GUIDELINES FOR EXPLORATION AND DEVELOPMENT PROJECTS IN BOREAL CARIBOU HABITAT

IN THE NORTHWEST TERRITORIES

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LIGNES DIRECTRICES SUR LES PROJETS DE DÉVELOPPEMENT ET D'EXPLORATION RÉALISÉS DANS L'HABITAT DU CARIBOU BORÉAL

AUX TERRITOIRES DU NORD-OUEST

Le présent document contient la traduction française du résumé

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Government of Northwest Territories
Gouvernement des Territoires du Nord-Ouest

EXECUTIVE SUMMARY

The Guidelines for Exploration and Development Projects in Boreal Caribou Habitat: Northwest Territories (the NWT Boreal Caribou Guidelines) are intended for proponents of exploration and development activities in boreal caribou (*Rangifer tarandus caribou*) habitat in the Northwest Territories (NWT) as well as for regulators and other parties reviewing development proposals in NWT boreal caribou range.

Boreal caribou are designated as Threatened on Schedule 1 of the federal *Species at Risk Act* (SARA) (Environment and Climate Change Canada 2019) and under the *Species at Risk (NWT) Act* (Conference of Management Authorities (CMA) 2013, Northwest Territories Gazette 2014). In 2017, the NWT CMA, of which the Government of the NWT (GNWT) is a member, prepared a territorial recovery strategy for boreal caribou to ensure a healthy and sustainable boreal caribou population across their NWT range while offering harvesting opportunities for present and future generations.

In the NWT, boreal caribou are found within the boreal forest east of the Mackenzie mountains, primarily within the Taiga Plains Ecozone. Currently, boreal caribou in the NWT are being managed as one single population unit. The biggest threat to boreal caribou in the NWT is habitat disturbance. Habitat disturbance includes loss, degradation, and fragmentation of large, continuous areas of mature forest that can result from anthropogenic land-use activities and natural processes, such as wildfire. Range plans are being developed as a means to manage habitat disturbance within the NWT boreal caribou range. The GNWT, in collaboration with two regional working groups[1], also developed *A Framework for Boreal Caribou Range Planning* (Government of the Northwest Territories 2019) outlining an overarching approach to range planning for boreal caribou in the NWT.

The guidelines are presented following the hierarchical mitigation approach of "avoidance", "minimization", and "restoration" mitigation measures. As the NWT Boreal Caribou Guidelines is designed as a living document, it will evolve with time and may eventually include the complete mitigation hierarchy, including the last step of "offsetting" mitigation measures.

Mitigation through avoidance is the most effective in limiting any adverse effects to boreal caribou and their habitat during the project design phase before commencement of activities. This approach is followed by the minimization of effects by reducing the area of disturbance and length of exposure of boreal caribou to sensory disturbance, and

[1] See Appendix D of *A Framework for Boreal Caribou Range Planning* for the list of organizations that participated on the working groups.

implementing awareness training for all workers. If residual effects are anticipated and/or observed following avoidance and minimization measures, restoration of a disturbed site is the next accepted mitigation measure. When residual impacts are expected after all efforts to avoid, minimize and restore on-site impacts have been made, habitat offsetting may need to be considered.

Prior to planning any activities in the NWT boreal caribou range, proponents are encouraged to review the NWT Boreal Caribou Guidelines and contact regional and headquarters GNWT Department of Environment and Natural Resources (ENR) offices, Indigenous governments and organizations, and renewable resources boards to obtain up-to-date information on boreal caribou in their project area. Proponents are also encouraged to obtain advice on designing their projects to:

- Minimize habitat degradation and fragmentation resulting from development activities to maintain the function and connectivity of caribou habitat (e.g., calving/post-calving areas, late winter use areas);
- Minimize the footprint (i.e., habitat loss) of a development activity, including its overall contribution to cumulative habitat disturbance;
- Minimize the density of linear features associated with development activities to avoid potential increases in predator efficiency (i.e., distribution, ease of travel);
- Minimize sensory disturbance (e.g., noise, light, dust, vibrations, human presence) associated with development activities;
- Avoid and minimize activities associated with the project that increase the risk of caribou mortality (e.g., hunting, vehicle collisions); and
- Plan for effective project closure and reclamation of caribou habitat disturbed by the project.

The listed guidelines may also assist with collaborations among and between sectors in managing effects related to cumulative disturbances within boreal caribou habitat. The NWT Boreal Caribou Guidelines are intended to complement mitigation measures already required in applicable land use plans, GNWT Department of Lands surface leases, water licence and land use permit conditions, and those recommended in the Northern Land Use Guidelines series.

SOMMAIRE

Les Lignes directrices sur les projets de développement et d'exploration réalisés dans l'habitat du caribou boréal aux Territoires du Nord-Ouest (les lignes directrices) visent les promoteurs qui souhaitent réaliser des activités de développement et d'exploration dans l'habitat du caribou boréal (*Rangifer tarandus caribou*) aux Territoires du Nord-Ouest ainsi que les organismes de réglementation et les autres acteurs qui examinent les projets proposés pour l'aire de répartition du caribou boréal aux TNO.

Le caribou boréal est inscrit à titre d'espèce menacée à l'annexe 1 de la *Loi sur les espèces en péril* (Environnement et Changement climatique Canada, 2019) et en vertu de la *Loi sur les espèces en péril (TNO)* (Conférence des autorités de gestion [CAG] 2013, Gazette des Territoires du Nord-Ouest, 2014). En 2017, la CGA des TNO, dont le gouvernement des Territoires du Nord-Ouest (GTNO) est membre, a élaboré une stratégie territoriale de rétablissement du caribou boréal permettant d'assurer la présence d'une population saine et durable dans l'ensemble de son aire de répartition aux TNO tout en offrant des occasions de chasse aux générations actuelles et à venir.

Aux TNO, le caribou boréal se trouve dans la forêt boréale à l'est des monts Mackenzie, principalement dans l'écozone de la Taïga des plaines. Aux TNO, le caribou boréal est géré comme une seule population. Sa plus grande menace est la perturbation de l'habitat, comme la perte, la dégradation et le morcellement des forêts qui doivent être vastes, matures, denses et continues. Cette perturbation est susceptible de se produire lors d'activités anthropiques d'aménagement du territoire et de certains processus naturels, comme les feux de forêt. On élabore actuellement des plans visant à gérer la perturbation de l'habitat dans l'aire de répartition du caribou boréal. En collaboration avec deux groupes de travail régionaux[2], le GTNO a également élaboré un Cadre de planification de l'aire de répartition du caribou boréal[3] (gouvernement des Territoires du Nord-Ouest, 2019) établissant une approche générale de la planification de l'aire de répartition du caribou boréal aux TNO.

Les mesures d'atténuation proposées dans les lignes directrices sont organisées selon une approche hiérarchique : les mesures « d'évitement », de « réduction » et de « restauration ». Comme les lignes directrices sur le caribou boréal des TNO sont évolutives, elles pourraient tôt ou tard prévoir toute la séquence hiérarchique des mesures, y compris les mesures de compensation.

[2]Voir l'annexe D du *Cadre de planification de l'aire de répartition du caribou boréal* pour connaître les organismes qui participent aux groupes de travail.

[3]Voir l'annexe D du Cadre de planification de l'aire de répartition du caribou boréal pour connaître les organismes qui participent aux groupes de travail.

Les mesures d'évitement sont efficaces pour limiter tout effet néfaste sur le caribou et son habitat durant la phase de conception de projet avant que les activités de développement ne commencent. Les mesures de réduction permettent de diminuer les effets néfastes en réduisant l'aire de perturbation et la durée de l'exposition du caribou boréal aux perturbations sensorielles et en offrant des formations de sensibilisation aux travailleurs. Si des effets résiduels sont prévus ou remarqués après la mise en place des mesures d'évitement et de réduction; alors, des mesures de restauration sont instaurées sur le site touché. Si des effets résiduels sont toujours prévus après l'adoption de toutes les mesures d'atténuation (évitement, réduction et restauration), il pourrait être nécessaire d'envisager la mise en place de mesures de compensation.

Avant de planifier des activités de développement dans l'aire de répartition du caribou boréal des TNO, les promoteurs sont encouragés à examiner les lignes directrices sur le caribou boréal des TNO et à communiquer avec les représentants des bureaux régionaux ou de l'administration centrale du ministère de l'Environnement et des Ressources naturelles (MERN) du GTNO, des gouvernements et organisations autochtones ou des conseils de gestion des ressources naturelles pour obtenir des renseignements à jour sur le caribou boréal dans la zone visée par le projet. Lorsqu'ils conçoivent leur projet, les promoteurs sont également encouragés à obtenir des conseils pour :

- Réduire la dégradation et le morcellement de l'habitat découlant des activités de développement pour maintenir la fonction et la connectivité de l'habitat du caribou (p. ex., aires de mise bas, d'après mise bas et d'occupation de la fin de l'hiver);
- Réduire l'empreinte (c.-à-d., perte d'habitat) d'une activité de développement, dont sa contribution générale aux perturbations cumulatives de l'habitat;
- Réduire la création d'éléments linéaires associés à des activités de développement pour éviter l'augmentation éventuelle de l'efficacité des prédateurs (c.-à-d., faciliter la répartition et les déplacements);
- Réduire les perturbations sensorielles (p. ex., bruits, lumière, poussière, vibrations, présence humaine) associées à des activités de développement;
- Éviter ou réduire les activités qui augmentent les risques de mortalité du caribou associés à un projet de développement (p. ex., chasse, collisions avec des véhicules);
- Planifier de façon efficace la clôture du projet et la remise en état de l'habitat du caribou qui a été touché.

Les lignes directrices énumérées peuvent également vous guider vers des collaborateurs de différents secteurs qui pourraient vous aider à gérer les effets liés aux perturbations cumulatives dans l'habitat du caribou boréal. Ces lignes directrices visent à bonifier les mesures d'atténuation que l'on doit déjà mettre en place lorsque l'on effectue un plan

d'aménagement du territoire, que l'on demande un bail de surface du ministère l'Administration des terres du GTNO, que l'on souhaite obtenir une licence d'utilisation des eaux ou un permis d'utilisation des terres, ou les mesures d'atténuation qui sont recommandées dans les Lignes directrices sur l'aménagement des terres dans le Nord.

DISCLAIMER

These guidelines are intended to be implemented by proponents to the greatest extent feasible. It is recognized that it may not be possible for proponents to fully implement the guidelines exactly as written in all situations. Where the specific circumstances of a project require deviation from the guidelines, proponents are expected to explain why and to propose alternate mitigation measures that would achieve a similar outcome.

These guidelines do not replace legislation or the terms and conditions of regulatory authorizations. Although every attempt has been made to provide up-to-date information, it remains the developer's responsibility to obtain the most recent information related to boreal caribou and their habitat, to ensure all regulatory requirements have been met, and to undertake appropriate consultation with territorial and federal government departments and Indigenous governments and organizations. No parts of these guidelines are intended to infringe on asserted or established Aboriginal or treaty rights.

ACKNOWLEDGEMENTS

We would like to thank EDI Environmental Dynamics Inc. (EDI) for preparing these guidelines, and GNWT staff from the departments of Environment and Natural Resources (Wildlife and Fish, and Forest Management divisions), Lands, Industry, Tourism and Investment, and Infrastructure that provided valuable review, input and feedback during their development.

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GLOSSARY

Anthropogenic disturbance: disturbance caused by human activity.

Bioengineering: the use of living plant materials to perform some engineering function (e.g., enhanced soil stability).

Development: For the purpose of these guidelines, development includes any proposed or existing development (including exploration phase activities) and means (a) any public, commercial or industrial undertaking or venture, including support and transportation facilities, related to the extraction of renewable or non-renewable resources, and any infrastructure related to transportation and utilities; (b) any use of land that requires a permit under the *Mackenzie Valley Land Use Regulations* or the *Territorial Land Use Regulations*; or (c) any undertaking that requires a licence to use water or deposit waste under the *Northwest Territories Waters Act*. The term "public" is intended to include municipal, territorial, federal and Indigenous governments.

Direct habitat disturbance: includes the footprint of land directly affected by a development activity that results in loss or physical alteration of habitat for a wildlife species for a period of time.

Disturbed habitat: according to the national Recovery Strategy for boreal caribou (Environment and Climate Change Canada 2019), any "habitat showing i) anthropogenic [*human caused*] disturbance visible on Landsat [*i.e., satellite generated photographs*] at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, years, as identified in data from each provincial and territorial jurisdiction (without buffer)".

Important boreal caribou habitat / habitat importance: important boreal caribou habitat is being identified through traditional knowledge and western science during development of range plans (Government of the Northwest Territories 2019). This may include areas providing preferred vegetation, travel corridors, large undisturbed habitat patches, connectivity between large patches or between important areas. To identify important boreal caribou habitat in the proposed development footprint, proponents are advised to consult the information sources listed in Section 1.8.

Indirect habitat disturbance: habitat that is not directly affected by development, but which is avoided or used less by caribou because of factors like sensory disturbance or predation risk.

Large habitat patch: A patch of undisturbed habitat (as defined below) that is at least 100 km^2 in size.

Low-impact seismic: the objective of low-impact seismic exploration is to create a narrow, continuously meandering line. The low-impact seismic method ensures that the maximum width of a low-impact seismic line will not exceed 5.0 m unless specifically approved, includes hand- or mechanically cut lines, ensures a maximum 200 m line-of-sight on any line, avoids larger standing trees by meandering, and generally does not disturb the soil and ground cover (Government of Northwest Territories 2015).

Mineral lick: an area used by ungulates to obtain dietary minerals and can be found in wet or mucky seepage areas, dry earth exposures such as clay or lacustrine deposits found above river cut-banks, or rock-face licks. April to October is generally considered the high-use season for mineral licks. Ungulates typically use mineral licks the most during spring and early summer. Mineral licks are relatively rare on the landscape, can be utilized by multiple species, and often require animals to travel away from security habitat. Some useful photos and a description of mineral licks are on pages 10-13 of the Manitoba Forest Management Practices Guide available at the link below:

www.gov.mb.ca/sd/forestry/pdf/practices/terrestrial_final_jan2017.pdf

Offsetting: the process of creating measurable environmental benefits to compensate for the residual negative environmental impacts of development projects after all reasonable measures have been taken to avoid and minimize the losses (Business and Biodiversity Offset Program 2013).

Predator efficiency: the rate at which predators such as wolves encounter and kill prey such as caribou per unit of search effort.

Proponent: any person, government, or any other legal entity owning, operating, or causing to be operated any development in whole or in part in the Northwest Territories, including any co-contractant of such owner or operator. The term "government" is intended to include municipal, territorial, federal, and Indigenous governments. This definition is adapted from the definition of "Developer" in Section 2.0 of the Inuvialuit Final Agreement available at:

www.irc.inuvialuit.com/sites/default/files/Western_Arctic_Claim_Inuvialuit_FA_0.pdf

Range plan: a plan describing how habitat disturbance from human development activity and wildfires will be managed to maintain adequate habitat to ensure a healthy and sustainable boreal caribou population that offers harvesting opportunities for present and future generations (Government of the Northwest Territories 2019).

Reclamation: the process of returning a disturbed site to its natural state or which prepares it for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety (MVLWB/AANDC 2013). Progressive reclamation: select closure/reclamation activities that can be implemented before overall project completion.

Regeneration: the renewal of a forest stand by natural or artificial means (e.g., seeding in from adjacent stands vs. artificial regeneration planting) (Government of the Northwest Territories Environment and Natural Resources 2005).

Reforestation: the intentional or natural renewing of forest cover in an area that has been reduced by deforestation processes, such as timber harvest or wildfire.

Restoration: the process of assisting the recovery of a site that has been degraded, damaged, or destroyed by development activity. The goal of ecological restoration is to return a degraded site to its historic successional trajectory, not its historic condition. While **ecological restoration** activities can often place a degraded site on an initial trajectory of recovery relatively quickly, full recovery of the site can take decades. (Source: adapted from https://www.ser-rrc.org/what-is-ecological-restoration/). **Functional restoration** is generally focused on reducing the ability of predators and humans to use linear features as travel corridors in the short-term, or to prevent repeated disturbances caused by vehicular traffic which may impede longer-term regeneration of vegetation (Government of the Northwest Territories 2019).

Risk timing windows (low-risk or least risk): the period of the year when industrial work or development can occur with a lower probability of impacting the ecological component for which the window was developed, in this case for boreal caribou.

Sensory disturbance: an activity that can be sensed by a wildlife species and elicit a behavioural change. For example, habitat adjacent to a project footprint, while remaining structurally unchanged, may become less effective for wildlife species due to sensory disturbance (e.g., noise, light, dust, vibrations, human presence) associated with project activities.

Terrestrial lichen resources: Areas with >30% ground cover of preferred boreal caribou winter forage species from the genera *Cladonia*, *Cladina,* and *Cetraria* (based on Macander et al. 2020).

Undisturbed habitat: according to the national Recovery Strategy for boreal caribou (Environment and Climate Change Canada 2019), any habitat not showing "i) anthropogenic [*human caused*] disturbance visible on Landsat [*i.e., satellite generated photographs*] at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction(without buffer). Disturbance within the 500 m buffer would result in a reduction of the undisturbed habitat".

LIST OF ACRONYMS

CIMP	Cumulative Impact Monitoring Program
cm	centimetre
CMA	Conference of Management Authorities
COSEWIC	The Committee on the Status of Endangered Wildlife in Canada
EA	Environmental Assessment
EDI	EDI Environmental Dynamics Inc.
EIR	Environmental Impact Review
EISC	Environmental Impact Screening Committee
ENR	GNWT Department of Environment and Natural Resources
GNWT	Government of the Northwest Territories
ha	hectare
IGOs	Indigenous Governments and Organizations
ISR	Inuvialuit Settlement Region
km^2	square kilometre
LWB	Land and Water Board
m	metre
MVLWB	Mackenzie Valley Land and Water Board
NLUG	Northern Land Use Guidelines
NWT	Northwest Territories
SARA	Species at Risk Act
WMIS	Wildlife Management Information System
WMMP	Wildlife Management and Monitoring Plan

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Figure 2. Potential impacts of habitat change on boreal caribou. (Illustration: Soren Heinrich; Design: Alaris Design; with thanks to the B.C. Oil and Gas Research and Innovation Society; taken from Government of the Northwest Territories, A Framework for Boreal Caribou Range Planning – August 2019 (Government of the Northwest Territories 2019)). 7

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1 INTRODUCTION

The *Guidelines for Exploration and Development Projects in Boreal Caribou Habitat in the Northwest Territories* (the NWT Boreal Caribou Guidelines) were developed to support proponents in following best management practices related to boreal caribou (*Rangifer tarandus caribou*).

The NWT Boreal Caribou Guidelines describe general guidelines applicable to all exploration and development sectors and then list sector specific guidelines. The sector specific guidelines are meant to be implemented **in addition** to the general guidelines outlined for all exploration and development sectors. Applicable exploration and development sectors and their associated activities captured by these guidelines include, but are not limited to the following:

- Camps and support facilities;
- Forestry;
- Mineral exploration and mining;
- Oil and gas exploration (including seismic surveys) and production;
- Pits and quarries;
- Renewable energy, energy infrastructure, and energy transmission; and
- Transportation (roads and trails) including public infrastructure.

These guidelines are also intended to apply to new habitat disturbance or sensory disturbance which may be associated with remediation projects. Although they are not intended to apply specifically to tourism or recreational development activities, some of the guidelines may be helpful to mitigate potential impacts associated with these activities.

The listed guidelines are prioritized using the **avoid**, **minimize**, and **restore** mitigation hierarchy. As the NWT Boreal Caribou Guidelines evolve with time, they will eventually include the complete mitigation hierarchy of:

1) avoid;
2) minimize;
3) restore; and
4) offset.

Avoidance (1) is the most effective mitigation strategy over the long-term. Avoidance guidelines provide guidance to plan activities to limit the impact to boreal caribou and their habitat before commencing any type of activity. The next best mitigation strategy is to minimize (2) impacts by modifying operations to reduce the area of disturbance and length

of exposure to sensory disturbance and implementing awareness training for all workers. Where there are residual impacts following avoidance (1) and minimization (2) measures, restoration (3) of a site to either pre-disturbance conditions or to a successional trajectory to pre-disturbance conditions is the end goal. In general, progressive reclamation practices should be implemented during all development stages (i.e., construction, operations, closure and post-closure) to ensure that disturbed habitat is restored as soon as possible. When on-site restoration is not feasible, habitat offsetting (4) should be considered. Definitions of specific terms used throughout the NWT Boreal Caribou Guidelines can be found in the glossary at the start of this document (page iv).

Prior to planning any activities, proponents should review the NWT Boreal Caribou Guidelines and contact the Government of the NWT (GNWT) Department of Environment and Natural Resources (ENR), as well as local Indigenous governments and organizations, and renewable resources boards to obtain the most recent information on boreal caribou in the project area (refer to Section 1.8) and for advice on mitigation strategies to consider (avoid, minimize, restore and offset). The NWT Boreal Caribou Guidelines are designed as a living document that will evolve with time.

1.1 General Habitat Description for Boreal Caribou

1.1.1 Distribution

In the NWT, boreal caribou can be found dispersed in small groups, predominantly across the boreal forest. The southern extent of their range is continuous with boreal caribou ranges in northeastern British Columbia and northern Alberta. The eastern edge of boreal caribou range in the NWT is roughly defined by the eastern limit of the Taiga Plains ecozone (Ecosystem Classification Group 2007) and the Little Buffalo River, while the western edge roughly follows the foothills of the Mackenzie Mountains (Species at Risk Committee 2012) (Figure 1). Currently, boreal caribou in the NWT are being managed as a single population unit (NT1), although it is acknowledged that there are knowledge gaps about sub-population structure within the NT1 range.

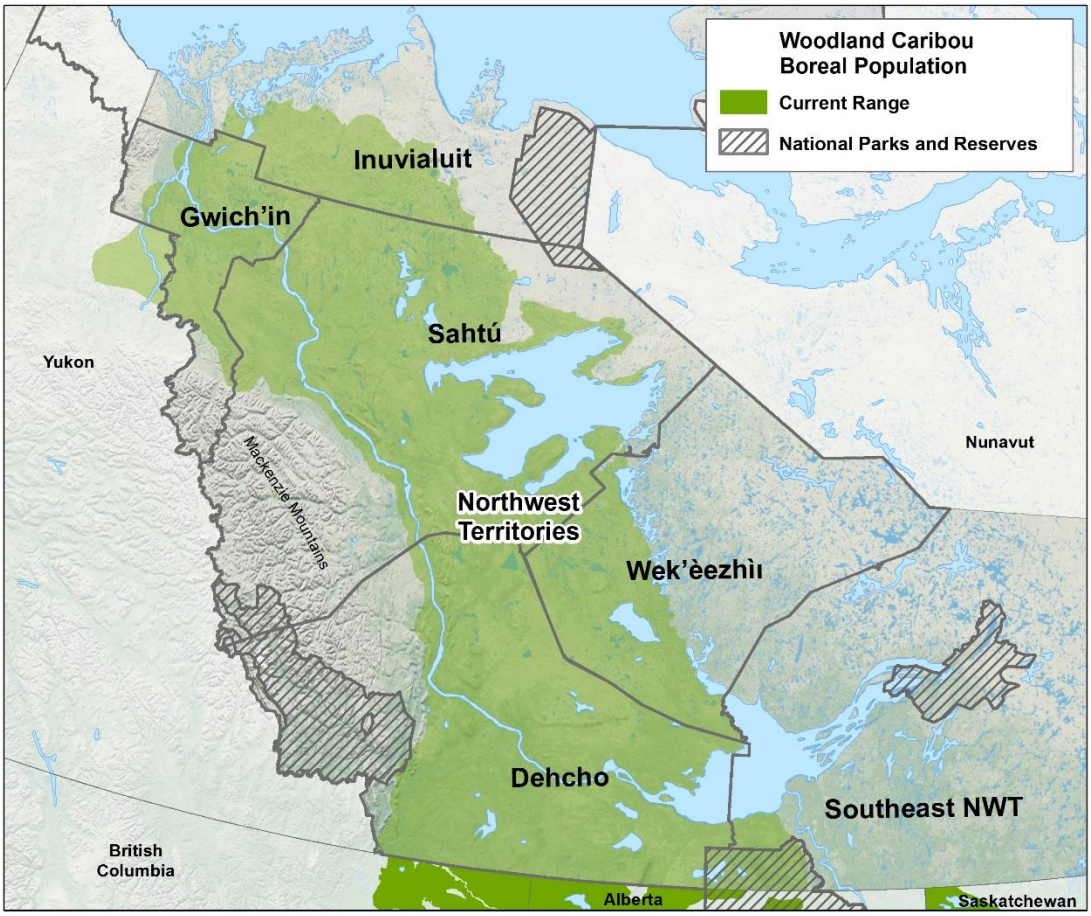

Figure 1. Illustration of the boreal caribou range in the NWT, and the different regions with settled land claim agreements (Wek'èezhìı, Sahtú, Gwich'in and Inuvialuit) and regions without settled land claim agreements (Dehcho and Southeast NWT) that overlap the range. The Dehcho region corresponds to the Dehcho Interim Measures Agreement area. The Southeast NWT is a geographic area descriptor but is not considered an official name for this region.

1.1.2 Habitat Selection

Boreal caribou are forest-dwelling caribou that occur at low densities across their range and are usually found individually or in small groups (typically 5-15 individuals, but groups as large as 26 have been observed), a strategy which helps to reduce the risk of predation (Environment and Climate Change Canada 2019, COSEWIC 2014, Conference of Management Authorities (CMA) 2017, Species at Risk Committee 2012). Spreading out across the landscape at low densities means boreal caribou require large areas of continuous, undisturbed habitat to meet their seasonal requirements (Environment and Climate Change Canada 2019, COSEWIC 2014, CMA 2017). Unlike other types of caribou, boreal caribou are relatively sedentary and do not undertake long-distance migrations or migrate seasonally to different elevations; however, they are continually on the move within their home ranges to

meet their seasonal requirements and may travel short distances between ranges in response to disturbances (Environment and Climate Change Canada 2019, COSEWIC 2014, CMA 2017).

In general across Canada, boreal caribou are often found in mature to old-growth coniferous forests where arboreal and terrestrial lichens are abundant and prey competitors (e.g., moose and deer) and predators are less common (Environment and Climate Change Canada 2019, COSEWIC 2014, CMA 2017). They also use treed and open muskegs, peatlands (i.e., bogs and fens), ponds, and lakes interspersed with upland areas (Environment and Climate Change Canada 2019, COSEWIC 2014, CMA 2017). Boreal caribou tend to avoid early seral habitats and recently disturbed areas (Environment and Climate Change Canada 2019). However, in the NWT, boreal caribou may use recent burns in certain seasons to access other high quality forage sources, to rut or for insect relief (Species at Risk Committee 2012).

Seasonal habitat selection by boreal caribou is influenced by predation risk and forage availability (Environment and Climate Change Canada 2019). During calving and post-calving periods, pregnant females spread out across the landscape and are generally solitary, selecting more isolated habitats with good quality forage (i.e., shrub and herbaceous new growth) (Environment and Climate Change Canada 2019). Typical calving habitat includes islands in lakes, peatlands or muskegs, lakeshores, and forests (Environment and Climate Change Canada 2019, CMA 2017). Maintaining large areas of suitable habitat where caribou can spread out and occur at low densities to avoid predation, especially during vulnerable periods, is critical for population survival (CMA 2017).

In the NWT wildfires are the main source of habitat disturbance. A recent study of habitat selection by adult female boreal caribou across fire-disturbed landscapes in the NWT found that they appear to seek out recently burned (<10 yrs) land-cover types during the snow-free season (DeMars et al. 2020). Adult female caribou in the NWT generally showed an avoidance for middle-aged burns (11-30 years old) and a higher selection for younger burns (<10 years old) and older burns (>30 years old) (DeMars et al. 2020). It has been suggested that caribou may select more open areas such as recent burns and clear cuts during calving and summer months because these areas provide longer sight lines that facilitate the early detection of predators (DeMars et al. 2020, Pinard et al. 2012). Also, female caribou in the NWT may be selecting burns to access higher quality and/or quantities of forage to meet nutritional demands of lactation (Parker et al. 2009, Denryter et al. 2020). Seasonal changes in diet towards consuming mostly lichens during the winter may also explain why caribou selection for burns declined during the winter (DeMars et al. 2020).

During late winter and early spring when snow depths are greatest, boreal caribou typically select forested habitats (Environment and Climate Change Canada 2019, COSEWIC 2014). Closed canopies intercept snow, making it easier for boreal caribou to travel between lichen

sources and dig for terrestrial lichens (Environment and Climate Change Canada 2019, COSEWIC 2014). Windswept upland areas in muskeg, bog, fen, and peatland habitats may be used occasionally as terrestrial lichens are more easily accessible (Environment and Climate Change Canada 2019). Boreal caribou in the NWT were found to increase their selection for older burns (40-60 yrs old), and especially areas that hadn't been disturbed by fire in >60 yrs, as the winter season progresses (DeMars et al. 2020). **GNWT-ENR has developed predictive maps of seasonal and annual boreal caribou habitat selection which can assist developers in planning their activities to avoid or minimize disturbance within areas of preferred boreal caribou habitat (DeMars et al. 2020). On these maps, areas of seasonally or annually preferred habitat generally correspond to resource selection function bins 7 and higher. Maps of important areas for boreal caribou are also being developed based on traditional and local knowledge as part of the development of range plans.** See Section 1.8 for further information on how to request access to spatial data about important areas for boreal caribou.

1.2 Threats, Limiting Factors, and Impact Pathways

Direct mortality, habitat change, stress, and poor health can negatively impact the survival or reproduction of boreal caribou (Species at Risk Committee 2012). The biggest threat to boreal caribou in the NWT is habitat disturbance (Government of the Northwest Territories 2019). Habitat disturbance includes loss, degradation, and fragmentation of large, continuous areas of mature forest that can result from anthropogenic land-use activities and natural processes such as wildfire (Figure 2). As of 2017, most habitat disturbance in the NWT is caused by wildfire (CMA 2017). Boreal caribou are more likely to select patches of residual forest habitat that are greater than 100 km^2, and probability of use is greater than 75% when patches exceed 270 km^2 in size (Lesmerises et al. 2013). In the NWT, boreal caribou were more likely to exhibit stable or positive population growth rates when they had access to patches of undisturbed habitat >500 km^2 in size (Nagy 2011). **In these guidelines, patches of undisturbed habitat need to be at least 100 km^2 in size to be considered a "large habitat patch".**

Currently, resource exploration, development, and extraction, primarily associated with the oil and gas sector, and to a lesser extent with mining, timber harvesting, and road construction, account for the majority of human-caused disturbances across the NWT range (CMA 2017). These activities typically involve pipelines, seismic lines, industrial infrastructure, cut blocks, and roads that can cause sensory disturbance, increased access for predators and humans, and habitat loss, degradation, and/or fragmentation.

Caribou are sensitive to human disturbances such as industrial noise, aircraft, and motorized vehicles including snowmobiles. The extent of the impact of sensory disturbance on caribou at the population level is currently unknown (CMA 2017). Few caribou-vehicle collisions

have been reported in the NWT and collisions with caribou are not currently considered a major threat (CMA 2017).

Boreal caribou avoid predators by selecting habitats with difficult access for predators and avoiding habitats preferred by alternate prey (e.g., moose and wood bison) (CMA 2017). Some habitat disturbances create conditions that can attract or increase the abundance of alternate ungulate prey such as moose and wood bison resulting in increased predator presence or abundance (CMA 2017). Linear features such as seismic lines, pipelines, and roads can facilitate predator and human access into areas boreal caribou use for refuge (CMA 2017). Large areas of undisturbed habitat (>500 km^2) need to be maintained to minimize predator interactions (Nagy 2011).

Predator density is not well documented across the NWT range of boreal caribou, but aerial surveys conducted in the southern part of the NWT suggest that wolf densities are much lower than in boreal caribou ranges in Alberta and B.C. (Serrouya et al. 2016). The actual effect of predators such as wolves (*Canis lupus*), bears (*Ursus arctos* and *Ursus americanus*), wolverine (*Gulo gulo*) and lynx (*Lynx canadensis*) on boreal caribou survival is unknown (CMA 2017). Currently, there are gaps in understanding the specific relationship between boreal caribou abundance, habitat disturbance, and predation in the NWT (CMA 2017). In contrast, these relationships are well studied in Alberta, British Columbia, Ontario and Quebec (Racey et al. 1999, McLoughlin et al. 2003, Beauchesne et al. 2014, Culling and Cichowski 2017).

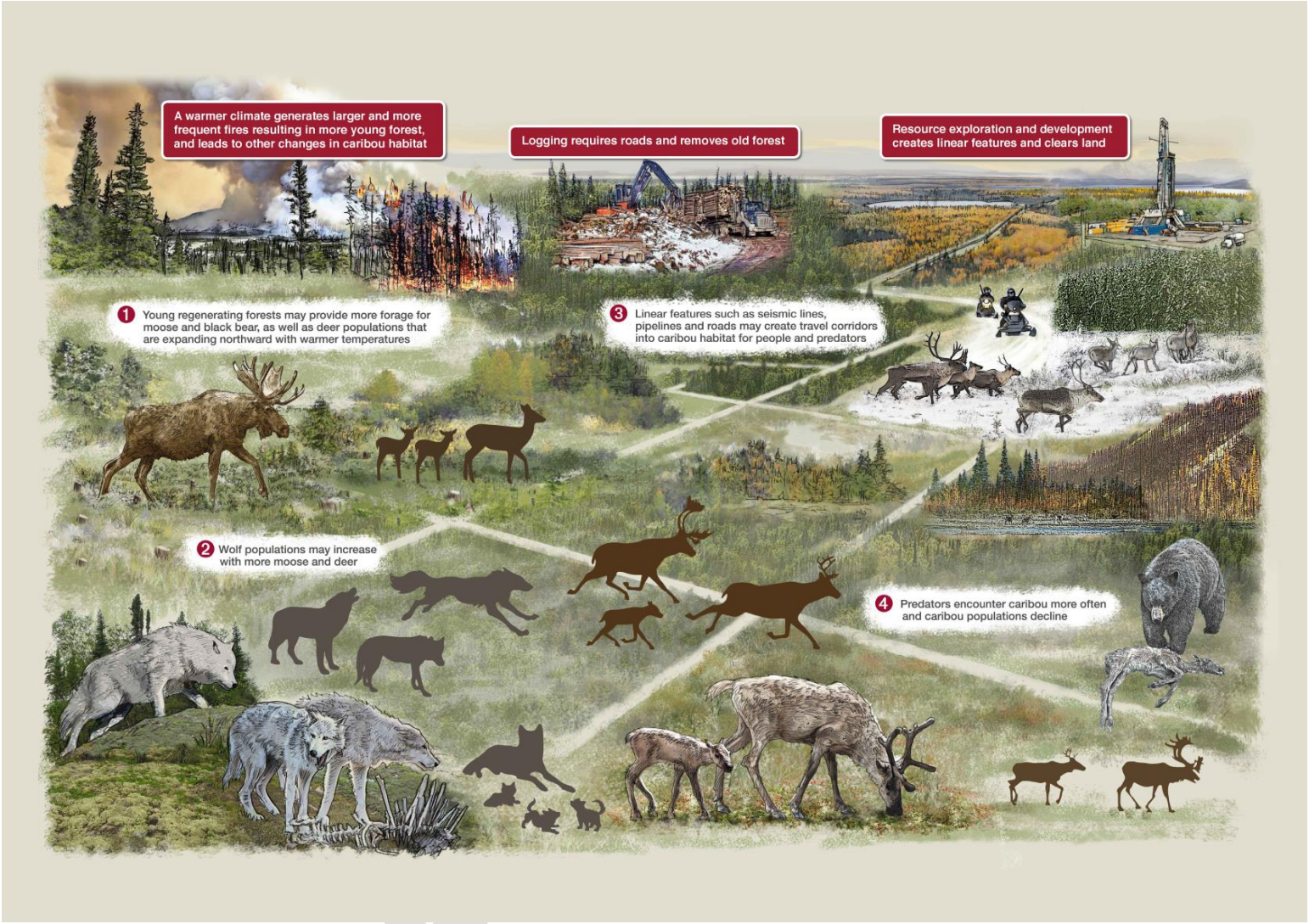

Figure 2. Potential impacts of habitat change on boreal caribou. (Illustration: Soren Heinrich; Design: Alaris Design; with thanks to the B.C. Oil and Gas Research and Innovation Society; taken from Government of the Northwest Territories, A Framework for Boreal Caribou Range Planning – August 2019 (Government of the Northwest Territories 2019)).

Boreal caribou across Canada generally avoid habitats with a high density of linear disturbances. In the NWT, the response of satellite collared females to seismic line density varied by latitude and time of the year. In the southern portion of NWT, collared females avoided seismic lines in the summer whereas in the northern portion of NWT, collared females avoided seismic lines in the winter (Species at Risk Committee 2012).

Threats to boreal caribou can be considered separately, but all threats should be considered in combination since it is the cumulative effect of combined disturbances that influences boreal caribou behaviour and demographics across the landscape.

1.3 Recovery Strategies for Boreal Caribou

Boreal caribou are designated as Threatened on Schedule 1 of the federal *Species at Risk Act* (Environment and Climate Change Canada 2019), and as Threatened on the NWT List of Species at Risk under the *Species at Risk (NWT) Act* (CMA 2013, Northwest Territories Gazette 2014). The Northwest Territories (NWT) population of boreal caribou is currently considered to be healthy overall, but careful management of habitat disturbance will be important to maintain a healthy and sustainable boreal caribou population for the future. Management and recovery of the NWT boreal caribou population is guided by national and NWT recovery strategies, both of which call for the development of range plans to manage habitat disturbance.

1.3.1 Federal Recovery Strategy

In 2012, Environment Canada prepared a federal recovery strategy for boreal caribou and this Strategy was amended in 2019 (Environment and Climate Change Canada 2019). The goal of recovery is to achieve self-sustaining local populations in all boreal caribou ranges throughout their current distribution in Canada, to the extent possible. The recovery strategy recognizes that achieving this recovery goal for all boreal caribou populations across Canada will take several decades.

The federal recovery strategy defines critical habitat for boreal caribou in all boreal caribou ranges as:

- The area within the boundary of each boreal caribou range that provides an overall ecological condition that will allow for an ongoing recruitment and retirement cycle of habitat, which maintains a perpetual state of a minimum of 65% of the area as undisturbed habitat in all ranges other than SK1, and a minimum of 40% undisturbed habitat in SK1; and

- Biophysical attributes required by boreal caribou to carry out life processes (see Appendix H of Environment and Climate Change Canada 2019).

In the context of critical habitat, **disturbed habitat** is defined as "habitat showing i) anthropogenic [*human caused*] disturbance visible on Landsat [*i.e., satellite generated photographs*] at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, years, as identified in data from each provincial and territorial jurisdiction (without buffer)" (Environment and Climate Change Canada 2019).

Undisturbed habitat is defined as habitat not showing any "i) anthropogenic [*human caused*] disturbance visible on Landsat [*i.e., satellite generated photographs*] at a scale of 1:50,000, including habitat within a 500 m buffer of the anthropogenic disturbance; and/or ii) fire disturbance in the last 40 years, as identified in data from each provincial and territorial jurisdiction(without buffer). Disturbance within the 500 m buffer would result in a reduction of the undisturbed habitat" (Environment and Climate Change Canada 2019).

Biophysical attributes are defined as the "habitat characteristics required by boreal caribou to carry out life processes necessary for survival and recovery" (Environment and Climate Change Canada 2019).

Proponents can contribute to the goal of maintaining at least 65% undisturbed habitat in the NWT boreal caribou range by avoiding, minimizing and quickly restoring new habitat disturbance to the greatest extent feasible. The NWT Boreal Caribou Guidelines identify many mitigation measures to help achieve this goal.

To learn more about the federal recovery strategy, visit the **Government of Canada Species at Risk Public Registry** available at the following link: www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html.

1.3.2 NWT Recovery Strategy

In 2017, the GNWT and the other Management Authorities responsible for boreal caribou prepared a territorial recovery strategy for this species (CMA 2017). The goal of the NWT recovery strategy is to ensure a healthy and sustainable boreal caribou population across their NWT range that offers harvesting opportunities for present and future generations. The management approaches recommended in the NWT recovery strategy include the development of guidelines and best practices for industry to minimize impacts to boreal caribou, specifically:

- Review and update existing guidelines and standard advice for industry, and develop new guidance documents where needed, to address current best practices for mitigating the impacts of development (e.g., seismic techniques, restoration of habitat and management of access); and

- Develop or update guidelines and/or regulations under the *NWT Wildlife Act* for how to plan and conduct development activities to minimize impacts on boreal caribou and their habitat, and ensure that Wildlife Management and Monitoring Plans (WMMPs) for development projects adequately address boreal caribou and their habitat.

Please refer to the NWT recovery strategy document for more detailed information, available at the following link:
https://www.nwtspeciesatrisk.ca/sites/enr-species-at-risk/files/nwt_boreal_caribou_recovery_strategy_2017_final_0.pdf.

1.4 Range Planning Framework

One of the goals for the NWT Boreal Caribou Guidelines is to be integrated within the context of the NWT range planning framework. *A Framework for Boreal Caribou Range Planning* (Government of the Northwest Territories 2019) outlines an overarching approach to range planning for boreal caribou in the NWT. The framework provides a common approach for how "*individual range plans, which manage habitat disturbance at a regional level, will be developed and updated over time*" (Government of the Northwest Territories 2019). The framework also outlines a tiered management approach where different areas of boreal caribou habitat in each region will be assigned to one of three management classes (i.e., Basic, Enhanced, or Intensive) based on the *"importance of habitat for caribou and range status relative to regional human disturbance thresholds"* (Government of the Northwest Territories 2019). For each management class, management actions will be proposed to address disturbance from both development activity and wildfire. The management actions will be designed to avoid, minimize, restore, or offset disturbance to boreal caribou habitat resulting from development activities and forest wildfires.

In Basic management class areas, the framework states that proponents are encouraged to follow best practices. The NWT Boreal Caribou Guidelines are intended to describe those best practices that should be followed within Basic management class areas. In Enhanced and Intensive management class areas these guidelines may become strict requirements that have to be met, and additional measures beyond those identified in these guidelines (such as offsets) may be required to help ensure no net loss of undisturbed habitat over time.

Further details are provided in the framework document and supporting appendices, available at the following link: www.enr.gov.nt.ca/sites/enr/files/resources/boreal_caribou_range_planning_framework_2019_-_cadre_de_planification_de_laire_de_repartition_du_caribou_boreal_2019.pdf.

1.5 Who these Guidelines are for and how they can be used

The NWT Boreal Caribou Guidelines are intended to be used not only by proponents who are planning and/or conducting development activities in the NWT boreal caribou range, but also by regulators and other parties who review and make recommendations on proposals for development activities and/or issue authorizations for such activities.

Proponents should use the NWT Boreal Caribou Guidelines when planning their development projects and associated applications for land use permits, water licences or other types of authorizations (e.g. timber harvesting permits/licences) to identify specific mitigation measures that can be used to avoid, minimize or restore impacts to caribou and their habitat. The guidelines may also be used to assist proponents in demonstrating how conformity requirements or land protection directives related to boreal caribou in approved regional land use plans will be met, or how the guidance provided in community conservation plans was used. It is important to note that approved regional land use plans are legally binding, whereas community conservation plans are advisory. Figure 3 shows where there are currently approved regional land use plans or community conservation plans that overlap with the boreal caribou range in the NWT. Further information on regional land use plans and community conservation plans can be found at: https://www.lands.gov.nt.ca/en/services/land-use-planning-nwt

Parties such as Indigenous governments and organizations, renewable resources boards, environmental impact review boards and territorial and federal government departments that review, comment and make recommendations on proposals for development activities during environmental screening and assessment processes can use the NWT Boreal Caribou Guidelines to assess the adequacy of mitigation measures proposed by developers and to recommend specific mitigation measures that should be implemented by the proponent.

Regulators such as land and water boards, and Indigenous, territorial and federal governments that issue permits, licences or other types of authorizations for development projects can use the NWT Boreal Caribou Guidelines to assess project applications for conformity with applicable requirements in approved regional land use plans, the application of guidance from community conservation plans, adequacy of management plans prepared by the proponent, or to identify specific terms and conditions for boreal caribou to include in authorizations.

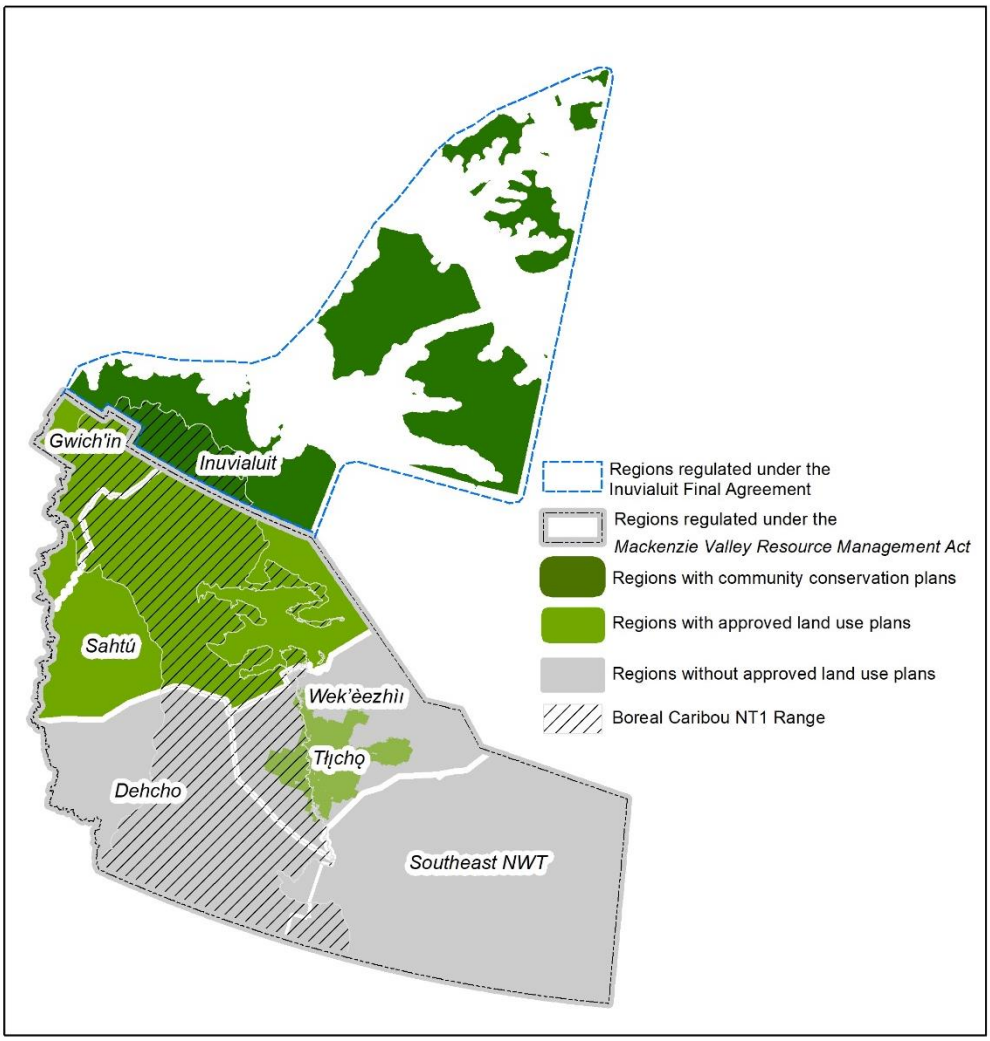

Figure 3. NWT regions and areas with currently approved land use plans or community conservation plans in place.[4] The Dehcho region corresponds to the Dehcho Interim Measures Agreement area. The "Southeast NWT" is a geographic descriptor but is not considered an official name for this region.

[4] *Note:* In the Sahtú region, community conservation plans have been developed for the Bluenose East barren-ground caribou herd by Délı̨nę [approved], and for the Bluenose West barren-ground caribou herd by Colville Lake [under review]. Consult the Sahtú Renewable Resources Board website to obtain the most current community conservation plans.

1.6 Statutory Requirements – NWT Wildlife Legislation

All proponents need to be aware of the prohibitions and requirements under the *Wildlife Act* and SARA(NWT) that typically apply to most development projects.

A summary of sections of the *Wildlife Act* and the SARA(NWT) that commonly apply to development projects is available at the following link:
www.enr.gov.nt.ca/sites/enr/files/resources/statutory_requirements_for_wildlife_in_the_nwt_july_2019.pdf

1.6.1 Wildlife Management and Monitoring Plans

Under section 95 of the *Wildlife Act* and section 13 of the Wildlife General Regulations, the Minister of ENR can require a Wildlife Management and Monitoring Plan (WMMP) for developments that are likely to:

a) result in a significant disturbance to big game or other prescribed wildlife;
b) substantially alter, damage or destroy habitat;
c) pose a threat of serious harm to wildlife or habitat; or
d) significantly contribute to cumulative impacts on a large number of big game or other prescribed wildlife, or on habitat.

Where the Minister has determined that an approved WMMP is required for a development project, proponents may not undertake or engage in the development until the plan is approved, and a proponent may be fined for not complying with an approved WMMP, unless otherwise authorized to do so by the Minister. As defined in the Wildlife General Regulations, boreal caribou are considered both a big game species and prescribed wildlife for the purposes of section 95 of the *Wildlife Act*. Given the Threatened status of boreal caribou, and the link between habitat disturbance and declining boreal caribou populations, it is more likely that projects that occur within boreal caribou range will trigger the requirements for an approved WMMP.

Guidelines related to WMMPs, and resources to help proponents in preparing a WMMP, can be downloaded from the following link:
www.enr.gov.nt.ca/en/services/wildlife-management-and-monitoring-plans

The guidelines describe high-level criteria to assess whether a WMMP will likely be required for different types of projects based on their scale. Additional resources are also provided such as a questionnaire that proponents can fill out and submit to ENR to assess whether a WMMP might be required, and a template for a basic WMMP.

Appropriate guidelines from the NWT Boreal Caribou Guidelines should be incorporated into a WMMP when one is required. As many of the boreal caribou

guidelines are goal-oriented rather than prescriptive, a WMMP is a useful tool for proponents to describe how such goal-oriented guidelines will be achieved.

Proponents may also be responsible for monitoring the effectiveness of implemented measures stemming from these guidelines and may need to adaptively manage for unanticipated project-related effects to boreal caribou and their habitat. Such monitoring would be part of a WMMP if one was required for the proposed project.

Proponents should note that a Wildlife Research Permit is required to carry out any monitoring programs that involve researching, observing and/or handling wildlife in the NWT. More information on how to obtain a Wildlife Research Permit can be found here:

https://www.enr.gov.nt.ca/en/services/apply-research-observe-and-handle-wildlife-nwt

1.7 Statutory Requirements – Federal Legislation

A permit under the federal *Species at Risk Act* (SARA) may be required to disturb or destroy boreal caribou critical habitat on federally administered lands in the NWT, or for activities outside federally administered lands where the 500 m buffer around a project footprint extends onto federally administered land. On June 7, 2019, the Government of Canada issued an order[5] to protect critical habitat of boreal caribou on federal lands in Canada. This protection order excludes *Indian Act* lands, properties administered by the Parks Canada Agency that are not federal protected areas under subsection 58(2) of SARA, and devolved lands in the Yukon and NWT. A summary of the Order can be found at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/related-information/order-summary-critical-habitat-woodland-caribou-boreal-population.html

1.8 Sources of Available data and information

1.8.1 Project Planning and Engagement

Proponents should consult the available information sources outlined below, applicable regional land use plans and community conservation plans, and seek input from ENR, applicable land owners/managers, regional and local Indigenous Governments and Organizations, Renewable Resource Boards and Councils, and Hunter and Trapper Committees in order to identify the location of important habitat areas, undisturbed habitat patches, known movement corridors, and sensitive features such as mineral licks, travel corridors or calving sites, so that potential impacts can be avoided through good project

[5] See Canada Gazette Part II, Vol. 153, No. 13, Registration SOR/2019-188, available at: http://gazette.gc.ca/rp-pr/p2/2019/2019-06-26/pdf/g2-15313.pdf

planning. If this information is not available for a particular project location, proponents should document baseline habitat conditions in that area before carrying out development activities. Once range plans are completed, they will become a key source for this information, and will identify additional management actions that may be required in different management class areas.

Proponents should engage early on with affected communities and Indigenous governments and organizations (IGOs) and are encouraged to follow the Mackenzie Valley Land and Water Board (MVLWB) *Engagement Guidelines for Applicants and Holders of Water Licences and Land Use Permits in the Mackenzie Valley* or Section 4.2 of the *Environmental Impact Screening Committee (EISC) Guidelines* in the Inuvialuit Settlement Region when planning engagement for their project. These guidelines are available at:
https://mvlwb.com/sites/default/files/mvlwb_engagement_guidelines_for_holders_of_lups_and_wls_-_october_2_19.pdf

www.screeningcommittee.ca/pdf/eisc_guidelines.pdf

Contact information for regional and community Indigenous Governments is also available at:

https://www.eia.gov.nt.ca/en/nwt-indigenous-government-directory

1.8.2 Spatial Information on Boreal Caribou Habitat and Distribution

GNWT-ENR has developed predictive maps of seasonal and annual boreal caribou habitat selection which can assist developers in planning their activities to avoid or minimize disturbance with areas of preferred boreal caribou habitat.

The **Wildlife Management Information System (WMIS)** is the GNWT online, geo-referenced wildlife database. WMIS provides a central repository for government staff, proponents, researchers and public to store and access standardized wildlife observation data to support the conservation and management of wild species and their habitat in the NWT. Proponents of development projects can submit a request for boreal caribou observation data or predictive habitat selection maps within their area of interest or submit observations of boreal caribou to WMIS.
www.enr.gov.nt.ca/en/services/recherche-et-donnees/wildlife-management-information-system

The NWT Species and Habitat Viewer is an online mapping tool which contains a boreal caribou tab that allows proponents to view current spatial data related to boreal caribou in the NWT such as range boundaries, fire and human disturbance, and other layers related to development and resource tenure. It also has tools to allow proponents to calculate the disturbance footprint within a user-defined area of interest, or to upload spatial data for the

footprint of a proposed development and calculate the amount of new buffered disturbance that the project would contribute at regional and range-wide scales.

https://www.maps.geomatics.gov.nt.ca/Html5Viewer/index.html?viewer=NWT_SHV

The **NWT Cumulative Impact Monitoring Program** (CIMP) maintains a spatial database of development projects based on land use permits and water licence permit registry data from the LWBs. The **NWT Inventory of Landscape Change Webviewer** allows users to explore spatial data related to human and natural disturbance. It can be used as a tool by proponents to identify active or past projects that may overlap with their proposed development, identify opportunities to share access or re-use currently disturbed areas to minimize new habitat disturbance, or assist in assessing potential cumulative effects of a project in combination with other active or past projects.
www.enr.gov.nt.ca/en/services/cumulative-impact-monitoring-program-nwt-cimp/inventory-landscape-change-webviewer

The GNWT maintains a **map showing the density of known mineral licks** in the NWT and this map is available at www.enr.gov.nt.ca/sites/enr/files/map-sf-minerallicks-pas-areas.pdf. Proponents requiring more detailed information on mineral licks may contact ENR's Wildlife Division.

Boreal caribou range plans, once developed, will contain maps of important areas for boreal caribou based on both western science and traditional and local knowledge.

1.8.3 Background Information on Boreal Caribou

To learn more about boreal caribou planning initiatives and regional boreal caribou monitoring programs, visit **ENR's boreal caribou website**:
www.enr.gov.nt.ca/en/services/boreal-caribou

To learn more about the general biology, status, listing, recovery planning and implementation of recovery plans for boreal caribou in the NWT, visit the **NWT Species at Risk website**:
www.nwtspeciesatrisk.ca/species/boreal-caribou

1.8.4 Reclamation Information

The NWT Boreal Caribou Guidelines describe some caribou specific reclamation guidelines under the "Restore" mitigation sections (i.e., Sections 2.1.2.3, 2.1.4.3, 2.2.1.3, 2.3.2.3, and 2.4.1. 3). Additional closure and reclamation mitigation measures are described in the NWT Northern Land Use Guidelines series (Appendix D).

Although terms such as revegetation, reclamation and restoration are often used interchangeably when discussing habitat restoration, they are not equivalent and instead represent a spectrum of ecological outcomes following disturbance. On one end, re-vegetation may focus simply on the establishment of plant cover in a disturbed area, while on the other end of the spectrum, restoration aims to eventually return a site to its pre-disturbance ecological trajectory (i.e., vegetation structure and composition). Reclamation is usually used to mean the return of the land to a useful (yet productive) purpose (MVLWB/AANDC 2013), but not necessarily to a return to pre-disturbance habitat conditions. Whenever possible, full restoration following disturbance should be the goal; however, depending on site conditions and project timelines, only reclamation may be feasible.

To date, most development project closure efforts undertaken in the NWT have been focused on reclamation and there are currently no measurable ecological restoration criteria that have been established for boreal caribou in the NWT. Based on the current limited experience implementing habitat restoration in the NWT and the absence of restoration criteria and policy, the guidelines in this document focus primarily on reclamation of disturbed areas rather than full restoration. As regional restoration criteria and policy are defined, the guidelines will be updated to clarify restoration requirements and best practices. Refer to A Framework for Boreal Caribou Range Planning (GNWT 2019) for additional information.

Proponents should review reclamation practices that can facilitate and accelerate natural regeneration such as site preparation treatments to make compacted soil rough and loose, mounding to create higher/drier microsites, and scattering of coarse woody debris in sufficient volumes. The short-term goal for reclamation of linear disturbances in boreal caribou habitat should be to reduce sight lines and make them less easily traveled by people and predators. The long-term goal for reclamation of linear and polygonal disturbances should be re-establishment of vegetation that provides protective cover and forage for boreal caribou similar to pre-disturbance conditions. Appendix C provides a list of resource documents from the NWT and other jurisdictions that describe specific practices that may be suitable for reclaiming boreal caribou habitat.

2 GUIDELINES

The guidelines listed in the following sections are intended to address boreal caribou habitat protection objectives and concerns. Proponents will be responsible for all activities associated with their projects, including implementation and management of the NWT

Boreal Caribou Guidelines. Ultimately, the acceptability of individual project mitigation measures will be reviewed on a project-by-project basis.

Proponents should train project personnel in the expectations and procedures related to all guidelines presented in the NWT Boreal Caribou Guidelines. Proponents should consult a qualified wildlife biologist and/or local/traditional knowledge holders when needed (e.g., to confirm identified important boreal caribou habitat features such as calving areas or when unanticipated impacts result from project-related activities and adaptive management measures are required).

Proponents conducting any type of development activity are encouraged to implement the guidelines for all industrial sectors presented in Section 2.1 that are pertinent to their work activities. Additionally, proponents conducting sector specific activities are encouraged to implement the applicable sector specific guidelines presented in Sections 2.2 to 2.4 in addition to the guidelines for all industrial sectors (Section 2.1). The guidelines in Sections 2.1-2.4 are further organized into sub-sections according to the mitigation hierarchy of "**Avoid**", "**Minimize**", or "**Restore**".

These guidelines are intended to be implemented by proponents to the greatest extent feasible. It is recognized that it may not be possible for proponents to fully implement the guidelines exactly as written in all situations. Where the specific circumstances of a project require deviation from the guidelines, proponents are expected to explain why and to propose alternate mitigation measures that would achieve a similar outcome.

The guidelines in the following sections were adapted from a comprehensive list of existing guidelines, best management practices, standards, and requirements related to mitigation of project-related effects on boreal caribou and their habitat from different jurisdictions across Canada. The methods used to create the list of guidelines presented in the NWT Boreal Caribou Guidelines are further described in Appendix A and the list of documents reviewed can be found in Appendix B.

Proponents are also encouraged to consult the NWT Northern Land Use Guidelines series listed in Appendix D for additional mitigation measures that may be of benefit to wildlife and wildlife habitat more broadly.

The objective of the NWT Boreal Caribou Guidelines is to assist proponents when designing mitigation measures to:

- Minimize habitat degradation and fragmentation resulting from exploration and development activities to maintain the function and connectivity of caribou habitat (e.g., calving/post-calving areas, late winter use areas);

- Minimize the footprint (i.e., habitat loss) of a development activity, including its overall contribution to cumulative disturbance;
- Minimize the density of linear features associated with exploration and development activities to avoid potential increases in predator efficiency (i.e., distribution, ease of travel);
- Minimize sensory disturbance associated with exploration and development activities; and
- Avoid and minimize activities associated with the project that increase the risk of caribou mortality (e.g., hunting, vehicle collisions).

Appendix E summarizes which potential impacts to caribou and their habitat are mitigated by each of the guidelines listed in the sections below. The listed guidelines may also assist with collaborations among and between sectors in managing effects related to cumulative disturbances within boreal caribou habitat.

2.1 All Development Sectors

2.1.1 Risk Timing Windows

Risk timing windows are intended to help proponents plan the timing of their activities to avoid or reduce sensory disturbance to boreal caribou during more sensitive periods. The risk timing windows apply in areas or habitat types that are most selected by caribou during those periods.

In the NWT, the calving, post-calving, and late winter activity periods are considered to be the highest risk activity periods for boreal caribou. Development activities in boreal caribou habitat should be avoided during these highest risk periods (Table 1).

Table 1. Risk timing window for activities.

Activity Period	Southern NWT (Dehcho / South Slave / North Slave)	Northern NWT (Sahtú / Gwich'in / Inuvialuit)	Risk Category	Caribou Ecology / Rationale
Early Winter	1 Dec - 25 Jan	26 Oct - 12 Jan	Lowest	Boreal caribou are beginning to shift towards greater use of older forest/wetland habitats, but still have relatively high daily movement rates.
Mid Winter	26 Jan - 15 Mar	13 Jan - 21 Mar	Medium	Movement rates are decreasing and habitat use focused mostly in conifer forests/wetlands that haven't burned in >40 yrs.

Activity Period	Southern NWT (Dehcho / South Slave / North Slave)	Northern NWT (Sahtú / Gwich'in / Inuvialuit)	Risk Category	Caribou Ecology / Rationale
Late Winter	16 Mar - 1 Apr	22 Mar - 5 Apr	**Highest**	Lowest daily movement rates; caribou in largest groups at this time of year; narrow range of habitat types selected; increased energetic costs of moving through deep snow.
Dispersal	2 Apr - 30 Apr	6 Apr – 30 Apr	Medium	Females spread out to find suitable calving sites; vulnerability during late gestation, period of higher adult female mortality; wider range of habitat types used during dispersal.
Calving / Post-calving	1 May - 30 Jun	1 May - 12 Jul	**Highest**	Calves most susceptible to mortality during this period.
Summer	1 Jul - 12 Sept	13 Jul - 8 Sept	Medium	Period of higher susceptibility to mortality for adult females; critical period for females to regain body condition; wider range of habitat types used during summer than winter.
Rut	13 Sept - 4 Oct	9Sept – 10 Oct	Medium	Disturbance during peak rut could result in lower pregnancy rates. More individuals susceptible to disturbance since they are in larger groups at this time of year.
Late Fall	5 Oct – 30 Nov	11 Oct - 25 Oct	Lowest	Boreal caribou are still using a wide variety of habitat types at this time of year; relatively high daily movement rates.

Note: Based on seasonal date ranges defined by Nagy (Nagy 2011) and presented in the NWT Species Status Report for Boreal Caribou (*Rangifer tarandus caribou*) in the Northwest Territories (Species at Risk Committee 2012), which were based on changes in movement rates from collared female caribou. These date ranges were further refined as part of an NWT boreal caribou resource selection function modeling project that includes more recent collar data collected over a broader area of the range (DeMars et al. 2020).

2.1.2 Habitat Disturbance and Hazards to Caribou

2.1.2.1 To avoid new disturbance to caribou habitat and risk of caribou injury or mortality from physical hazards, the following mitigation measures should be considered:

1. Use previously disturbed areas and existing access and avoid constructing new permanent roads and trails within caribou range.
2. Employ alternate means of development to avoid and minimize surface disturbance.
3. Avoid locating new infrastructure within large patches (i.e., >100 km^2) of mature forest to assist in limiting habitat fragmentation and/or causing a possible disruption in habitat connectivity.

4. Avoid placing debris/slash piles on terrestrial lichen resources within boreal caribou habitat.
5. Locate and use new sources of granular materials near the development as much as possible, or, consider using existing borrow sources that are more distant if this results in less habitat disturbance. This should avoid the need to create additional linear features to access distant sources of granular materials. Proponents will have to assess which options will result in the lowest amount of new habitat disturbance.
6. Avoid using sites that support abundant terrestrial lichen resources as sources of granular material for building roads or for any other purpose within important caribou habitat.
7. Fence open excavations (e.g., trenches, pits, sumps) for as long as they pose a hazard or backfill/contour them to a stable angle of repose to prevent caribou entrapment or injury.
8. Contain and fence potential sources of industrial contamination (e.g., sumps, settling ponds) to prevent caribou from accessing and ingesting hazardous material.
9. Fencing should be designed to prevent entanglement of caribou antlers. Temporary fencing should use a material similar to that used in snow fences, and be at least 1.8 m high. For longer-term exclosure fencing, see Huisjer et al. 2015 for guidance on fencing specifications. Fenced areas should be regularly monitored to ensure caribou are not gaining access to the fenced area or becoming entrapped inside it.
10. Report to ENR any mineral lick observed during any type of development activity. Record the location and implement a 250 m no-activity buffer around the mineral lick and well-defined wildlife trails connecting to the mineral lick.
11. Avoid known mineral licks during spring (April to June). Proponents should contact the local ENR office to determine if mineral licks are present in their project area.
12. Avoid disruptions to drainage and groundwater flows that could affect the size and quality of mineral licks.

2.1.2.2 To minimize the extent and duration of new disturbance to caribou habitat, the following mitigation measures should be considered:

13. Construct permanent camps within 100 m of arterial all-weather permanent access roads.
14. Minimize disturbance within important boreal caribou habitat by concentrating disturbances spatially and temporally.
15. Minimize the number and size of new clearings for infrastructure by using shared/common sites and incorporating existing footprint into project plans.

16. Remotely operate relevant infrastructure to the greatest extent possible.
17. Use alternative access means such as lower class access (refer to road classifications in NLUG for roads and trails) or helicopter support for maintenance activities of infrastructure.
18. Locate activities that have the potential to disturb important boreal caribou habitat as close as possible to existing or proposed anthropogenic features.
19. Project footprints should only be as large as necessary to conduct activities safely.
20. Demonstrate that the timeframe needed to carry out scheduled activities is minimized.
21. Manage activities to occur in area-based clusters to reduce the timeframe of vegetation clearing and other disturbances.
22. Minimize activities that disturb the ground surface to reduce the amount of topsoil that is moved, unless there is a specific silvicultural or reclamation prescription for the site that recommends ground disturbance to facilitate regeneration.
23. Minimize impacts to terrestrial lichen resources by avoiding disturbance of duff layer and vegetative root mat.
24. Minimize impacts to terrestrial lichen resources within important boreal caribou habitat by conducting activities during winter with an adequate snowpack.
25. Maintain known and potential mineral licks and associated wildlife trails to maximise caribou access to them during the snow-free season.
26. For existing activities within 500 m of mineral licks, minimize site use and sensory disturbance during the snow-free season.
27. If working within 500 m of a mineral lick cannot be avoided:

    a. maintain visual screening (i.e., vegetative cover) to provide security and escape cover around mineral lick sites and associated trails;
    b. implement a minimum 250 m operational setback with connectivity to adjacent forested areas being maintained; and
    c. if development cannot be located outside of the operational setback, contact ENR for further guidance.

2.1.2.3 To restore caribou habitat disturbed by development activities, the following mitigation measures should be considered:

28. Undertake progressive reclamation activities throughout the life of the project. An early and progressive approach to reclamation should facilitate habitat suitability returning to pre-disturbance conditions and reduce the duration of habitat disturbance.

29. Use reclamation prescriptions within important boreal caribou habitat to encourage rapid re-establishment of caribou habitat to a functional level similar to pre-development (this will require baseline documentation of pre-disturbance habitat suitability). Examples include site preparation treatments to make compacted soil rough and loose, mounding to create higher/drier microsites, or scattering of coarse woody debris in sufficient volumes.
30. Artificial seeding should be done using seed mixes of plant species native to the NWT so as not to introduce non-native or invasive species.
31. Refer to Section 1.8.4 and Appendix C for additional reclamation information.

2.1.3 Sensory Disturbances

2.1.3.1 To avoid impacts to caribou resulting from sensory disturbances, the following mitigation measures should be considered:

32. Schedule project activities that have the potential to cause sensory disturbance to occur outside of the highest risk timing windows for boreal caribou (see Table 1).
33. Implement a project-specific program to monitor boreal caribou sightings within 500 m of construction, operations, closure or any other project activities. It is recognized that the ability to detect caribou within 500 m of project activities may be limited when operating within densely forested habitat.
34. If caribou are observed within 500 m prior to starting up activities that could lead to sensory disturbance or startling of caribou, delay starting up until the caribou have moved at least 500 m away from the site of project activities. If caribou approach active project activities within 500 m, monitor and document their behaviour, and suspend activities if there is an imminent threat of injury or mortality to the caribou.

2.1.3.2 To minimize impacts to caribou resulting from sensory disturbances, the following mitigation measures should be considered:

35. Minimize sensory disturbance within and directly adjacent to important boreal caribou habitat at all times, but especially during the medium and highest risk timing windows as defined in Table 1.
36. Minimize idling of equipment and vehicles to the extent practicable.
37. Do not approach boreal caribou closer than 250 m if they are encountered when traveling by snowmobile.
38. Implement a no harassing, feeding, approaching or hunting wildlife policy (including but not limited to boreal caribou).

2.1.4 Linear Feature Disturbances

It is recommended that proponents develop traffic and access management plans applicable to all development stages (i.e., project planning, construction, operations, closure and reclamation) to assist with avoiding and minimizing project effects on boreal caribou and their habitat. It is important for proponents to plan and consider sharing access to areas to avoid creating high densities of linear features in the future.

Proponents (for a new access trail or road) should consider the impact on boreal caribou populations from access into an area (e.g., program timing to avoid medium and highest risk timing windows; avoid the destruction or fragmentation of important caribou habitat).

Proponents should consider management actions that reduce or limit predator access associated with industrial activities. This can be achieved in part by:

- not providing access to new remote areas or areas within caribou habitat that were not previously accessible;
- not plowing or packing access into or within caribou habitat during winter except when necessary; and
- deactivating access that is no longer required through functional restoration techniques as soon as possible after use.

Proponents should also consider management actions that minimize line-of-sight distances along linear features, except where longer line-of-sight is required for safety on roads, and maintain visual screening. These management actions help to provide adequate visual and escape cover (i.e., wildlife blinds), and reduce predation risk by minimizing line-of-sight and ease of travel for predators and people.

To assist with reducing cumulative disturbances across the landscape, it is recommended that existing infrastructure (e.g., trails, roads) be used for personnel and equipment travel when conducting operations. Where the development of new access trails or roads and other linear features cannot be practicably avoided, proponents should consider designing temporary structures instead of permanent structures, including winter roads.

Note: Not all of the guidelines in Section 2.1.4 may be applicable to public road networks (either existing or proposed) as they are relatively permanent features on the landscape.

2.1.4.1 To avoid impacts to caribou and caribou habitat resulting from the creation of linear features, the following mitigation measures should be considered:

39. Avoid constructing new linear features (e.g., roads, trails, pipeline rights-of-way, seismic lines) in important boreal caribou habitat.

40. Plan roads and design features of roads (e.g., pullouts, construction staging areas) so that they are not in conflict with important boreal caribou habitats or habitat features.
41. Avoid the establishment of road systems with "circle" or "loop" routes. In some instances, a "loop" route may be acceptable if it is a way of reducing traffic density or reduces the length of linear disturbance.
42. Deactivate access within or to important boreal caribou habitat as soon as operations are complete (as described in Section 2.1.4.3).
43. Build temporary winter access over lakes instead of land.

2.1.4.2 To minimize impacts to caribou and caribou habitat resulting from the creation of linear features, the following mitigation measures should be considered:

44. Plan and implement work so that disturbances furthest from all-weather access roads are completed in early winter.
45. Coordinate unavoidable access into important areas of boreal caribou habitat to minimize the duration and footprint.
46. Minimize duration of new access in and near important boreal caribou habitat.
47. Avoid creating barriers to caribou movement with construction activities. Where the top height of potential barriers (e.g., strung pipe, soil stockpiles, windrows, berms) exceeds 1.0 m in height for more than 72 hours in duration, it is recommended that physical breaks (10 m gaps) in pipe/material be employed every 300 m.
48. For project-related traffic, use convoys to create predictable gaps in traffic to minimize any barrier effects to caribou.
49. Enforce speed limits on project roads within boreal caribou habitat that ensure drivers have enough time to react in a safe manner if caribou are encountered on the road or trail.
50. Identify reduced speed limits and/or seasonal travel restrictions during the highest risk timing windows as defined in Table 1.
51. If caribou are observed on the road or trail, stop traffic as far back as safely possible. If after five minutes the caribou have not moved off the road, vehicles may proceed slowly and cautiously (<20 km/h).
52. Use busses to transport workers to and from work sites to reduce traffic volumes and vehicle collision risk to boreal caribou.
53. Place signs along roads to increase awareness of potential vehicle collisions with boreal caribou in areas where they are known or observed to frequently cross the road.
54. Limit the use of road chloride-based salts (NaCl, $CaCl_2$) in boreal caribou range to prevent attracting the animals and reduce potential for vehicle-caribou collisions.

55. Limit snow plowing of access and maintenance roads to only those required for current operations or maintenance and/or emergency access.
56. Minimize the height of snowbanks (less than 1 m in height).
57. Place snowbanks on alternate sides of an access route with 10 m gaps at 300 m intervals to provide breaks for wildlife egress.
58. Deactivate temporarily unused roads by leaving them in a condition to discourage motorized access and passage by predators (as described in Section 2.1.4.3).
59. Minimize the width of linear corridor right-of-ways to the narrowest width possible while still meeting requirements for safe operations. Practices that should help achieve this include, but are not limited to:

    a. combining and overlapping new linear corridors with existing rights-of-way (e.g., access, utility corridors, and pipelines) to the greatest extent possible;
    b. incorporating pullouts for access;
    c. making minor incremental increases along existing linear corridors (slowly increase the width of an existing corridor instead of creating a new one parallel to it);
    d. using variable widths along access and/or pipeline rights-of-way; and
    e. sharing workspaces (e.g., sharing road access, using the same right-of-way clearing for a transmission line and pipeline corridor).

60. Provide adequate visual screening along easements, right-of-ways, and decommissioned roads that can accommodate obstructions. Minimize line-of-sight along linear features (<200 m). Practices that should help achieve this include, but are not limited to:

    a. line blocking using woody debris, rollback, tree bending, planting, and/or transplanting seedlings (including mounding on wet sites);
    b. constructing doglegs at access intersections (i.e., sharp bends along road/trail segments as they approach intersections to minimize line-of-sight);
    c. leaving shrub or tree bands along the linear corridor; and
    d. minimizing root mat and duff disturbance to expedite site re-vegetation.

2.1.4.3 To restore impacts to caribou habitat resulting from creation of linear features, the following mitigation measures should be considered:

61. Fully deactivate and reclaim trails and roads once use is no longer required through combined use of physical control measures including, but not limited to:

a. removal of creek crossings, bridges, and culverts;
b. re-contouring to surrounding topography;
c. de-compacting of soil;
d. rollback of slash and stockpiled soil/organic matter;
e. restoring vegetation to the pre-development state and species mix by replanting trees and restoring terrestrial lichen resources if appropriate or allowing natural regeneration to occur;
f. if natural regeneration is not possible, consider environmental bioengineering at strategic locations along the linear corridor using appropriate vegetation species;
g. creating barriers at junctions with active trails and roads; and
h. minimizing compaction and encouraging regeneration by preventing ongoing use of inactive trails and roads.

62. Use signage, gates, or other barriers and consider the removal of bridges and culverts to discourage the use of deactivated or temporarily unused roads by residents.
63. Refer to Section 1.8.4 and Appendix C for additional reclamation information.

2.1.5 Aircraft Disturbances[6]

2.1.5.1 To avoid impacts to caribou resulting from disturbance by fixed-wing aircraft or helicopter, the following mitigation measures should be considered:

64. Do not fly below 300 m (1,000 feet) when over important boreal caribou habitat.[7]
65. Avoid flying over, or alter your flight path to avoid, important boreal caribou habitats, especially during the highest risk timing windows as defined in Table 1.
66. Do not take-off or land in important boreal caribou habitats during the highest risk timing windows (see Table 1).
67. Do not directly fly towards boreal caribou with young or towards important caribou habitat features (e.g., mineral licks, calving areas).
68. If/when boreal caribou are spotted from the air, do not fly towards, follow, chase, harass, hover over, or circle them.

[6] Some of the mitigation measures listed in this section may be applicable to the use of drones or unmanned aerial vehicles; however, with respect to flight altitudes, current regulations require that drones be flown below an altitude of 122 m (400 ft) and within line-of-sight (https://tc.canada.ca/en/aviation/drone-safety/flying-your-drone-safelylegally). Drone operators are also required to comply with the *Wildlife Act* and regulations which prohibits disturbance or harassment of wildlife, and requires a Wildlife Research Permit or Wildlife Observation Permit from GNWT-ENR if drones are to be used for the purpose of wildlife research, monitoring, or viewing wildlife.

[7] There may be specific circumstances which require flying at lower altitudes, or at times of year which are a higher risk for caribou, either for safety reasons, or to achieve the specific objective of the aerial survey. For example, this could include inspections along a pipeline right of way or operational access. It is up to the Proponent to justify why the specific circumstances of the project necessitate a deviation from the guidelines.

69. Ascend to a higher flight path or veer away if you observe running, panic, or other startle responses in caribou below.
70. Refer to the GNWT "Flying Low? Think again…." brochure for further details: https://www.enr.gov.nt.ca/sites/enr/files/128-flying_low_brochure_proof.pdf

2.1.5.2 To minimize impacts to caribou resulting from disturbance by fixed-wing aircraft or helicopter, the following mitigation measures should be considered:

71. Schedule flights during the lowest risk periods for boreal caribou (as defined in Table 1), and maintain over-flight altitudes >300 m (1000 ft) unless a lower altitude is specifically required to meet the objectives of the survey.
72. Contact the regional ENR office for information if low-level flights are necessary during the calving period. During the calving period, caribou go into hiding to have their calves. Low flying is especially harmful, stressing the female, which can cause separation from calves and lead to calf mortality.
73. Observe wildlife from a safe distance to minimize disturbing and stressing boreal caribou. If the animal changes its behaviour, you are too close. Limit your time in the area and avoid surprising (e.g., sneaking up on) wildlife.
74. Use natural open areas or existing clearings, where available, for helipads. Clearing of new helipads must not exceed 35 m in diameter, or as required for safe operation.

2.2 Additional Guidelines for Oil and Gas Exploration and Production

2.2.1.1 To avoid impacts to caribou and caribou habitat resulting from oil and gas exploration and production activities, the following mitigation measures should be considered:

75. Avoid seismic operations during the highest risk timing window for boreal caribou as defined in Table 1.
76. Demonstrate in applications for new seismic exploration that reprocessing existing seismic data cannot be used in place of field operations.

2.2.1.2 To minimize impacts to caribou and caribou habitat resulting from oil and gas exploration and production activities, the following mitigation measures should be considered:

77. Use low-impact seismic lines rather than conventional seismic lines in boreal caribou range, and especially within important boreal caribou habitat.
78. Where existing disturbances occur (i.e., clearings and 4 m or less in width cleared lines with vegetation <1 m in height and within 400 m of proposed seismic program line), avoid creating new seismic lines >5 m wide and reuse existing lines.

79. Where existing disturbances are not available, new seismic lines should strive to meet the following guidelines:

    a. Receiver lines should be meandering, under-canopy, hand-cut and should not exceed 1 m in width. Tree avoidance techniques should be followed (i.e., no trees with a diameter at breast height >20 cm to be removed). Receiver lines should be spaced at least 200 m apart unless the receiver lines have zero new cut (i.e., lines should not require any clearing), in which case no spacing restrictions apply;
    b. Source lines should be meandering and should not exceed 3 m in width. Tree avoidance techniques should be followed to limit line-of-sight to <50 m. Source lines should be spaced at least 200 m apart unless the source lines have zero new cut (i.e., lines should not require any clearing), in which case no spacing restrictions apply; and
    c. Doglegs (i.e., sharp bends along road/trail segments as they approach intersections) should be employed at all intersections with other linear features to minimize line-of-sight.

80. Heli-portable seismic programs must have shot hole drop zones <7 m in diameter.

81. If brush is disposed of in windrow piles, the height of the piles should not exceed 1 m (snow free), with a minimum 10 m gap every 300 m and at any identified game or trapping trails.

82. Pipelines should use existing linear corridors and proponents may revegetate (as directed by relevant regulatory agencies) on top of active underground pipelines to maintain a minimum level of forest cover that would be acceptable for caribou following construction, ensuring that any residual linear corridor is <4 m wide. If human or predator access is still possible (insufficient vegetation height and density), access should also be effectively managed on the pipeline corridor using methods such as berms, woody debris, or another suitable strategy as determined by the GNWT, relevant regulators and the proponent.

2.2.1.3 To restore impacts to caribou habitat resulting from oil and gas exploration and production activities, the following mitigation measures should be considered:

83. Refer to the guidelines listed in Sections 2.1.2 and 2.1.4, and the additional resources listed in and Appendix C or any other practices that can assist in the reclamation of caribou habitat.

2.3 Additional Guidelines for Forestry

2.3.1 Forest Management Planning

The objective for planning boreal caribou landscapes is to maintain a continuous supply of suitable, mature, year-round habitat distributed both geographically and temporally across the landscape in such a manner as to maintain permanent range occupancy. When planning forestry activities, the following practices should be considered:

84. Use natural forest pattern harvesting methods to emulate landscape patterns created by natural disturbances, both in distribution and scale, and reduce road network requirements.
85. Maintain the connection between summer and winter habitat by placing cut blocks and access roads to maintain spatial connectivity between large habitat patches (i.e., >100 km^2).
86. Avoid short to medium term (10 year) sequencing of major harvesting operations in portions of caribou range that currently receive high levels of caribou use. Subsequent harvest sequencing should consider the maintenance of caribou habitat.
87. Select harvest rotation and stand age distribution that maintain old forest stands that mimic natural range of variation.
88. Plan site regeneration to the pre-development forest stand composition and avoid converting conifer dominated stands to deciduous or mixedwood stands.

2.3.2 Forest Harvesting/Silviculture

2.3.2.1 To avoid impacts to caribou and caribou habitat resulting from forest harvesting/silviculture activities, the following mitigation measures should be considered:

89. Avoid building access roads in areas of abundant terrestrial lichen resources.
90. Favour construction of temporary winter roads for logging.
91. Complete harvesting activities prior to the caribou calving season (see Table 1) and concentrate harvesting activities in the early- to mid-winter periods to reduce activity during the high-risk late winter period. Where planned timber harvest blocks overlap with preferred late winter habitat, schedule those blocks for harvest during early- to mid-winter rather than late winter.
92. If a calving area is close to a winter harvest sequence, those areas should be prioritized for earlier harvest.

2.3.2.2 To minimize impacts to caribou and caribou habitat resulting from forest harvesting/silviculture activities, the following mitigation measures should be considered:

93. Demonstrate that the area required for operations has been minimized (e.g., through providing detailed maps of all project components and activities).
94. Avoid the creation of a persistent footprint. Use minimal disturbance techniques, such as accessing harvest areas on frozen ground and preventing topsoil removal during operations, unless otherwise specified by a silvicultural prescription that recommends ground disturbance to promote natural regeneration. Minimizing ground disturbance during harvest and site preparation should promote lichen persistence after logging.
95. Limit impacts on large patches of terrestrial lichen resources by winter logging.
96. Implement a project specific program to monitor boreal caribou sightings within 500 m of forest harvesting and silviculture activities or any other forestry activities.
97. If boreal caribou are observed within 500 m of a harvest block or access construction activities or any silviculture activity that could lead to sensory disturbance or startling of caribou, delay starting up until the caribou have moved at least 500 m away from the site of forestry activities. If caribou approach active forestry activities within 500 m, monitor and document their behaviour, and suspend activities if there is an imminent threat of injury or mortality to caribou.

2.3.2.3 To restore impacts to caribou habitat resulting from forest harvesting/silviculture activities, the following mitigation measures should be considered:

98. Refer to the guidelines listed in Sections 2.1.2 and 2.1.4, and the additional resources listed in and Appendix C or any other practices that can assist in the reclamation of caribou habitat.

2.4 Additional Guidelines for Mineral Exploration and Mining

2.4.1.1 To avoid impacts to caribou and caribou habitat resulting from mineral exploration and mining activities, the following mitigation measures should be considered:

99. There are no additional avoidance guidelines to include for mineral exploration and mining. Refer to the avoidance guidelines for all development sectors (Section 2.1).

2.4.1.2 To minimize impacts to caribou and caribou habitat resulting from mineral exploration and mining activities, the following mitigation measures should be considered:

100. Establish cut lines using hand tools only (e.g., machete, fern hook, axe, chainsaw).
101. Flag and peg lines <1.5 m wide whenever possible.
102. Stagger base lines and leave vegetation breaks to limit predator travel and search efficiency.
103. For airborne geophysical surveys, if not possible to avoid important caribou habitat, maintain higher flight altitudes during the medium and highest risk timing windows (see Table 1) and if caribou are startled ascend to a higher flight path or veer away from the animals.
104. For ground geophysical surveys requiring a generator, maintain survey wires close to the ground to avoid caribou from becoming entangled; remove wires as soon as possible after the survey is completed.
105. Demonstrate how frequency of activity and noise from drilling rigs and drilling equipment will be minimized. At pump set-up sites, minimize the number of trails to the shoreline and set-up areas (i.e., use the same pump set-up as much as possible).
106. For manual and mechanical stripping, leave large trees standing (i.e., no trees with a diameter at breast height >20 cm to be removed). All stripped overburden stockpiled on site should be backfilled and contoured to a stable angle of repose.
107. Construct trenches to allow for easy escape of caribou. Fence excavations until they are backfilled (see Section 2.1.2 for further guidance on fencing design). Backfill and/or contour pits and trenches to a stable angle of repose.
108. Install fencing of an appropriate height (minimum 1.8 m) around potential hazards (e.g., infrastructure, footprint, settling ponds, tailings ponds, open pits, mine shafts) during and after construction to prevent caribou injury or entrapment.

2.4.1.3 To restore impacts to caribou habitat resulting from mineral exploration and mining activities, the following mitigation measures should be considered:

109. Refer to the guidelines listed in Sections 2.1.2 and 2.1.4, and the additional resources listed in and Appendix C or any other practices that can assist in the reclamation of caribou habitat.

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APPENDIX A. GUIDELINE METHODOLOGY

The guidelines presented in the NWT Boreal Caribou Guidelines were derived from a comprehensive list of guidelines, best practices, standards, and requirements related to mitigation of project-related effects on boreal caribou and their habitat from different jurisdictions across Canada. The original guidelines list was compiled from internet searches and background information documents provided by the GNWT. The focus was on documents relating specifically to boreal caribou and existing exploration and development guidelines within boreal caribou habitat. Other documents selected were general wildlife guidelines and general exploration and development guidelines. The literature review comprised many document types, including recent scientific literature, range plans, management plans, and species and population updates. Once the documents were compiled, they were separated by jurisdiction, including NWT, Yukon, British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, Newfoundland and Labrador, Federal, and Multi-jurisdictional (Documents reviewed are listed in Appendix B).

A Microsoft Excel database was created to track all the reviewed documents, including the type of mitigation measures discussed and the guidelines found in each applicable document. The database was created to query the collected information by jurisdiction, development sector, and mitigation hierarchy (avoid, minimize, restore). The reference documents were searched for topics or habitat values that could be measured and related to mitigation measures that could avoid, minimize, or restore potential effects to boreal caribou and their habitat. The selection of topics and habitat values was based on those previously described in existing environmental assessment reports and caribou mitigation plans.

Once the literature review was completed, a first iteration draft list of guidelines was created in a Microsoft Excel database. This list was composed of guidelines from all jurisdictions and contained some duplications with slight wording differences. The list of draft guidelines was grouped within the following industrial sector headings:

- General Guidelines;
- Mineral Exploration and Mining;
- Oil and Gas; and
- Forestry.

The general guidelines were subdivided into the following subject headings:

- caribou habitat;
- habitat disturbances;
- timing windows / sensitive periods;
- sensory disturbance;
- linear features;

- transportation (access management, roads and trails);
- camps;
- aircraft/helicopter;
- monitoring wildlife sightings and staff training;
- mortality/predation;
- mineral licks;
- habitat offsets; and
- restoration and reclamation.

The draft list was composed of approximately 388 guidelines from 123 documents. Step one was a coarse filter approach whereby GNWT staff reviewed the complete draft list of guidelines and indicated whether each guideline was applicable (yes, no, maybe) to NWT. The next step was to amalgamate the reviews completed by the GNWT staff. A second guideline iteration list was created based the GNWT staff reviews.

The guidelines that GNWT staff agreed were relevant were then incorporated into a second iteration of the guidelines list. The guidelines that had a 'maybe' or did not have 'yes' from all staff were flagged for further discussion. The guidelines that GNWT staff agreed were not applicable to NWT were removed from the list. The remaining 'maybe' guidelines and those that didn't have 'yes' consensus (mixture of 'yes' and 'no's) were discussed further with GNWT staff during a workshop in Yellowknife on July 31 and August 1, 2019. Based on discussions during this workshop, GNWT staff came to a consensus to either drop the guideline from further consideration or to incorporate the guideline into the second iteration list. Guidelines that were retained in the second iteration of the list were then incorporated into the NWT Boreal Caribou Guidelines by adapting, modifying and combining some of them to eliminate duplication, ensure consistent use of similar terms, and to reflect operating conditions in the NWT (e.g. preference for conducting operations during winter on frozen ground, lack of existing access roads in many areas).

APPENDIX B. GUIDELINES AND DOCUMENTS REVIEWED TO DEVELOP THE NWT BOREAL CARIBOU GUIDELINES

Table B-1. Summary of existing Guidelines and Documents from the NWT and other jurisdictions reviewed to develop the NWT boreal caribou guidelines.

Topic / Habitat Value	Summary of guidelines and recommendations reviewed	Reference Code	
Access management	General recommendations on ways to limit traffic on project roads. General recommendations for creating access management plans, using existing roads and trails, control/restrict public access and predators, deactivating roads not in use, avoiding permanent access through priority caribou habitat and reducing line-of-sight. General recommendations to limit/block public access and minimize disturbance caused by motorized vehicles. General recommendations for using existing access, creating and using temporary access roads, controlling public and predator access and decommissioning roads when no longer in use.	Nor1 Nor24 Nor26 Mul2 Mul3 Mul4 Yuk3 Yuk6 Bri1 Bri4 Bri10 Bri15	Alb1 Alb5 Alb10 Alb11 Alb12 Alb14 Alb17 Sas1 Sas4 Sas8 Man1 Man4 Ont2 Ont4 Ont5 Ont7 Lab2
Amount of permitted disturbance within specified area (ha)	General and specific guidelines for logging operations in areas disturbed by fire within certain time frames.	Que1	
General buffers/setback distances	Minimum distances for camp infrastructure, such as grey water sumps and fuel caches, from water bodies.	Nor1	

Topic / Habitat Value	Summary of guidelines and recommendations reviewed	Reference Code	
General disturbance	General recommendations to minimize new disturbance to land and vegetation, avoid species at risk, and effectively clear and dispose of brush to minimize fire risk and allow for movement of wildlife. General management actions to minimize new disturbance and use areas that were previously disturbed. General recommendations to select areas and project design that will have minimal impact on wildlife habitat, use natural landscape features to deter wildlife, monitor revegetated areas, and create the infrastructure that ensures safe wildlife passage. General recommendations/guidelines for minimizing disturbance, scheduling project activities, avoiding wildlife, minimizing the chances of entanglement of caribou by survey wires, minimizing noise and frequency of activities and the installation of fences, trenches and excavations to minimize entrapment of caribou and other wildlife. General recommendations on logging techniques, limiting impact on lichens, assessing cumulative effects, timber management planning, restricting development in core caribou habitat, scheduling operations to avoid key habitat features and minimizing new disturbance. General guidelines to manage wildfire disturbance and harvest levels. General recommendations for minimizing total and new disturbance, minimizing cumulative effects, constraining anthropogenic disturbance based on the level of natural disturbance and connectivity between core habitat areas, using existing infrastructure/seismic lines when possible, using multi-well pads and directional drilling when within caribou ranges, and avoiding/minimizing vegetation clearing. General guidelines and management actions to minimize total disturbance and new disturbance, use existing infrastructure/disturbed areas when possible, avoid specific sensitive habitats and be aware of other operations in the area. General recommendations for conducting remote operations, constructing seismic lines, minimizing surface disturbance and using minimum disturbance techniques. Specific guidelines for pipeline construction, wellsite size and well density. General recommendations to minimize noise and dust using methodologies such as berm construction and dust suppression. General recommendations for minimizing total and new disturbance, minimizing activities that result in caribou mortalities, using existing infrastructure, scheduling project activities and minimizing noise and frequency of activities.	Nor1 Nor19 Nor22 Nor24 Nor25 Fed1 Fed2 Mul2 Mul4 Mul5 Yuk3 Yuk6 Bri1 Bri3 Bri4 Bri6 Bri7 Bri9 Bri10 Bri11 Bri19	Alb1 Alb5 Alb10 Alb11 Alb12 Alb14 Sas1 Sas8 Man1 Man4 Ont1 Ont2 Ont4 Ont5 Ont7 Que1
General habitat	General recommendations for planning projects and activities around critical boreal caribou habitat. General recommendations for planning the protection of certain habitats, imitating natural disturbance process, timber harvest planning, conserving and regenerating terrestrial lichens, avoiding key habitat features and seasonal habitats, minimizing disturbance, maintaining habitat mosaics and maintaining habitat connectivity. General recommendations to develop range plans, monitor habitat, and manage anthropogenic and wildfire disturbance. Limit land disturbance to <10%. General recommendations for minimizing habitat fragmentation and barrier creation, managing fire suppression and forest harvesting, minimizing disturbance, creating forest harvest plans and protecting sensitive caribou habitats. General guideline to maintain live or dead trees along route that provide wildlife habitat where safe to do so. General guidelines to minimize habitat changes and fragmentation and to avoid seasonal ranges where possible.	Nor17 Nor19 Nor26 Mul2 Mul3 Mul4 Mul5 Yuk3 Bri1 Bri3 Bri4 Bri11 Alb5 Alb10 Alb11 Alb13	Sas1 Sas4 Sas8 Man1 Man2 Man3 Man4 Ont1 Ont2 Ont4 Ont5 Ont7 Que1 Que3 Lab3

Topic / Habitat Value	Summary of guidelines and recommendations reviewed	Reference Code	
General road	Environmental impacts should be minimized during road construction and operation. General recommendations for road signage and ensuring proper water movement around roads. General recommendations to avoid construction of roads in protected areas, use temporary or existing roads when possible and methods to reduce the potential for caribou-vehicle collisions. General recommendations for limiting road salt within caribou ranges, deactivating roads when no longer in use, using seasonal routes/roads, decreasing number of roads required, minimizing use of roads during sensitive periods of the year for caribou, designing roads across various habitat types and placing wildlife signs along roads.	Nor1 Yuk6 Bri1 Bri4 Bri10 Bri19 Alb1 Alb5 Alb11 Alb12	Sas4 Sas8 Man4 Ont1 Ont2 Ont4 Ont5 Ont7 Que1 Lab1
Habitat area (size of core habitat, size of undisturbed habitat)	Specific minimum patch and core habitat sizes. Percent of undisturbed habitat, with requirements for distance from human disturbance and time since fire disturbance. General and specific guidelines for minimum habitat size including protection blocks, stand ages for each protected block, required habitat features and minimum corridor sizes. Specific and general guidelines for buffer and core habitat size and composition.	Nor15 Nor17 Nor19 Mul2 Bri5 Alb10 Alb11	Sas1 Man1 Ont1 Ont8 Que1 Que3
Habitat restoration	General recommendations for progressive clean up throughout project operation, removal of all material brought on site at closure, restoration of natural contours and vegetation, and revegetation/seeding of site of native species. General guidelines/requirements to minimize new disturbance, restore disturbed areas and decommission infrastructure as soon as they are no longer in use, apply functional restoration methods to limit predator and human use, and use revegetation methods for more rapid restoration. General guidelines/requirements to minimize new disturbance, restore disturbed areas and decommission infrastructure as soon as they are no longer in use, apply functional restoration methods to limit predator and human use, and use revegetation methods for a more rapid restoration. General recommendations for site remediation including revegetation and topsoil restoration. General recommendations for revegetation, seed storage, avoidance of invasive species, the timing of restoration and minimization of soil compaction. Specific guidelines for tree planting densities. General recommendations for forest regeneration plans and the rapid restoration of conifer stands to remove/discourage other ungulate/prey species and promote boreal caribou habitat. General recommendations for implementing rapid re-establishment of coniferous forest and caribou habitat, limiting other ungulate species and predators from moving into early seral stage habitats, removing all project materials from site, seed and organic material storage and avoiding seeding/planting using non-native species. General recommendations for restoration techniques using soil mounds and woody debris, reducing site compaction to improve moisture availability, implementing revegetation techniques and decommissioning project infrastructure as soon as possible.	Nor1 Nor21 Nor22 Nor24 Nor25 Mul3 Mul10 Yuk6 Bri3 Bri4 Bri5 Bri10 Bri14 Bri15 Bri19 Bri21	Alb1 Alb10 Alb11 Alb15 Alb16 Alb17 Sas1 Man1 Man3 Man4 Ont2 Ont4 Ont5 Ont7 Que1
Line of sight thresholds	Specific guidelines for maximum line-of-sight, and general guidelines for vegetation height and right of way (ROW) design to reduce sight lines. Specific guidelines for light-of-sight management and general guidelines on techniques for line-of-sight management.	Yuk6 Bri7 Bri10 Bri19	Alb11 Sas1

Topic / Habitat Value	Summary of guidelines and recommendations reviewed	Reference Code	
Linear features	General management action to minimize the creation of new linear feature, use existing linear features and to minimize length and width. Specific guidelines for linear feature density and general guidelines for the planning (type, location, grouping) of linear features. General management actions to minimize the creation of new linear feature, use existing linear features, minimize length and width. Specific guidelines for width and pattern of seismic lines. General and specific guidelines regarding linear feature planning, density and width and the use of hand tools to cut lines. General recommendation to minimize road and trail density and avoid sensitive areas. General guidelines for minimizing linear feature density, using existing lines when possible and using low impact seismic lines near high-value caribou habitat. Specific guidelines for distances between linear features and linear feature width. Specific guidelines for linear feature width, distance between linear features and spacing of sight lines. General recommendation to minimize linear feature density.	Nor17 Nor21 Nor24 Yuk6 Bri4 Bri7 Bri10 Bri19	Alb5 Alb10 Alb11 Alb12 Sas4 Man1 Ont2 Ont4 Ont5 Ont7
Minimum flight altitudes	Specific minimum flight altitudes around wildlife for different types of flying and various times of year. Specific minimum flight altitudes around caribou and wildlife features (such as mineral licks), and general guidelines on flying behaviour. General guidelines to follow designated flight paths during sensitive periods to minimize disturbance.	Nor24 Fed1 Fed2 Mul5	Yuk3 Yuk6 Bri4 Bri9
No disturbance buffers/minimum setback distance	Specific buffer for overwintering areas, calving areas and mineral licks. Specific guidelines for minimum disturbance buffers around particular project activities and wildlife features (such as mineral licks) and wildlife trails. General recommendations for the location of buffers and availability for escape routes for wildlife. Specific guidelines for minimum distance buffers/setbacks for various features and work activities.	Bri4 Bri7 Bri10 Bri21	Alb5 Ont1 Que1
Snow/road bank	Specific and general guidelines for windrow height and spacing. General recommendation to decrease slope where possible. General guidelines for building windrows. Specific guideline for the spacing of windrows. General recommendations to allow for breaks in low windrows and ensure unobstructed access across the ROW. Specific guidelines for snow berm height and break frequency.	Nor22 Nor24 Nor25 Nor26 Mul4 Bri10 Bri19	Alb1 Alb10 Ont2 Ont4 Ont5 Ont7 Lab1
Speed restrictions	General recommendation to implement speed zones. General recommendations to post speed limits, establish and enforce road restrictions, posting appropriate signage and to travel in convoys. Specific guidelines for speed limits depending on road surface type.	Mul4 Yuk6	Bri4 Bri10 Bri19 Alb1
Staff training and education	General recommendation to provide training to staff regarding caribou. General recommendations to create stewardship and education programs and create wildlife monitoring programs/wildlife logbooks. General recommendation to develop and deliver educational sessions to all project staff.	Yuk6 Bri4 Bri9 Bri10 Bri19 Alb10	Man2 Ont2 Ont4 Ont5 Ont7 Lab3

Topic / Habitat Value	Summary of guidelines and recommendations reviewed	Reference Code	
Timing windows	Minimum avoidance distance of significant habitat during critical life-cycle periods (breeding and birthing). General window for completing winter project work. Recommendation to allow for additional time for annual variability and demobilization. Specific guidelines for minimum setback/shut down distances from caribou during sensitive times of the year. Specific guidelines for minimum avoidance distances for certain activities during sensitive times of the year. General recommendations for when to complete project operations to minimize environmental disturbance and disturbance to caribou during sensitive times of the year, the use of remote operation techniques and avoidance of work activities during sensitive periods for caribou. Specific sensitive windows for boreal caribou. General guidelines to minimize/avoid work around boreal caribou at particular times. General recommendations for timing of work to reduce environmental impacts and avoid sensitive caribou habitats. Specific guidelines for the timing of particular work activities.	Nor1 Nor17 Nor18 Nor24 Fed1 Fed2 Mul4 Mul5 Yuk3 Yuk6 Bri4 Bri6 Bri8 Bri10 Bri19	Alb5 Alb10 Alb11 Alb12 Alb14 Sas1 Sas4 Sas8 Man4 Ont2 Ont4 Ont5 Ont7 Lab1

Table B-2. Guidelines and Documents reviewed to develop the NWT boreal caribou guidelines

Jurisdiction	Reference Code	Title	Author	Year
Northwest Territories	Nor1	Northern Land Use Guidelines: Camp and Support Facilities	Government of the Northwest Territories	2015
Northwest Territories	Nor2	Forest Management Act	Government of the Northwest Territories	2014
Northwest Territories	Nor3	Commercial Timber Harvest Planning and Operations Standard Operating Procedures Manual	Government of the Northwest Territories, Environment and Natural Resources	2005
Northwest Territories	Nor9	Tłı̨cho̜ Wenek'e Tłı̨cho̜ Land Use Plan	Tłı̨chǫ Government	2013
Northwest Territories	Nor10	Activities Requiring a Land Use Permit for Land Outside the Boundaries of a Local Government	Mackenzie Valley Land and Water Board	Unknown
Northwest Territories	Nor21	A Framework for Boreal Caribou Range Planning - Discussion Document: Appendices	Government of the Northwest Territories	2018
Northwest Territories	Nor11	A Framework for Boreal Caribou Range Planning - Discussion Document	Government of the Northwest Territories	2018
Northwest Territories	Nor12	Species Status Report: Boreal Caribou (*Rangifer tarandus caribou*) in the Northwest Territories	Species at Risk Committee	2012
Northwest Territories	Nor13	Nan Geenjit Gwitr'it T'agwàa'in / Working for the Land: Gwichin Land Use Plan	Gwich'In Land Use Planning Board	2003
Northwest Territories	Nor14	Wildlife Management and Monitoring Plan (WMMP) Guidelines	Government of the Northwest Territories, Environment and Natural Resources	2018
Northwest Territories	Nor15	Landscape Projections on Boreal Caribou Habitat in NWT	Caslys Consulting	2016

Jurisdiction	Reference Code	Title	Author	Year
Northwest Territories	Nor16	Guide to the Land Use Permitting Process	Mackenzie Valley Land and Water Board; Gwich'in Land and Water Board; Sahtu Land and Water Board; Wek'èezhii Land and Water Board	2013
Northwest Territories	Nor17	Respect for the Land: The draft Dehcho Interim Land Use Plan	The Dehcho Land Use Planning Committee	2016
Northwest Territories	Nor6	Longevity and Mortality of Boreal Woodland Caribou (*Rangifer tarandus caribou*) of the Dehcho Region, Northwest Territories	Larter, N. C. and D. G. Allaire	2016
Northwest Territories	Nor7	Mackenzie Valley Land Use Regulations	Minister of Justice	2017
Northwest Territories	Nor8	MVLWB Working Group Four - Standard Land Use Permit Conditions Template -	Mackenzie Valley Land and Water Board	2016
Northwest Territories	Nor5	Guide to Completing Water Licence Applications to the Mackenzie Valley Land and Water Board	Mackenzie Valley Land and Water Board	2003
Northwest Territories	Nor4	Comments on the Proposed NWT Boreal Caribou Recovery Strategy	Hoefer, T.	2015
Northwest Territories	Nor24	Northern Land Use Guidelines: Northwest Territories Seismic Operations	Government of the Northwest Territories	2015
Northwest Territories	Nor23	Well Suspension and Abandonment Guidelines and Interpretation Notes	NWT Office of the Regulator of Oil and Gas Operations	2016
Northwest Territories	Nor25	Northern Land Use Guidelines: Pits and Quarries	Government of the Northwest Territories	2015
Northwest Territories	Nor26	Northern Land Use Guidelines: Access: Roads and Trails	Government of the Northwest Territories	2015
Northwest Territories	Nor20	*NWT Wildlife Act*	Department of Justice	2017
Northwest Territories	Nor19	Recovery Strategy for the Boreal Caribou (*Rangifer tarandus caribou*) in the Northwest Territories.	Conference of Management Authorities	2017
Northwest Territories	Nor18	Sahtu Land Use Plan	Sahtu Land Use Planning Board	2013
Northwest Territories	Nor22	Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories	Mackenzie Valley Land and Water Board; Aboriginal Affairs and Northern Development Canada	2013
Northwest Territories	Nor27	Flying Low? Think Again …	Government of the Northwest Territories, Environment and Natural Resources	Unknown
Federal	Fed8	Range Plan Guidance for Woodland Caribou, Boreal population.	Environment and Climate Change Canada	2016
Federal	Fed7	Scientific assessment to inform the identification of critical habitat for woodland caribou (*Rangifer tarandus caribou*), boreal population, in Canada.	Canadian Wildlife Service	2011
Federal	Fed6	Action Plan for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada — Federal Actions [Proposed]	Environment and Climate Change Canada	2017

Jurisdiction	Reference Code	Title	Author	Year
Federal	Fed5	Progress report on steps taken to protect critical habitat for the woodland caribou (*Rangifer tarandus caribou*), boreal population, in Canada.	Environment and Climate Change Canada	2018
Federal	Fed4	Report on the progress of recovery strategy implementation for the woodland caribou (*Rangifer tarandus caribou*), boreal population, in Canada for the period 2012–2017.	Environment and Climate Change Canada	2017
Federal	Fed3	Recovery strategy for the Woodland Caribou (*Rangifer tarandus caribou*), boreal population, in Canada.	Environment Canada	2012
Federal	Fed2	Flying in and Around National Parks and National Historic Sites in Canada's Western Arctic	Parks Canada	2018
Federal	Fed1	Wildlife Flight Guidelines: Jasper National Park	Parks Canada	Unknown
Multi-jurisdictional	Mul9	Considerations in Developing Oil and Gas Industry Best Practices in the North	AECOM	2009
Multi-jurisdictional	Mul8	Defining Habitat Restoration for Boreal Caribou in the Context of National Recovery: A Discussion Paper	Ray, J. C.	2014
Multi-jurisdictional	Mul7	Role of Functional Restoration in Woodland Caribou Recovery	Wilson, S. F.	2015
Multi-jurisdictional	Mul4	Woodland Caribou Recovery: Audit of operating practices and mitigation measures employed within woodland caribou ranges	Forest Products Association of Canada	2013
Multi-jurisdictional	Mul1	Understanding Disturbance Thresholds and Opportunities to Achieve Better Outcomes for Boreal Caribou in Canada: A Primer	Canadian Boreal Forest Agreement	2015
Multi-jurisdictional	Mul2	Proposed Indicators to Address Species at Risk, Including Woodland Caribou, in Canada's Forest Management Standard	Wedeles, C., J. Ray, E. Dzus, C. Korol, and S. Morel	2014
Multi-jurisdictional	Mul10	Seismic lines in the boreal and arctic ecosystems of North America: environmental impacts, challenges, and opportunities	Dabros, A., M. Pyper, and C. Gillermo	2018
Multi-jurisdictional	Mul3	A Methodological Framework for Caribou Action Planning in Support of the Canadian Boreal Forest Agreement: Iteration 2	Antoniuk, T. E. Dzus, and J. Nishi	2015
Multi-jurisdictional	Mul5	Environmental Impact Review Guidelines	Environmental Impact Review Board	2011
Multi-jurisdictional	Mul6	Environmental Impact Screening Guidelines	Environmental Impact Screening Committee	2014
Multi-jurisdictional	Mul11	Wildlife Accident Reporting: A fundamental element in BC's mitigation efforts	Sielecki, L. E.	2003
Multi-jurisdictional	Mul12	The FSC National Forest Stewardship Standard of Canada	Forest Stewardship Council	2018
Yukon	Yuk3	Flying in Caribou Country: How to Minimize Disturbance from Aircraft	Mining and Petroleum Environment Research Group	2010
Yukon	Yuk6	Oil and Gas Best Management Practices - Seismic Exploration	Yukon Energy Mines and Resources	2006

Jurisdiction	Reference Code	Title	Author	Year
Yukon	Yuk4	Science-Based Guidelines for Management of Northern Mountain Caribou in Yukon	Yukon Environment	2016
Yukon	Yuk5	Assessing Caribou Vulnerability to Oil and Gas Exploration and Development in Eagle Plains, Yukon	Russell, D. and A. Gunn	2017
Yukon	Yuk1	Development of a Threshold Approach for Assessing Industrial Impacts on Woodland Caribou in Yukon	Anderson, R. B., S. J. Dyer, S. R. Francis, and E. M. Anderson	2002
Yukon	Yuk2	Yukon Species At Risk 2017	Environment Canada	2017
British Columbia	Bri1	Compendium Northern Woodland Caribou Forestry Guidelines in British Columbia	Cichowski, D.	2005
British Columbia	Bri2	BC Boreal Caribou Research and Effectiveness Monitoring Board Final Report 2018	BC Boreal Caribou Research and Effectiveness Monitoring Board	2018
British Columbia	Bri3	Implementation Plan for the Ongoing Management of Boreal Caribou (*Rangifer tarandus caribou* Pop. 14) in British Columbia	BC Ministry of Environment	2011
British Columbia	Bri4	Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia	BC Ministry of Forests, Lands and Natural Resource Operations North Area	2014
British Columbia	Bri19	Interim Operating Practices for Oil and Gas Activities in Identified Boreal Caribou Habitat in British Columbia	BC Ministry of Environment	2011
British Columbia	Bri5	Assessing Spatial Factors Affecting Predation Risk to Boreal Caribou Calves	DeMars, C.	2014
British Columbia	Bri14	Boreal Caribou Habitat Restoration	Golder Associates	2012
British Columbia	Bri15	Boreal Caribou Habitat Restoration Operational Toolkit for British Columbia	Golder Associates	2015
British Columbia	Bri16	Boreal Caribou Habitat Restoration Monitoring Framework	Golder Associates	2015
British Columbia	Bri17	Pilot Boreal Caribou Habitat Restoration Program Year 1 (2017) Implementation Report	Golder Associates	2017
British Columbia	Bri18	Enabling Solutions for Boreal Caribou Habitat Restoration: A Framework	Golder Associates	2018
British Columbia	Bri6	Boreal Caribou in Northeastern British Columbia: Biological Rationale, Data Summary & Literature Review	Goddard, A. D.	2009
British Columbia	Bri20	Boreal Caribou (*Rangifer tarandus*) in British Columbia: 2017 Science Review	Culling, D. E. and D. B. Cichowski	2017
British Columbia	Bri7	Boreal Caribou Recovery Implementation Plan	BC Ministry of Environment; BC Ministry of Forests, Lands and Natural Resource Operations	2017
British Columbia	Bri8	Peace Region Least-Risk Timing Windows: Biological Rationale	BC Ministry of Environment	2009
British Columbia	Bri21	Environmental Protection and Management Guideline	BC Oil and Gas Commission	2018
British Columbia	Bri9	Wildlife and Aircraft Operation: Assessment of Impacts, Mitigation and Recommendations for Best Management Practices in the Peace Region	Churchill, B., and B. Holland	2003

Jurisdiction	Reference Code	Title	Author	Year
British Columbia	Bri10	South Peace Northern Caribou Standardized Industry Management Practices	BC Ministry of Forests, Lands and Natural Resource Operations	2016
British Columbia	Bri11	Medzih Action Plan: Fort Nelson First Nation Boreal Caribou Recovery Plan	Fort Nelson First Nation	2017
British Columbia	Bri12	Testing Functional Restoration of Linear Features within Boreal Caribou Range	DeMars, C. and K. Benesh	2016
British Columbia	Bri13	Testing Functional Restoration of Linear Features within Boreal Caribou Range (Phase 1: Revised Proposal)	DeMars, C. and M. Dickie	2017
British Columbia	Bri22	Ecological Restoration Guidelines for British Columbia	Ministry of Water, Land and Air Protection	Unknown
Alberta	Alb15	Cenovus Caribou Habitat Restoration Project	Cenovus Energy	Unknown
Alberta	Alb16	Restoring Functional Caribou Habitat: Testing Linear Feature Mitigation Techniques in Northeast BC	Bohm, A., R. Dunham, C. DeMars, S. Williams, and S. Boutin	2015
Alberta	Alb17	Linear Feature Restoration in Caribou Habitat: A summary of current practices and a roadmap for future programs	Pyper, M., J. Nishi, and L. McNeil	2014
Alberta	Alb10	Master Schedule of Standards and Conditions	Government of Alberta	2018
Alberta	Alb1	Caribou Habitat Conservation Strategy	Bonar, R.	2015
Alberta	Alb11	Caribou Mitigation and Monitoring Plan: Guidance v.3 - DRAFT	Alberta Environment and Sustainable Resource Development	2013
Alberta	Alb12	Strategic Plan and Industrial Guidelines for Boreal Caribou Ranges in Northern Alberta	Boreal Caribou Committee	Unknown
Alberta	Alb2	Caribou Protection Plan Guidelines and Caribou Calving Information	Government of Alberta	2012
Alberta	Alb14	Operating Guidelines for Industrial Activity in Caribou Range -Northwest Alberta	Alberta Energy and Utilities Board	1994
Alberta	Alb3	Status of the woodland caribou (*Rangifer tarandus caribou*) in Alberta	Dzus, E.	2001
Alberta	Alb5	DRAFT Provincial Woodland Caribou Range Plan	Government of Alberta	2017
Alberta	Alb4	Alberta Woodland Caribou Recovery Plan, 2004/05-2013/14	Alberta Woodland Caribou Recovery Team	2005
Alberta	Alb8	Industry Bulletin: Caribou Protection Plan (CPP) Submission Requirements for Winter 2012/2013	Government of Alberta	2012
Alberta	Alb7	Wildlife Habitat Sensitivity Map	Government of Alberta	2017
Alberta	Alb6	Industry Bulletin: Caribou Protection Plan (CPP) Submission Requirements for Winter 2013/2014	Government of Alberta	2013
Alberta	Alb9	Interpreting the Areas of Wildlife Habitat Sensitivity Map	Government of Alberta	2017
Alberta	Alb13	Testing Fence Designs to Provide a Predator-Free Area for Boreal Caribou	DeMars, C., K. Benesh, R. Serrouya, and S. Boutin	2015
Alberta	Alb18	Managing Woody Materials on Industrial Sites: Meeting economic, ecological, and forest health goals through a collaborative approach	Vinge, T. and M. Pyper	2012

Jurisdiction	Reference Code	Title	Author	Year
Saskatchewan	Sas1	Land management strategies for the long-term persistence of boreal woodland caribou in central Saskatchewan	Arsenault, A. A. and M. Manseau	2011
Saskatchewan	Sas7	Woodland Caribou Range Assessment and Range Planning in Saskatchewan	Saskatchewan Ministry of Environment	
Saskatchewan	Sas4	Conservation Strategy for Boreal Woodland Caribou in Saskatchewan	Saskatchewan Ministry of Environment	2013
Saskatchewan	Sas9	Proposed Recovery Strategy Boreal Caribou Population - Initial SMA Concerns with Environment Canada Proposal December 2011	Saskatchewan Mining Association	2011
Saskatchewan	Sas2	Population Dynamics and Critical Habitat of Woodland Caribou in the Saskatchewan Boreal Shield	McLoughlin, P. D., K. Stewart, C. Superbie, T. Perry, P. Tomchuck, R. Greuel, K. Singh, A. Truchon-Savard, J. Henkelman, and J. F. Johnstone	2016
Saskatchewan	Sas8	Draft Range Plan for Woodland Caribou in Saskatchewan: Boreal Plain Ecozone - SK2 Central Caribou Administration Unit	Saskatchewan Ministry of Environment	2017
Saskatchewan	Sas3	Draft Agreement for the Conservation of the Woodland Caribou, Boreal Population ("Woodland Caribou") in Saskatchewan	Department of Environment and Climate Change Canada	Unknown
Saskatchewan	Sas6	Saskatchewan Activity Restriction Guidelines for Sensitive Species	Saskatchewan Ministry of Environment	2017
Saskatchewan	Sas10	Mineral Exploration Guidelines for Saskatchewan	Saskatchewan Mineral Exploration and Government Advisory Committee	2016
Saskatchewan	Sas5	Research Studies Related to the Woodland Caribou Range Assessment Process	Saskatchewan Ministry of Environment	Unknown
Manitoba	Man1	Distribution and Movements of Woodland Caribou on Disturbed Landscapes in West-Central Manitoba: Implications for Forestry	Lander, C.	2006
Manitoba	Man2	Conserving a Boreal Icon: Manitoba's Boreal Woodland Caribou Recovery Strategy	Manitoba Boreal Woodland Caribou Management Committee	2015
Manitoba	Man4	Bipole III Transmission Project: Caribou Technical Report	Joro Consultants Inc.	2011
Manitoba	Man3	Ecology and Habitat Selection of a Woodland Caribou Population in West-central Manitoba, Canada	Metsaranta, J. M. and F. F. Mallory	2007
Ontario	Ont7	Best Management Practices for Aggregate Activities and Woodland Caribou in Ontario	Government of Ontario	Unknown
Ontario	Ont5	Best Management Practices for Renewable Energy, Energy Infrastructure and Energy Transmission Activities and Woodland Caribou in Ontario	Government of Ontario	Unknown
Ontario	Ont4	Best Management Practices for Mineral Exploration and Development Activities and Woodland Caribou in Ontario	Government of Ontario	Unknown
Ontario	Ont2	Best Management Practices for Tourism Activities and Woodland Caribou in Ontario	Government of Ontario	Unknown

Jurisdiction	Reference Code	Title	Author	Year
Ontario	Ont1	Forest Management Guidelines for the Conservation of Woodland Caribou: A Landscape Approach	Racey, G., H. Allan, L. Gerrish, T. Armstrong, J. McNicol and J. Baker	1999
Ontario	Ont3	Draft Guidance for Assessing Impacts of Activities on Woodland Caribou and their Habitat	Government of Ontario	2013
Ontario	Ont6	Reducing Wildlife Collisions: What is working in Northeastern Ontario	Healy, A. and K. E. Gunson	2014
Ontario	Ont8	Forest Management Guide for Boreal Landscapes	Ontario Ministry of Natural Resources	2014
Quebec	Que2	Lignes Directrices Rattachées À L'objectif Sur La Protection De L'habitat des Espèces Menacées Ou Vulnérables Du Milieu Forestier	Déry, S. and L. Deschênes	2010
Quebec	Que4	Guidelines for the Forest Dwelling Caribou Habitat	Québec Forêts, Faune et Parcs	Unknown
Quebec	Que1	Lignes directrices pour l'aménagement forestier en regard du caribou forestier	Courtois, R., J. Oullet S. de Bellefeuille, C. Dussault, and A. Gingras	2003
Quebec	Que3	Lignes directrices pour l'aménagement de l'habitat du caribou forestier (*Rangifer tarandus caribou*)	Équipe de Rétablissement du Caribou Forestier du Québec	2013
Newfoundland and Labrador	Lab1	Environmental Protection Guidelines for Forestry Operations in Newfoundland and Labrador	Government of Newfoundland and Labrador	2018
Newfoundland and Labrador	Lab3	Recovery Strategy for Three Woodland Caribou Herds (*Rangifer tarandus caribou*; Boreal population) in Labrador	Schmelzer, I.	2004
Newfoundland and Labrador	Lab2	A Report on the Newfoundland Caribou	Newfoundland and Labrador Environment and Conservation	2015
Newfoundland and Labrador	Lab4	Geophysics for Mineral Exploration: a manual for prospectors	Scott, W. J.	2014

APPENDIX C. RECLAMATION GUIDANCE DOCUMENTS AND PUBLICATIONS.

The following resource documents from NWT and other jurisdictions describe specific practices that may contain suitable measures for reclaiming boreal caribou habitat:

- Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories (MVLWB/AANDC 2013), available at:

  https://mvlwb.com/sites/default/files/documents/wg/WLWB_5363_Guidelines_Closure_Reclamation_WR.pdf

- Site preparation for restoring forest cover on oil and gas sites, available at:

  https://cfs.nrcan.gc.ca/publications?id=39507

- Yukon Revegetation Manual: Practical Approaches and Methods, available at:

  www.yukoncollege.yk.ca/sites/default/files/inline-files/Yukon-Revegetation-Manual.pdf

- Handbook of Reclamation Techniques in the Yukon: Yukon Placer Mining Land Use Regulations, available at:

  www.emr.gov.yk.ca/mining/pdf/handbook_placer_regulations.pdf

- Restoring Functional Caribou Habitat: Testing Linear Feature Mitigation Techniques in Northeast BC (Bohm et al. 2015)
- Linear Feature Restoration in Caribou Habitat: A summary of current practices and a roadmap for future programs (Pyper et al. 2014)
- Managing Woody Materials on Industrial Sites: Meeting economic, ecological, and forest health goals through a collaborative approach (Vinge and Pyper 2012)
- Boreal Caribou Habitat Restoration Operational Toolkit for British Columbia (Golder Associates 2015)

There are also a few research articles on restoration of lichen communities that could provide guidance such as:

- Examining the role of terrestrial lichen transplants in restoring woodland caribou winter habitat (Rabai et al. 2017)

- Restoring *Cladonia* subgenus *Cladina* in a post mine environment (Rabai et al. 2018)
- Woodland caribou alpine range restoration: An application for lichen transplant (Duncan 2015)

APPENDIX D. NORTHERN LAND USE GUIDELINES

Northern Land Use Guidelines – Camp and Support Facilities
www.lands.gov.nt.ca/sites/lands/files/resources/nlug_camps_2015_english_16_sept_2015.pdf

Northern Land Use Guidelines – Seismic Operations
www.lands.gov.nt.ca/sites/lands/files/resources/nlug_seismic_2015_english_-_16_sept_2015.pdf

Northern Land Use Guidelines – Access: Roads and Trails
www.lands.gov.nt.ca/sites/lands/files/resources/nlug_roadstrails_2015_english_16_sept_2015.pdf

Northern Land Use Guidelines – Pits and Quarries
www.lands.gov.nt.ca/sites/lands/files/resources/nlug_-_pits_and_quarries_-_16_september_2015.pdf

APPENDIX E. MITIGATION SUMMARY TABLE

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Guidelines Section	Guidelines Sub-Section	Mitigation Hierarchy (Guidelines sub-section)	Mitigation	Impacts Mitigated								
				Habitat loss (direct habitat disturbance footprint)	Habitat fragmentation (splitting large patches into smaller patches)	Improved access / efficiency for predators or hunters	Improved habitat / forage resources for alternate prey (moose, bison, deer)	Reduced forage resources for boreal caribou	Sensory disturbance (noise, light, smells)	Sensory disturbance during vulnerable time	Direct injury / mortality boreal caribou	Barriers to caribou movement
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Avoid (2.1.2.1)	1. Use previously disturbed areas and existing access and avoid constructing new permanent roads and trails within caribou range.	X	X	X	X	X				X
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Avoid (2.1.2.1)	2. Employ alternate means of development to avoid and minimize surface disturbance.	X	X	X	X	X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Avoid (2.1.2.1)	3. Avoid locating new infrastructure within large patches (i.e., >100 km2) of mature forest to assist in limiting habitat fragmentation and/or causing a possible disruption in habitat connectivity.	X	X		X	X				X
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Avoid (2.1.2.1)	4. Avoid placing debris/slash piles on terrestrial lichen resources within boreal caribou habitat.	X				X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Avoid (2.1.2.1)	5. Locate and use new sources of granular materials near the development as much as possible, or, consider using existing borrow sources that are more distant if this results in less habitat disturbance. This should avoid the need to create additional linear features to access distant sources of granular materials. Proponents will have to assess which options will result in the lowest amount of new habitat disturbance.	X	X	X		X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Avoid (2.1.2.1)	6. Avoid using sites that support abundant terrestrial lichen resources as sources of granular material for building roads or for any other purpose within important caribou habitat.	X				X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Avoid (2.1.2.1)	7. Fence open excavations (e.g., trenches, pits, sumps) for as long as they pose a hazard or backfill/contour them to a stable angle of repose to prevent caribou entrapment or injury.								X	

Guidelines Section	Guidelines Sub-Section	Mitigation Hierarchy (Guidelines sub-section)	Mitigation	Impacts Mitigated								
				Habitat loss (direct habitat disturbance footprint)	Habitat fragmentation (splitting large patches into smaller patches)	Improved access / efficiency for predators or hunters	Improved habitat / forage resources for alternate prey (moose, bison, deer)	Reduced forage resources for boreal caribou	Sensory disturbance (noise, light, smells)	Sensory disturbance during vulnerable time	Direct injury / mortality boreal caribou	Barriers to caribou movement
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Avoid (2.1.2.1)	8. Contain and fence potential sources of industrial contamination (e.g., sumps, settling ponds) to prevent caribou from accessing and ingesting hazardous material.								X	
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Avoid (2.1.2.1)	9. Fencing should be designed to prevent entanglement of caribou antlers. Temporary fencing should use a material similar to that used in snow fences, and be at least 1.8 m high. For longer-term exclosure fencing, see Huisjer et al. 2015 for guidance on fencing specifications. Fenced areas should be regularly monitored to ensure caribou are not gaining access to the fenced area or becoming entrapped inside it.								X	
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Avoid (2.1.2.1)	10. Report to ENR any mineral lick observed during any type of development activity. Record the location and implement a 250 m no-activity buffer around the mineral lick and well-defined wildlife trails connecting to the mineral lick.	X				X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Avoid (2.1.2.1)	11. Avoid known mineral licks during spring (April to June). Proponents should contact the local ENR office to determine if mineral licks are present in their project area.	X				X		X		
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Avoid (2.1.2.1)	12. Avoid disruptions to drainage and groundwater flows that could affect the size and quality of mineral licks.	X				X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	13. Construct permanent camps within 100 m of arterial all-weather permanent access roads.	X	X			X				X
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	14. Minimize disturbance within important boreal caribou habitat by concentrating disturbances spatially and temporally.	X	X	X	X	X				X
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	15. Minimize the number and size of new clearings for infrastructure by using shared/common sites and incorporating existing footprint into project plans.	X	X	X	X	X				X

Guidelines Section	Guidelines Sub-Section	Mitigation Hierarchy (Guidelines sub-section)	Mitigation	Impacts Mitigated								
				Habitat loss (direct habitat disturbance footprint)	Habitat fragmentation (splitting large patches into smaller patches)	Improved access / efficiency for predators or hunters	Improved habitat / forage resources for alternate prey (moose, bison, deer)	Reduced forage resources for boreal caribou	Sensory disturbance (noise, light, smells)	Sensory disturbance during vulnerable time	Direct injury / mortality boreal caribou	Barriers to caribou movement
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	16. Remotely operate relevant infrastructure to the greatest extent possible.	X	X	X	X	X	X	X		
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	17. Use alternative access means such as lower class access (refer to road classifications in NLUG for roads and trails) or helicopter support for maintenance activities of infrastructure.	X	X	X		X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	18. Locate activities that have the potential to disturb important boreal caribou habitat as close as possible to existing or proposed anthropogenic features.	X	X	X	X	X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	19. Project footprints should only be as large as necessary to conduct activities safely.	X	X	X	X	X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	20. Demonstrate that the timeframe needed to carry out scheduled activities is minimized.						X	X		
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	21. Manage activities to occur in area-based clusters to reduce the timeframe of vegetation clearing and other disturbances.						X	X		
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	22. Minimize activities that disturb the ground surface to reduce the amount of topsoil that is moved, unless there is a specific silvicultural or reclamation prescription for the site that recommends ground disturbance to facilitate regeneration.	X				X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	23. Minimize impacts to terrestrial lichen resources by avoiding disturbance of duff layer and vegetative root mat.	X				X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	24. Minimize impacts to terrestrial lichen resources within important boreal caribou habitat by conducting activities during winter with an adequate snowpack.	X				X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	25. Maintain known and potential mineral licks and associated wildlife trails to maximise caribou access to them during the snow-free	X				X				

Guidelines Section	Guidelines Sub-Section	Mitigation Hierarchy (Guidelines sub-section)	Mitigation	Impacts Mitigated								
				Habitat loss (direct habitat disturbance footprint)	Habitat fragmentation (splitting large patches into smaller patches)	Improved access / efficiency for predators or hunters	Improved habitat / forage resources for alternate prey (moose, bison, deer)	Reduced forage resources for boreal caribou	Sensory disturbance (noise, light, smells)	Sensory disturbance during vulnerable time	Direct injury / mortality boreal caribou	Barriers to caribou movement
			season.									
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	26. For existing activities within 500 m of mineral licks, minimize site use and sensory disturbance during the snow-free season.	X				X	X			
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Minimize (2.1.2.2)	27. If working within 500 m of a mineral lick cannot be avoided: a. maintain visual screening (i.e., vegetative cover) to provide security and escape cover around mineral lick sites and associated trails; b. implement a minimum 250 m operational setback with connectivity to adjacent forested areas being maintained; and c. if development cannot be located outside of the operational setback, contact ENR for further guidance.	X				X	X			
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Restore (2.1.2.3)	28. Undertake progressive reclamation activities throughout the life of the project. An early and progressive approach to reclamation should facilitate habitat suitability returning to pre-disturbance conditions and reduce the duration of habitat disturbance.	X	X	X	X	X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Restore (2.1.2.3)	29. Use reclamation prescriptions within important boreal caribou habitat to encourage rapid re-establishment of caribou habitat to a functional level similar to pre-development (this will require baseline documentation of pre-disturbance habitat suitability). Examples include site preparation treatments to make compacted soil rough and loose, mounding to create higher/drier microsites, or scattering of coarse woody debris in sufficient volumes.	X	X	X	X	X				
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Restore (2.1.2.3)	30. Artificial seeding should be done using seed mixes of plant species native to the NWT so as not to introduce non-native or invasive species.	X			X	X				

Guidelines Section	Guidelines Sub-Section	Mitigation Hierarchy (Guidelines sub-section)	Mitigation	Impacts Mitigated								
				Habitat loss (direct habitat disturbance footprint)	Habitat fragmentation (splitting large patches into smaller patches)	Improved access / efficiency for predators or hunters	Improved habitat / forage resources for alternate prey (moose, bison, deer)	Reduced forage resources for boreal caribou	Sensory disturbance (noise, light, smells)	Sensory disturbance during vulnerable time	Direct injury / mortality boreal caribou	Barriers to caribou movement
All Industrial Sectors (2.1)	Habitat Disturbances (2.1.2)	Restore (2.1.2.3)	31. Refer to Section 1.8.4 and Appendix C for additional reclamation information.	X			X	X				
All Industrial Sectors (2.1)	Sensory Disturbances (2.1.3)	Avoid (2.1.3.1)	32. Schedule project activities that have the potential to cause sensory disturbance to occur outside of the highest risk timing windows for boreal caribou (see Table 1).						X	X		
All Industrial Sectors (2.1)	Sensory Disturbances (2.1.3)	Avoid (2.1.3.1)	33. Implement a project-specific program to monitor boreal caribou sightings within 500 m of construction, operations, closure or any other project activities. It is recognized that the ability to detect caribou within 500 m of project activities may be limited when operating within densely forested habitat.						X		X	
All Industrial Sectors (2.1)	Sensory Disturbances (2.1.3)	Avoid (2.1.3.1)	34. If caribou are observed within 500 m prior to starting up activities that could lead to sensory disturbance or startling of caribou, delay starting up until the caribou have moved at least 500 m away from the site of project activities. If caribou approach active project activities within 500 m, monitor and document their behaviour, and suspend activities if there is an imminent threat of injury or mortality to the caribou.						X		X	
All Industrial Sectors (2.1)	Sensory Disturbances (2.1.3)	Minimize (2.1.3.2)	35.Minimize sensory disturbance within and directly adjacent to important boreal caribou habitat at all times, but especially during the medium and highest risk timing windows as defined in Table 1.						X	X		
All Industrial Sectors (2.1)	Sensory Disturbances (2.1.3)	Minimize (2.1.3.2)	36.Minimize idling of equipment and vehicles to the extent practicable.						X			
All Industrial Sectors (2.1)	Sensory Disturbances (2.1.3)	Minimize (2.1.3.2)	37.Do not approach boreal caribou closer than 250 m if they are encountered when traveling by snowmobile.						X		X	
All Industrial Sectors (2.1)	Sensory Disturbances (2.1.3)	Minimize (2.1.3.2)	38.Implement a no harassing, feeding, or approaching wildlife policy (including but not limited to boreal caribou).						X		X	

Guidelines Section	Guidelines Sub-Section	Mitigation Hierarchy (Guidelines sub-section)	Mitigation	Impacts Mitigated								
				Habitat loss (direct habitat disturbance footprint)	Habitat fragmentation (splitting large patches into smaller patches)	Improved access / efficiency for predators or hunters	Improved habitat / forage resources for alternate prey (moose, bison, deer)	Reduced forage resources for boreal caribou	Sensory disturbance (noise, light, smells)	Sensory disturbance during vulnerable time	Direct injury / mortality boreal caribou	Barriers to caribou movement
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	[General guidance]	It is recommended that proponents develop traffic and access management plans applicable to all development stages (i.e., project planning, construction, operations, closure and reclamation) to assist with avoiding and minimizing project effects on boreal caribou and their habitat.	X	X	X			X		X	
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	[General guidance]	Proponents (for a new access trail or road) should consider the impact on boreal caribou populations from access into an area (e.g., program timing to avoid medium and highest risk timing windows; avoid the destruction or fragmentation of important caribou habitat).	X	X	X			X	X		
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	[General guidance]	Proponents should consider management actions that reduce or limit predator access associated with industrial activities. This can be achieved in part by: - not providing access to new remote areas or areas within caribou habitat that were not previously accessible; - not plowing or packing access into or within caribou habitat during winter except when necessary; and - deactivating access that is no longer required.	X	X	X						
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	[General guidance]	Proponents should also consider management actions that minimize line-of-sight distances along linear features, except where longer line-of-sight is required for safety on roads, and maintain visual screening.			X			X			
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	[General guidance]	To assist with reducing cumulative disturbances across the landscape, it is recommended that existing infrastructure (e.g., trails, roads) be used for personnel and equipment travel when conducting operations to the greatest extent feasible. Where the development of new access trails or roads and other linear features cannot be practicably avoided, proponents should consider designing temporary structures instead of permanent structures, including winter roads,	X	X	X						

Guidelines Section	Guidelines Sub-Section	Mitigation Hierarchy (Guidelines sub-section)	Mitigation	Impacts Mitigated								
				Habitat loss (direct habitat disturbance footprint)	Habitat fragmentation (splitting large patches into smaller patches)	Improved access / efficiency for predators or hunters	Improved habitat / forage resources for alternate prey (moose, bison, deer)	Reduced forage resources for boreal caribou	Sensory disturbance (noise, light, smells)	Sensory disturbance during vulnerable time	Direct injury / mortality boreal caribou	Barriers to caribou movement
			to the greatest extent feasible.									
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Avoid (2.1.4.1)	39. Avoid constructing new linear features (e.g., roads, trails, pipeline rights-of-way, seismic lines) in important boreal caribou habitat.	X	X	X						
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Avoid (2.1.4.1)	40. Plan roads and design features of roads (e.g., pullouts, construction staging areas) so that they are not in conflict with important boreal caribou habitats or habitat features.	X	X	X		X				
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Avoid (2.1.4.1)	41. Avoid the establishment of road systems with “circle” or “loop” routes. In some instances, a “loop” route may be acceptable if it is a way of reducing traffic density or reduces the length of linear disturbance.	X	X	X						
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Avoid (2.1.4.1)	42.Deactivate access within or to important boreal caribou habitat as soon as operations are complete (as described in Section 2.1.4.3).	X	X	X			X			
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Avoid (2.1.4.1)	43. Build temporary winter access over lakes instead of land.	X	X	X						
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	44.Plan and implement work so that disturbances furthest from all-weather access roads are completed in early winter.			X			X	X		
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	45. Coordinate unavoidable access into important areas of boreal caribou habitat to minimize the duration and footprint.	X	X	X			X			
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	46. Minimize duration of new access in and near important boreal caribou habitat.			X			X			

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				Habitat loss (direct habitat disturbance footprint)	Habitat fragmentation (splitting large patches into smaller patches)	Improved access / efficiency for predators or hunters	Improved habitat / forage resources for alternate prey (moose, bison, deer)	Reduced forage resources for boreal caribou	Sensory disturbance (noise, light, smells)	Sensory disturbance during vulnerable time	Direct injury / mortality boreal caribou	Barriers to caribou movement
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	47. Avoid creating barriers to caribou movement with construction activities. Where the top height of potential barriers (e.g., strung pipe, soil stockpiles, windrows, berms) exceeds 1.0 m in height for more than 72 hours in duration, it is recommended that physical breaks (10 m gaps) in pipe/material be employed every 300 m.		X							X
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	48. For project-related traffic, use convoys to create predictable gaps in traffic to minimize any barrier effects to caribou.									X
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	49. Enforce speed limits on project roads within boreal caribou habitat that ensure drivers have enough time to react in a safe manner if caribou are encountered on the road or trail.								X	
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	50. Identify reduced speed limits and/or seasonal travel restrictions during the highest risk timing windows as defined in Section 2.1.1.							X	X	
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	51. If caribou are observed on the road or trail, stop traffic as far back as safely possible. If after five minutes the caribou have not moved off the road, vehicles may proceed slowly and cautiously (<20 km/h).								X	
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	52. Use busses to transport workers to and from work sites to reduce traffic volumes and vehicle collision risk to boreal caribou.						X		X	
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	53.Place signs along roads to increase awareness of potential vehicle collisions with boreal caribou in areas where they are known or observed to frequently cross the road.								X	
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	54. Limit the use of road chloride-based salts (NaCl, CaCl2) in boreal caribou range to prevent attracting the animals and reduce potential for vehicle-caribou collisions.								X	
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	55. Limit snow plowing of access and maintenance roads to only those required for current operations or maintenance and/or emergency access.			X						

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All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	56. Minimize the height of snowbanks (less than 1 m in height), to the greatest extent feasible.									X
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	57. Place snowbanks on alternate sides of an access route with 10 m gaps at 300 m intervals to provide breaks for wildlife egress.		X						X	X
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	58. Deactivate temporarily unused roads by leaving them in a condition to discourage motorized access and passage by predators (as described in Section 2.1.4.3).			X						
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	59. Minimize the width of linear corridor right-of-ways to the narrowest width possible while still meeting requirements for safe operations. Practices that should help achieve this include, but are not limited to: a. combining and overlapping new linear corridors with existing rights-of-way (e.g., access, utility corridors, and pipelines) to the greatest extent possible; b. incorporating pullouts for access; c. making minor incremental increases along existing linear corridors (slowly increase the width of an existing corridor instead of creating a new one parallel to it); d. using variable widths along access and/or pipeline rights-of-way; and e. sharing workspaces (e.g., sharing road access, using the same right-of-way clearing for a transmission line and pipeline corridor).	X	X	X	X	X				

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All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Minimize (2.1.4.2)	60. Provide adequate visual screening along easements, right-of-ways, and decommissioned roads that can accommodate obstructions. Minimize line-of-sight along linear features (<200 m). Practices that should help achieve this include, but are not limited to: a. line blocking using woody debris, rollback, tree bending, planting, and/or transplanting seedlings (including mounding on wet sites); b. constructing doglegs at access intersections (i.e., sharp bends along road/trail segments as they approach intersections to minimize line-of-sight); c. leaving shrub or tree bands along the linear corridor; and d. minimizing root mat and duff disturbance to expedite site re-vegetation.			X						
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Restore (2.1.4.3)	61. Fully deactivate and reclaim trails and roads once use is no longer required through combined use of physical control measures including, but not limited to: a. removal of creek crossings, bridges, and culverts; b. re-contouring to surrounding topography; c. de-compacting of soil; d. rollback of slash and stockpiled soil/organic matter; e. restoring vegetation to the pre-development state and species mix by replanting trees and restoring terrestrial lichen resources if appropriate or allowing natural regeneration to occur; f. if natural regeneration is not possible, consider environmental bioengineering at strategic locations along the linear corridor using appropriate vegetation species; g. creating barriers at junctions with active trails and roads; and	X	X	X	X	X				

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			h. minimizing compaction and encouraging regeneration by preventing ongoing use of inactive trails and roads.									
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Restore (2.1.4.3)	62. Use signage, gates, or other barriers and consider the removal of bridges and culverts to discourage the use of deactivated or temporarily unused roads by residents.			X			X		X	
All Industrial Sectors (2.1)	Linear Feature Disturbances (2.1.4)	Restore (2.1.4.3)	63. Refer to Section 1.8.4 and Appendix C for additional reclamation information.	X	X	X	X	X				
All Industrial Sectors (2.1)	Aircraft Disturbance (2.1.5)	Avoid (2.1.5.1)	64. Do not fly below 300 m (1,000 feet) when over important boreal caribou habitat.						X			
All Industrial Sectors (2.1)	Aircraft Disturbance (2.1.5)	Avoid (2.1.5.1)	65. Avoid flying over, or alter your flight path to avoid, important boreal caribou habitats, especially during the highest risk timing windows as defined in Table 1.						X	X		
All Industrial Sectors (2.1)	Aircraft Disturbance (2.1.5)	Avoid (2.1.5.1)	66. Do not take-off or land in important boreal caribou habitats during the highest risk timing windows (see Table 1).						X	X		
All Industrial Sectors (2.1)	Aircraft Disturbance (2.1.5)	Avoid (2.1.5.1)	67. Do not directly fly towards boreal caribou with young or towards important caribou habitat features (e.g., mineral licks, calving areas).						X			
All Industrial Sectors (2.1)	Aircraft Disturbance (2.1.5)	Avoid (2.1.5.1)	68. If/when boreal caribou are spotted from the air, do not fly towards, follow, chase, harass, hover over, or circle them.						X			
All Industrial Sectors (2.1)	Aircraft Disturbance (2.1.5)	Avoid (2.1.5.1)	69. Ascend to a higher flight path or veer away if you observe running, panic, or other startle responses in caribou below.						X			
All Industrial Sectors (2.1)	Aircraft Disturbance (2.1.5)	Avoid (2.1.5.1)	70. Refer to the GNWT “Flying Low? Think again….” brochure for further details: https://www.enr.gov.nt.ca/sites/enr/files/128-flying_low_brochure_proof.pdf						X			
All Industrial Sectors (2.1)	Aircraft Disturbance (2.1.5)	Minimize (2.1.5.2)	71. Schedule flights during the lowest risk category for boreal caribou (as defined in Table 1), and maintain over-flight altitudes >300 m (1000 ft) unless a lower altitude is specifically						X	X		

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			required to meet the objectives of the survey.									
All Industrial Sectors (2.1)	Aircraft Disturbance (2.1.5)	Minimize (2.1.5.2)	72. Contact the regional ENR office for information if low-level flights are necessary during the calving period. During the calving period, caribou go into hiding to have their calves. Low flying is especially harmful, stressing the female, which can cause separation from calves and lead to calf mortality.						X	X		
All Industrial Sectors (2.1)	Aircraft Disturbance (2.1.5)	Minimize (2.1.5.2)	73.Observe wildlife from a safe distance to minimize disturbing and stressing boreal caribou. If the animal changes its behaviour, you are too close. Limit your time in the area and avoid surprising (e.g., sneaking up on) wildlife.						X			
All Industrial Sectors (2.1)	Aircraft Disturbance (2.1.5)	Minimize (2.1.5.2)	74. Use natural open areas or existing clearings, where available, for helipads. Clearing of new helipads must not exceed 35 m in diameter, or as required for safe operation.	X	X		X	X				
Additional Guidelines for Oil and Gas Exploration and Production (2.2)	Oil and Gas Exploration and Production (2.2.1)	Avoid (2.2.1.1)	75 Avoid seismic operations during the highest risk timing window for boreal caribou as defined in Table 1.						X	X		
Additional Guidelines for Oil and Gas Exploration and Production (2.2)	Oil and Gas Exploration and Production (2.2.1)	Avoid (2.2.1.1)	76. Demonstrate in applications for new seismic exploration that reprocessing existing seismic data cannot be used in place of field operations.	X	X	X			X			
Additional Guidelines for Oil and Gas Exploration and Production (2.2)	Oil and Gas Exploration and Production (2.2.1)	Minimize (2.2.1.2)	77. Use low-impact seismic lines rather than conventional seismic lines in boreal caribou range, and especially within important boreal caribou habitat.	X	X	X	X	X				

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Additional Guidelines for Oil and Gas Exploration and Production (2.2)	Oil and Gas Exploration and Production (2.2.1)	Minimize (2.2.1.2)	78. Where existing disturbances occur (i.e., clearings and 4 m or less in width cleared lines with vegetation <1 m in height and within 400 m of proposed seismic program line), avoid creating new seismic lines >5 m wide and reuse existing lines.	X	X	X	X	X				
Additional Guidelines for Oil and Gas Exploration and Production (2.2)	Oil and Gas Exploration and Production (2.2.1)	Minimize (2.2.1.2)	79. Where existing disturbances are not available, new seismic lines should strive to meet the following guidelines: a. Receiver lines should be meandering, under-canopy, and hand-cut and should not exceed 1 m in width. Tree avoidance techniques should be followed (i.e., no trees with a diameter at breast height >20 cm to be removed). Receiver lines should be spaced at least 200 m apart unless the receiver lines have zero new cut (i.e., lines should not require any clearing), in which case no spacing restrictions apply; b. Source lines should be meandering and should not exceed 3 m in width. Tree avoidance techniques should be followed to limit line-of-sight to <50 m. Source lines should be spaced at least 200 m apart unless the source lines have zero new cut (i.e., lines should not require any clearing), in which case no spacing restrictions apply; and c. Doglegs (i.e., sharp bends along road/trail segments as they approach intersections) should be employed at all intersections with other linear features to minimize line-of-sight.	X	X	X	X	X				
Additional Guidelines for Oil and Gas Exploration and Production (2.2)	Oil and Gas Exploration and Production (2.2.1)	Minimize (2.2.1.2)	80. Heli-portable seismic programs must have shot hole drop zones <7 m in diameter.	X	X	X	X	X				

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Additional Guidelines for Oil and Gas Exploration and Production (2.2)	Oil and Gas Exploration and Production (2.2.1)	Minimize (2.2.1.2)	81.If brush is disposed of in windrow piles, the height of the piles should not exceed 1 m (snow free), with a minimum 10 m gap every 300 m and at any identified game or trapping trails.									X
Additional Guidelines for Oil and Gas Exploration and Production (2.2)	Oil and Gas Exploration and Production (2.2.1)	Minimize (2.2.1.2)	82. Pipelines should use existing linear corridors and proponents may revegetate (as directed by relevant regulatory agencies) on top of active underground pipelines to maintain a minimum level of forest cover that would be acceptable for caribou following construction, ensuring that any residual linear corridor is <4 m wide. If human or predator access is still possible (insufficient vegetation height and density), access should also be effectively managed on the pipeline corridor using methods such as berms, woody debris, or another suitable strategy as determined by the GNWT, relevant regulators and the proponent.	X	X	X	X	X				
Additional Guidelines for Oil and Gas Exploration and Production (2.2)	Oil and Gas Exploration and Production (2.2.1)	Restore (2.2.1.3)	83. Refer to the guidelines listed in Sections 2.1.2 and 2.1.4, and the additional resources listed in and Appendix C or any other practices that can assist in the reclamation of caribou habitat.	X	X	X	X	X				
Additional Guidelines for Forestry (2.3)	Forest Management Planning (2.3.1)	-	84. Use natural forest pattern harvesting methods to emulate landscape patterns created by natural disturbances, both in distribution and scale, and reduce road network requirements.		X	X						
Additional Guidelines for Forestry (2.3)	Forest Management Planning (2.3.1)	-	85. Maintain the connection between summer and winter habitat by placing cut blocks and access roads to maintain spatial connectivity between large habitat patches (i.e., >100 km2).		X							

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Additional Guidelines for Forestry (2.3)	Forest Management Planning (2.3.1)	-	86. Avoid short to medium term (10 year) sequencing of major harvesting operations in portions of caribou range that currently receive high levels of caribou use. Subsequent harvest sequencing should consider the maintenance of caribou habitat.	X			X	X				
Additional Guidelines for Forestry (2.3)	Forest Management Planning (2.3.1)	-	87. Select harvest rotation and stand age distribution that maintain old forest stands that mimic natural range of variation.	X				X				
Additional Guidelines for Forestry (2.3)	Forest Management Planning (2.3.1)	-	88.Plan site regeneration to the pre-development forest stand composition and avoid converting conifer dominated stands to deciduous or mixedwood stands.	X			X	X				
Additional Guidelines for Forestry (2.3)	Forest Harvesting/Silviculture (2.3.2)	Avoid (2.3.2.1)	89.Avoid building access roads in areas of abundant terrestrial lichen resources.	X				X				
Additional Guidelines for Forestry (2.3)	Forest Harvesting/Silviculture (2.3.2)	Avoid (2.3.2.1)	90. Favour construction of temporary winter roads for logging.	X	X	X		X				
Additional Guidelines for Forestry (2.3)	Forest Harvesting/Silviculture (2.3.2)	Avoid (2.3.2.1)	91. Complete harvesting activities prior to the caribou calving season (see Table 1) and concentrate harvesting activities in the early- to mid-winter periods to reduce activity during the high-risk late winter period. Where planned timber harvest blocks overlap with preferred late winter habitat, schedule those blocks for harvest during early- to mid-winter rather than late winter.						X	X		
Additional Guidelines for Forestry (2.3)	Forest Harvesting/Silviculture (2.3.2)	Avoid (2.3.2.1)	92.If a calving area is close to a winter harvest sequence, those areas should be prioritized for earlier harvest.						X	X		
Additional Guidelines for Forestry (2.3)	Forest Harvesting/Silviculture (2.3.2)	Minimize (2.3.2.2)	93. Demonstrate that the area required for operations has been minimized (e.g., through providing detailed maps of all project components and activities).	X	X			X				

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Additional Guidelines for Forestry (2.3)	Forest Harvesting/Silviculture (2.3.2)	Minimize (2.3.2.2)	94. Avoid the creation of a persistent footprint. Use minimal disturbance techniques, such as accessing harvest areas on frozen ground and preventing topsoil removal during operations, unless otherwise specified by a silvicultural prescription that recommends ground disturbance to promote natural regeneration. Minimizing ground disturbance during harvest and site preparation should promote lichen persistence after logging.					X				
Additional Guidelines for Forestry (2.3)	Forest Harvesting/Silviculture (2.3.2)	Minimize (2.3.2.2)	95. Limit impacts on large patches of terrestrial lichen resources by winter logging.					X				
Additional Guidelines for Forestry (2.3)	Forest Harvesting/Silviculture (2.3.2)	Minimize (2.3.2.2)	96. Implement a project specific program to monitor boreal caribou sightings within 500m of forest harvesting and silviculture activities or any other forestry activities.						X		X	
Additional Guidelines for Forestry (2.3)	Forest Harvesting/Silviculture (2.3.2)	Minimize (2.3.2.2)	97. If boreal caribou are observed within 500m of a harvest block or access construction activities or any silviculture activity that could lead to sensory disturbance or startling of caribou, delay starting up until the caribou have moved at least 500m away from the site of forestry activities. If caribou approach active forestry activities within 500m, monitor and document their behaviour, and suspend activities if there is an imminent threat of injury or mortality to caribou.						X		X	
Additional Guidelines for Forestry (2.3)	Forest Harvesting/Silviculture (2.3.2)	Restore (2.3.2.3)	98. Refer to the guidelines listed in Sections 2.1.2 and 2.1.4, and the additional resources listed in and Appendix C or any other practices that can assist in the reclamation of caribou habitat.	X	X	X	X	X				

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Additional Guidelines for Mineral Exploration and Mining (2.4)	Mineral Exploration and Mining (2.4.1)	Avoid (2.4.1.1)	99. There are no additional avoidance guidelines to include for mineral exploration and mining. Refer to the avoidance guidelines for all development sectors (Section 2.1).									
Additional Guidelines for Mineral Exploration and Mining (2.4)	Mineral Exploration and Mining (2.4.1)	Minimize (2.4.1.2)	100. Establish cut lines using hand tools only (e.g., machete, fern hook, axe, chainsaw).						X		X	
Additional Guidelines for Mineral Exploration and Mining (2.4)	Mineral Exploration and Mining (2.4.1)	Minimize (2.4.1.2)	101. Flag and peg lines <1.5 m wide whenever possible.		X	X						
Additional Guidelines for Mineral Exploration and Mining (2.4)	Mineral Exploration and Mining (2.4.1)	Minimize (2.4.1.2)	102. Stagger base lines and leave vegetation breaks to limit predator travel and search efficiency.		X	X						
Additional Guidelines for Mineral Exploration and Mining (2.4)	Mineral Exploration and Mining (2.4.1)	Minimize (2.4.1.2)	103. For airborne geophysical surveys, if not possible to avoid important caribou habitat, maintain higher flight altitudes during the medium and highest risk timing windows (see Table 1) and if caribou are startled ascend to a higher flight path or veer away from the animals.						X	X		
Additional Guidelines for Mineral Exploration and Mining (2.4)	Mineral Exploration and Mining (2.4.1)	Minimize (2.4.1.2)	104. For ground geophysical surveys requiring a generator, maintain survey wires close to the ground to avoid caribou from becoming entangled; remove wires as soon as possible after the survey is completed.								X	

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Additional Guidelines for Mineral Exploration and Mining (2.4)	Mineral Exploration and Mining (2.4.1)	Minimize (2.4.1.2)	105. Demonstrate how frequency of activity and noise from drilling rigs and drilling equipment will be minimized. At pump set-up sites, minimize the number of trails to the shoreline and set-up areas (i.e., use the same pump set-up as much as possible).			X			X			
Additional Guidelines for Mineral Exploration and Mining (2.4)	Mineral Exploration and Mining (2.4.1)	Minimize (2.4.1.2)	106. For manual and mechanical stripping, leave large trees standing (i.e., no trees with a diameter at breast height >20 cm to be removed), if feasible. All stripped overburden stockpiled on site should be backfilled and contoured to a stable angle of repose.	X	X	X					X	X
Additional Guidelines for Mineral Exploration and Mining (2.4)	Mineral Exploration and Mining (2.4.1)	Minimize (2.4.1.2)	107. Construct trenches to allow for easy escape of caribou. Fence excavations until they are backfilled (see Section 2.1.2 for further guidance on fencing design). Backfill and/or contour pits and trenches to a stable angle of repose.								X	X
Additional Guidelines for Mineral Exploration and Mining (2.4)	Mineral Exploration and Mining (2.4.1)	Minimize (2.4.1.2)	108. Install fencing of an appropriate height (minimum 1.8 m) around potential hazards (e.g., infrastructure, footprint, settling ponds, tailings ponds, open pits, mine shafts) during and after construction to prevent caribou injury or entrapment.								X	
Additional Guidelines for Mineral Exploration and Mining (2.4)	Mineral Exploration and Mining (2.4.1)	Restore (2.4.1.3)	109. Refer to the guidelines listed in Sections 2.1.2 and 2.1.4, and the additional resources listed in and Appendix C or any other practices that can assist in the reclamation of caribou habitat.	X	X	X	X	X				