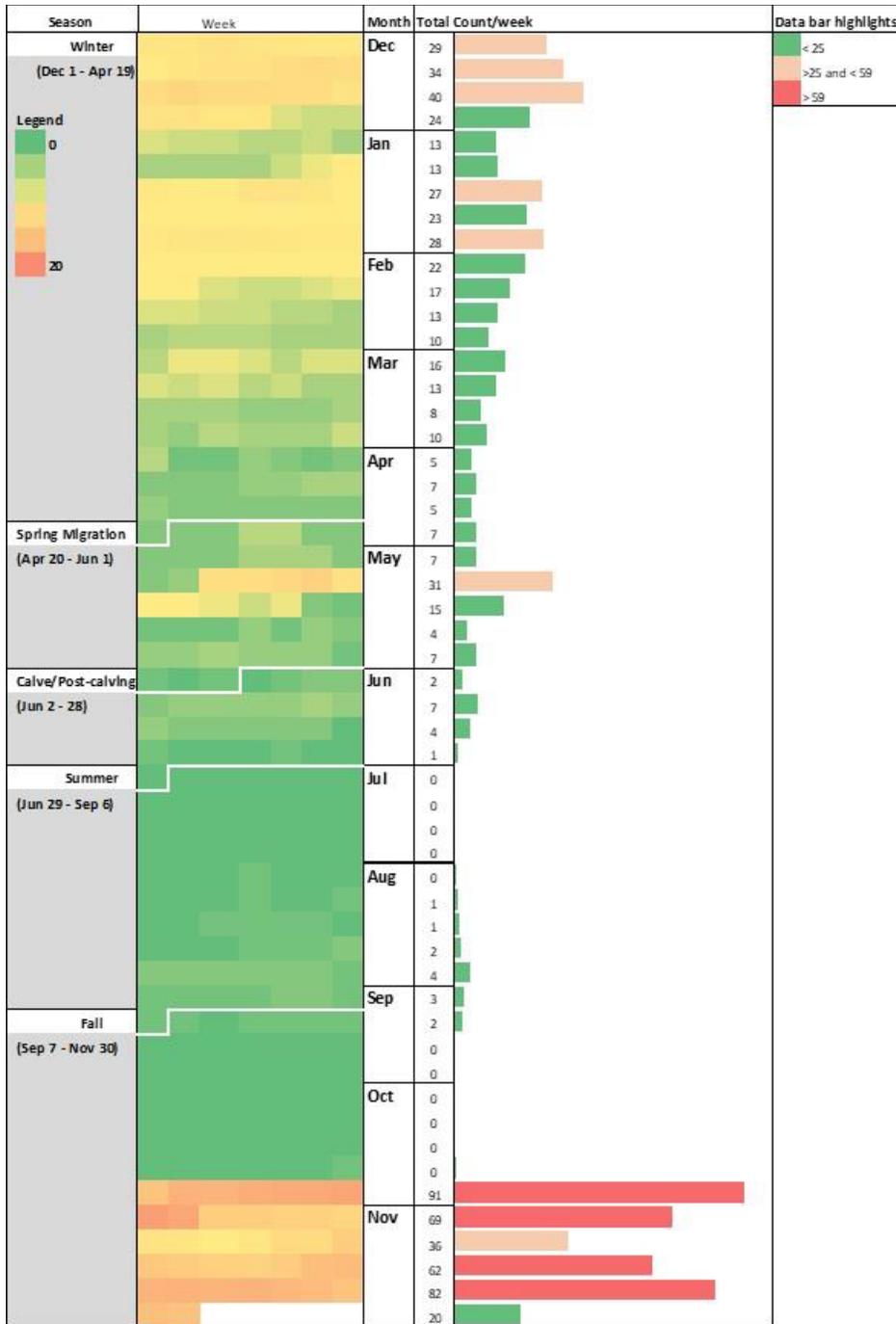


Figure 6. Example of caribou collar proximity analysis to develop a frequency chart from the Bathurst, Bluenose-East and Beverly herds within 35 km of Zip camp on a weekly basis, based on use during 2018-20. This type of figure will be available from ENR, on request, for land use operations or can be developed by the operator with caribou collar data provided by ENR through a data share agreement.

Steps to develop a caribou collar frequency chart

Guidance to conduct a caribou collar proximity analysis to develop a frequency chart from the Bathurst, Bluenose-East and Beverly herds within 35 km of a camp on a weekly basis, based on use during 2018-20 (see Figure 6). The 35 km distance and this process should be verified and expanded.

1. The number of caribou collar locations from the Bathurst, Bluenose-East and Beverly herds can be counted per day and by year within a 35 km buffer of a camp.
2. After creating a daily mean, conditional colour-scale formatting was applied in Excel to the chart of values for each day of a calendar year.
3. The result shows when the camp experienced the highest average number of collared caribou within a 35 km radius over the past 3 years.
4. The bar graph on the right-hand side shows the sum of the average number of counts per week.
5. High counts can be highlighted.

Appendix D – Communication contacts

Karin Clark

Manager, Wildlife Research and Management

Wildlife and Fish Division, Environment and Natural Resources

Karin_clark@gov.nt.ca

867-767-9237 ext. 53225

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Appendix E – Data Forms

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Height of Land Survey

Height of Land caribou survey form										
Camp/Obs. site					Long.		Lat.			
Max. visibility (m): N E S W				Obstruct (none / fog / rain / snow)			Ground (bare / snow)			
				Caribou	No. caribou	Direction moving	No. caribou	Total caribou	Other species	Comment
Obs. No.	Date	Time	Direction	Distance (m)	moving	to/away camp	Bedded/Foraging /milling			
			N							
			E							
			S							
			W							
			Total							
			N							
			E							
			S							
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			W							
			Total							
			N							
			E							
			S							
			W							
			Total							

Appendix F – Operator Annual Report template

The Operator annual report is provided as an Excel file with two worksheets, to provide qualitative comments on the first worksheet and to document monitoring and mitigation activities in the second worksheet.

Please see “Appendix F - Mobile Measures Operators report template Nov 2021.xlsx”.

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Appendix G – Government Annual Report template

The government's annual report will summarize implementation of Mobile Measures within Bathurst caribou range. The government report could include:

- Summary of the number of camps/land use operations employing Mobile Measures;
- Summary of the number of collared caribou entries into each land use operation's Early Warning Zone and Zone of Influence;
- Examination of the timing of entry and departure by collared caribou into the Early Warning Zone, and compare with set seasonal dates;
- Summary of the number of collared caribou thresholds that triggered mitigation and the nature of the mitigation;
- Summary of the duration of delays in operations;
- Summary of the number and nature of communications between the government and land use operators to consider if improvements or adjustments are necessary;
- Assessment of staff requirements and costs;
- Assessment of desired outcomes, e.g., whether disturbance and displacement were reduced and impact of implementing Mobile Measures to the operators.

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Appendix H – MCCM Desktop Pilot Project

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Introduction

Mobile Caribou Conservation Measures (Mobile Measures) are a flexible tool to avoid or minimize effects on caribou (*Rangifer tarandus groenlandicus*) when caribou are exposed to human disturbance. Mobile Measures link monitoring with site-specific mitigation, and are based on thresholds relative to numbers and proximity of caribou to development coupled with seasonal sensitivity and movement rates. Two documents describe the approach to implementing Mobile Measures in the NWT:

- *An Implementation Framework for Mobile Caribou Conservation Measures on the Bathurst Caribou Range*; and,
- *Mobile Caribou Conservation Measures: Operational Guidance*

This report briefly describes a Pilot Project undertaken in 2020 to test the approach with real data to assess the methods, operational guidance, data sharing and data reporting templates. The Pilot Project was meant to be conducted at the site of a mineral exploration camp in the central NWT within the Centre of Habitation of the Bathurst Caribou herd. In 2020, however, camps were not operational due to economic restrictions related to the global COVID19 pandemic. Since there were no people onsite, the Pilot Project was conducted as a desktop exercise which considered caribou presence (as determined through satellite collared caribou in the Bathurst and Beverly caribou herds) in relation to five mineral exploration camps and one research station.

The application of Mobile Measures relies on monitoring of specific zones around development sites to give early warning of approaching caribou so that actions to avoid and minimize interaction between caribou and development can be taken. The criteria for caribou presence within an Early Warning Zone and Zone of Influence around development vary with season and are determined through several monitoring approaches (e.g., locations of satellite-collared caribou, height of land surveys and incidental observations of caribou from aircraft). Tiered mitigation is a pre-determined, progressive reduction of activities that is applied as caribou approach and move through the zones.

Methods

- The methods defined in the Framework and Operational Guidance documents for defining the early warning zone by season was followed for each of six camps within the Centre of Habitation of the Bathurst Caribou herd:
 1. Tundra Ecosystem Research Station (Daring lake)
 2. Zip camp
 3. Harry Winston camp
 4. Bob camp
 5. Margaret Lake camp
 6. Kelvin camp
- Maps were produced by staff at Wildlife and Fish Division, Department of Environment and Natural Resources three times a week from August 19, 2020 through to March 2, 2021 showing the location of collared caribou from the Bathurst and Beverly caribou herds and the six camps with respective early warning zones and zones of influence (see Figure 1).

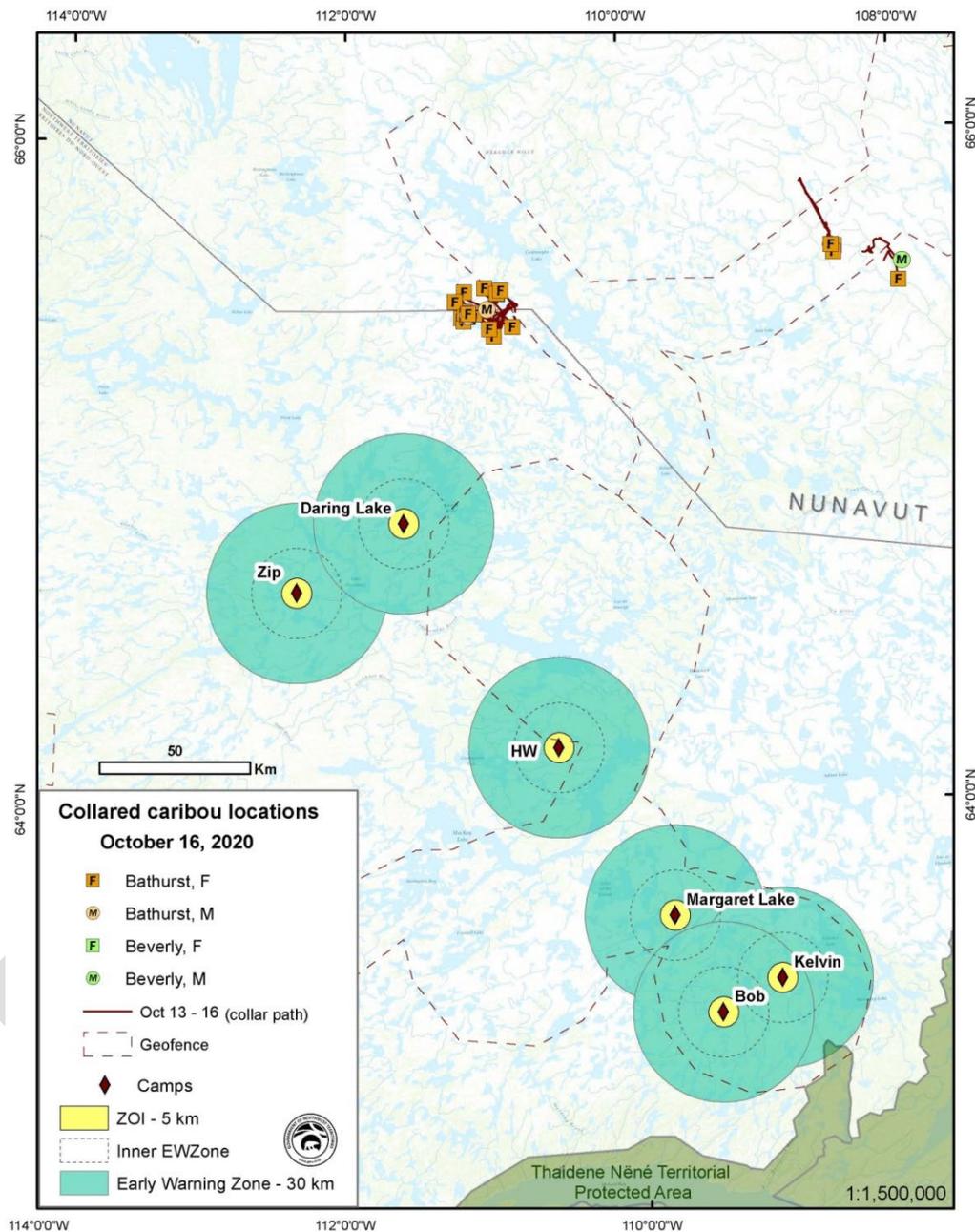


Figure 1. Example of the maps produced showing caribou collar locations in relation to six camps with respective early warning zones and zones of influence. The size of the early warning zone is scaled to sensitivity and seasonal movement rates of caribou. The 30km radius depicted here is reflective of the fall season.

- Steps were followed as outlined in Figure 2 for comparing mapped locations to Mobile Measures trigger levels and recording the data in the appropriate templates. In this exercise, height of land and aerial surveys were not conducted / simulated.
- Daily data recording templates were filled out for each camp which documented:

NWT Mobile Measures Operational Guidance – Preliminary Draft

- whether collared caribou were within the early warning zone or zone of influence;
- the number of caribou;
- whether the threshold number was reached to trigger mitigation; and,
- the level of mitigation.
- As there were no interactions of caribou with the Margaret Lake, Bob and Kelvin camps they were dropped from the exercise
- Summary datasheets were filled out for each camp summarizing the number of days caribou were within either the early warning zone or the zone of influence and the number of days mitigation was potentially triggered
- Zip and Harry Winston camps are middle stage mineral exploration camps (see Appendix B, MCCM Operational Guidance. The mitigation associated with each level is:
 - Level 1. Plan flying to avoid quadrant with caribou
 - Level 2. Reduce flights for alternating days
 - Level 3. Delay flights; personnel restricted to camp until caribou move out of the area
- If the camps were also conducting diamond drilling, the additional mitigations would be:
 - Level 1. Plan flights to avoid flying over caribou
 - Level 2. Select targets/drill sites to avoid caribou
 - Level 3. Delay drill moves, crew change flights and ground activity until caribou move out of the area (can complete drilling of hole).
- The Operational Guidance further stipulates in cases of prolonged residency of caribou in the early warning zone or zone of influence (48 hrs in winter, 72 hrs in other seasons), programs can be restarted after ENR is notified.

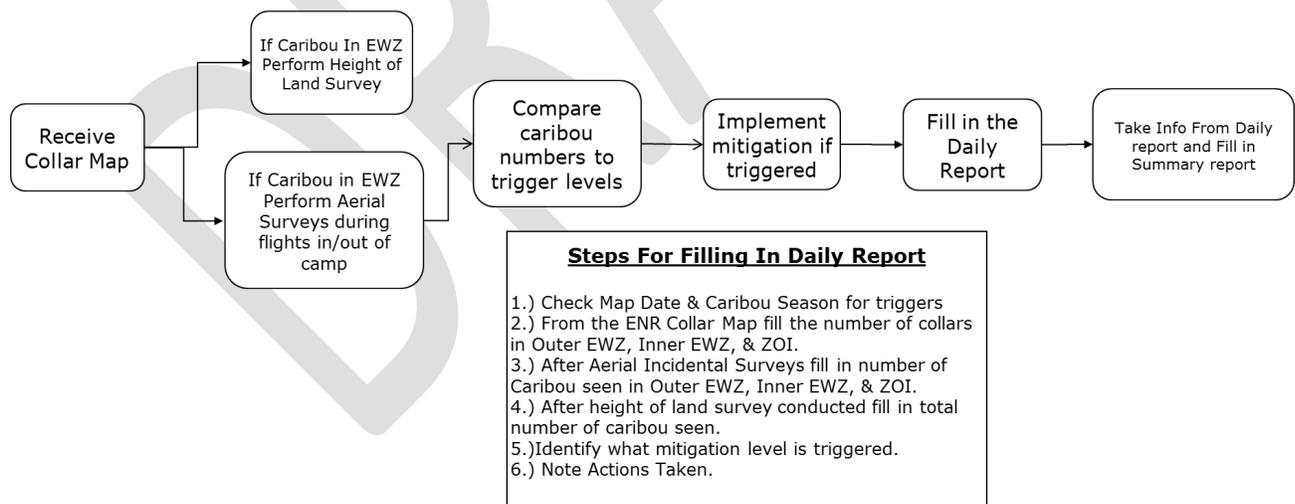


Figure 2. Flowchart for data collection and reporting

Results

Tables 1 and 2 show examples of the Daily Reporting Template and the Summary Template for operators to record presence of collared caribou near their site, incidental observations, results of any height of land surveys as well as when mitigations were triggered. Results are summarized for each camp below.

Tundra Ecosystem Research Station (Daring Lake)

- For three days at end of October one collared caribou was within the early warning zone and three days in mid-November one collared caribou was within the zone of influence.
- Level one mitigation was triggered on both occasions and in place for six days total.

Zip Camp

- Caribou interacted with the Zip camp for a total of 95 days on four separate occasions: October, November/December and twice in January
- In October, over 14 collared caribou were in the early warning zone for three days and subsequent to that, four collared caribou were present in the zone of influence for four days. Level two mitigation was triggered for three days and level three mitigation was triggered for an additional four days.
- In November / December, there were between one and eight caribou in the early warning zone for 40 days. During that time between one and two collared caribou were present in the zone of influence for 26 days. Mitigation alternated between level one and two:
 - November 20 – level one mitigation triggered for 4 days
 - November 24 – Level two mitigation triggered for 17 days
 - December 11 – level one mitigation triggered for 5 days
 - December 15 – level two mitigation triggered 14 days
- Starting January 5th, three collared caribou were present in the early warning zone for three days and then subsequently two collared caribou were present in the zone of influence for four days. Level one mitigation was triggered for three days starting January 5th and then level two mitigation was triggered for four days starting on January 8th
- Starting January 19th, one to two collared caribou were present in the early warning zone for 41 days. During that time period, two collared caribou were present within the zone of influence for four days. Level one mitigation was triggered initially for three days followed by level two mitigation for four days and back to level one mitigation for the remaining 34 days until March 2nd.

Harry Winston Camp

- Caribou interacted with the Harry Winston camp for a total of 51 days on three separate occasions: August, November and February
- In August and into September, one collared caribou was present in the early warning zone for 24 consecutive days. Level one mitigation was triggered for that entire time

NWT Mobile Measures Operational Guidance – Preliminary Draft

- In November, one collared caribou was present in the early warning zone for seven days and during that time, two collared caribou were present within the zone of influence for four days. Level two mitigation was triggered for four days followed by level one mitigation for the remaining three days.
- In February/March, between one and four collared caribou were present within the early warning zone for 20 days and during that time one to two collared caribou were present within the zone of influence for 13 days. Levels one and two mitigation were triggered back and forth as caribou moved into and out of the zone of influence:
 - February 26 - level one mitigation was triggered for four days
 - March 2 - level two mitigation was triggered for eight days
 - March 9 - level one mitigation was triggered for three days
 - March 12 - level two mitigation for four days
 - March 16 - level one mitigation for three days

Summary

The Pilot Project Desktop exercise proved to be a useful first step in testing the methods for implementing Mobile Measures in the NWT. Key learning outcomes were:

- Maps are a useful means of sharing information with camp operators on location of caribou relative to their site of operation.
- Producing maps of caribou locations in relation to camps in the Centre of Habitation will entail dedicated man power within the GNWT Department of Environment and Natural Resources, Wildlife and Fish Division.
- Daily data reporting templates are an efficient way to document the experience at camp with respect to caribou detection either through collars, incidental observations or height of land surveys.
- Summary data templates are an effective way to roll up the results of implementing Mobile Measures at a project site and facilitate annual reporting

The next steps for testing the application of Mobile Measures are to identify operational exploration camps that are willing to test implementation at their site. This will entail close work with ENR staff to ensure the camp operator understands the Mobile Measures, what they are meant to achieve, what the shared responsibilities are for ENR staff and camp operator staff including requirements for reviewing information and filling out reporting templates and implementing mitigations as required. A short report will be compiled to summarize the key learnings and areas for improvement.

Table 1 – Example of Daily Reporting Template

Map Date	Caribou Season from Table 1	Outer EWZ	Inner EWZ	ZOI	# Caribou in Outer Early Warning Zone	Inner EWZ	ZOI	# caribou	Level 1	Level 2	Level 3	Actions Taken
Sept. 18th	Fall	0	0	0								
Sept. 21st	Fall	0	0	0								
Aug. 19th 2020	Summer	0	0	0								
Aug. 21st 2020	Summer	0	0	0								
Aug. 25th 2020	Summer	0	0	0								
Aug. 27th 2020	Summer	0	0	0								
Sept. 1 2020	Summer	0	0	0								
Sept 4th 2020	Summer	0	0	0								
Sept. 8th 2020	Fall	0	0	0								
Sept 11th 2020	Fall	0	0	0								
Sept. 15th 2020	Fall	0	0	0								
Sept. 21st 2020	Fall	0	0	0								
Sept. 25th 2020	Fall	0	0	0								
Sept. 29th 2020	Fall	0	0	0								
Oct. 2nd 2020	Fall	0	0	0								
Oct. 6th 2020	Fall	0	0	0								
Oct. 9th 2020	Fall	0	0	0								
Oct. 13th 2020	Fall	0	0	0								
Oct. 16th 2020	Fall	0	0	0								
Oct. 19th 2020	Fall	0	0	0								
Oct. 23rd 2020	Fall	0	0	0								
Oct. 27th 2020	Fall	****	****	0						X		
Oct. 30th 2020	Fall	****	****	****							X	
Nov. 3rd 202	Fall	****	0	0								
Nov. 6th 2020	Fall	5	0	0								
Nov. 10th 2020	Fall	0	0	0								
Nov. 13th 2020	Fall	****	0	0								
Nov. 20th 2020	Fall	****	3	1					X			
Nov. 24th 2020	Fall	5	****	1						X		
Nov. 27th 2020	Fall	8	8	1						X		
Dec. 1st 2020	Winter	9	5	2						X		
Dec. 4th 2020	Winter	8	7	1						X		
Dec. 8th 2020	Winter	****	****	1						X		
Dec. 11th 2020	Winter	12	2	0					X			
Dec. 15th 2020	Winter	16	3	0						X		
Dec. 18th 2020	Winter	8	3	0						X		
Dec. 22nd 2020	Winter	****	6	2						X		
Dec. 25th 2020	Winter	10	3	3						X		
Dec. 29th 2020	Winter	5	1	0								
Jan. 1st 2021	Winter	6	0	0								
Jan. 5th 2021	Winter	1	3	0					X			
Jan. 8th 2021	Winter	1	0	2						X		
Jan. 12th 2021	Winter	3	0	0								
Jan. 15th 2021	Winter	3	0	0								
Jan. 19th 2021	Winter	4	1	0								
Jan. 22nd 2021	Winter	2	1	2						X		
Jan. 26th 2021	Winter	1	2	0					X			
Feb. 2nd 2021	Winter	3	2	0					X			
Feb. 5th 2021	Winter	6	1	0								
Feb. 9th 2021	Winter	5	1	0								
Feb. 12th 2021	Winter	0	1	0								
Feb. 16th 2021	Winter	0	1	0								
Feb. 19th 2021	Winter	0	1	0								
Feb. 23rd 2021	Winter	1	1	0								
Feb. 26th 2021	Winter	0	1	0								
Mar. 2nd 2021	Winter	0	1	0								
Mar. 5th 2021	Winter	1	0	0								
Mar. 9th 2021	Winter	1	0	0								
Mar. 12th 2021	Winter	1	0	0								
Mar. 16th 2021	Winter	2	1	0								

Note: **** indicates more than the trigger level of caribou were present but actual number could not be distinguished on the maps due to overlapping symbols.

Table 2 – Example summary reporting template

Activity	Monitoring						Zone of Influence				Mitigation			
	Start date	Monitoring Method Used?	Min # Caribou	Max. no. caribou	No. days	End Date	Start date	Min # Caribou	Max. no. caribou	No. Days	End Date	Start date	Level	No. days
Collared caribou	19-Aug-20	Yes	1	1	24	9/11/2020						19-Aug-20	1	24
Aerial incidental														
Height of Land														
Other														
Collared caribou	20-Nov-20	Yes	1	1	7	11/27/2020	20-Nov-20	2	2	4	23-Nov-20	20-Nov-20	2	4
Aerial incidental												24-Nov-21	1	3
Height of Land														
Other														
Collared caribou	23-Feb-21	Yes	1	4	20	3/16/2021	26-Feb-21	1	2	13	28-Feb-21	26-Feb-21	1	4
Aerial incidental												2-Mar-21	2	8
Height of Land												9-Mar-21	1	3
Other												12-Mar-21	2	4
												16-Mar-21	1	3

